COMMISSIONING SECURITY REPORT

Chapter 12

NAME OF THE PROJECT: **New Nuclear Power Source Project at Jaslovské Bohunice**

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CONTENTS

12. ENSURING RADIATION PROTECTION

This part of the ZBS describes the radiation , summarizes the basic legislative requirements for the radiation protection method and also contains a description of the project in terms of their fulfilment.

Due to the specifics of radiation , protectionthis part of the ZBS uses a single term worker .for both internal employees and external staff of the NPP

12.0 Basic legislative requirements

Reference [1] - Act of the National Assembly of the Slovak Republic No. 87/2018 Coll., on Radiation Protection and on Amendments and Additions to Certain Acts

Reference [2] - Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Coll. on ensuring radiation protection

Reference [3] - Decree of the Nuclear Safety Authority of the Slovak Republic No.430/2011 Coll., which establishes details of the requirements for nuclear safety

Reference [4] - Decree of the Slovak Nuclear Power Authority No. 431/2011 Coll. on the quality management system

Nuclear safety in relationto radiation protection is to the subjectrequirements of Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex 3, Part B, point G [3]. Radiation protection, ventilation systems and filtration systems. These requirements fall into two groups: general requirements for radiation protection and technical requirements, in particular for filtration systems. The general requirements of Decree No 430/2011 Coll. on radiation protection are fully detailed in Act No 87/2018 Coll. and Decree No 99/2018 . of the Ministry of Health of the Slovak Republic, .. iecompliance with the requirements of Act Coll87/2018 .
Z. z. [1] and Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Z. z. 2] is a sufficient condition for meeting the general requirements for radiation protection under Decree 430/2011 Z. .z
z. Annex 3, Part B, point G are covered by other parts of the ZBS, in particular Chapter 9 of the ZBS.

For completeness it should be noted that the implementation of the programme NPP radiation protection will also respect the relevant requirements of Decree of the Slovak Nuclear Safety Authority No. 431/2011 . [4] in Annex 1 and 6.

Due to the scope and level of detail of the generally binding legislation cited, not the separately binding legislative requirements for the individual parts of this arelisted separately. This is due alsoto the structuring of this chapter in accordance with the recommendations of the guidance of the SR Nuclear Safety Authority for the preparation of the safety report. In the relevant sections the ,compliance of the NPP radiation protectionwith generally binding is highlighted.

IAEA Recommendations

Reference [5] - IAEA SSR-2/1 (Rev. 1) Specific Safety

- *Requirement No 5 and No 81*

Reference [6] - IAEA GSG-8 - Radiation Protection of the Public and the Environment, 2018

12.1 Optimising radiation protection and safety

The radiation protection system will be , in optimisedaccordancewith current legislation and recommendations, e.g. ICRP [7]. to the conditions of the specific technology and the NPP . projectIt will be based the onfollowing general principles:

a) Any practical activity involving exposure should generate sufficient benefit to exposed persons or society to outweigh the radiation harm caused (justification for the practical activity).
b) The exposure of to persons any single source of radiation will be kept as low as reasonably achievable (principleALARA). This minimisation requirement applies to the following quantities or areas of practical :
   - the size of individual doses,
   - the number of exposed persons,

- the likelihood of significant exposures where it is not what values of these quantities will be achieved, taking account intoeconomic and social factors; this principle is implemented by limiting the doses to individuals or the risks to individuals in the event of potential exposures (optimisation of protection).

c) The exposure of individuals resulting from the combination of all relevant sources of radiation will be governed by the requirement that no individual is exposed to radiation risks that are unacceptable under normal circumstances (limitsindividual dose and risk). Thus, the requirements of Act No 87/2018 Coll., Sections 15 to 20., will be fully respected

d) The safety of the operation of the NJZ Project will be ensured at all times:

- Implementing a quality system for radiation protection in accordance with the requirements.
- By carrying out monitoring.
- Medical supervision of workers in the controlled zone.
- Ensuring continuous supervision of radiation protection.
- By informing workers about the risks of their work and providing a system for training them and verifying their competence according to the importance of the work .they do
- Classification of sources of ionising radiation , in usecategorisation of workplaces and categorisation of radiation workers.
- The definition of monitoring and control zones, taking into account the estimation of the expected exposure in normal operation and the likelihood and extent of potential exposure.
- Preventive measures to restrict the entry of workers into monitored and controlled areas (physical barriers) so that accidental exposure of persons .cannot occur
- Equipping with the site instruments, equipment and devices, in sufficient quantity and quality to ensure all measurements specified in the monitoring , programmethe internal emergency plan, the radiation protection assurance programme and to ensure all measurements carried out in the operational stability or tests in the conditions of the licence disposalset by the Authority, as appropriate, and to maintain them in good working order.
- Equipping with workers in the controlled zone personal protective equipment with corresponding shielding effect and corresponding protective devices.
- By maintaining radioactive contamination of surfaces, clothing, equipment or structural parts of workplaces below the guideline values for radioactive contamination.

The NJZ project will ensure :

- the impact of the operation of the workplace on the surroundings is kept to the lowest reasonably achievable level necessary to ensure that the established limits are not exceeded and that the protection of the population in the vicinity of the workplace ,is optimised
- ionising radiation sources are stored securely and will be subject to accountability to that they are not handled by unauthorised persons and to prevent loss or theft of the source or damage to .it

The main principles of radiation that will be respected in the NPP :project

a) no person shall receive a radiation dosein excess of the permitted limit dose during normal operation of the NPP Value;
b) the exposure of employees during all operational conditions will comply with the ALARA ;principle
c) benefits will be kept within limits to avoid unevenness in the distribution of benefits;
d) will be taken to protect employees from receiving a benefit close to the annual limit value;
e) appropriate practical measures will be takento prevent accidents with radiological consequences;
f) appropriate practical measures to will be taken minimise the radiological consequences of any accident/incident.

The operator shall carry out optimisation of radiation protection before starting to carry out an activity giving rise to exposure, during the course of an activity giving rise to exposure, before implementing a measure to ensure radiation protection in an existing exposure situation or an emergency exposure situation and before starting to remove a radioactive substance from a workplace with an increased risk of exposure to natural radiation sources by assessing various alternative protective measures, during the implementation of radiation protection measures in the context of an existing exposure situation or an emergency exposure situation, ensuring regular training and application of optimisation methods in the light of new approaches.

The Operator shall ensure that prohibited activities .cannot occur in any of the operating modes in the NICU

In the of caseobtaining a permit pursuant to Section 29 or Section 25(2) of Act No. 87/2018 Coll. [1], the operator shall ensure compliance with the conditions for the provision of the service important from the of view of pointradiation protection specified in the permit and shall proceed in accordance with the operational documentation attached to the application for a permit, shall ensure the quality , systemupdate training of the professional guarantor, if mandatory, shall keep and maintain documentation in the scope of Annex 6, Part of 6 Act No. 87/2018 Coll...

The operator shall report to radiation facts, send documents and submit reports on the provision of the radiation protection-relevant service the extent and within the time limits specified by the competent radiation protection authority in the authorisation or registration.

12.2 Sources of ionising radiation

The NPS project assumes the occurrence of all source categories from insignificant to very significant. All ionising radiation sources considered in the project will be classified according to the apportionment criteria.

12.2.1 *Sources of ionising radiation*

1) The primary source of ionising radiation will be nuclear fuel. The main measure to minimise sources of ionising radiation will be the high containment of the nuclear fuel, with the aim of achieving the lowest possible level of leakage in the fuel .cover
2) Secondary sources of ionising radiation:
    - Fission products that enter the coolant from surface contamination of the core structural elements by fissile material, in particular the fuel .cladding
    - Primary circuit , refrigerant activation productse.g. ^{16}N, ^{14}C, ^{24}Na, ^{41}Ar, ^{42}K. The formation of the nitrogen nuclide 16N will be dominated by the reaction (n,p) type on the oxygen nuclei ^{16}O.
    - Corrosion products e.g. ^{51}Cr, ^{55}Fe, ^{59}Fe, ^{54}Mn, ^{56}Mn, ^{58}Co.
    - Tritium that cannot be captured after primary circuit water is treated at treatment plants.
    - Radioactive waste such as work equipment, equipment , partsradioactive concentrate from evaporators and cartridges of ion exchange filters of cleaning stations.
    - Possible secondary circuit activity in case of steam generator .leaks

From a viewradiation protection point of, the handling of spent nuclear fuel, the management of with operational radioactive waste and repairs and revisions of technology during outages.

In addition to the neutron flux, whichis a itselfsource of ionising radiation and a potential source of radiation doses, which andis generated in the reactor core during , the neutron activation process and the subsequent generation of activation products . are significantalsoAt the end of the lifetime of a nuclear power plant, activation products form the most significant part of the radiological inventory (other than spent fuel) and the largest proportion is found in the reactor . The total activity of these products may be in the order of ~10 E15 Bq. The most significant activation products include ^{3}H, ^{14}C, ^{22}Na, ^{36}Cl, ^{39}Ar, ^{41}Ca, ^{54}Mn, ^{55}Fe, ^{59}Ni, ^{63}Ni, ^{60}Co, ^{65}Zn, ^{93}Mo, ^{93}Zr, ^{94}Nb, ^{108m}Ag, ^{110m}Ag, ^{125}Sb, ^{133}Ba, ^{134}Cs, $^{152,154,155}Eu$, ^{166m}Ho.

Another important group of radionuclides in terms of their origin are fission . productsThese radionuclides remain as part of the fuel, but a proportion of them gradually enter the primary circuit . through leaksThe largest migration

ability has a group of noble gases and gaseous radioiodine. Leakage of these products generally occurs whenever the primary circuit , e.is unsealedg. during a fuel . changeOther important fission products include ^{90}Sr, ^{99}Tc, ^{106}Ru, ^{129}I, ^{137}Cs, ^{144}Ce. Heavy nuclei , are alsoformed in the fuelin particular $^{238,239,241}Pu$, ^{241}Am, $^{242,244}Cm$. Other isotopes of uranium .remain present and are produced by neutron capture and subsequent decays

12.2.2 *Possible routes and routes of exposure of persons*

To apply safety principles, the will NPP Project be designed and operated so that all radiation sources are under strict technical and administrative control. However, this principle will not preclude limited doses from exposure or the release of permitted quantities of radioactive substances into the environment from nuclear power plants in operational states. Such exposures and radioactive releases will be strictly controlled and kept as low as reasonably achievable, in accordancewith regulatory and operational limits well as asradiation requirements.

During normal , operationonly routine exposures are expected when performing maintenance and surveillance . activitiesIn most , casesthe exposure pathway will consist of particle emissions the fromprimary process equipment.

For the selected specific NPP project, the will be requirements for technical means to provide the radiation protection necessary for the identification of sources of ionising radiation and radioactive substances, including emerging activation and corrosion products, and the control of the transport of sources of ionising radiation and radioactive substances in the systems of the nuclear installation and in the working determined.

12.2.3 *Source article for emergency conditions*

The next stage of the licensing documentation will specifically describe the sources of ionising radiation inside the NPP in both operational and emergency conditions and possible ways of exposing to radiationpersons . Also in the next stage of the licensing dossier, the will be specific source member for emergency conditions, including nuclear fuel meltdown conditions, and specific quantitative characteristics . specifiedThe NPS source term for accident conditions for the purpose of assessing the magnitude of the area hazard by the envelope approach without knowledge of the specific technology is givenin [8].

12.3 Design characteristics of radiation protection

The design characteristics of radiation protection consist of a set of technical and organisational measures. The used following principles, consistentwith the general principles set out in the introduction to Chapter 12.1, .areto ensure radiation protection

a) Non-exceedance of radiation exposure limits under Act No. 87/2018 . [1] § 15 will be ensured by optimisation of activities under Act . 87/2018 . § 14, compliance with general safety requirements e.g. Decree of the Ministry of Health of the Slovak Republic No. 99/2018 . [2] § 6, continuous supervision of radiation protection in a nuclear installation under Decree of the Ministry of Health of the Slovak Republic No. 99/2018 . § 12, etc.
b) The basic tools for fulfilling the ALARA requirement will be the application of the radiation protection principles implemented in the NPP , projectchapter 12.3.1 paragraph b), the rigorous optimisation of activities, see following paragraphs c) and d), and the maintenance of a high level of occupational .safety culture
c) Unequal distribution of benefits will be prevented by planning of marginal benefits according to Act No 87/2018 Coll. § 16 and by close personal monitoring of workers according to the requirements of Act Coll87/2018 .
Z. z. § 64 and Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Z. z. § 16 to 19.
d) Protection of workers from receiving a dose approaching the annual limit value will be ensured in a manner similar to thatdescribed in paragraph (c).
e) The adoption of all reasonable practical measures to prevent an accident with radiological consequences is guaranteed by the fact that the design NPP will fully respect the WENRA requirements for new reactors [9].
f) The minimisation of the radiation consequences of any accident/incident is ensured in a similar way as in paragraph (e), .. ieNPP
will be equipped with a highly resistant container.

Details of radiation principles, design features and exposure reduction measures are described in and other Text.

12.3.1 *Radiation protection principles implemented in the NPP project to ensure radiation protection*

The radiation protection principles implemented in the NPP project to ensure radiation protection are summarised in the following points:

a) The non-exceedance of the permitted limit of valueradiation doses will be ensured by the optimisation of activities under the of requirements Act No. 87/2018 Coll. [1] § 14 and by the consistent fulfilment of the obligations under Act Coll. 87/2018 .
Z. z. z. § 36 and the implementation of measures under the requirements of § 55 and 56.

b) The for the ALARA . principle will be applied exposure of employees during all operational statesALARA will be implemented on the basis of general experience and experience from operating nuclear facilities in the Slovak Republic, e.g. [10]. The ALARA principle will be applied in the following areas: radioactive discharges, worker doses and radioactive waste . managementThe basic measures for the application of ALARA will include:
   - Technical solutions to enable seamless decontamination of equipment.
   - Safe working practices.
   - Mapping the real radiation situation.
   - Detailed planning of work operations.
   - Staff .training
   - Organisational and technical provision of works.
   - Organisational structure, dePba of powers and responsibilities.

c) In the optimisation of activities, will individual not-toexceed dose limits be defined, according to the requirements of Act No. 87/2018 . [1] § 16, so that radiation doses of workers are kept within the prescribed limits, Act No. 87/2018 . § 15, and to avoid unevenness of dose .distributions

d) A monitoring system will be in place to protect workers from receiving a dose closeto the annual limit value, see Chapters 12.4 and 12.5.

e) Within the framework of the project, NPP all practical measures will be taken to prevent the occurrence of accidents with radiological consequences. These measures are dealt with in the relevant chapters of the ZBS, see Chapters 2 to 11. and Chapters 13 to 18 of the ZBS.

f) Practical measures to minimise the radiological consequences of any accident/incident are dealt with in the relevant chapters of the ZBS, see Chapters 6, 15 and 19.

12.3.2 *Design characteristics of equipment providing radiation protection*

To ensure radiation protection, the will be following requirements :respected in the NPP project

a) The obligation to minimize the source term follows from the requirements of legislation but also from generally accepted guidelines and recommendations, e.g. [9]. The design of the NPP will fully respect all these requirements so that the impact on the surroundings of the NPP is minimised or virtually eliminated, see Chapter 6 of the ZBS.

b) Minimisation of the total working time spent in the source zone will be achieved for servicing activities by dividing the Controlled Area, see Chapter 12.3.3(d), into servicing and semi-servicing areas with access . controlDuring maintenance activities, the will be the main tools for minimising the total working time spent in the source zone training of personnel leading to the efficient execution of activities, the technical preparation of the work, including methods of optimising the activities so as to maintain the continuity of the work without unnecessary downtime, e.g. lifting equipment, material .supply

c) The reduction of radiation levels in the zone with radiation sources or around any equipment (component) stems from Act No. 87/2018 Coll. § 76, § 84 and § 162 of which paragraph (1) is regulated by Decree No. 99/2018 Coll. of the Ministry of Health of the Slovak Republic will implement the measures referred to in Act No. 87/2018 Coll. of Annex

č. 3. Organisational measures will be implemented in the form of operating rules, working procedures and within the management . systemTechnical measures leading to minimisation of radiation levels around radiation sources will be part of the design the ofNPP, see Chapter 12.3.3.

d) Reduction of the formation of activated corrosion products will be ensured by the appropriate choice of construction materials. The materials used for the manufacture of primary circuit components and other downstream equipment that willbe in contactwith ionising radiation or contaminated fluids will be alwaysselected with to regardthe parameters of the operating fluids and the requirements for maintaining their necessary quality. When selecting materials exposed to neutron flux, will be paid the special attention tocobalt and nickel content of the steels so as limit tothe formation of cobalt . isotopesSee Chapter 4 of the ZBS . for detailsMinimisation of transport and deposition of activated corrosion products will be ensured by continuous cleaning of the coolant. See Chapter 9 of the ZBS .for details

12.3.3 *Measures to reduce exposure of employees*

Measures to reduce the exposure of NPS workers will cover:

a) Ensuring minimisation of contamination through the selection of corrosion , the resistant materialsuse of an appropriate water , chemistry regimeincreasing the cleaning capacity of the primary coolant and decontamination of the plant resulting from the design of the NPP, which will consist of a proven next generation . reactor designFor details, see in particular chapters 4, 5 and 9 of the BSS.

b) Measures to reduce outdoor exposure:

- The use of radiation shielding follows from the design of the NPP, which will consist of a proven next-generation . reactor designThe shielding will consist mainly of concrete and steel structures so that the requirements of Act No 87/2018 Coll. [1] § 76 and Decree No 99/2018 of the Ministry of Health of the Slovak Republic Z. z. 2] § 3.
- The requirements of Act No. 87/2018 Coll., § 36 (1) (v), § 41 (1) (c) and 4), § 44 and § 79 (7) for general knowledge of radiation protection and competence do not require explicitly training on mock-ups. Training on mock-ups will be provided in the training of personnel within the limits of the capability dependent on the scope of supply of the NPS and the availability of specialised training centres at the NPS .supplier
- DiaPk control, in accordancewith the requirement of Decree of the Ministry of Health of the Slovak Republic No. 99/2018 . § 3, will be used everywhere
  where the dose rate would exceed the dose rate equivalent of 2.5 µSv/h .
- Manipulators, screens, portable shielding and protective barriers will be used where necessary
  to reduce external exposure.

c) Measures to reduce internal exposure:

- Adequate isolation shall be provided in workplaces of categories I to III, see paragraph (d)(2)
  in accordance with the requirements of Act No. 87/2018 Coll., § 82 and Annex No. 5.
- In workplaces of categories I to III, will be ventilation provided in accordance with the requirements of Decree of the Ministry of Health of the Slovak Republic No. 99/2018 § 6, paragraphs (12) to (17). Decontamination will be carried out by special procedures or directly at the NICU facilities or in specialised workshops. If it is not possible to perform decontamination to the minimum level prescribed in Act No 87/2018 ., Annex 5, or if such decontamination is impractical, a level will be chosen such that, together with other measures (shielding, ventilation, exposure), the timeexposure limits specified in Act No 87/2018 Coll., § 15, .are not exceeded during the work
- The NICU will enable effective decontamination of persons and workplaces in accordance with the requirements of Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Coll., § 3, paragraph (2).
- The use of protective clothing and protective breathing apparatus will be applied in fullcompliance with
  Act . 87/2018 Coll. § 55 and 56.

d) Categorisation of the NPS into zones and categorisation of workplaces:

- In accordance with the level of radiation and contamination, to ensure radiation protection at the workplace in accordance with the requirements of Act No. 87/2018 . § 59 to § 62 will be implemented by defining the so-called protection zone , which will include the monitored zone - § 60, the controlled zone - § 61 and the restricted access zone - § 62. The requirement under § 62, .. ithe restricted access , zonewill be addressed by defining service and semi-service areas, where semi-service areas will constitute restricted access .areas
- Designated workplaces in the Protection Zone will be categorised in accordance with the requirements of Act No. 87/2018 Coll.
  z. § 22 (8).

e) The NPP workers will be categorised according to the working conditions into two categories A and B according to the requirements of Act No.87/2018 ., § 57, including the implementation of the corresponding measures for work control and work , .. supervisioniespecial monitoring for category A, equipment with personal dosimeters, protective equipment according to § 61 and ...

f) Monitoring of individuals and work areas will be ensured in accordance with the requirements of Act No. 87/2018 Coll.
z. § 36 (1) i), (p), (r) as as the wellrelevant requirements of § 42, § 55, § 60, § 61.

