**RO – Answers to TPR2 Qs**

**I – Answers to Qs from TPR Experts**

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| **Question ID** | **Reviewer** (TPR experts - AFP, PFP, FSA) | **Country/NAR** | **Fire Protection Thematic** (for experts' questions) | **Chapter and relevant section of TS** (for experts' questions) | **Installation type** (NPP, RR, SFS…) | **Installation name** | **Question - installation specific** (experts' questions) | **Question - General** (including generic/general experts' questions for type of installation) | **Country's response** |
| **RO-E-1436** | FSA | **RO** | **Fire safety analysis** | **Assumptions (TS 02.3)** | **Fuel fabrication facilities** | **Pitesti Plant** | P29, why the deterministic analysis § addresses probabilistic aspects? |  | The requirements for NFP Pitesti for conducting fire safety analyses (FSA) refer to Fire Hazards Analysis (FHA). Probabilistic fire risk analysis (called Fire PSA) is not applied to NFP Pitesti. |
| **RO-E-1437** | FSA | **RO** | **Fire safety analysis** | **Licensee and regulatory experience** | **Fuel fabrication facilities** | **Pitesti Plant** |  | [generic/general]: 1. Defence in Depth (DiD): Regarding the level of fire DiD and the assumptions in the Fire Safety Analyses (FSA) the following questions arise: a) Provide information on which combinations of fires and other events have been included in the fire analysis with their justification. Please refer to Appendix I of the IAEA SSG-64 to address possible combinations of events. b) With regard to these combinations of fires with other events in the analysis, is the failure of the fire protection features (for detection or suppression) caused by combined hazards – such as earthquake and consequential fire or a fire occurring coincidentally with a long-lasting external flooding – considered? What are the qualification requirements ensuring their required function during and after these events?  2. Fire resistance/fire hazard rating: The fire resistance rating of fire compartments, or fire hazard level, is often determined based on the fire load density (MJ/m²) in every fire area or compartment accounting for both permanent and transient fire loads and potential ignition sources. a) Provide details on the rationale followed. b) Fire load criteria values may differ amongst facilities and countries depending on the regulatory framework. How are these respective criteria justified? c) Are they justified knowing that fires in nuclear facilities are generally under-ventilated?  