- Personal monitoring of both Category A and B workers will be provided in accordance with the requirements of Act No. 87/2018 Coll. § 64 and § 70.
- Monitoring of workplaces will be ensured in accordance with the requirements of Act No. 87/2018 Coll., § 86, including monitoring of discharges of substances into the environment under § 87. The details of the instrumentation and its location for monitoring the spatial dose equivalent , the powervolumetric activity of radionuclides in the air, the surface activity, or the scattered and leaked radiation will be specified in the next stages of the projectNPP .
- Monitoring of the radiation situation in the vicinity of the NPP will be provided by the existing set of monitoring stations, which can be supplemented by mobile workstations .if necessary

g) The use of warning signs to control access and prevent unintentional access to radiation sources and unnecessary exposure will be applied in accordancewith the requirements of Act No. 87/2018 Coll., § 80, Decree of the Ministry of Health of the Slovak Republic No. 99/2018, § 3, § 15, paragraph (2).

12.3.4 *Air handling systems in the controlled area zone*

The ventilation systems used in the controlled area shall provide artificial air exchange or negative pressure to prevent the escape of radioactive contamination into the surroundings outside the controlled area. Due to the location of the installation on a site with other nuclear installations , the in operationfresh air intake air handling systems will be equipped with a suitable filtration system to capture any radioactive substances from the incoming air. Exhaust air systems will provide a suitable working environment in the controlled area, using negative pressure gradients to provide a functional system to prevent the spread of radioactive contamination of aerosols and gases. The filtration system of the exhaust air system will enable the filtration and containment of radioactive aerosols and radioactive gases discharged from the installation into the environmentin accordance with the conditions of the decision of the ÚVZ SR. The filtration system will ensure continuous measurement of the negative pressure and the efficiency of the filtration stages and will be designed in such a way the thatexhaust air filtration system will not be inoperative . in any planned operating conditionThe air handling system will also allow for the replacement of filter media during operation if necessary without adversely affecting the filtration parameters. Details are givenin Chapter 9 of the ZBS.

12.3.5 *Design solution from the radiation protection point of view*

In the development of the project, the application of the protection of persons and the population against the negative impact of ionising radiation in connectionwith the operation of a nuclear installation .will be ensured on the basis of the current scientific and technical level of knowledge, taking into account economic and social factors

First of all, the project will deal with the appropriate placement of technological equipment and, in terms of radiation protection, ensuring their shielding by the use of appropriate building , i.. e protection will be used. The level of these sources required will depend on the need for people to enter the vicinity or area of these facilities.

When siting large equipment that will be major sources of ionising radiation (e.g. active media , filtersactive media)tanks, the shall appropriate structural design of the premises ensure shielding from the surrounding areas, taking into account the need for workers to carry out their activities in the surrounding areas. In view of the assumption that these areas will achieve the spatial dose equivalent dose rate levels for the establishment of a restricted area, these areas shall be structurally or mechanically secured against uncontrolled entry of persons.

Piping routes containing active media will be located outside service areas and areas used for the normal passage of people, e.g. in , where necessary or located in unshielded areas, will be these routes sufficiently shielded. At the same time, any handling areas used to carry out servicing activities on these ducts (e.g. control points for X-ray tests, etc) . shall be shadedAs these pipelines will be operated with active media, they will be designed and constructed as maintenance-free .as possible

Routine operational equipment, the operation of which will require regularly scheduled maintenance, will be located in the space so that the building construction will allow shielding of workers performing work on that equipment from other equipment in the common area. Where dispersion of equipment working with active media is anticipated, will the project address the interception and directed collection of these media.

All equipment controls in the controlled zone , shallwhere practicable, be located in areas with the lowest possible spatial dose equivalent . powerThis rule will be appliedto both mechanical and electronic equipment. As as farpossible, design procedures will be applied so that not only the but also the signals and outputs from the measurements of the various parameters are transmitted and displayed outside the exposed areas.

On the basis of the project, it will be to possiblecarry out planned activities at equipment and elements where undesirable conditions are expected to occur (deposition, material) wearby using service points for drainage and decontamination.

The next stage of the licensing documentation will describe the design characteristics of the NPP facilities that will provide radiation . The description will cover in particular:

a) minimizing the source member;
b) minimising the total working time spent in the source zone;
c) reducing the level of radiation in the zone with radiation sources or around any equipment (component);
d) reducing the formation of activated corrosion products and minimising their transport and deposition. A

description of measures to reduce worker exposure will specifically cover:

a) minimising contamination by selecting corrosion-resistant , materialsusing an appropriate water , chemistry regimeincreasing the cleaning capacity of the primary coolant and decontaminating the equipment;
b) use of shielding, prior training on mock-ups, remote control and other activities to reduce external exposure;
c) reducing indoor exposure by isolation, ventilation, decontamination and the use of protective clothing and protective breathing apparatus;
d) categorisation of the NPS into zones in accordance with radiation and contamination levels and restriction of access into a controlled zone;
e) categorisation of NHS staff according to working conditions and implementation of appropriate measures to control and supervise the ;
f) monitoring individuals and work areas;
g) the use of warning signs to control access and prevent inadvertent access to radiation sources and unplanned exposure.

The next stage of the licensing dossier shall also include a description of the stationary instrumentation for monitoring radiation levels and for continuous monitoring of airborne radioactive substances and a description of the means of

for monitoring and decontamination of workers in the NPP, including fixed and portable instruments for surface measurements contamination during operational and emergency conditions.

12.4 Benefit limitations and rating of benefits

Optimization in radiation protection as one of the basic principles of using radiation sources will be a prerequisite for the NPP Project for all works in the environment with ionizing radiation and will therefore form an integral part of the preparation, implementation and evaluation of works in the NPP . protection zoneThe requirements will applyto all personnel whowill prepare, implement and evaluate work in the NPS protection zone and whowill assess the impact of the NPS.

Optimisation in radiation protection will ensure that the doses to personnel carrying out work in the Protection Zone are as low as reasonably achievable while respecting economic and social factors and avoiding unnecessary and unjustified exposures of persons.

Radiation protection will be optimised by assessing and comparing the alternative radiation solutions are that for the planned activity: assessing the necessary costs of the relevant protective measures and evaluating the collective and individual doses to workers and the doses to representative groups of the population., respectively

The optimisation of radiation protectionwill compare the costs of different measures to improve radiation protection (change of source, shielding, special instruments, protective equipment) with the financial evaluation of the expected benefit of the measure.

The activity leading to the exposure will be assessed in terms of the potential risk to health and the environment from ionising radiation on the basis of :

a) Characteristics
   - the used sources of ionising radiation and the normal way in which they are used,
   - the generated radioactive waste and the conditions for its storage and disposal,
   - the area affected by the performance of an activity leading to exposure and the area likely to be affected in a radiation accident,

b) the risk of a radiation accident or , the severity of its consequences and the possibility of intervention,
c) the anticipated exposure of persons resulting from conditions of normal operation, foreseeable malfunctions and deviations from normal operation, unauthorised use or ,
d) the anticipated impact of the activity on the working environment and the environment,
e) the difficulty of ensuring radiation protection and operational ,safety
f) requirements for equipment and workplace provision for safe work with sources of ionising radiation.

Prior to the commissioning of a workplace where an activity leading to exposure to radiation is carried out, the shall protection zones under Section of 59 Act No 87/2018 . be defined and marked [1].

The protection zones under the preceding paragraph shall be defined in such a way as to, by regulating the movement of persons, by the creation of protective barriers, by building modifications, by the mode of work, by the extent of monitoring and by other measures appropriate to the used sources of ionising radiation and the way in which they are handled, that sources of ionising radiation are handled only by persons who are competent, who professionally have been instructed in the possible risks of the work and who are equipped with personal protective equipment and work equipment, and that the consequences of a radiation accident are limited .as far as possible

For the purpose of defining buffer zones, a 40-hour workweek and 50 workweeks per calendar are not expected to be exceeded.

12.5 Radiation protection programme

The radiation protection programme shall be part of the documentation submitted to the radiation protection supervisory authority

87/2018 ., Annex 6 [1], in the following stages of the NPP Project and will provide information on technical, organisational and administrative measures taken to ensure the objectives of the programme radiation protection for NPP . workersIt will also describe and assess the means and equipment determining the technical of levelthe radiation protection programme for workers, including compliance with the requirements of the safety standards. It will be demonstrated that the radiation protection programme is based on a prior assessment of the radiation risk below the site of occurrence and severity. The assessment will include:

a) The assignment of responsibility for radiation protection and safety for different levels of management will be dealt with withinthe organisational structure and quality management system in accordance with Decree of the Slovak Nuclear Safety Authority No. 431/2011
Z. z. § 4, including Annexes 1, 4 and 6, [4]. The administrative system of radiation protection management shall respect Act No. 87/2018 Coll., § 36 (1) (i) to (z) and 2) as as well§ 40 [1].

b) The designation and functions of qualified experts; providing radiation protection, will be addressed in accordancewith the requirements of Act No. 87/2018 Coll., § 42 and § 43. A will be radiation unit established within the organisational structure of the NPP, which will perform the duties of the expert representative under the requirements of Act No 87/2018 Coll.
§ 42. The radiation protection unit will include a alsopermanent dosimetry service, which will provide
the duties of the person with direct responsibility as requiredby Act No. 87/2018 Coll., § 43.

c) Integration of radiation protection into other areas of health and safety such as industrial hygiene, occupational safety and fire safety will be addressed withinthe procedural approach under Decree of the Slovak Nuclear Safety Authority No. 431/2011 Coll§ 3. The integration of radiation protection into other areas of occupational safety will be based on the experience of NPPs operating in the Slovak Republic.

d) The application of the principle of optimisation of radiation protection will be set so that the number of exposed persons, the level and the probability of their exposure are kept permanently as low as reasonably achievable, taking into account the current level of scientific and technical knowledge and economic and social factors. Optimisation shall be addressed in accordance with the requirements of Act No 87/2018 Coll., Section 14 and Annex 2. See also chapters 12.1 and 12.3.1.

e) The classification of individual work zones/workplaces will be addressed in the radiation protection programme in accordance with the requirements of Act No. 87/2018 Coll., § 59 to § 61 and Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Coll, § 15 by defining the so-called *Controlled Zone*, chapter 12.3.3 paragraph d). The control of access to these workplaces will be regulated and managed in accordance with the requirements of Act No. 87/2018 Coll., § 61 and Decree No. 51/2006 Coll. the Slovak ofNuclear Power Authority so as to prevent the entry of unauthorised persons.

f) Issuance of regulations and procedures related to radiation protection will be in accordance with the requirements of Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 ., Annex No. 4, Act No. 87/2018 Coll., § 66 and Annex No. 6, Decree of the Ministry of Health of the Slovak Republic No. 99/2018
Z. z. § 12.

g) Monitoring of individual workers at the workplace and workplaces, creation and maintenance of records on radiation , exposure and contaminationresults of radiation level monitoring and other relevant information will be provided by the radiation protection unit under the of requirements Act No. 87/2018 Coll., § 36, § 42, § 55, § 57, § 61,
§ 64, § 65, § 66, § 67, § 70, § 86. Monitoring shall be carried out in accordance with the monitoring plan under Decree of the Ministry of Health of the Slovak Republic No. 99/2018 § 16. The relevant operating rules and procedures for monitoring of workers shall take into account the requirements of Decree of the Ministry of Health of the Slovak Republic No. 99/2018 § 17 to § 20.

h) The limitation on the number of workers working in the *Controlled Zone* is implicit in the Controlled function, Chapter 12.3.3(d)(1).The planning and management of work in the *Controlled Zone* from a radiation protection point of view will be guided by efforts to minimise the radiation burden on workers, see (d). In accordance with the general requirements of Law No. 87/2018 § 35, § 36, will only activities leading to radiation exposure be carried out the onbasis of a permit (Work Order). The permit will include alsomeasures to ensure radiation protection (so-called R order).

i) The selection and use of protective clothing and protective work equipment will be governed by the requirements of Act No. 87/2018, § 55, § 61, § 81 and Decree of the Ministry of Health of the Slovak Republic No. 99/2018, § 3, § 6. The scope and characteristics of clothing and equipment will be defined in the operating rules and procedures issued under paragraph f) .in accordance with the requirements of Act No. 87/2018, Annex No. 6

j) The use of shielding and other technical means of radiation protection will be governed by the principles set out in in paragraph (i).
k) The health supervision of the workers will be managed by the unit radiation protection under Act No. 87/2018, § 42, .para 70. When the is exceededlimit dose , the shall order an radiation protection service extraordinary medical examination under Section 15 Health surveillance shall include medical preventive examinations and proof of medical fitness. The activity shall be governed by the requirements of Law No 87/2018, Sections 71 to 75.
l) Reduction of ionising radiation sources is, by the of naturethe NPP's activities, possible onlyif radioactive waste . is minimisedThis aspect is addressed in Chapter 11 of the ZBS.
m) Worker , training programmeincluding retraining, programme review and verification of qualifications workers in the of fieldradiation protection will be governed by the requirements of Act No. 87/2018 Coll., § 41, § 43, § 44, § 50, § 53, § 54.
n) Investigation and reporting of any radiation accidents (in relationto exceedance of dose limits in source activities) and taking corrective measures to prevent recurrence of such an accident will be an integral part of the NPP management system in accordance with the requirements of Decree of the Slovak Nuclear Safety Authority No. .431/2011 Z. z. Annex No 1 (ak), al).
o) Measures related to preparedness for emergency situations (in relation to exceeding the limit doses for activities with radiation) sourceand response to them will be part of the planned protective measures in accordance with Act No. 87/2018 Coll., § 14, § 20, or § 146. Under the circumstances, comprehensive emergency response plans will be developed based on anticipated events and related scenarios for workplaces with a concentration of workers.

12.6 Monitoring of radiation characteristics

Monitoring will be carried out by monitoring, measuring, evaluating, verifying and recording quantities and parameters important for monitoring the radiation situation. Parameters and quantities relevant for radiation protection characterising the ionising radiation field and the occurrence of radionuclides in and around the plant will be monitored according to the Monitoring Plan and the Radiation Protection Assurance Programme with appropriate .

The project will be equipped with stationary and mobile means for monitoring the radiation situation, which will enable the signalling of exceeding the established monitoring levels during operational conditions and in the accidents . considered by the projectThe stationary monitoring systems will provide information on the measured quantities to the unit control room, to the emergency control centre, to orthe technical support centre, orto the radiation protection . control roomThe stationary monitoring systems will provide monitoring :in all states of the nuclear installation

- batch power inputs
- the volumetric activity of radioactive substances in air and water
- surface contamination
- the volumetric activity of radioactive substances in the systems of a nuclear installation.

The monitoring plan will be set up to allow verification of compliance with the exposure , limitsto demonstrate that radiation protection is optimised and to ensure deviations from normal operation .in a timely manner

Monitoring during a radiation accident or emergency will be alsodescribed in the Site Emergency Plan in accordance with Act . 87/2018 Coll., Annex No. 6, Section 5, point C.

The monitoring process will be carried out in with accordancethe monitoring plan, which will be developed in the later stages of the NJZ project in accordance with the requirements of Act No. 87/2018 Coll., § 86 (4), Decree of the Ministry of Health No. 99/2018 Coll., § 16, including the establishment of reference monitoring levels in accordance with the requirements of Decree of the Ministry of Health No. 99/2018 Coll., § 23. The monitoring plan will cover the monitoring:

a) work areas of the workplace and areas adjacent to work areas,
b) the surroundings of the workplace,
c) Personal,
d) the discharge of radioactive substances from the workplace into the .

a) Monitoring of workplaces and adjacent areas will be ensured in accordance with the requirements of the Decree of the Ministry of Health of the Slovak Republic
No. 99/2018 Coll., § 19, § 23. The monitoring will cover the requirements of Act No. 87/2018 ., § 86

a) spatial dose equivalent ,power
b) the volumetric activity of radionuclides in air,
c) area activity, or
d) scattered and escaping radiation.

The site monitoring system will be usedto control the radiation situation in individual construction objects and alsoto control the radiation of situationindividual technological systems of the power plant (containing radioactive medium). The monitoring system will be designed to provide immediate information on changes in the radiation situation in the plant's process systems and associated work areas.

Site monitoring shall be carried out on the basis of a monitoring plan on a continuous, repeated or operational basis for a specific exposure activity in order to assess and ensure the acceptability of that exposure activity from a radiation point of view. Monitoring will be provided by stationary systems and, if necessary, by mobile equipment. The equipment will be equipped with an alarm function in the event of an exceedance of the set parameters.

As part of the workplace monitoring programme, will surface contamination of persons and objects be measured using stationary or portable instruments:

- in the sanitary loop areas at the boundary of the entry and exit of the controlled zone
- in sanitary nodes in controlled zones
- in other locations where surface contamination may occur

Gauges and will be used to monitor the workplace willbe regularly maintained, verified for functionality, calibrated and metrologically verified.

The monitoring planshall, depending on the type of activity leading to the exposure, include monitoring of the workplace during normal operation, during foreseeable deviations from normal operation, during radiation accidents or radiation incidents.

The monitoring plan shall take into account the nature of the workplace and the extent of the activity leading to exposure is thatcarried out at the workplace and shall include:

- the quantities relevant from the of view of pointradiation protection tobe monitored, the method, extent and frequency of measurements,
- the procedure for evaluating the results of measurements and the method of ,
- the reference levels and the measures to be taken if they are exceeded,
- specification of methods,
- specification of the parameters of the types of measuring instruments and devices .used

b) The monitoring of the workplace surroundings will cover the monitoring of radioactivity of the working environment, technology, premises and surroundings of the nuclear facility in accordance with the requirements of Act No.87/2018 § 87 and Decree of the Ministry of Health of the Slovak Republic No.99/2018 Coll§ 12,
§ 29

By monitoring the surroundings of a workplace with a source of ionising radiation, the operator ensures:

- checking compliance with the permitted values for discharges into the ,
- early detection of releases of radioactive substances into the ,
- objectifying the impact of discharges into the environment; and
- assessment of the radiation exposure of the population.

Ambient monitoring will be carried out under a monitoring plan and will beused during operation to check compliance with permitted discharges and monitoring levels to confirm safe operation in relationto the surroundings and, in emergency conditions, to detect and assess early any leakages and their consequences for the surrounding population

of the new nuclear source and on the environment.

Ambient monitoring will be provided by monitoring sites fromwhichthe magnitude and distribution of effective doses and their dose rates . will be calculated on the basis of measurements of dose equivalents from external radiation, sampling and determination of the radionuclide content of air, water sources and selected environmental compartments and foodstuffsThis will ensure the assessment of the exposure of a representative person.

Ambient monitoring will be put in place before the nuclear source is commissioned to provide evidence of the initial condition of the surroundings of the future source and thusto verify the monitoring plan.

Discharge of radioactive substances into the environment means a controlled is continuous release or campaign discharge of radioactive substances into the air, surface water or public sewers which systematically monitored. The operator shall keep recordsof discharges of radioactive .

The operator of the new source shall ensure an assessment of the impact of the operation of the site and the discharge of radioactive substances on the environment around the site at least once a year. At least once a year, it shall assess the impact of the operation of the site on the population and evaluate the exposure of a representative person.

Records of monitoring of the workplace environment will be by keptthe operator for 10 years. The operator shall submit to the Health Authority Slovak an annual balance sheet of radioactive substances released into the environment from the site for the previous calendar year.

The monitoring of the radiation situation at selected locations within the NPP site in the of eventa radiation accident or accident will be by a systemradiation , which will include systems providing continuous radiation monitoring and be willcarried out by means of probes measuring the dose rate at selected locations within the site. Measurements at other locations will be carried out by a technician using portable equipment.

The monitoring of the surroundings NPP will be sufficient to provide the basis for monitoring and evaluation of the exposure of the population in the vicinity of nuclear installations on the basis of knowledge of relevant radiation parameters (such as dose rate values or measured radionuclide activities in individual compartments) and other parameters that affect the individual exposure pathways of the surrounding population. The ambient monitoring system will be alsoused to detect long-term trends in the radioactivity of the components of the environment and to correlate the evolution of the values of the relevant variables with the existence of nuclear installations. In the of eventemergencies, will be the system used to indicate radiation effects and to verify the effectiveness of possible measures.

The radiation monitoring system of the NPP surroundings will be integrated with the relevant systems of the Bohunice nuclear installations and will
aimed at control:

- radiation characteristics in the surroundings by measuring dose rates above the ground surface and by measuring radionuclide activity in aerosols and fallout in the near-surface atmosphere,
- contamination of paved areas of the site and soil surfaces of the surrounding terrain of the site,
- subsurface water in the unsaturated (undrained) geological strata by means of drainage and seepage probes in the vicinity of tanks where potentially contaminated water ,is stored
- groundwater in the saturated (aquifer) geological layer on a local and regional scale,
- surface hydrological systems, which represent: water recipient for liquid waste, sources of drinking, irrigation and other service water,
- the occurrence of radionuclides in site-specific components of the environment (fodder, agricultural products, vegetables, , fruitmeat, milk, etc.).

Part of the system and its integration into the set of systems at the Jaslovské Bohunice site will include alsoits connection or appropriate modification of the teledosimetric system (TDS). The tele-dosimetry system (TDS) will thus enable automatic and continuous monitoring of the surroundings of the JZJaslovské Bohunice , including the effects of the NPP, through the measurement and recording of the following variables:

- the dose rate of external gamma radiation,
- the volumetric activity of aerosols,

- the bulk activity and the time integral of the bulk of the activityradioiodide.

The measurements in the outlets of the NJZ . vents will be alsoconnected to the TDSThe location of the monitoring points of the TDS circuits will be adapted to the monitoring needs of the NPP.

For more precise monitoring of the radiation situation in the surrounding areas, will mobile monitoring . equipment also be included in the NPP equipment projectThe mobile means will be able to take , deploy or collect thermoluminescence dosimeters, measure external gamma radiation dose rates and ground contamination using in-situ spectrometry. It will be to alsopossiblesample and monitor aerosol .content in the near-surface atmosphere

c) Personal monitoring is covered in Chapter 12.5(g).

Personal monitoring of the worker to determine personal doses will only be carried out by a dosimetry service authorised by the Authority. The dosimetry service shall submit to the employer the results of the monitoring and the determined personal doses of its employees for the monitoring period and the total doses for the whole year in accordance with Section of 64 Act No 87/2018 Coll. and Section of 24 Decree No 99/2018 Coll of the Ministry of Health of the Slovak Republic.

Personal monitoring will be carried out by personal dosimeters placed at the reference site and will be provided for all category A workers and for persons who, according to the internal workplace plan, intervene in the event of radiation accidents or incidents. Within the protection , zoneradiation protection shall be provided for any person entering it by meansof protective . If the directional dose equivalent dose rate in the protection zone may exceed 1 mSv/h, the operator shall equip the workers with personal dosimeters and operational direct-reading dosimeters with signalling of exceeding the set levels in accordance with the Decree of the Ministry of Health of the Slovak Republic No 99/2018 Coll. Only personal dosimeters which shall be used for monitoring ensure that the measured values are retained for the entire time the personal dosimeters are used and which allow the measurement of all types of radiation whichwill contribute to the worker's external exposure during the performance of his/her work activity.

In a workplace where internal exposure of a worker may occur from the intake of radionuclides, shall be measurement of the activity of radionuclides in the workers 'body or excreta .ensured

The received doses will be regularly evaluated and archived by the dosimetry service and will be alsokept by the holder of the permit for the operation of the workplace in accordance with § of 67 Act No. 87/2018 Coll. and § 244 and § of 25 Decree No. 99/2018 Coll. the Ministry of Health of the Slovak Republic.

In a workplace with sources of ionising radiation where a radiation accident or accident cannot be ruled out, in will addition to personal dosimeters, workers also have operational direct-reading dosimeters to indicate that the have been exceededset dose levels and dose rates . In the event of an accidental exposure, the operator of the protection zone shall, take the , immediately upon discovering that a radiation accident or radiation emergency has occurredpersonal dosimeters assigned to the exposed workers and evaluate them within 24 hours of receipt. Personal doses received by workers in an emergency exposure shall be recorded separately and shall not be counted against personal doses received during normal work activities. Doses received during a radiation accident or emergency shall be reported to without delay by the operator the competent radiation protection authority and to the worker.

d) Monitoring of radioactive substances discharged from the workplace into the environment will be governed by the requirements of Act No. 87/2018 § 87 and Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Coll§ 30.

Monitoring of radioactive substances discharged from the workplace into the environment will be carried out on the basis of a permit under Section 28(1)(e) of Act No. 87/2018 Coll.

Radioactive substances may only be discharged into the air and surface waters from a workplace where an activity leading to exposure is to be carried out if authorised by the Authority and if it is ensured that the average effective dose to a representative person due to their release into the environment does not exceed the legal in any calendar year, evenif the radioactive substance released accumulates .as a result of the activity

As there will be multiple nuclear installations at the site that affect the dose to a representative person, the limit values will be based on the total exposure from all nuclear installations at the site.

The project will ensure that monitoring of discharges and other pathways of release of radioactive substances into the environment will be carried out by monitoring, measuring, recording and evaluating quantities and parameters characterising the released radioactive , particular in by determining the balance of the total released activity and the volumetric activity of radionuclides.

Monitoring of discharges will serve to control compliance with permitted values (authorised limits) and early detection of uncontrolled releases of radioactive substances into the . It will also serve to assess the impact of discharges of radioactive substances into the environment on the environment and on the radiation burden of the population.

Monitoring of discharges will include:

- continuous balance measurement of all radionuclides contributing to the exposure of the population for a specified period, as determined by the Authority,
- radionuclide monitoring capable of rapidly signalling deviations from normal operation
- monitoring of other potential pathways for the release of radioactive substances from the workplace in the event of a spillage, sothat this spillage is also included in the effluent .balance

The balance measurement at the workplace with sources of ionizing radiation, from which radioactive substances will be discharged into the environment and the surroundings of the workplace on the basis of the permit under § 28 (1) (e) of Act No. 87/2018 Coll., will be carried out for a calendar year in accordance with the relevant permit of the Institute of Health Protection of the Slovak Republic with the with the data data under under Annex Annex 3, 3 3, Table Table of Decree of the Ministry of Health of of the Ministry of Health of the Slovak Republic the Slovak Republic No. No. 99/2018 99/2018 Coll.., 3 of Decree Coll

Monitoring of radioactive effluents discharge under emergency conditions at the NPP

The monitoring of radiation characteristics in discharges in the event of a radiation accident or accident will be a standard system of radiation , which will include systems to ensure

- Continuous control of the outlets from the ventilation stack of the NPP,
- continuous monitoring of the volumetric activity of wastewater discharged from the NPP.

The standard monitoring of discharges from the ventilation stack will be supplemented by emergency monitoring of discharges with a higher range of monitoring of variables important from the of viewradiation point .

Monitoring of radioactive effluents discharge during decommissioning of NPP

Monitoring of the radiation characteristics in the decommissioning process shall be ensured alsoby the operator by means of mobile devices for monitoring the volumetric activity of aerosols with signalling of exceeding the established monitoring levels at the location of the equipment and with data transmission to the control room. The mobile monitoring equipment will be used to monitor aerosols in the mobile extraction equipment at the individual workplaces and in the plant'. s air handling equipmentThe dismantling of the individual parts of the plant air handling equipment will only take place after the dismantling of the technology in the rooms exhausted by the air handling equipment, and the dismantling of the monitoring system in the ventilation stack will only take place after the entire air handling equipment has been decommissioned and dismantled. Aerosol monitoring during decontamination of the building will be provided by the operator using mobile equipment in the mobile extraction equipment of the site.

Monitoring of the volumetric activity of the water discharged from the plant shall be ensured by the operator using the standard monitoring equipment used during operation.

ABBREVIATIONS

Shortcut	Meaning of
BN/BNS	Safety instructions
BS	Security report
MINISTRY OF HEALTH OF THE SLOVAK REPUBLIC	Ministry of Health of the Slovak Republic
NJZ	New Nuclear Facility
ZBS	Entry security report

CONCEPTS

Concept	Definition
	The terms used are specified in Act 87/2018 Coll. § 2

REFERENCES TO CHAPTER 12

All references to legislative documents (decrees, laws, government) regulationsshall take into account their current the text, or the current text, if applicable, as amended.

[1] *Act of the National Assembly of the Slovak Republic No. 87/2018 Coll. on Radiation Protection and on Amendments and Additions to Certain Acts,* Collection of Acts
Slovak Republic.

[2] *Decree of the Ministry of Health of the Slovak Republic No. 99/2018 . on radiation protection,* Collection of Laws of the Slovak .

[3] Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Z. z. on nuclear safety , requirementsCollection of Laws of the Slovak .

[4] Decree . 431/2011 Z. z. on the quality , management systemCollection of Laws of the Slovak .

[5] SSR-2/1 (Rev. 1) Specific Safety Requirements, IAEA, 2016.

[6] GSG-8 - Radiation Protection of the Public and the Environment, IAEA, 2018.

[7] "The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103," [Online]. Available: https://www.icrp.org/publication.asp?id=ICRP%20Publication%20103.

[8] *Background Study - Determination of the envelope source member for the determination of the threat , area*2021.

[9] *WENRA Report Safety of new NPP designs,* WENRA, 2013.

[10] *PBS for MO34 Rev. 1 ch. 11.1.*

COMMISSIONING SECURITY REPORT

Chapter 13

NAME OF THE PROJECT: **New Nuclear Source Project at Jaslovské Bohunice**

DOCUMENT :TITLE **Conditions of operation**

IDENTIFICATION CODE: NJZJB_AZUK_60_DOK_A_ZBS_VUJE_JESS_0013R02

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CONTENTS

13. TERMS OF OPERATION

The set of operating conditions is created as a set of requirements from legislative documents, from mainlySlovak national legislation and then from IAEA and WENRA requirements, so that the set of these requirements is a coherent basis for determining the organizational structure and basic rules of the future NPP . operatorAt this level of project preparation the ,specific supplier of the unit , but is yet not knownthis not isa major for the establishment of the rules for the future organisation of the operation of the NPP. This organisation has to comply with the basic legislative requirements irrespective of the specific design of the nuclear installation chosen , in the futureand the following requirements are thus applicable to the type of NPP .publicly available (design)

From the point of view of the Atomic Energy Act of the Slovak , § 10, paragraph 1 [1] are selected obligations of the organization holding the
permits, related to the operation of the NPP, as follows:

- Nuclear safety, physical protection, emergency preparedness, including their verification., will be ensured
- Compliance with the following principles for the peaceful uses of nuclear energy will be systematically and comprehensively assessed
  energy:
  - The use of nuclear energy will give priorityto safety aspects over all other aspects of such activities. The approach to safety aspects will be graded according to the type of nuclear installation, the inventory of nuclear materials, radioactive waste and spent nuclear fuel and the activities carriedtherein.
  - In the use of nuclear energy, a level of nuclear safety, security, occupational health safety and safety and safety of technical installations, health protection against ionising radiation, physical protection, emergency preparedness and fire protection shall be achieved suchthat the risk to life, health, occupational or the environment is as low as is reasonably according to the available knowledge, without exceeding the exposure . limitsWhen significant new information becomes available on the risks and consequences of the use of nuclear energy, will be the level reassessed and the necessary measures will be taken to comply with the conditions under the Atomic Energy Act.
- The conditions of the permit or consent will be complied with and any breach of these will be investigated promptly conditions and the measures taken to remedy and prevent the recurrence of such breach.
- The will be limits and conditions for safe operation or the limits and conditions for safe decommissioning ; observedtheir violation, non-observance or exceedance will be immediately reported to the Nuclear Safety Authority of the Slovak Republic.
- A management system shall be established and implemented in which nuclear safety is given due consideration Priority.
- Only persons fulfilling the conditions set out in Section of 24 the Atomic Energy Act [1] shall be entrusted with the performance of work activities and, in the case of persons carrying out activities under a special regulation, shall be ensured verification of their competence under that special regulation (see Chapter 13.1).
- All changes to the sub-paras of the relevant category (Atomic Energy Act [1], § 2(w) and (x)) will be duly communicated with the ÚJD SR.
- A preliminary internal emergency plan, an internal emergency plan and an emergency traffic order , as will be drawn upaswelldocuments for the public protection plan and for the emergency traffic .
- All interventions aimed at averting an accident or accident or at eliminating their consequences shall be demonstrably and promptly notified to the Nuclear Safety Authority of the Slovak Republic.

- The performance of aeronautical activities in the premises of a nuclear installation and in its immediate vicinity in accordance with
  with the approved physical protection plan will be immediately notified to in writing the ÚJD SR.
- A systematic analysis of operational events and experience, developments in international safety standards and new knowledge gained through research and development will be ensured and used to improve the safety of the NPP and the activities of the organisation.
- It will be ensured that, before a measure is adopted in relationto nuclear safety, analysis and consultation of experts in the relevant who have not been involved in the development of the measure or the analysis thereof is carried out so that the measures are informed and all safety aspects of the proposed measure .are taken into account
- The SR Nuclear Safety Authority shall be informed without delay of such internal measures which affect the permitted activities and whose implementation may affect nuclear , well as asof interruptions of activities described in the licence documentation and the reasons for such interruptions.
- During the construction, reconstruction or repair of nuclear facilities, the will compliance of with assembled systems, structures, components or their parts the design documentation, quality , and assurance requirementsquality requirements the compliance of their accompanying technical documentation with generally binding legal regulations . be verified with the participation of the Nuclear Safety Authority of the Slovak Republic or persons authorised by the Nuclear Safety Authority of the Slovak RepublicRecords of .the checks carried out shall be drawn up
- The training system for personnel forwhom professional competence or special competence is required will ensure the acquisition, maintenance and development of professional knowledge, practical skills and personal attitudes in the field of nuclear safety and emergency preparedness in the NPP .area

These obligations and other legislative documents imply the requirements summarised in the following text, to the extent required by IAEA Guidance Document SSG-61 [2], Appendix I for ZBS, . i.egeneral requirements for the conduct of . The related requirements for the organisation of the licence holder are givenin a separate Chapter 17 of this ZBS.

13.1 Operating regulations

13.1.1 Basic legislative requirements

Reference [1] - Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (Atomic Energy Act) and on Amendments and Additions to Certain Acts § 23(2)

IAEA and WENRA recommendations

Reference [3] - Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR- 2/2 (Rev. 1)

- *Requirement No 26*
- *paragraphs 7.1; 7.2; 7.3; 7.4; .5; 7.6; 9.1; 9.2; 9.3; .4; 9.5; .6*

Reference [4] - WENRA Safety Reference Levels for Existing Reactors 2020

- *LM1.1; LM2.1; LM2.2; LM2.3; LM2.4; .5; LM2.7; LM3.1; LM3.2; LM3.3; LM3.4; .5; LM4.1; LM4.2; LM5.1; LM6.2; .4*

13.1.2 Description of the project in of termsmeeting legislative requirements

Operating rules and will be developed used comprehensively for normal operation, anticipated operational events and emergency conditions in accordancewith the safety policy of the organisation operating and the requirements of the Slovak Nuclear Safety Authority Atomic Act § 23(2); [1], Requirement 26; IAEA [3]).

The level of detail of a particular regulation will be appropriate for its level (normal operation, emergency conditions, etc.). The guidance given in the operating rules will be clear and concise and will be verified and validated . as as farpossibleThe basic rules and reference materials (annexes with details etc.) will be clearly marked and easily accessible at the block guardroom and at all other operating locations where their use is required. The Safety Authority Nuclearwill have access to . these regulationsStrict adherence to the written operating rules will be an essential element of the safety policy in the licensee's organisation (7.1; IAEA [3]).

Operating rules will be developed and validated for in usethe event of foreseeable operational events and emergencies under the NPS . project (design)For events that go beyond the basic design events under the NPS design, procedures for dealing with these conditions . will be developedBoth procedures basedon identified events and procedures based on the symptoms of these events . will be used as appropriateThe operating rules will be supported by documented analyses (7.3; IAEA [3]).

The operating rules and supporting documentation will be issued as controlled documents, subject to approval. They be will periodically reviewed and revised as necessary ensure their adequacy and currency. The operating rules will be updated in a timely manner the inlight of operational experience and the actual configuration of the installation (7.4; IAEA [3] and LM5.1; WENRA [4]).

A system . will be put in place for the management and control of the equipment of employees carrying out work activities in the NICUThe device management system will prevent the use of unauthorised devices and any other unauthorised documents and tools, such as unauthorised instructions, notes or unofficial labels of any kind on equipment, local panels, counters and measuring instruments in work areas. A tool management system will be usedto ensure that documents and ancillary tools always contain the correct information and thatthey are updated, reviewed and approved in a timely manner 7.5; IAEA [3]).

A clear operational safety policy will be established and maintained to minimise the use of and reliance on temporary (approved) devices. Temporary procedures and devices will be changed to permanent or incorporated into the operating rules within a reasonable time 7.6; IAEA [3]).

13.1.2.1 Operating rules for normal and abnormal operation

Operating rules will be developed for normal and abnormal operation to that the facility is operated within operating limits and conditions (Atomic Energy Act § 23(2); [1], 7.2; IAEA [3]).

A planned and systematic procedure . will be used to develop a set of regulations, for use in normal and abnormal operationThis will be aided by the use of a uniform methodology for the authors of operating rules (9.1; IAEA [5]).

Any operating prescription for normal and abnormal operation will be sufficiently detailed to enable a qualified person to carry out the required activities without direct supervision, but need not contain a full description of the physical processes involved in the installation (9.2; IAEA [5]).

The format of the operating rules will be developed in accordancewith established requirements and recommendations to ensure the quality of the quality management sub-management of the operating organisation. (9.3; IAEA [5])

Persons with appropriate competence shall be designated to draw up and verify the operating rules and experience (9.4; IAEA [5]).

Techniques that take into account the PUD factor . will be used to develop and prepare reliable and effective operating rulesConsideration to will be given the layout of the , the overall layout of the JRC, staffing and operational experience at the facility (9.5; IAEA [5]).

The operating rules will be basedon the following principles (9.6; IAEA [5]):

a) Clear definition of the operational area under safety analyses and operational limits and conditions;

b) Establishing appropriate linkages between the different procedures so as to exclude/limit omissions and duplication of data, and defining clear entry and exit conditions to/from a given operating rule;

c) The possibility of use by the s staff permit holder'so as to limit/eliminate the PUD factor during the performance of the procedures, including the establishment of a clear objective and the importance of the different parts of the procedures. Where , flow charts, diagrams and other aids will be used;

d) A written explanation of the basis of the operating rule procedure so that it is clear to the user and those who will regulate the rule in future the why the procedure was chosen, what its objectives are and the reasons for each manipulation;

e) The operating rules will be verified and approved, including validation of the procedure on the specific equipment used or on a full-scale simulator, if;

f) For foreseeable operational events and accident (abnormal) conditions, will event-based or symptom-based ; procedures be usedfor dealing with emergency conditions and severe accidents, the use of symptom-based operating rules .is preferred

Requirements for Operating Limits and Conditions are included in a separate Chapter 16 of the ZBS.

13.1.2.2 Procedures for dealing with emergencies

A comprehensive set of regulations and procedures, including Emergency Operating Procedures (EOPs) and Severe Accident Management Procedures (SAMGs), will be developed to cover all emergencies at all levels of protection in depth (Atomic Energy Act § 23(2); [1], LM1.1; WENRA [4]).

The EOP will cover the emergency conditions defined by the project documentation. These EOPs will provide guidance for restoring the NPP to a safe state (LM2.1; WENRA [4]).

EOPs, possibly with other special procedures or instructions, will be processed to cover DEC Level A . eventsThe objective will be to restore or compensate for lost or compromised essential safety functions and to establish measures to prevent severe fuel damage in the reactor core or spent fuel storage pool (LM2.2; WENRA [4]).

EOPs for project emergencies will be based on event symptoms or a combination of procedures based on event symptoms and identified events. However, EOPs for DEC A will be symptom-based unless an be justified event-based approach can (LM2.4; WENRA [4]).

A set of emergency regulations will be appropriate to handle emergency conditions that simultaneously affect the reactor and the spent pool. However, it will alsotake account intopotential interactions between the reactor and the spent pool, especially in the case of NPP operating conditions associated with reactor shutdown and ongoing nuclear fuel exchange (LM2.5; WENRA [4]).

If the EOP uses assets from another nuclear facility at the site, the safety of that nuclear facility will not be compromised, and the EOP will account for the coincidence of events at multiple nuclear facilities (LM2.6; WENRA [4] and LM2.7; WENRA [4]).

The EOPs will be developed in a systematic manner and will be supported by realistic and specific analyses of events at the NPP . facilityThe EOPs will be developed in accordancewith other operational regulations and procedures, suchas emergency preparedness procedures and major accident management procedures (LM3.1; WENRA [4]).

EOPs will allow employees to quickly recognize the condition of the equipment or the event towhich the rule . Entry and exit conditions will be defined to in the EOP allow the employee to select the appropriate EOP, navigate between EOP sections, and eventually move from the EOP to the SAMG (LM3.2; WENRA [4]).

EOPs for design basis incidents will rely on appropriately qualified equipment and instrumentation (LM3.4; WENRA [4]).

The set of regulations and procedures will take into account the anticipated conditions that may occur during an emergency at the site, including the radiological conditions associated with the consequences of the accident and the conditions that may have initiated

cause the event (LM3.5; WENRA [4]).

A set of policy and procedure documents will be verified and validated in the form in which these documents will be used by staff, where technically feasible. This will that ensurethey are administratively and technically correct, compatible with the internal and external environment in which they will be used and with available Pud resources (LM4.1; WENRA [4]).

The in the approach . used will be documented verification and validation of the EOPDuring verification and validation, will the incorporated engineering principles be assessed and the Pud will be taken into account. The validation of the EOP will be based on representative simulations, possibly using a full-scale simulator (LM4.2; WENRA [4]).

13.1.2.3 Guidance on the management of severe accidents

To mitigate the consequences of severe accidents in cases where responses, including measures set out in the EOP, have not been successful in preventing severe fuel , damageSevere Accident Management Procedures (SAMG) or other special procedures or instructions, including emergency response preparedness instructions, will be established (Atomic Energy Act § 23(2); [1], LM2.3; WENRA [4]).

SAMGs will be developed in a systematic manner using a project-specific approach for a particular NPS . solutionSAMGs will address strategies for coping with scenarios identified by severe accident analyses (Atomic Energy Act § 23(2); [1], LM3.3; WENRA [4]).

Procedures for DEC-B and SAMG will rely on adequately qualified equipment (LM3.4; WENRA [4]).

The set of SAMG procedures will take into account the anticipated conditions that may occur during site , emergenciesincluding the radiological conditions associatedwith the consequences of the accident and the conditions that may havecaused the initiating event (LM3.5; WENRA [4]).

The during the approach . used will be documented verification and validation of the SAMGDuring verification and validation, will the incorporated engineering principles be assessed and the Pud will be taken into account. Validation of the SAMG will be based on representative simulations, possibly using a full-scale simulator (if available). However, deterministic analyses (Atomic Energy Act § 23(2); [1], LM4.2; WENRA [4]) .will be a fundamental element of SAMG verification and validation

The staff of the emergency response organisation (technical support centre) will be regularly trained and exercised under the foreseen and expected role in managing the , . i.efor situations and conditions covered by the SAMG set of procedures and guidelines (LM6.2; WENRA [4]).

Intervention drills required in the SAMG set of procedures necessary to restore essential safety functions, includingthose requiring the use of mobile equipment or facilities, will be planned and regularly conducted by external entities. During the drills, will be given consideration to the possible unavailability of necessary equipment, lighting and supplies, or the inability to use (unavailability of) protective equipment LM6.4; WENRA [4]).

13.2 Regular maintenance, inspections and tests

13.2.1 Basic legislative requirements

Reference [1] - Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Energy Act) and on
amendment of certain laws § 23 (2)

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic . 430/2011 Coll. on requirements for nuclear safety, Annex No. 3 and Annex No. 4

Reference [7] - Decree No. , 58/2006 Coll. of the Nuclear Safety Authority of the Slovak Republicwhich establishes details on the scope, content and method of preparation of documentation of nuclear installations required for individual decisions § 15 and § 16

IAEA and WENRA recommendations

Reference [3] - Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR- 2/2 (Rev. 1)

- *Requirement 31*
- *Paragraphs 8.1; 8.2; 8.3; 8.4; .5; 8.6; .7; 8.8; 8.9; 8.10; .11; 8.12; 8.13; 8.14; 8.14A; 8.15; 8.16; .17;*

Reference [4] - WENRA Safety Reference Levels for Existing Reactors 2020

- *K1.1; K1.2; K2.1; K2.2; .3; .4; K3.1; K3.2; K3.3; K3.4; K3.5; K3.6; K3.7; K3.8; K3.9; .10; K3.11; K3.12; .13*

13.2.2 Description of the project in of termsmeeting legislative requirements

Effective maintenance, testing, surveillance and operational inspection programmes will be established and implemented (Atomic Energy Act § 23(2); [1], Requirement 31; IAEA [3]). The maintenance programmes will be part of the design documentation of the NPP (Decree of the Nuclear Safety Authority No 430/2011 Coll., Annex Nos 3 and 4; [6]).

Maintenance, testing, surveillance and operational control and programmes will be in place will include predictive, preventive and corrective maintenance . activitiesMaintenance activities will be carried out in such a way as tomaintain the operability and availability of the selected equipment throughout its lifetime through controlled ageing of the equipment and prevention of breakdowns (Decree of the Nuclear Safety Authority No 430/2011 Coll, Annex Nos 3 and 4; [6]). Testing programmes for selected equipment will be prepared within the scope of Decree of the Nuclear Safety Authority of the Slovak Republic No. 58/2006 Coll., § 15 [7] and the Operational Inspection Programme for selected equipment will be prepared within the of scopeDecree of the Nuclear Safety Authority of the Slovak Republic No. 58/2006 Coll., § 16 [7]. In the eventof malfunctions, maintenance activities will be carried out with the aim of restoring the ability of the damaged selected facilities to function while meeting the established criteria for acceptability of operation (Atomic Energy Act § 23(2); [1], 8.1; IAEA [3] and K1.1; WENRA [4]).

Monitoring, inspection and testing programmes will be in place to ensure compliance with the established operating limits and conditions (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 ., Annex No. 3; [6]) and to detect and correct any abnormal condition before it can have serious consequences for safety (8.2; IAEA [3], K1.2; WENRA [4], K2.2; WENRA [4]).

The selected equipment will be designed that soit can be regularly tested, maintained and, where necessary, repaired. Furthermore, they will be regularly monitored, in terms of integrity and safety functions, throughout the lifetime of the selected equipment, without endangering the personnel occupational safety ofor significantly reducing the availability of the system . during these activitiesIf this cannot be achieved, proven alternative or indirect control methods will be identified and appropriate safety measures will be taken to compensate for any undetected failures (K3.1; WENRA [4]).

Procedures for all maintenance, testing, supervision and inspection . tasks will be developed and implementedThese procedures will be developed and reviewed the inlight of operational experience. Where necessary, they will be modified, validated, approved and distributed in accordancewith the processes set out in the management system (8.3; IAEA [3], K2.4; WENRA [4], K3.2; WENRA [4]).

Data on maintenance, testing, surveillance and inspections will be recorded (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex No. 3; [6]), stored and analysed to confirmthat the operational performance is in accordancewith the design intent and the reliability and availability requirements of the facility (8.4; IAEA [3]). These records will be reviewed with the aim of finding evidenceof incipient and recurrent failures, or to initiate timely corrective maintenance and/or to review the preventive maintenance programme accordingly (K2.3; WENRA [4]).

The frequency of maintenance, testing, supervision and operational checks of the individual selected devices will be determined based on (8.5; IAEA [3] and K2.1; WENRA [4]):

a) the relevance of structures, systems and components to safety, takingintoaccount knowledge from a probabilistic safety ;assessment

b) their reliability and availability for operation;
c) their assessed in-service degradation potential (diagnostics) and their ageing ;characteristics
d) operational experience;
e) manufacturers' .recommendations

A comprehensive and structured approach will be used to identify potential failure scenarios to ensure proper management maintenance , activitiespossiblyusing probabilistic safety analysis methods (8.6; IAEA [3]).

New approaches thatcould lead to significant changes to existing maintenance, testing, surveillance and control strategies will only be adopted after careful consideration of the safety implications and after appropriate authorisation, if. (8.7; IAEA [3]).

A comprehensive system of work to planning and coordination will be in place ensurethat work for maintenance, testing, surveillance and control purposes is properly authorised, carried out safely and documented in accordancewith the established procedures of the 's management system (8.8; IAEA [3], K3.3; WENRA [4]).

An appropriate system of good work management will be in place for the protection and safety of personnel, including contractors, and for the protection of equipment during maintenance, testing, supervision and inspection. Complete relevant information on the status of selected equipment will be conveyed at shift changeovers and during pre- and briefings on maintenance, testing, surveillance and inspection8.9; IAEA [3]).

The work management system shall ensure that the shutdown of the equipment and its seizure for maintenance, testing, supervision or inspection can only be carried out with the consent of the designated staff of the operation unit and in accordancewith the operating limits and conditions (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex No. 3 and 4; [6]). The work management system shall also ensure that the authorisation to place the plant intooperation after maintenance, testing, supervision and inspection is issued by an employee of the unitoperation . This authorisation will only be given by staff the operations after a documented check that has been completed the new configuration of the equipment after maintenance complies with the operating limits and conditions. The commissioning of the equipment after maintenance will be subject to the performance of functional tests (8.10; IAEA [3], K3.4; WENRA [4]).

Coordination between the various maintenance groups (e.g., maintenance groups for mechanical, electrical, I&C, and construction SKKs) . will be performedCoordination will also be carried out between maintenance , groupsoperations staff and support groups (e.g. fire , radiation protection, physical protection and non-radiation). safety groupsArrangements will be made with the operators of the external electrical networks so that appropriate approved rules and procedures are established for maintaining the connection of the SKK to the external network (8.11; IAEA [3]).

A system will be put in place to manage deviations of the equipment from the optimum state so that the staff of the operations department are not overburdened. The method of dealing with identified deviations will be described in the work procedures. This system will also ensure that the cumulative effects of these deviations do not compromise the safety of the installation (8.12; IAEA [3], K3.5; WENRA [4],).

It will be ensured that maintenance work during normal operation is carried out maintaining adequate and sufficient levels of protection in . Where practical, a probabilistic safety assessment may be used to that risks are not significantly increased during maintenance work (8.13; IAEA [3]).

Corrective maintenance of the selected equipment will be carried out as quickly as practicable while ensuring work safety (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 ., Annex 3 and 4; [6]) and in accordancewith the operating limits and conditions. For corrective maintenance, will repair , taking priorities be establishedinto account in the first place the significance safetyof defective equipment (8.14; IAEA [3], K3.6; WENRA [4]).

Maintenance programmes will be established for diversionary (mobile) SKCs to beusedfor more severe than design basis events so that the high reliability of these facilities . is maintainedRegular staff training and drills will be carried out in handling such equipment and connecting it to the process systems of the nuclear power plant (8.14A; IAEA [3]).

Appropriate processes will be in place for the procurement, receipt, control, storage and issue of materials (including inventory), spare parts and components (8.15; IAEA [3]). Responsibility will be established for the use of these processes for the procurement of materials, spare parts and components and for ensuring that their characteristics are consistentwith applicable safety standards and the design of the nuclear installation (8.16; IAEA [3]).

It will be ensured that storage conditions are adequate and that materials (including stocks), spare parts and components were available and in proper condition for use (8.17; IAEA [3]).

After any that couldcompromisethe correct performance of the safety of functionthe selected equipment and the functional integrity of any component or system, the ability to perform the safety of functionsthe affected selected equipment will be verified and all necessary corrective measures, including inspection, testing, maintenance and repair, will be carried out (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex Nos. 3 and 4; [6], K3.7; WENRA [4]).

Prior to restarting operation after a reactor which shutdown inthe primary circuit , a has leakedleak test will be performed on the primary pressure assembly. However, the pressure test of the primary circuit is still to be performed at regular intervals as specified in the maintenance programme (K3.8; WENRA [4], K3.9; WENRA [4]).

All equipment and instruments, including accessories, used for testing and trials shall be qualified for the purpose and calibrated . before useAll equipment and instruments will be properly identified in the calibration records and the validity of the calibration will be periodically verified in accordance with the requirements of the set up management system (K3.10; WENRA [4]).

Each operational control process will be qualified in terms of the required area of control, the method of non-destructive testing, the detection of possible failures and the required effectiveness of the controls (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex Nos. 3 and 4; [6], K3.11; WENRA [4]).

If, during the inspection or non-destructive test, a defect is found in the sample to be verified that exceeds the acceptance , criteriaadditional tests or trials will be performed to investigate the specific problem area in the analysis other analogous areas (or components). The extent of further investigations will be decided with due regardto the nature and extent of the defect and the extent to which the is affected nuclear of safetythe installation and the possible further consequences (K3.12; WENRA [4]).

Control tests to verify the integrity of the container will include (K3.13; WENRA [4]):

a) leak ;tests
b) testing of grommets and closing devices such as air locks and valves that are part of the boundary of the container, to demonstrate their tightness and functionality;
c) structural integrity checks (e.g. checks carried out on the cladding and prestressing elements).

13.3 Qualification and training of staff

13.3.1 Basic legislative requirements

Reference [1] - Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Energy Act) and on the amendment of and amendments to certain laws

- *§ 4(2)(a)(4) and (5), and(3)(c)*
- *§ 7, paragraph (2)(c)*
- *§ 10, paragraph (1), point (z)*
- *§ 23 (2) (a), (b)*
- *§ 24, para (1); para (2); para (3); para (4); para (6); para(7); (para9); para10), para (16), para (17). para (23)*
- *Annex 3*

Reference [8] - Decree . 52/2006 Coll. on professional competence

- *§ 2, paragraph (1); paragraph (2); paragraph (5)*
- *§ 3, paragraph (2); paragraph (3); paragraph (4), paragraph 5)*

- *§ 4, paragraphs (1); 2); 3); (4); (5)*
- *§ 5, para (1); para (2); para (3); para (4); para (5), para6)*
- *§ 6, paragraph (1)*
- *§ 7, paragraph (1); paragraph (2)*
- *§ 8, paragraph (2), paragraph (5)*
- *§ 9*
- *§11, paragraph (1)*
- *§ 12, paragraph (1)*
- *§ 13, paragraph (1); paragraph (2)*
- *§15*
- *§16*

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll. on requirements for nuclear safety as amended by Decree of the Nuclear Safety Authority of the Slovak Republic No. 103/2016 Coll.

- *Annex 4, Part B II, paragraph G*

IAEA and WENRA recommendations

Reference [3] - Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR- 2/2 (Rev. 1)

- *Requirement 7*
- *Paragraphs 4.16; 4.17; 4.18; 4.19; .20; 4.22; .23; .24*

Reference [4] - WENRA Safety Reference Levels for Existing Reactors 2020

- *D1.1; D1.2; D2.1; D2.2; D2.3; D3.1; D3.2; .3; D3.4; D3.5; .6; D4.1; LM6.1; LM6.3*

13.3.2 Description of the project in of termsmeeting legislative requirements

The licensee shall establish an overall policy, training system and comprehensive training programmes for personnel, based on long-term competence needs and training objectives that play a critical safety . roleThe 's licenseestaff training system and the training programme for selected staff shall be approved by the Nuclear Safety Authority Atomic Energy Act § 4(2)(a)(4) and (5); 1]). The training plan shall be updated from time to time (Atomic Act
§ 10(1)(z); [1], D1.1; WENRA [4]). Qualified personnel performing work activities at the NPP shall be available in sufficient time and in sufficient numbers prior to the start-up of the NPP so as to enablethe NPP NPP to be commissioned prior to the application fora licence under Section 5(3) of the Atomic Energy Act
[1] demonstrate the competence of personnel to carry out activities that have a direct impact on nuclear safety or affect
on nuclear safety.

A systematic approach . will be used in the preparation of the plantrainingA systematic approach will be used to ensure a logical progression of training programmes, from the identification of the competences and skills required for the performance of the work of individual employees, through the preparation and implementation of training programmes and the provision of appropriate didactic aids (to achieve the identified competences), to the subsequent evaluation of the level of knowledge of employees and the effectiveness of the training (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006, § 3(5)(d); [8], D1.2; WENRA [4]).

Under Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §2(2) and (5); [8] the licence holder shall identify all work functions where work activities with an impact on nuclear safety are performed and other work functions with a direct impact on nuclear safety, together with a description of the work activities in the quality management system documentation, including the required number of . work activitiesIn determining the required number of work functions, the competence of the personnel and their

sufficient number will be based on a systematic analysis, which will be regularly verified and documented under the rules of the quality .management system

13.3.2.1 Qualification of staff

Professional competence is the sum of professional knowledge, practical experience, knowledge of generally binding legislation and operational regulations issued by the holderpermit , necessary for the performance of the work activities of the employees holder's . Professional competence is acquired by successful completion of training in a specialised facility (Atomic Energy Act § 24(1); [1]).

Specific competence is the sum of professional knowledge, practical experience, fundamental attitudes and knowledge of generally applicable legislation and operational regulations issued by the holder of a nuclear safety , authorisationwhich is necessary for the performance of work activities with a direct impact on nuclear safety (Atomic Energy Act § 24(2); [1]).

Only professionally qualified personnel whose competence has been verified by a professional commission established by the operator of the specialised installation and issued a withcertificate of professional competence shall perform work activities thataffect the nuclear of safetynuclear installations (Atomic Energy Act § 24(3); [1]).

The selected employees of the holder of the licence for commissioning, operation or decommissioning of nuclear ainstallation shall be employees performing work activities that have a direct impact on nuclear , who have a second degree university education obtained in the Slovak Republic or in the of the territoryEU , Member Stateshave completed professional training, are medically fit and mentally competent, whose special professional competence has been verified by the examination commission established by the Authority and the Authority has issued with them a certificate of special professional competence (Atomic Energy Act, § 24 (4); [1]).

In the system of training of employees, the holder permitshall determine the for each job function requirements for education, experience, training, mental competence and medical competence that ensure that the employee acquires the necessary knowledge, skills and attitudes required for the performance of work activities (competence") to acquire and maintain professional competence (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §3(2); [8]). The training system will include a staff which training plan will identify the short- and long-term training needs and objectives the andmeans necessary to achieve . themThe staff training plan shall be updated to reflect the needs of the holder licence and the actual condition of the nuclear installation (Decree No 52/2006 of Nuclear Safety Authority the§3(4); 8]).

All activities that may affect safety will be carried out only by qualified and competent persons (Atomic Act §24 (3) [1], Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §2 (1) [8], Requirement No. 7, IAEA SSR-2/2 (Rev. 1) [3]). The system training and training programme for selected staff will be approved by the Nuclear Safety Authority of the Slovak Republic (Atomic Act §4(2)(a)(4), (5); [1]). A condition for the issuance of a licence by the Nuclear Safety Authority of the Slovak Republic for the operation of the NPP will be the demonstration of a sufficient number of permanent staff with the required expertise (Atomic Act §7(2)(c); 1]). The definition of specific skilled (regulated) occupations with an indication of the required education and experience is givenin Annex 3 of the Atomic Act [1].

Suitably qualified personnel , will be selected for safety-sensitive positionsprovidedwith the necessary basic or recurrent training (especially for regulated occupations under Annex 3 of the Atomic Energy Act [1]) and equipped with the regulations toenable them to perform their duties properly in all plant operating conditions and under emergency conditions in accordancewith safety principles and procedures (4.17; IAEA SSR-2/2 (Rev. 1) [3]). All licence holder personnel performing activities with nuclear implications, including contractor personnel, will be adequately trained and qualified (Atomic Energy Act §23(2)(a), (b); [1] D2.1; WENRA [4]).

13.3.2.2 Selected employees

Types of training of selected staff to beappliedto the future permit holder's staff

for commissioning of the NPP and the future holder of the permit for operation of the NPP, are (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §
4(1); 8]):

a) basic preparation,
b) periodic training,
c) preparing for a change of job function.

The phases of basic preparation are (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 § 4 (2); [8]):

a) theoretical preparation,
b) an internship at a nuclear installation,
c) training on a representative full-scale simulator,
d) preparation for the verification of professional competence,
e) verification of professional competence,
f) training.

The phases of periodic preparation are (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 § 4 (3); [8]):

a) theoretical training, whichfocuses on:

   1) Repeating the theoretical knowledge from the basic theoretical training in the field of normal operation, abnormal operation and emergency conditions,
   2) changes to the nuclear installation and to the internal rules of the holder,
   3) lessons learned from analyses of events and operational experience at its own nuclear installation and at similar nuclear installations around the world,
   4) preparation for overhaul or other shutdowns,
   5) nuclear safety,
   6) emergency preparedness,
   7) security policy and objectives,

b) training on a representative full-scale simulator of at least 5 days or 40 training hours :

   1) normal operation,
   2) abnormal operation,
   3) emergency conditions,
   4) collaborative change,
   5) Selected tools for Pud errors prevention with focus on three-way communication. The phases of

preparation for change of job function are (Decree of the Nuclear Safety Authority of the Slovak Republic

No. 52/2006 § 4 paragraph 4; [8]):

a) theoretical preparation,
b) training on a representative full-scale simulator,
c) training.

The operator of the specialised facility shall prepare, on the basis of the methodology (under Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 § 3, paragraph 5; [8]), training for programmes selected employees for training on a representative full-scale simulator for a specific training period. An employee being trained for a selected employee's job function (but hereinafter referred to as
'the applicant') shall not be authorised to handle the nuclear installation and its systems . during the internship at the nuclear installation and on-the-job trainingIn case of a change of the selected employee's job function to another nuclear installation, the applicant shall undergo basic training (Decree of the Nuclear Safety Authority of the Slovak Republic No 52/2006 §4(6)-(8); [8]).

13.3.2.3 Qualified staff

Types of training of competent personnel to beappliedto the future holder's employees

permit for commissioning of the NPP and the future holder of the permit for operation of the NPP are (Decree of the ÚJD SR No 52/2006 §5(1); [8]):

a) basic preparation,
b) periodic training,
c) preparing for a change of job function.

The phases of the basic preparation will be (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §5 (2); [8]):

a) theoretical preparation,
b) an internship at a nuclear installation,
c) preparation for the verification of professional competence,
d) verification of professional competence,
e) training.

Periodic training will be focused on (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §5 paragraph 3; [8]):

a) changes to the nuclear installation and its regulations,
b) lessons learned from analyses of operational events at its own nuclear installation and at similar nuclear installations ,
c) preparation for overhaul or other shutdowns,
d) nuclear safety,
e) emergency preparedness,
f) security policy and objectives.

The phases of preparation for the change of work function will be (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §5 paragraph 4; [8]):

a) theoretical preparation,
b) preparation for the verification of professional competence
c) verification of professional competence
d) training.

A staff member being trained as a competent staff member shall not handle the nuclear installation and its systems . independently during the period of his traineeship at a nuclear installationA staff member being trained as a competent member of staff may, during on-the-job training under the immediate supervision of a designated instructor, handle nuclear installations and their systems. (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 §5, paragraph 5; paragraph 6; [8]).

13.3.2.4 Lecturers and instructors

All lecturer (Atomic Energy Act §24(9); [1]) and instructor (Atomic Energy Act §24(10); [1]) positions will be by performedqualified and experienced persons who possess the required technical knowledge and skills and are trusted by the employees . being trainedInstructors will be technically competent in their fields of training, willhave the necessary training skills and will alsobe familiar with the routine activities and work procedures at the workplace from which the employees . are being trainedQualification requirements will be established for training instructors (4.23; IAEA SSR-2/2 (Rev. 1) [3]).

The of trainingspecially qualified staff and professionally competent staff will be carried out by the staff of the operator of the specialised establishment in the following job functions:

a) lecturer for theoretical training of selected employees of the holder of the licence under § 5 (3) (b) or (c) of Act No. 541/2004 .; [1] for a specific nuclear installation,
b) a trainer for training on a representative full-scale simulator for a specific nuclear installation,
c) lecturer for the theoretical training of qualified staff,
d) Internship instructor for selected employees,
e) On-the-job training instructor for selected employees,

f) traineeship instructor for qualified staff,
g) on-the-job training instructor for competent staff.

Qualification requirements for lecturers and instructors will correspond to the Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 § 12 paragraph 2 [8]. The competence of lecturers will be verified by an oral examination before the examination committee for lecturers according to the Decree of the Nuclear Safety Authority of the Slovak Republic No 52/2006 § 6 paragraph 4 [8].

13.3.2.5 Training and verification of specific competence

The management of the permit holder's organisation will be responsible for the qualification and competence of the personnel carrying out work activities at the NPP. Managers will be involvedin identifying training needs and ensuring that operational experience . is taken into account in trainingManagers and supervisors will ensure that the demands of operations do not interfere with the unduly implementation of training programmes (4.18; IAEA SSR-2/2 (Rev. 1) [3]). This includes, for example, allowing staff to participate in training. Thus, staff will not be given other tasks relatedto ensuring the operation of the NPP .during training

Qualification and competency requirements will be defined to that staff performing safety-related functions are able to perform their duties . safelyFor some operational positions (selected personnel), authorization (licence or special competence) cardmay be required (Atomic Energy Act §24(4); [1], 4.16; IAEA SSR-2/2 (Rev. 1) [3]). Qualification and competence requirements will be clearly documented (D2.2; WENRA [4]), approved (Atomic Act §4(2)(a)(4) and (5); 1]), and subject to review by the Nuclear Safety Authority Atomic Act §4(3)(c); 1]).

The verification of specific competence will that the selected staff member has the required competences to perform the job activities. The specialised staff competence verification committee will be set up by the operator of the specialised establishment. The establishment and operation of the expert committee will be governed by the statute of the expert committee, which will be drawn up by the operator of the specialised installation and will be part of its quality management system documentation (Decree of the Nuclear Safety Authority of the Slovak Republic No 52/2006, § 6(1); § 7(1); [8]). Once all qualification requirements have been fulfilled and the specific competence has been successfully verified, will be issued with the selected employee a certificate of specific competence, which is valid for three years from the date of issue (Decree No 52/2006 of the Nuclear Safety Authority of the Slovak Republic, § 8(2) and (5); 8]).

Regular medical fitness checks will be arranged for the holder'permits employees
and mental fitness, ifnecessary for the performance of the employees' work activities (Atomic Energy Act § 24, para. 6; [1]).

13.3.2.6 Training and proficiency testing

The professional of competenceemployees performing work activities in the NICU shall be verified by an examination before a professional board (hereinafter referred to as 'the examination before the professional board') established by the operator of the specialised equipment after completion of the training under Chapter 13.3.2.3. The examination before the professional board shall consistof a written and an oral part, the details of which shall be defined by the operator of the specialised equipment in the quality . management system documentationUpon successful completion of the examination before the expert committee, the shall issue a to operator of the specialised installation certificate of competence the personnel pursuant to Article 24(3) of the Atomic Energy Act [1]. NJZ as a future licence holder will keep a register of professionally qualified employees (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 § 9(5); [8]).

13.3.2.7 Training and educational programmes

Appropriate training and instructional programs . will be established and maintained for the instruction and training of permittee employees prior to their assignment to safety-related positionsThe programmes will include initial training, which will qualify the employee to perform the duties of the, and periodic refresher training (D3.1; WENRA [4]). The selected employees of the holder of the authorisation to , operate or decommission a nuclear installation will be employees performing work activities thathave a direct

impact on nuclear safety. They shall have a second-degree university education obtained in the Slovak Republic or in the of the territoryMember States, they shall have completed professional training, they shall be medically fit and mentally competent, and their special professional competence shall have been verified by an examination commission established by the Authority and they shall have been issued a special professional competence certificate by the Authority (Atomic Energy Act § 24 (4); [1]).

The training and qualification maintenance programme shall include provisions for periodic verification of the competence of these personnel and for periodic refresher training (periodic training). The refresher training and training will also include the renewal of the authorisation upon expiry or retraining of the employee, particular inif the employee holding the authorisation moves to a different job (with a different type of authorisation) or has been absent of time from for a prolonged period a position requiring authorisation (e.g. due to illness). Training will emphasize the importance of safety in all aspects of facility operations and promote a culture of safety. Documented criteria will be used in assessing the competence and suitability of an individual as a basis for granting authorisation to perform a function (Atomic Energy Act § 23(1), (2); [1], Nuclear Safety Authority Decree No. 52/2006 § 3(5); [8] 4.19; IAEA [3] and D4.1; WENRA [4]).

All qualified employees of the , including contractors operating at the NPP , sitewill have a basic understanding of nuclear safety, radiation safety, fire safety, emergency arrangements at the site in the event of an emergency and industrial safety, and safety culture requirements (Atomic Energy Act § 23(2); [1], D3.2; WENRA [4]). Basic trainingof the future licensee's employees will be alsocarried out based on the requirements of Act No. 124/2006 Coll. [9], specifically in §7 Briefing and informing employees. Periodic training will be set in two-year cycles.

Appropriate training records and personal assessment records will be prepared and maintained for each employee in a safety-sensitive job role D2.3; WENRA [4]).

Training programmes will be evaluated and continuously improved through regular review. In addition, will a system be in place for the timely modification and updating of training equipment, computer models, simulators and training to that all training resources adequately reflect current nuclear facility conditions and operational needs and that, where appropriate, differences between reality and training materials are justified (4.22; IAEA [3]).

Operational experience from the nuclear installation, well as 's own operationasexperience from the operation of other nuclear installations, will be appropriately incorporated into teaching and training programmes (Decree No 52/2006, § 4(3)(a)(3) and § 5(3)(b); 8]). Training on the root cause(s) of the incidents and on the corrective actions identified will be provided reduce the likelihood of their recurrence (4.22; IAEA [3]).

Maintenance and technical support staff, including contractors, receive practical training in the required safety-relevant activities (D3.6; WENRA [4]).

13.3.2.8 Simulator training

The simulator training will comply with the requirements of the Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011, Annex 4, Part B I, paragraph G [6], that activities important from the of view of pointnuclear safety will be carried out by the holder licence only in accordance with the operating documentation and the the procedures developed or written orders in such a way that they are in accordance with the approved staged assurance programme, with the limits and conditions and in accordancewithapproved documentation, and that these activities do not violate or jeopardise the nuclear safety.

Adequate training facilities, including a representative full-scale simulator (a replica of a unit control room with the capability to simulate nuclear plant conditions in real), appropriate training materials and equipment for technical training, will be made available for the training of selected personnel (in particular the permanent operators of the unit control room). (Decree No 430/2011, Annex 4, , Part BII, paragraph C, point (7)(e) [6]). Employees working as unit guard operators and other qualified employees designated by the holder licence shall be regularly trained in emergency response procedures using a representative full-scale simulator (Decree No 430/2011, Annex 4, Part B, Part I, paragraph G, point (13) [6]). Employees, working as operators of the block guard and others, holding

permits designated, qualified employees will be regularly trained in severe accident management instructions using a representative full-scale simulator (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011, Annex 4, Part B, II, paragraph G, item (14) [6]); LM6.1; WENRA [4]). Suitable training equipment will be provided for maintenance personnel to practice routine and emergency work .procedures (4.24; IAEA [3])

A representative full-scale simulator will represent the guardroom to allow selected personnel to perform all work activities that canbe performed on the guardroom . during trainingThe representative full-scale simulator will be part of the technical equipment of the operator of the specialised facility (Decree of the Nuclear Safety Authority No 52/2006 § 4(5); [8]).

A representative full-scale simulator will be usedfor hands-on training of permanent employees working as block watch operators to the extent that employees master all normal and emergency operating procedures. The simulator will be equipped with software covering normal NPP , operationsanticipated operational events and . The annual refresher training will include at least 5 days of simulator training (Decree of the NPP No 52/2006 § 4(3)(b); [8] D3.3; WENRA [4] and D3.4; WENRA [4]).

Recurrent training for selected employees (periodic training) will include in particular the following items (Decree of the Nuclear Safety Authority of the Slovak Republic No. 52/2006 § 4; [8], D3.5; WENRA [4]):

- Operation of the plant in normal operating conditions, selected anticipated operational events and emergency conditions;
- Collaborative teamworkchange ;
- Operational experience of incidents and modifications to equipment and procedures.

Training to manage the transition from EOP to SAMG for severe accident management will be carried out on a regular basis, including the interaction of the permanent staff of the block watch and the supporting parts of the emergency response organisation (LM6.3; WENRA [4]).

13.4 Feedback from operational experience

13.4.1 Basic legislative requirements

Reference [1] - Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Energy Act) and on the amendment of
and amendments to certain laws § 10, § 23 and § 27

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic . 430/2011 Coll. on requirements for nuclear safety, Annex No. 4

Reference [10] - Decree of the Nuclear Safety Authority of the Slovak Republic No. 48/2006 Coll., which establishes details on the method of reporting operational and transport events and details on the investigation of their causes

IAEA and WENRA recommendations

Reference [3] - IAEA SSR-2/2 rev. 1, Safety of Nuclear Power Plants: Commissioning and Operation

- *Requirement No 8 and No 24*
- *paragraphs 4.25; 4.26; .27; 4.28; 4.29; 4.30; .31; 4.32; 5.27; 5.28; 5.29; .30; 5.31; 5.32; .33*

Reference [4] - WENRA Safety Reference Levels for Existing Reactors 2020

- *A2.1; A2.2; J1.1; J1.2; .3; J1.4; J1.5; J2.1; J3.2; J3.3; .4; J4.1; J4.2; J4.3; J4.4; J4.5; J5.1*

13.4.2 Description of the project in of termsmeeting legislative requirements

13.4.2.1 Carrying out security-related activities

The licence holder will be responsible for compliance with nuclear requirements. This responsibility cannot be

get rid of. The liability under the first sentence also includes liability for the activities of suppliers and subcontractors whose activities may affect the nuclear of safetythe nuclear installation (Atomic Act, § 23; [1], Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 ., Annex No. 4 [6]).

It will be ensured that safety-related activities are identified and recorded, adequately analysed and managed to that the risks associated with the harmful effects of ionising radiation are kept aslow as reasonably achievable (Atomic Energy Act § 23(2); [1], Requirement 8; IAEA [3]).

A safety policy will be put in place through a guideline to implement this policy and monitor safety performance (A2.1; WENRA [4]). The policy will have clear safety goals and objectives defined so that these goals and objectives can be monitored and managed by the s management organisation'(A2.2; WENRA [4]).

All routine and non-routine operational activities will be assessed for potential risks associated with the harmful effects of ionising radiation. The level of assessment and control depends on the safety significance of the task and a graded approach should be used (4.25; IAEA [3]).

All safety-critical activities will be carried out in accordance with written procedures to that the NPP is operated within specified operating limits and conditions. Sufficient margins must bemaintained between the normal operating parameter values and the safety system activation settings prevent unwanted actuation of safety systems (4.26; IAEA [3]).

No tests will be carried out at the NPP facility without proper justification. If an extraordinary test or trial that is is required not covered by existing operating procedures, a special safety review will be carried out and a specific procedure , will be developedsubject to approval in accordancewith the established management system and applicable legislation (4.27; IAEA [3]).

Written communication will be preferred and spoken communication . will be minimized in the operation of the NJZWhere spoken communication , is usedcare will be taken toensurethat spoken instructions are clear and understandable. (4.28; IAEA [3]).

Aspects of the work environment that affect Puda performance factors (such as workload or fatigue) and the ability of employees to perform activities . safely will be identified and managedPudi performance improvement tools (4.29; IAEA [3]) will. be used to support employee responses

The holder's permitorganisation will encourage staff to adopt a questioning approach. Employees will make appropriate and conservative decisions so that risk is minimised and the facility is maintained in a safe condition (Atomic Energy Act § 10; [1], 4.30; IAEA [3]).

The responsibilities and authorities for restarting the reactor after an event leading to an unplanned shutdown, a controlled shutdown or a significant transient or prolonged outage will be clearly defined . in writingInvestigations will be out carriedto determine the cause of the event (ifnecessary by root analysis) and corrective will be taken to reduce the likelihood of a recurrence of the event. Prior to restarting or restoring the NPP to full , operationthe necessary corrective actions, including inspection, testing and repair of damaged selected equipment, will be carried out to demonstrate assurance that the are being performedsafety functions that have maybeen compromised . by the event conditions and criteria will be established and adhered to (4.31; IAEA [3]).

Where probabilistic risk , it assessment will be for useddecision-making purposeswill be ensured that the risk analysis is of the appropriate quality and scope requiredfor decision-making . purposesThe risk analysis will be performed by appropriately qualified specialists and will be applied in a manner that complements the deterministic approach to decision making (4.32; IAEA [3]).

13.4.2.2 Operational experience feedback

Prior to the application for authorisation of a NPP for the commissioning of a nuclear installation under Section 5(3) of the Atomic Energy Act [1], an will operational experience so programme be put in place that lessons can be learnt from the operational

incidents in the power plant, incidents in other nuclear industry and other industries worldwide (Atomic Energy Act § 23(2); [1], Requirement 24; IAEA [3]).

An operational event is an event in which nuclear safety is compromised or violated at a nuclear installation during the commissioning, , decommissioning or closure of a repository (Atomic Energy Act § 27; [1]).

A programme for the systematic collection, review and reporting of operational events and experiences in the NPS . will be established and implementedEvents and operational experiences will be analysed, trends in individual factors and causes , will be establishedand everything will be properly documented. Available information on operational experiences and events at other nuclear installations will be collected and evaluated to determine lessons for their own operations, including the addition of their own corrective actions to these experiences. The exchange of experience within national and international systems for feedback of operational experience . will be encouragedRelevant lessons from other industries will be alsotaken into account where appropriate (Atomic Energy Act § 23(2); [1], 5.27; IAEA [3], J1.1; WENRA [4], J3.3; WENRA [4]).

Safety significant events will be investigated according to their actual or potential safety significance using a graded approach. Events with significant safety implications will be investigated with the aim of determining their direct and root causes, including those related to the design, operation and maintenance of the installation or to human and organisational factors. The results of the evaluation of the events and the corrective actions identified will be included in the relevant training programmes and will be used in the review of operating rules and other documentation (e.g. equipment). maintenance documentationOperational incident investigation reports (including non-radiation) related accident reportswill identify activities and procedures where inadequate training may contribute to damage to selected equipment, excessive unavailability of selected equipment, the need for unscheduled maintenance, or the need for repetitive work. Further, these reports will identify situations leading to the use of unsafe practices or non-compliance with approved procedures (Atomic Energy Act § 27; [1],]§ 23(2); [1, 5.28; IAEA [3], J1.2; WENRA [4], J3.4;
WENRA [4]).

The information from the operational experience management system shall be reviewed by designated qualified persons for any precursors of adverse safety conditions or adverse trends so that any necessary corrective action can be taken before the conditions for the occurrence of a serious operational event . are establishedQualified persons will be appropriately trained, adequately resourced for their work and supported by the top management of the 's organisation. Significant trends and findings will be communicated to the top management of the licensee organisation (Atomic Energy Act § 23(2); [4], 5.29; IAEA [4], J1.3; WENRA [4], J1.4; WENRA [4]).

As a result of the investigation of operational incidents, clear recommendations will be made to the responsible , who must take appropriate corrective action in a timely manner to prevent . Corrective actions (e.g. technical adjustments, administrative measures, addition of staff training, etc.) will be categorised according to their relevance to safety and will be , planned and implemented, and their effectiveness will be reviewed. Operations staff will be informed of events that arerelevant and of the necessary corrective actions taken reduce the likelihood of recurrence (Atomic Energy Act § 23(2); [1], 5.30; IAEA [3], J1.5; WENRA [4] J4.5; WENRA 4]).

The licensee shall be responsible for instilling in anattitudelicensee employees and contractors that supports the reporting of all operational events, including minor and near-misses. Furthermore, systematic reporting of potential problems related to equipment , failuresdeficiencies in PUD performance, procedural deficiencies or discrepancies in documentation that arerelevantto safety will then be encouraged (Atomic Energy Act § 23(2); [1], 5.31; IAEA [3], J3.2; WENRA [4]).

Liaison will be maintained, as appropriate, with supporting organisations (e.g. manufacturers, research organisations and designers) involvedin the design, , commissioning and operation of the plant, with aim of theproviding feedback on operational experience and, where necessary, obtaining

Advice in the event of equipment failure or other operational incidents (Atomic Energy Act § 23(2); [1], 5.32; IAEA [3], J4.4; WENRA [4]).

Information relating to experience from normal and emergency operations and other relevant safety-related information will be systematically a sorted, documented and stored in such way that it can be easily retrieved, reviewed and assessed by the employee designated (Atomic Energy Act § 23(2); [1], J2.1; WENRA [4]).

Following an operational incident with safety implications, an will initial assessment be carried out so that immediate corrective action (if) . can be takenFurther, appropriate methods of investigation of the incident will be available, including a Puddy Factor . assessmentThe investigation of the incident will then follow an agreed procedure with the following steps:

- Creating a complete event sequence
- Determination of deviations and non-conformities
- Analysis of the direct causes and root causes of the event
- Assessment of the safety impact of the incident
- Identification of and prioritisation appropriate corrective actions

Subsequently, a schedule for the implementation of corrective actions will be established (J4.1; WENRA [4], J4.2; WENRA [4], J4.3; WENRA [4]).

The operational experience programme will be evaluated periodically to determine its effectiveness and to assess possible improvements (5.33; IAEA [3], J5.1; WENRA [4]).

Feedback from operational experience will take alsointo account the safety instruction of Nuclear Safety Authority theBNS 1/2023 "Reporting, investigation of causes and assessment of operational incidents at nuclear installations" [11].

13.5 Aging management and long-term operation

13.5.1 Basic legislative requirements

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic No.430/2011 Coll., which establishes details of the requirements for nuclear safety, § 3 and Annex No. 3

Reference [7] - Decree No. 58/2006 Coll. of the Nuclear Safety Authority of the Slovak Republicwhich establishes details on the scope, content and method of preparation of documentation of nuclear installations necessary for individual decisions, § 19

Reference [12] - BN 2/2023 Ageing management and long-term operation of nuclear power plants (3rd edition - revised and supplemented)

IAEA and WENRA recommendations

Reference [3] *- IAEA SSR-2/2 rev. 1, Safety of Nuclear Power Plants: Commissioning and Operation*

- *Requests No 13, No 14 and No 16*
- *paragraphs 4.48; 4.49; 4.50; 4.51; .53; .54*

Reference [4] *- WENRA Safety Reference Levels for Existing Reactors 2020*

- *I1.1; I1.2; I1.3; I2.1; I2.2; .3; .5; I2.6; I3.1; I3.2*

13.5.2 Description of the project in of termsmeeting legislative requirements

13.5.2.1 Qualification of selected equipment

A systematic assessment will be carried out to demonstrate that the selected facilities are capable of performing their safety functions as required for all operational and emergency conditions (Requirement 13; IAEA [3]).

The appropriate design, scope and procedure for qualification of the selected facilities will be established and effective and feasible methods for upgrading and maintaining the qualification of the selected facilities . will be usedThe programme for establishing, confirming and maintaining the required qualification of the selected equipment will be initiated from the early stages of the project (design), during the manufacture, supply and installation of the selected equipment, and will cover the entire operational lifetime of the selected equipment. The effectiveness of the programmes qualification for the selected equipment will be reviewed on a regular basis (Decree of the Nuclear Safety Authority No 430/2011 Coll., §3 and Annex 3; [6], 4.48; IAEA [3]).

The scope and details of the qualification process for the selected facilities will be documented and submitted to the Nuclear Safety Authority Slovak for review and approval. The content of the qualification process for the selected facilities will include the areaof (s) control, the methodof (s) non-destructive testing, the possible defects to be controlled and the required control . effectivenessThe process will take into account national and international experience and the normative documentation . used(4.49; IAEA [3]).

13.5.2.2 Management of ageing

In order to ensure the safety and reliability of the NPP , operationwith the aim of ensuring its optimal economic use and in accordancewith the requirements of the legislation of the Slovak Nuclear Safety Authority, a will NPP , which ageing management programme be developed and implementedwill enable monitoring and evaluation of the impact of operation and degradation processes on selected SKKs, monitoring of trends of changes in their condition and timely adoption of corrective measures to eliminate or mitigate the causes of ageing. The ageing management programme is also one of the prerequisites for extending the operational lifetime of NPPs (BN 2/2023 [12]). An effective ageing to that management programme will be in place ensurethe required safety functions of the selected equipment will be fulfilled throughout the lifetime of the equipment, including the design, , commissioning, operation and decommissioning phases (Decree of the NPP No 58/2006 Coll., § 19; [7], Requirement No 14; IAEA [3], I1.1; WENRA [4]).

The Managed Ageing Programme will include equipment thatis safety critical (selected equipment) and, but not limited to, SKCs whose failure may prevent the selected equipment from performing its safety functions (BN 2/2023 [12], I1.3; WENRA [4]).

The selection of SKKs for the implementation of the programme managed ageing will be made on the basis of sound criteria basedon safety and technical principles. The following safety principles will be respected (BNS I.9.2/2014 [12]):

1. All SKKs that ensure the integrity of the reactor .cooling pressure boundary
2. All the SKKs essential for the safe shutdown of the reactor and its maintenance in a shutdown condition.
3. All SKCs that are important for preventing the release of radioactive substances and SKCs that mitigate the consequences of such accidents.
4. All SKKs whose failure could result in any of the above safety functions .being affected

The holder permitorganisation may extend the list of SKCs for the implementation of a managed ageing programme to include equipment selected by applying its own technical principles.

Managed obsolescence , programmedetermining the cause and consequences of obsolescence and the actions necessary to maintain the serviceability and reliability of selected equipment, including addressing the technological obsolescence of selected equipment. The managed obsolescence programme shall be coordinated with and with other programmes of the operator, including the periodic safety review programme. A systematic approach (4.50; IAEA [3], I1.2; WENRA [4], I2.6; WENRA [4]) .will be used to ensure the development, implementation and continuous improvement of managed obsolescence programmes

Monitoring, testing, sampling and inspection activities will be carried out to assess the effects of ageing on selected equipment, especially major components, and to detect unexpected behaviour or signs of deterioration early. Where necessary, will be corrective actiontaken in a timely manner, taking into account the significance of the specific equipment selected. Acceptability criteria will be established against which the assessedneed for corrective action will be

measures (BN 2/2023 [4], I2.2; WENRA [4], I3.2; WENRA [4]).

Managed obsolescence programmes for selected equipment will take into account the design basis, manufacturing, environmental and process conditions, and operational history (duty cycles, maintenance , schedulesservice life, inspection and testing programme, and component), as replacement strategyaswellthe results of periodic safety reviews. Due consideration will be given to the results of qualification procedures for the lifetime of selected equipment (BN 2/2023 [12], I2.3; WENRA [4]).

The managed ageing programme will assess the long-term effects arising from operating and environmental conditions (i.. etemperature conditions, radiation , conditionscorrosion effects or other degradation that may affect the long-term reliability of the selected equipment). The programme will take into account the safety significance of the selected equipment (BN 2/2023 [12], .51; IAEA [3], I2.1; WENRA [4]).

The ageing management of the reactor pressure vessel and its welds will take into account all relevant factors, including embrittlement, thermal ageing and fatigue, in order to evaluate its condition with a prediction for the whole lifetime of the NPP (I3.1; WENRA [4]).

13.5.2.3 Programme for long-term operation

A comprehensive programme will be developed and implemented to ensure the long-term safe operation of the facility beyond the time in specifiedthe licence conditions, design limits, safety standards and/or regulations (Requirement 16; IAEA [3]).

The justification for long-term operation will based beon the results of a assessment safety with due regard to the ageing of the selected equipment. The Long Term Operation Justification will use the results of the periodic safety review and is expected to be submitted to the Nuclear Safety Authority SRfor approval. This justification will be made on basis of thean analysis of a programme managed ageing to ensure the safety of the plant throughout its extended operational life (4.53; IAEA [3]).

A comprehensive programme for long-term operation will focuson (4.54; IAEA [3]):

a) Preliminary conditions for long-term operation (including the existing licence base, security enhancement and verification and operational programmes);
b) Determining the scope of the programme for all selected facilities;
c) categorisation of selected equipment with regard to degradation and ageing ;processes
d) extending the validity of safety analyses carried out on the of basistime-limited assumptions;
e) reviewing managed ageing ;programmes
f) implementation of the programme for long-term operation.

Relevant selected equipment whose reliability and operability may be compromised due to technological obsolescence . will be proactively identifiedSelected equipment will be prioritised on the basis of the impact on the safety of the operation of the equipment and the fulfilment of safety functions, and a strategy to will be developed ensurethat appropriate solutions are put in place in a timely manner (I2.5; WENRA [4]).

13.6 change management

13.6.1 Basic legislative requirements

Reference [1] - Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Energy Act) and on the amendment of
and amendments to certain laws, § 2 (g) and (w)

a) limits and conditions for safe operation or safe decommissioning, a document that contains the permissible values of the equipment parameters of a nuclear installation, defines its operating modes or its decommissioning ,modes

w) changes to a nuclear installation affecting nuclear safety during construction, commissioning, , operationdecommissioning, closure or post-closure, which may be implemented only after prior consent or approval of the Authority and, in special cases, after the opinion of the European Commission, changes

1. *selected devices whichcarry their safety function or which change their characteristics in to relationthe safety function,*
2. *documentation assessed or approved by the Authority,*
3. *resulting in a change in the limits and conditions referred to in point (g),*

Reference [1] - Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Energy Act) and on the amendment of
and amendments to certain laws, § 23, para. (2)

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic No.430/2011 Coll., which establishes details of the requirements for nuclear safety, § 3 and Annex No. 4

IAEA and WENRA recommendations

Reference [3] - IAEA SSR-2/2 rev. 1, Safety of Nuclear Power Plants: Commissioning and Operation

- *Requirement No 10 and No 11*
- *paragraphs 4.38; 4.39; 4.40; 4.41; 4.42; .43*

Reference [4] - WENRA Safety Reference Levels for Existing Reactors 2020

- *Q1.1; Q1.2; Q2.1; Q2.2; Q3.2; Q3.3; .4; Q4.1; Q4.2; .3*

13.6.2 Description of the project in of termsmeeting legislative requirements

An will equipment to configuration management system be developed and implemented ensure consistency between the design requirements (design), the physical configuration and the documentation of the equipment . (Requirement 10; IAEA [3])Selected changes will be subject to the approval of the Nuclear Regulatory Authority (NRA) under the Atomic Energy Act[1], Section 2(w). These changes :are as follows

1. Modification of selected devices which are carriers of their safety function or which change their characteristics in relationto the safety function,
2. Change of documentation assessed or approved by the Nuclear Safety Authority of the Slovak Republic
3. Changes resulting in a change of limits and conditions (Atomic Energy Act § 2 (g); [1])

Facility configuration management will ensure that safety-related changes to the facility and its systems are properly identified, vetted, designed, , evaluatedimplemented, and documented. Processes will be in place to handle the management of equipment configuration changes resulting from maintenance work, testing, repair, operational limits and conditions, and equipment modifications due to adjustments caused by component , ageingtechnology , obsolescenceoperational experience, technical developments and safety research results (4.38; IAEA [3]).

A will be change management programme developed and implemented (Atomic Energy Act Section 23(2); [1], Requirement ; IAEA [3]). No modification or change to the NPP, regardless of the reason for it, will reduce the ability to operate the plant safely (Q1.1; WENRA [4]). Modifications will be made in accordance with the design requirements applicable to the original systems, structures and components or their documentation (Decree NPS No. 430/2011, Annex 4; [6]).

Change management programmes will be in place to ensurethat all changes are properly identified, specified, reviewed, proposed, evaluated, authorised, implemented and recorded. Change management programmes will include modifications:

- Selected facilities.
- Operating limits and conditions.

- Procedures and regulations.
- Controlled Documents.
- Structures of the holder's organisation.

Changes will be categorised on the basisof their safety significance. Changes will be subject to approval by the Nuclear Safety Authority in accordance with their safety significance under the principles of the tiered approach (Atomic Energy Act § 23(2); [1], 4.39; IAEA [3], Q1.2; WENRA [4]). The procedure and responsibility for the review of the documentation approved by the Nuclear Safety Authority or assessed by the Nuclear Authority Safetyprior to the implementation of a change will be established (Decree of the Nuclear Safety Authority No. 430/2011 Coll, Annex 4; [6]).

Change management in accordance with the requirements set out in IAEA [13] shall ensure proper change , justificationdesign, safety assessment and review, updating of associated documentation, change , managementimplementation and testing of all permanent and temporary changes. The implications of the proposed change on PUDI operations and the performance of the selected facilities will be systematically analysed and evaluated. Appropriate consideration to will be given PUD and organisational factors in all modifications to the NPP (Atomic Energy Act § 23(2); [1], 4.40; IAEA [3], Q2.1; WENRA [4],
Q2.2; WENRA [4]).

A developed temporary management system will be to ensure that each temporary change is marked on site and in the documentation (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 ., Annex 4 [6]). Temporary changes will be limited by their duration and the number of changes currently in force in order to minimise their cumulative significance. The scope of temporary changes will be subject to periodic review. Temporary changes shall be clearly identified at point theof implementation and in any associated operational documentation. A formal system will be put in place to inform staff in a timely manner of temporary changes and their implications for the operation and safety of selected facilities (Atomic Energy Act
§ 23(2); 1], Decree .430/2011, Annex 4; [6], 4.41; IAEA [3], Q4.1; WENRA [4], Q5.3; WENRA [4], Q5.4;
WENRA [4]).

A will be put change management system in place to that plans, project documents and computer programmes are revised in the linewithmodifications . madeIf a change is implemented, the will be impact on operating regulations, training and the full-scale simulator alsoassessed (Atomic Energy Act § 23(2); [1], 4.42; IAEA [3], Q4.2; WENRA [4]).

Before the modified plant is put back intooperation, will staff be trained on the nature and extent of the change and all relevant documents necessary for the operation of the plant will be updated (4.43; IAEA [3], Q4.3; WENRA [4]).

For all changes, an will be initial safety assessment carried out to determine the potential safety implications (Atomic Energy Act Section 23(2); [1], Q3.2; WENRA [4]). Further, a detailed and comprehensive safety assessment will be conducted unless the initial safety assessment demonstrates that the scope of the comprehensive assessment can be limited (Atomic Energy Act § 23(2); [1], Q3.2; WENRA [4]). The comprehensive safety assessment will demonstrate that all applicable safety considerations and have been considered that system and design specifications and safety requirements are met (Atomic Energy Act § 23(2); [1], Q3.3; WENRA [4]). The scope, safety implications and consequences of the proposed changes will be reviewed by independent personnel notdirectlyinvolved in their design or implementation (Q3.4; WENRA [4]).

Implementation and testing of equipment modifications will be carried outin accordancewith applicable work management and testing procedures
facilities (Q4.1; WENRA [4]).

13.7 Reactor core and nuclear fuel management

13.7.1 Basic legislative requirements

Reference [1] - Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (Atomic Energy Act) and on Amendments and Additions to Certain Acts, § 13 to § 16

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic No.430/2011 Coll., which establishes details of the requirements for nuclear safety, Annex No. 3 and Annex No. 4

IAEA and WENRA recommendations

Reference [3] - Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR- 2/2 (Rev. 1)

- *Requirement No 30*
- *Paragraphs 7.18; 7.19; 7.21; 7.22; .23; 7.24; 7.25; .26; .27; .28; .29*

13.7.2 Description of the project in of termsmeeting legislative requirements

Measures will be taken to ensurethat only fuel that hasbeen properly fabricated . is loaded into the reactor coreThe fuel design and fuel enrichment criteria will be in accordancewith the design specifications and subject to the approval of the Nuclear Safety Authority of the Slovak Republic Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex No. 3; [6]). The same requirements will be applied prior to the introduction of fuel of a new design or a modified core design (7.18; IAEA [3]). Fuel loading and unloading will be carried out under a separately developed programme for each fuel campaign. The control of loading of fuel into the reactor and the BSVP will be carried out under a separately developed programme for each handling (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex Nos. 3 and 4; [6]).

The fuel exchange programme will include the design of the fuel load, the arrangement of fuel assemblies in the reactor core and in the BSVP before and after the fuel exchange with the determination of the relevant safety characteristics, which will be compared with the characteristics and data specified in the safety report (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Z. z., Annex No. 3 and 4; [6]).

The export and loading of nuclear fuel from and into the nuclear reactor without changing the configuration of the fuel assemblies in the core will be carried out by the holder licenceunder a nuclear fuel , which export and loading programmewill include a cartogram of the fuel assemblies in the core and the BSVP. After the nuclear fuel has been loaded into the nuclear reactor, the will licence holder carry out a check of the loading of the reactor core and the spent fuel store with the participation of the Nuclear Safety Authority Slovak Decree of the Nuclear Safety Authority Slovak No 430/2011 Coll., Annex Nos 3 and 4; [6]).

During operation, the will effectiveness of the performance of the nuclear reactor , control and protection systemcompensation elements, accident protection and the effectiveness of the liquid absorber . be knownThe actual performance of the nuclear reactor control and protection system performance elements will have a sufficient margin to guarantee the shutdown of the nuclear reactor and to maintain it in a subcritical state. The personnel will have sufficient information on the state of the reactor core and on the rate of change of important data affecting nuclear safety (Decree of the Nuclear Safety Authority of the Slovak Republic No 430/2011 Coll., Annex Nos 3 and 4; [6]).

Specifications and procedures will be developedfor the registration (Atomic Energy Act § 13, paragraphs 1 and 2; 1]), procurement, verification, receipt, loading, use, transfer, unloading and testing of nuclear fuel and its major components (Atomic Energy Act § 14, 15, [1]). The fuel programme will be drawn up in accordancewith the assumptions of the project (proposal) and the requested details . will be submitted to the Nuclear Safety Authority of the Slovak RepublicIn the of casenuclear fuel exchange, calculations and measurements will confirm that the currently loaded core meets the established safety criteria. It will be alsoconfirmedthat any changes to the reactor core are in with accordancethe approved nuclear fuel configuration (7.19; IAEA [3]).

A comprehensive nuclear fuel baseline monitoring programme will be put in place toensurethat baseline parameters are monitored, analysed for trends and evaluated with the of aimdetecting abnormal behaviour. Furthermore, this programme will ensure that the actual performance of the core is in accordancewith its design requirements and that the values of key operating parameters are recorded and maintained in a logical, consistent and traceable manner (7.21; IAEA [3]).

Reactor core reactivity management will be carried out in a deliberate and carefully controlled manner to that the reactor is maintained within prescribed operating limits and conditions and that the expected and desired reactivity response is achieved (7.22; IAEA [3]).

The operating proceduresfor reactor , start-upnormal operation, shutdown and fuel exchange will include the precautions and limitations necessary to maintain fuel integrity and to meet operating limits and conditions throughout the life cycle of the nuclear fuel (7.23; IAEA [3]).

Radiochemical data that are indicative of the integrity of the coverage fuel will be systematically monitored and analysed for trends so that it is possible to monitor whether the integrity of the nuclear fuel coverage is maintained under all operating conditions (7.24; IAEA [3]).

Appropriate methods will be established to identify any anomalies in the activity of the primary coolant so that analyses of nuclear fuel blanket leakage data can be performed to determine their nature and severity, their location, their probable causes, and the necessary corrective action (7.25; IAEA [3]). Operational acceptance criteria will be established for nuclear fuel leaks and procedures will be establishedfor dealing with situations of indicated nuclear fuel .cover leak damage

Handling to procedures will be developed for the nuclear fuel and the main structural parts of the core (reactor) ensure the controlled handling of fresh and irradiated fuel, its proper storage at the NPP site and its subsequent transport. Storage plans for both fresh and irradiated fuel will be submitted to the NRC for approval (7.26; IAEA [3]).

The transport of fresh and irradiated fuel will be carried out in with accordancethe relevant national regulations (Atomic Act § 14, § 15; , [1]Decree of the Nuclear Safety Authority of the Slovak Republic No. 57/2006 Coll. [14]) for domestic transport and in the of caseinternational transport (Atomic Act § 16; [1]) in accordance withthe IAEA safety standards (7.27; IAEA [3]).

Prior to any fuel handling, it will be ensured that an authorised, trained and qualified person and is present responsiblefor the on-site inspection and handling of the fuel in accordance with written procedures. Access to nuclear fuel storage areas will be restricted to authorised personnel (7.28; IAEA [3]).

Nuclear fuel records will be kept as the requiredforstorage, use and movement of all fissile material, including both fresh and irradiated fuel (Atomic Energy Act § 13; [1], 7.29; IAEA [3]).

13.8 Record keeping and operational documentation system

13.8.1 Basic legislative requirements

Reference [1] - Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Energy Act) and on
amendment of certain laws, § 13

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic . 430/2011 Coll, which establishes details of requirements for nuclear , Annex No. 3 and Annex No. 4

IAEA Recommendations

Reference [3] - Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR- 2/2 (Rev. 1)

- *Requirement 15*

- *paragraph 4.52*

13.8.2 Description of the project in of termsmeeting legislative requirements

A maintained records and documentation management system will be (Requirement 15; IAEA [3]). In the of casenuclear material accountancy and control, will inventory records and operational records be maintained and inventory change reports will be submitted to the Nuclear Safety Authority Atomic Energy Act § 13; [1]). A responsible person will be appointed to maintain the accounting and operational records for the control of nuclear materials and his name and other contact details will be notified to the Nuclear Safety Authority andthe European Commission (Atomic Energy Act § 13; [1]).

According to the Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll. [6], Annex No. 4, the quantities important from the of view nuclear safety point during the construction, start-up, operation and decommissioning of a nuclear installation and in the case of a repository during its closure shall be truthfully and comprehensibly recorded continuously so that the time of spantheir changes before, states during and after the transient captured. From the start of start-up and during operation, they shall be recorded :by the organisationpermit holder

- the results of equipment tests during construction and commissioning,
- the lapse or breach of limits and conditions,
- traffic flow during working shifts,
- results and records of tests, inspections, maintenance and repairs of selected equipment,
- parameters and records that areimportant for informing the status of the nuclear installation,
- surface contamination values of equipment,
- data on operational events,
- the results of medical and psychological fitness checks,
- the results of verifications of the specific competence of staff,
- the results of staff ,proficiency tests
- data on the form and quantity of discharged radioactive , on the level of radiation in the nuclear installation and on the dose burden to personnel,
- details of modifications made to the nuclear installation,
- data on quantities and movements of nuclear materials, special materials and equipment and radioactive waste,
- data on the generation and management of radioactive waste,
- details the ofchecks carried out in accordance with the requirements laid down in the limits and conditions.

During the start-up, operation, decommissioning and closure of the repository, the shall permit holder's organisation ensure the maintenance, recording and storage of this documentation:

- operating rules,
- operational schemes,
- handling cards,
- maintenance ,regulations
- operational programmes,
- emergency regulations,
- operating logs,
- evaluation of inspections and tests under the Staged Assurance Programme, the quality requirements of the nuclear installation and the quality requirements of selected equipment,
- evidence of compliance with the qualification requirements,
- records.

Records of operation, including maintenance and surveillance, will be availablefor all selected equipment, from the initial tests during the commissioning of each selected equipment (including manufacturer's or supplier's). tests of selected equipmentRecords of all activities will be retained in proper archives for the period required by the Safety Authority.

All records shall be legible, complete, identifiable and easily traceable. The period of retention of records and documents will be commensurate with their level of relevance for operational , purposeslicensing of facilities and for future decommissioning (4.52; IAEA [3]).

During the construction, start-up, operation and decommissioning of a nuclear installation and in the of casea storage facility during , its closurethe quantities important from the of view nuclear safety pointshall be recorded by the holder licence truthfully and comprehensibly on a continuous basis so that the time of spantheir changes before, during and after the is captured (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex No. 3; [6]).

From the start of start-up and during operation, data on (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll, Annex 3; [6]) :will be recorded

a) transient states and parameter changes of selected devices,
b) indications left in selected devices ensuring the integrity of the primary circuit and their propagation,
c) newly emerging indications in selected establishments and their spread.

13.9 Shutdowns reactor

13.9.1 Basic legislative requirements

Reference [6] - Decree of the Nuclear Safety Authority of the Slovak Republic No.430/2011 Coll., which establishes details of the requirements for nuclear safety, Annex No. 3 and Annex No. 4

IAEA Recommendations

Reference [3] - Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR- 2/2 (Rev. 1)

- *Requirement 32*
- *paragraphs 8.18; 8.19; 8.20; 8.21; .22; .23; .24*

13.9.2 Description of the project in of termsmeeting legislative requirements

Procedures will be established and implemented to ensure the planning, management of work activities and overall effectiveness of the safe conduct of shutdowns (Requirement 32; IAEA [3]).

Outage planning will be a continuously improving process involving past outages, current outages, the next planned outage, and all future outages. Milestones that are relevant to the work being carried out prior to the outage will be identified and the process of preparatory work will be monitored using these milestones (8.18; IAEA [3]).

The organisation holding the permit shall prepare (Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll., Annex No. 3; [6]):

a) one month prior to the start of the overhaul or extended overhaul, a schedule of operational inspections of selected equipment,
b) two weeks before the start of the overhaul or extended overhaul, the schedule of works during the ,
c) two weeks prior to the start of the primary circuit leakage test, the schedule restart after replacement Fuel,
d) one month before restart, the neutron-physical characteristics of the core are valid for the next campaign,
e) after completion of the overhaul or extended :
    1. a report on the results of operational checks,
    2. a report on the fulfilment of the safety criteria for nuclear fuel,
    3. a report on the uptake of the project-limited number of operating modes of selected primary

of the circuit, steam and feedwater pipes for the previous campaign and in total since the start of operation,

4. an evaluation report on the lifetime drawdown of the nuclear reactor pressure vessel and selected unit equipment, including the critical brittle fracture temperature of the nuclear pressure vessel,
5. a report on the evaluation of the success criteria for restart tests after nuclear fuel .exchange

Safety-related . items will be prioritised in the planning and outage execution processesParticular attention will be paid to maintaining the plant configuration in accordancewith the operating limits and conditions (8.19; IAEA [3]).

The holder permitorganisation will be responsible for issuing outage management programmes and procedures and for providing adequate resources to ensure safety during the shutdown (8.20; IAEA [3]).

The roles, authorities and responsibilities of groups and persons involved inthe preparation, implementation or review of shutdown schedules and activities during shutdowns will be set out in writing and will be adhered to by all personnel working on the NPP site, including contractors involved (8.21; IAEA [3]).

The interfaces between the group responsible for outage management and other groups on or off will be clearly defined. Operational personnel will be kept informed of ongoing maintenance , activitiesmodifications and testing .(8.22; IAEA [3])

The basic elements of outage programmes and planning will be optimisation of outage work in of termsradiation protection as well as optimisation in of termsother safety , requirementswaste minimisation and chemical risk . managementThese priorities will be clearly communicated to relevant personnel and contractors performing activities during the outage at the site (8.23; IAEA [3]).

After each outage, a will comprehensive evaluation be carried out with conclusions to improve the outage planning system (8.24; IAEA [3]).

13.10 The link between nuclear safety and physical protection

13.10.1 Basic legislative requirements

Reference [1] - Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (Atomic Energy Act) and on Amendments and Additions to Certain Acts. § Section 2(f)

Reference [15] - Decree No. 51/2006 Coll. the Nuclear Safety Authority of the Slovak Republic, which establishes details on requirements for ensuring
physical protection

IAEA Recommendations

Reference [13] - Safety of Nuclear Power Plants: Design, IAEA Safety Standards Series No. SSR-2/1 (Rev. 1)

- *Requirement No 8*

13.10.2 Description of the project in of termsmeeting legislative requirements

The physical protection of the NICU will provide the following functions:

- Access to the guarded area, the protected area and the inner area will be granted only to persons or vehicles that have been granted permission to enter or to enter the defined area.
- It will be ensured that persons lawfully entering the guarded area, protected area and interior space do not misuse this authorization for unauthorized activity.
- The combination of the electronic security system and mechanical barriers will ensure early detection of intruders and slow down their progress, thusenabling the intervention unit to stop them before unauthorized activity.

These physical protection functions will be fulfilled under Atomic Energy Act [1] § 2(f)(1) for the NPP for a period of six months before the start of .

The category of the construction object or technological system of a nuclear installation under the category of the nuclear material or radioactive waste placed therein shall be determined under the category of the placed therein nuclear material or radioactive waste with the highest category (Decree of the Nuclear Safety Authority of the Slovak Republic No. 51/2006 Coll. [15]; § 4). Construction facilities and technological of systemsnuclear installations, nuclear materials or radioactive waste classified as Category I shall be placedin an indoor area, nuclear materials or radioactive waste classified as Category II shall be placedin a protected area, nuclear materials or radioactive waste classified as Category III shall be in placeda guarded area.

The categorization of individual classes of nuclear materials and technologies is determined by the Decree of the Nuclear Safety Authority of the Slovak Republic No. 51/2006 . [15], Annex No. 1. In of termsrequirements for individual classes of NPP premises, will according to § 5 and § 6 of the Decree of the Slovak Nuclear Safety Authority No. 51/2006 . [15], the premises be converted as follows:

- The barriers of the guarded area, the protected area and the interior space shall be constructed in such a way thatthey cannot be illegally breached in less time than for ittakesthe intruder to be spotted reliably by industrial television or members of the security force.
- The barriers of the guarded area, the protected area and the interior space will be illuminated so that designated members of the security force can directly or by industrial television clearly observe their overcoming.
- It will be ensured that in the area within 200 m perpendicular to the barrier of the guarded area on its outer side, no activities are carried out that cause damage to the technical means of physical protection, unjustified activation of the electronic security system and injury to security personnel and service . This area shall be visibly marked.
- The barrier of the guarded area in which nuclear materials, radioactive waste or nuclear installations classified in Category I will be located will consist of a pair of mechanical barriers (hereinafter referred to as the 'isolation zone'):
    - at highleast 2.5 m ,
    - at apartleast 6 m ,
    - equipped with at least two independent types of electronic security system operating on different physical principles, at least one of which is of the of naturevolume detection,
    - monitored by industrial television so that the presence of in persons or vehicles .the area can be reliably controlled
- The construction of the isolation zone will provide
    - intrusion detection with a probability of at least 0,95,
    - stopping a wheeled vehicle with a mass up to 10 000 kg travelling at a speed of 40 $km.^{h-1}$.
- The building, which is part of the isolation zone, will be secured on the outside of the barrier by an electronic security system and industrial television.
- The barrier of the guarded area where nuclear materials, radioactive waste or nuclear facilities classified in category II will be located will consist of a fence at high least 2.5 m equipped with an electronic security system, industrial television and mechanical restraints at the crown of the fence.
- The barrier of the guarded area in which nuclear materials, radioactive waste or nuclear facilities classified as III will be located shall consist of a fence at high least 2.5 m with mechanical restraints at the crown of the fence.

- The barrier of the protected area will consist of a fence at high least 2.5 m equipped with an electronic security system and mechanical restraints at the crown of the fence.
- Indoor space barriers will consist of walls of buildings or rooms equipped with electronic security systems.
- Escape exits will be constructed in such a way as to allow the safe escape of persons from the endangered area. The use of an escape exit will be signalled in the control .
- The open terrain around the barriers will extend to a distance of
  - 6 m on both of sidesthe isolation zone,
  - 3 m on both of sidesthe barriers of the guarded area and the protected area,
  - 3 m on the outside of the interior space.
- The purpose of the electronic security system, which willequip the barriers of the guarded area, the protected area and the interior space, will be
  - enable reliable detection of unauthorised barrier, crossing
  - to signal a malfunction or attempt to damage or interfere with the operation of this equipment,
  - Signal the attempt in the control control centrecentre audibly, continuously and clearly in the unauthorised crossing of barriers; this signalling can only be switched off by a employeecontrol ,
  - enable the location of the unauthorised crossing of the barrier .to be determined reliably
- In isolation zones and on mechanical barrier means of the protected space and the interior space, will be only elements of an electronic security system assessed according to special regulations .used
- In cases where individual premises are merged, the will effectiveness of mechanical barriers and electronic security systems .be enhanced
- A reliable communication link shall be established between all units and departments involved in physical protection, preventing the leakage of classified information, under any conditions envisaged in the physical protection .plans
- Testing, maintenance, periodic inspection and upgrade programmes will be for developedthe technical physical protection equipment to ensure its reliability and effectiveness under the physical protection plans and throughout its expected lifetime.
- Unauthorised crossing of the barriers of the guarded area, the protected area and the interior area equipped with an electronic security system will be signalled in the control centre.
- The control centre will be located inside a secured area in a building with bullet-proof .walls, doors or windows
- The control center will be located so that the activities of employees inside the control cannot be monitored from outside the secured area.
- The control centre equipment will be manned .around the clock
- Basic functions of the control of centrephysical protection systems for nuclear facilities, nuclear materials and Category I radioactive waste will be backed up in a backup control .

Under IAEA IAEA Requirement ; [13], the security nuclearmeasures, physical protection measures and measures to ensure the accountability and control of nuclear material at the NPP shall be designed and implemented in an integrated manner so that they do not mutually restrict or compromise each other. From viewthis point of, an interrelation and evaluation of the individual physical protection , measures proposed will then be carried outwhich must, on the onehand

51/2006 Coll. [15], but on the , otherhandthe performance of the safety functions of the NPP must not be restricted, including the ability of the employees to perform effective prescribed interventions during emergencies and postulated initiating events, including events caused by external threats from natural conditions.

From the point of view of the interconnection of physical protection and the ability of the NPP to fulfil safety functions, then, within the preparation of the preliminary physical protection plan (Decree of the Nuclear Safety Authority of the Slovak Republic No. 51/2006 . [15], § 8), an be prepared, in analysis of the physical protection function during construction, commissioning, operationand decommissioning of the nuclear installation and possible operational events, including events associated with the consequences of external natural phenomena, will addition to other parts of the plan specified by the Decree. This analysis shall confirm the alsoperformance of physical protection that does not interfere with the necessary movement of personnel or response units.

ABBREVIATIONS

Shortcut	Meaning of
BNS	Safety instructions
BSVP	Spent fuel storage pool
DEC-A	Design Extended Conditions A
DEC-B	Design Extended Conditions B
EBO V2	Nuclear power plant Jaslovské Bohunice V2
EOP	Emergency operating rules
IAEA	International Atomic Energy Agency
NJZ	New nuclear source
SAMG	Guidance on the management of severe accidents
SKK	Systems, structures and components
SR	Slovak Republic
ÚJD SR	Office of Nuclear Supervision
WENRA	Association of EU nuclear watchdogs
ZBS	Entry security report

CONCEPTS

Concept	Definition
Atomic Law	Act of the National Assembly of the Slovak Republic No. 541/2004 Coll. on the peaceful use of nuclear energy (Atomic Energy Act) and on amendment and supplementation of certain laws
Permit holder	Legal entity, under the Atomic Energy Act [1]
Operational event	An operational event is an event in which nuclear safety is compromised or breached at a nuclear installation during the commissioning, , decommissioning or closure of a repository.

REFERENCES TO CHAPTER 13

All references to legislative documents (decrees, laws, government) regulationsshall take into account their current the text, or the current text, if applicable, as amended.

[1] Act of the National Assembly of the Slovak Republic No. 541/2004 ., on the Peaceful Use of Nuclear Energy (Atomic Act) and on Amendments and Additions to Certain Acts, Collection of Laws of the Slovak .

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Format and Content of the Safety Analysis Report for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-61, Vienna: IAEA, 2021.

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, *Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev. 1),* Vienna: IAEA, 2016.

[4] Western European Nuclear Regulators Association, RHWG Safety Reference Levels for Existing Reactors Revision 2020, WENRA, 2021.

[5] NTERNATIONAL ATOMIC ENERGY AGENCY, *Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.2,* Vienna: IAEA, 2000.

[6] Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Z. z. on nuclear safety , requirementsCollection of Laws of the Slovak .

[7] *Decree of the Nuclear Safety Authority of the Slovak Republic No. 58/2006 ., which establishes details on the scope, content and method of preparation of documentation of nuclear installations necessary for individual decisions,* Collection of Laws of the Slovak .

[8] *Decree of the Slovak Nuclear Safety Authority No. 52/2006 . on professional competence,* Collection of Laws of the Slovak .

[9] *Act of the National Assembly of the Slovak Republic No. 124/2006 . on Occupational Health and Safety and on Amendments and Additions to Certain Acts,*
Collection of Laws of the Slovak Republic.

[10] Decree of the Slovak Nuclear Safety Authority No. 48/2006 ., which establishes details on the method of reporting operational and transport events and details on the investigation of their causes, Collection of Laws of the Slovak .

[11] ÚRAD NADROVÉHO DOZORU SLOVENSKEJ REPUBLIKY, *BN 1/2023 - Notification, detection of causes and evaluation of operational events at nuclear installations,* Bratislava: ÚJD SR, 2023.

[12] ÚRAD JADROVÉHO DOZORU SLOVENSKEJ REPUBLIKY, BN 2/2023 - Management of ageing and long-term operation of nuclear power plants (3rd edition - revised and supplemented), Bratislava: Office of Nuclear Supervision of the Slovak , 2023.

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, *Safety of Nuclear Power Plants: Design, IAEA Safety Standards Series No. SSR-2/1 (Rev. 1,* Vienna: IAEA, 2016.

[14] *Decree of the Slovak Nuclear Safety Authority No. 57/2006 ., which establishes details on requirements for the transport of radioactive materials,* Collection of Laws of the Slovak .

[15] Decree No. 51/2006 Coll. of the Nuclear Safety AuthoritySlovakwhich establishes details on the requirements for physical protection, Collection of Laws of the Slovak .

COMMISSIONING SECURITY REPORT

Chapter 14

NAME OF THE PROJECT: **New Nuclear Source Project at Jaslovské Bohunice**

DOCUMENT :TITLE **Procedure and results of the commissioning of the NPP**

IDENTIFICATION CODE: NJZJB_AZUK_60_DOK_A_ZBS_VUJE_JESS_0014R02

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CONTENTS

14. PROCEDURE AND RESULTS OF THE COMMISSIONING OF THE JZ INTO OPERATION

This chapter of the Safety Commissioning Report describes the basic legislative requirements for the commissioning procedure the NPP. The chapter is prepared to the extent appropriate to the project , .e. stageifor the of purposeobtaining the Nuclear Installation Siting Permit for the NPP Project at the Jaslovské Bohunice .site

The chapter will be elaborated in more detail in the next phases of the project, .. iein the framework of the documentation submitted in with theconnection
the construction and commissioning of a particular type of nuclear installation.

14.1 Basic legislative requirements related to the procedure and results of commissioning of the JU to operation

Reference [1] - Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy (Atomic Energy Act) and on Amendments and Additions to Certain Acts, as amended, § 19

§ 19 Commissioning and operation of nuclear installations

(1) Only the holder of a NPP commissioning and licence may commission and operate a nuclear installation.

(2) The start of commissioning of a nuclear installation is the introduction of the first fuel of elementnuclear fuel into a nuclear reactor, well as asthe start of the management of nuclear materials or radioactive waste or spent nuclear fuel in nuclear installations which do not include a nuclear reactor.

(3) The Authority shall issue a licence for the commissioning of a nuclear installation upon submission of a written application accompanied by the documentation listed in Annex 1, point C. This authorisation shall form part of the authorisation for early use of the construction pursuant to a special regulation.

(4) Approval for the next stage of commissioning of a NPP shall be issued by the Authority upon submission of a written request by the holder licence pursuant to paragraph (3) after consideration of the report on the evaluation of the previous stage of commissioning the nuclear installation. The issue of consent for the next stage of commissioning of a NPP shall not be subject to the general rule on administrative procedure.

Reference [2]- Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Coll. on requirements for nuclear safety, § 6

§ 6 Nuclear safety requirements for nuclear installations during construction, commissioning, operation, decommissioning and, in the case of a repository, at its closure:

(1) Nuclear safety in the construction of nuclear installations, their start-up, operation, decommissioning and, in the case of a repository, also in its closure, is subject to compliance with the general requirements for nuclear installations, the special requirements for nuclear installations with a nuclear reactor and the special requirements for nuclear installations pursuant to Section 2(f), second to fifth points, of the Atomic Energy Act.

(2) The nuclear safety requirements under paragraph (1) are out setin Annex 4.

Annex 4 "REQUIREMENTS NUCLEAR SAFETY FOR NUCLEAR FACILITIES DURING THEIR CONSTRUCTION, CONSTRUCTION, OPERATION, EXPLOITATION AND, IN THE CASE OF A FACILITY, ALSO DURING ITS CLOSURE", Part B. "Content of Requirements":

Section I. "General requirements for nuclear installations"

A. Organisation of nuclear safety assurance and principles of safe construction, start-up, operation, decommissioning and the closure of the repository

(1) The construction of nuclear installations, their commissioning, operation, decommissioning and closure shall be governed by appropriate phased quality assurance programmes and safety .culture rules

(2) For the of purposesthe activities referred to in paragraph (1), the licensee shall establish an organisational structure with established responsibilities and functional duties and shall periodically review it to reflect the actual status of the nuclear installation.

(3) A test . programme shall be drawn up for each selected deviceWhere the equipment selected is part of a process system or forms part of a complete system, the test programme must be drawn up for the complete system or part of .it

(4) Test programmes for selected equipment shall be designed to verify the operations and functions of the to be commissioned equipment in the prescribed operating conditions envisaged by the design and specified in the pre-operational safety report.

(5) Prior to the start of start-up, the licensee shall check the readiness of the nuclear installation for start-up by verifying and recording the fulfilment of the SKK and post-installation test success criteria bykeeping a list of deficiencies and shortcomings. The continuation of commissioning shall be subject to the correction of deficiencies and deficiencies which could affect nuclear .

(6) Commissioning is the process duringwhich the licensee must verify that the SKKs are constructed in accordance with the design, that they are operable and that they meet the nuclear safety requirements of the pre-operational safety report.

(7) Prior to start-up, the licensee shall complete verification of the functional capability of each system under inactive conditions in accordance with programs, the results of which shall be documented by protocols and shall be the consistentwithsuccess criteria set forth in those programs. The results of the testing must be by the licensee.

(8) Start-up shall be carried out by the licensee in accordance with start-up programmes approved by the Authority such that each stage and sub-stage constitutes a coherent set of tests and the next stage or sub-stage shall be notstarted before all the success criteria set out in the programme of the previous stage or sub-stage have been completed duly and evaluated in a report, as one of the conditions for progression to the next stage or sub-stage of the start-up.

(9) Prior to the commencement of the relevant stage, the holder permitmust carry out a readiness check for that stage, :

- *a) completion of the works and tests required for the relevant stage,*
- *b) the achievement of the success , criteriawork and tests set out in the programmes of the previous stage and the readiness of the facilities for the next stage in with accordancethe programme of the relevant stage,*
- *c) the completeness and accuracy of the prescribed documentation, including documents and protocols for the testing and readiness of the JRCs involved in this start-up ,phase*
- *d) the implementation of a phased assurance programme,*
- *e) evidence of compliance with previous conditions issued by the Authority,*
- *f) evidence of compliance with the requirements of other supervisory authorities and a report .on the outcome of this inspection must be drawn up by the holderpermit*

(10) A nuclear installation onwhich the first stage of commissioning has already started shall be to subjectthe limits and conditions in the relevant regime.

(11) During start-up, the holder permitmust verify the correctness of the operating rules in of termstheir technical accuracy and the identified deficiencies are corrected on an ongoing basis.

(12) In the event of a nuclear emergency, safetythe licensee shall suspend the tests performed during start-up and restore the nuclear installation to a safe condition.

(13) A nuclear installation shall be to consideredbe started up when the have been metstart-up success criteria set out in the start-up .programmes

(14) Prior to the start of operation, the licensee shall check the readiness of the nuclear installation for operation by verifying and recording:

- *a) Completion of the testing of all stages of the launch,*
- *b) meeting the success criteria for each stage of the launch according to the relevant approved staging programmes,*
- *c) completion and evaluation of the trial run,*
- *d) readiness of the technological equipment and its operators for operation,*
- *e) compliance of the documentation according to Annex 1, point of C the Act with the current status of the nuclear installation.*

(15) The part of a nuclear installation that is being commissioned, operated, decommissioned or, in the case of a repository, closed, shall be separated by the licensee from the part where construction is in progress, so that installation work or possible incidents on the part of theinstallation under construction do not affect the nuclear of safetythe part of the installation that is being commissioned, operated, decommissioned or closed.

(16) The holder of the permit must draw up safety indicators for the operation.

(17) Examinations, tests or handling procedures and regime changes not described in the operating rules may only be carried out by the holder of the authorisation on the of basis a pre-defined procedure in with accordancethe current staged assurance programme.

(18) When deviations from operating theconditions contemplated in the operating rules occur, or when situations dangerous from the of view of pointnuclear safety arise during start-up, operation or decommissioning, the holder of the authorisation shall take such manipulations and measures to bring the nuclear installation immediately to a safe condition. When such a situation arises, may the licensee resume operations only after the causes to whichledthe have been clarified and eliminated.

B. Limits and conditions for safe operation

(1) The holder permitshall, before the start of the start-up, draw up limits and conditions, the scope and content of which shall be laid down in a special regulation.

(2) From the start-up, during start-up, operation and during decommissioning, shall the limits and conditions correspond to the current state of the process plant.

D. Documentation of activities and changes carried out

(1) Quantities relevant to nuclear safety must be recorded truthfully and comprehensibly by the holder licence on a continuous basis during the construction, start-up, operation and decommissioning of the nuclear installation and, in case of thea repository, during , its closureso that the time of spantheir changes before, during and after captured.

(2) From the start of start-up and during , operationthe holder permitmust record:

- *a) the results of equipment tests during construction and commissioning,*
- *b) the lapse or violation of limits and conditions,*
- *c) traffic flow during working shifts,*
- *d) results and records of tests, inspections, maintenance and repairs of selected equipment,*
- *e) parameters and records that areimportant for informing the status of the nuclear installation,*
- *f) surface contamination values of equipment,*
- *g) data on operational events,*
- *h) the results of medical and psychological fitness checks,*
- *i) the results of verifications of the specific competence of staff,*
- *j) the results of staff ,proficiency tests*
- *k) data on the form and quantity of discharged radioactive , on the level of radiation in the nuclear installation and on the dose burden to personnel,*
- *l) details of modifications made to the nuclear installation,*
- *m) data on quantities and movements of nuclear materials, special materials and equipment and radioactive waste,*
- *n) data on the generation and management of radioactive waste,*
- *o) data on the checks carried out according to the requirements prescribed in the limits and conditions.*

(3) During the start-up, operation, decommissioning and closure of the repository, the holder permitmust ensure maintenance, the recording and retention of this documentation:

- *a) operating rules,*
- *b) operational schemes,*
- *c) handling cards,*
- *d) maintenance ,regulations*

e) operational programmes,
f) emergency regulations,
g) operating logs,
h) evaluations of inspections and tests according to the staged assurance programme, the quality requirements for the nuclear installation and the quality requirements for selected equipment,
i) evidence of compliance with the qualification requirements,
j) records.

(4) Changes shall be made according to the design requirements applicable to the original SKKs or their documentation.

(5) The holder permitshall establish the procedure and responsibility for reviewing the Authority-approved documentation or Authority-assessed documentation before making a change.

(6) The holder permitshall develop and use a system for the management of temporary changes that ensures that each temporary change is identified on site and in the documentation.

G. Operating rules

(1) Activities relevant to nuclear safety must be carried out by the licensee only in accordance with the operating documentation and in accordance with established procedures or written orders, in such a way that they are consistent with the approved staged assurance programme, with the limits and conditions and in accordance with the approved documentation, and that these activities do not compromise or jeopardise nuclear .

Section II. "Special requirements for nuclear installations with a nuclear reactor"

A. Start-up readiness and compliance with the requirements the forphysical start-up phase and the power start-up phase

(1) The startup must be the holder:

a) divided intotwo stages, namely

1. physical start-up, the purpose of which is to verify the neutron-physical characteristics of the NPP and selected safety functions thatdepend on the neutron-physical characteristics the NPP; the start of physical start-up is to be the consideredintroduction of the first fuel assemblies into the ; this stage must be divided by the holder licence into two separate sub-stages, namely

1.a the introduction of into nuclear fuel the AZ nuclear reactor,
1.b physical trigger ,tests

2. energy start-up, the purpose of which is to verify at different power levels the design characteristics of the equipment and the design cooperation of all systems under steady-state operation and in transient processes; this stage must be divided by the holder authorisation into individual sub-stages taking into account the specified power of levelsthe tests,

b) be carried out according to the approved staging programme and the approved programmes of the individual physical tests and energy triggering,

c) be carried out in accordancewith the timetable and the relevant phased launch , which programmemay be adjusted if necessary on the of basisthe test .results

(2) Physical triggering and energy triggering programmes shall include:

a) the objective of the test,
b) baseline test ,conditions
c) security measures,
d) the procedureexamination ,
e) the criteria for success the exam,
f) designation of the person responsible for conducting and evaluating the test.

(3) The loading of into nuclear fuel a nuclear reactor shall be carried out by the holder licence in accordance with a fuel loading programme with a loading schedule. The documentation for fuel loading into the nuclear reactor must include a written procedure for the unplanned removal of fuel from the nuclear reactor to the storage .pool

(4) After the nuclear fuel has been loaded into the nuclear reactor, the licensee must inspect the AZ loading of the nuclear reactor in the presence of the Authority.

(5) During physical triggering, the licensee must obtain the results of the tests neutron-physical properties of the AZ, reactivity , coefficientscharacteristics of control, compensation and protection elements of the nuclear reactor.

(6) The holder permitmust prepare a report summarising the results of the physical start-up.

(7) The holder authorisation may only commence energy start-up after all physical start-up tests have been successfully carried out and after a preliminary evaluation of the physical start-up , results has been carried outdemonstrating that the have been metspecified conditions .

(8) The energy start-up shall be carried out by the holder permit in accordance with a timetable and an appropriate phasing programme, which may be adjusted if necessary according to the results of the physical start-up.

(9) The energy start-up shall be carried out by the holder permit in stages according to the approved staged start-up programme and according to the approved sub-programmes of the individual power sub-stages of the start-up. The holder permitmust prepare a report .on each sub-stage of the energy start-up

(10) The transition to the next sub-stage of the energy start-up may only be made by the holder authorisation after the assessment of the test results of the previous stage and after the success criteria of that stage .have been met

D. Record keeping and operational documentation

From the start of start-up and during , operationthe holder permitmust record data on:

a) *transient states and parameter changes of selected devices,*
b) *indications left in selected devices ensuring the integrity of the primary circuit and their propagation,*
c) *newly emerging indications in selected establishments and their spread.*

Section III. "Special requirements for nuclear installations under Section 2(f)(2) to (4) of the Atomic Energy Act [1]"

A. Launch readiness

(1) During start-up, the holder permitmust carry out

a) *testing with inactive and active model media to demonstrate functionality and operability of individual technological sets and the whole technological unit,*

b) *testing with operating media, the purpose of which is to demonstrate the operability of the entire technological unit at the performance parameters specified by the project.*

(2) The holder permitmay divide the start-up into stages.

IAEA Recommendations

Referencia [3] - Format and Content of the Safety Analysis Report for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-61

- *CHAPTER 14: CONSTRUCTION AND COMMISSIONING*

Referencia [4] - Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR- 2/2 (Rev. 1)

- *Ch. 6 "Start-up of NPPs", Requirement 25.*

Referencia [5] - Commissioning for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-28

- *Chapters 2 to 5*

14.2 Description of the project in terms of fulfilling legislative requirements

The commissioning of a NPP is the process during the whichlicence applicant demonstrates that the NPP is readyfor actual operation .on the basis of the implementation and results of the tests

The term "commissioning", used in the legislative documents of the Slovak Nuclear Safety Authority 2] and [6], is used in other legislative
In the documents of the Nuclear Safety Authority [2] and others, as well as in technical practice, it is replaced by the equivalent term "start-up".

As most of the applicable legislative requirements are based on [2], for the of purposethis chapter of the ZBS the term "triggering" , is usedwhich includes the preparation for triggering, carried out under inactive conditions, well the asasactual triggering, divided into physical and energetic triggering.

The process of commissioning of the NPP will be carried out in accordancewith the requirements of the Decree of the Nuclear Safety Authority of the Slovak Republic No. 430/2011 Z. z. [2] in the following stages:

1) Preparing for startup (activities covering Inactive Testing)
2) Startup (activities covering Active Testing)

All activities in both phases will be by governed the relevant Start-up , which Ruleswill be drawn up by the holder permit and will be binding on all legal and natural persons involvedin the start-up. The commissioning rules will describe the commissioning , staffingresponsibilities, scope and form of documentation, test procedure and other information. For the efficient and safe implementation of all activities, an will organisational structure with specific responsibilities and functional duties . be established at the NPP OperatorThis structure will be operationally adapted to the requirements of the actual situation and the tasks to be addressed in a given start-up .phase

14.2.1 Preparing NJZ for startup - inactive testing

Preparation for commissioning will be carried out in a logical and temporal sequence that respects the specificities of the individual SKKs as well as the interrelationships, functional and technological contexts of the individual SKKs and their position in the overall scheme of ensuring the safety of the NPS. The initial basis will be the results of functional tests carried out at the manufacturers (FAT) or at the suppliers of the equipment prior to installation at the NPP. This process will start with simple activities on individual devices, but more so on relatively separate parts of the FSS, and gradually increase the complexity of the tests and the number of FSS . to be examinedCompletion of the tests will be followed by tests of partial operating sets, whole operating sets up to the comprehensive testing of the NPP .technology

A separate test . programme shall be drawn up for each selected device or, if the selected device is part of a technological system, then for the complete system or a functional part thereofThe test programmes for the selected equipment or systems shall be designed to rigorously verify the operations and functions of the equipment or system in the full range of its required functionality, particularly in potentially safety .compromising conditions

A an integral comprehensive set of success , criteriaspecific to each device or system. , will be part of the testing programmesThe success criteria will allow to check the readiness of a facility to run the NPS by verifying that the have been metrequirements .defined by the project

Tests at lower levels will be carried out partly by simulation, which will replace the links to other systems (e.g. simulation of technological parameters during tests of control systems - control, signalling, simulation of inputs from higher-level protections and automata during tests of technological equipment and systems, etc.). Simulations will be to alsousedtest the response of systems to those signals whose real action cannot be ensured directly or safely (e.g. emergency signals and limits of operating parameters).

A special case of the lowest level tests will be the partial recovery and testing of individual functional units (e.g. pumps, fans).

The activities included among the tests performed in the process of NPP commissioning also include the operation of equipment, subsystems and systems for the of purposetesting downstream technological units. These are mainly auxiliary production complexes which serve as sources or stores for the discharge of auxiliary and operating media and energy, but also systems whose interaction is necessaryfor the performance of functional tests of other systems.

Quality checks of selected equipment on systems important for nuclear safety will also be an essential activity under the quality plans and inspection and test , which programmesare timed to be carried out during the pre-operational inspection period prior to fuel loading and must therefore be coordinated with the implementation of the functional tests during this period.

Organisationally, will be inactive testing closely coordinated with the completion of assembly and the course of post-assembly cleaning operations so that initial conditions are created for the gradual development of recovery work under the pre-complex and complex testing programmes of individual operating sub-assemblies until the unit is ready for start-up or for loading fuel into the reactor. During the tests, the will be functionality of all primary and secondary circuit systems progressively verified in relation to electrical equipment, measurement and control, automatic control system in conditions close the tonormal mode of operation.

In of termstechnology, will inactive testing, in accordance with the established procedures from the start-up of power plants already in operation in the Slovak Republic as as wellwith international practice, include the following subgroups of activities:

1) Post-assembly cleaning operations of equipment, circuits and technological systems
2) Hydraulic tests of separate parts
3) Cold hydraulic tests of complete circuits
4) Hot hydraulic circuit tests
5) Inspection of equipment after hydraulic tests

The inactive tests will include alsopressure and leak testing of the containment.

As part of the inspection (revision) of the equipment after hydraulic tests, the will be primary circuit equipment checked, among other things, for possible faults and defects that may have occurred during the pressure and leakage tests. After the evaluation of the inspection and the elimination of any defects, a final flushing of the primary circuit piping and systems with boric acid solution will be carried out in preparationfor fuel loading and the conditions will be set for the start of the physical start-up .phase

The results of the testing in each stage or sub-stage, e. i.from the verification of the functional capabilities of individual systems in inactive conditions under the test , programmeswill be , supported by protocols. It will be demonstrated that the results are in accordancewith the success criteria set out in these programmes. In the event of failure to meet the criteria during any test, will be action taken to eliminate the cause and to correct the problem so that the equipment or system meets the established criteria. The next stage or sub-stage shall not commence until all the success criteria set out in the programme of the previous stage or sub-stage .have been completed duly and evaluated by protocol

Completion of all planned stages of inactive testing will the demonstratefunctionality and operability of individual equipment, technology sets and the entire process unit within the full range of parameters specified by the project and considered in other licensing documentation.

The result of all activities in preparation for commissioning will be, in accordancewith the requirement of Section 19, point (3) of Act No. 541/2004 . [1], a written application for a commissioning permit containing relevant documentation documenting compliance with all relevant legislative requirements.

14.2.2 Launching NJZ - active testing

Actual commissioning is the process duringwhich the licensee verifies that all equipment and systems are constructed in accordance with the design , in a comprehensive sequence and within the full expected range of parametersthatthey are operational, that they provide the required functions and that they meet the nuclear safety requirements within the scope of the assumptions of the pre-operational safety report.

Prior to the start of commissioning, will be a comprehensive verification of the functional capabilities of the individual systems under inactive conditions completed under the respective programmes. The results will be documented by protocols, will be in accordance with the success criteria set out in these programmes and be willconsistent with the status and results described in the documentation accompanying the application for launch .authorisation

The actual start-up will only commence after all work and testing , has been completedas specified for inactive testing. The start-up starts with the loading of into the first fuel assemblies the reactor and is carried out according to the 'ProgrammeNPP Commissioning ', which will be submitted and approved by the Nuclear Safety Authority Slovak to extent thespecified in Act No 541/2004 ., Annex No 1, point C, letter d) [1].

The NPP commissioning programme, .e. iboth physical and energy start-up, will be . The phasing will be determined on the basis of a proposal by the holder licence and approved by the Nuclear Safety AuthoritySlovak .

Prior to start-up, will all operating rules , be developedoperators will be trained in their application, and all operating rules will be valid and operational within the scope of normal operation of the NPP, including limits and conditions for safe operation of the unit. Verification of the correctness of the limits and conditions well as asother operating rules will be one of the dominant areas of testing of the NPP during start-up. Identified deficiencies will be analysed and corrective measures - together with suggestions for improving reliability and efficiency - will be incorporated into their texts and procedures .on an ongoing basis

If a condition arises inwhich nuclear could be compromised during start-up, the start-up will be interrupted (will be tests performed during start-up), suspendedthe NPP will be brought to a safe steady state, the occurrence of such a condition will be reported to the Nuclear Safety Authority of the Slovak Republic, and the operator will initiate the process of identifying the causes and preparing and taking corrective measures.

Fuel loading of the reactor core and commencement of physical start-up will be carried out in accordancewith the programme loading . and scheduleDuring the physical start-up tests, the will be neutron-physical characteristics and properties of the core and the functions of the reactor control and protection systems verified in relation to the neutron-physical characteristics of the core. The accuracy of the theoretical neutron-physical calculations of the , which be willused to control the NPP unit during , will be verified. Under the current requirements of the NPP SR, the will be interim test results provided to the NPP SR for review. The continuation of the start-up will be subject to the approval of the NPS SR .at the specified stages

Within the framework of the power start-up, initiated after obtaining the approval of the Nuclear Safety Authority of the Slovak Republic, the will power load of the unit be gradually increased at predefined power levels from the minimum controlled power up to 100% of the nominal reactor , powerwith the aim of bringing all parameters closer to their nominal values. The neutron-physical characteristics and properties of the , the design characteristics of the equipment, the cooperation of equipment and systems at steady-state power levels as as wellin suitably selected transients considered by the design . will be investigatedThe whole energy start-up will be divided into several stages , in agreement with the NPP SRthe completion of each stage being conditional on the preparation of the relevant documentation and its submission to the NPP SR for assessment. Transition to the next stage will be subject to the approval of the .

Completion of the power start-up will the demonstrateoperation of the NPP at nominal power, which will be used to verify the reliability and safety of the entire unit before it is handed over to test operation.

14.3 Results of commissioning operation

Appropriate documentation , will produced befrom the launch processdemonstrating that the , have been metsuccess criteria for all stages of the launch, as set out the inlaunch . programmesCompliance with all relevant requirements of Slovak legislation . will be documentedThe documentation will include an update of all relevant parts of the Pre-operational Safety Report.

This subchapter will be elaborated in particular to summarise all the results of the of commissioningthe NPP, to identify possible weak points (low safety margins) and to contain proposals for improvement of the NPP from the nuclear safety .point of view

The summary documentation will be submitted to the ÚJD SR in due time.

ABBREVIATIONS

Shortcut	Meaning of
AZ	active zone
BNS	safety instructions
JE	nuclear NPP
JZ	nuclear device
IAEA	International Atomic Energy , AgencyVienna (A)
NJZ	New nuclear source
NR SR	National Council of the Slovak Republic
SKK	systems, components and structures
SR	Slovak Republic
ÚJD SR	Office of Nuclear Supervision of the Slovak Republic

CONCEPTS

Concept	Definition
Atomic Law	Act No.541/2004 . on the peaceful use of nuclear energy (Atomic Act) and on amendment and supplementation of certain acts, as amended
Physical triggering	Activities from the introduction of nuclear fuel into the core to the achievement of the minimum controlled reactor .power
Energy triggering	Activities from completion of physical start-up to proven operation of the JU
Proven operation	Operation of the power plant at nominal (specified) power for a defined period of time (usually 144 hours) without operator , interventionunder predefined conditions

REFERENCES TO CHAPTER 14

All references to legislative documents (decrees, laws, government) regulationsshall take into account their current the text, or the current text, if applicable, as amended.

[1] Act of the National Assembly of the Slovak Republic No. 541/2004 Coll., on the peaceful use of nuclear energy (Atomic Act) and on amendment and supplementation
some laws, Collection of Laws of the Slovak .

[2] Decree of the Slovak Nuclear Safety Authority No. 430/2011 Coll. on requirements for nuclear safety, Collection of Laws of the Slovak .

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, *Format and Content of the Safety Analysis Report for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-61,* Vienna: IAEA, 2021.

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, *Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev. 1),* Vienna: IAEA, 2016.

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, *Commissioning for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-28,* Vienna: IAEA, 2014.

[6] *Decree of the Nuclear Safety Authority of the Slovak Republic No. 58/2006 ., which establishes details on the scope, content and method of preparation of documentation of nuclear installations necessary for individual decisions,* Collection of Laws of the Slovak .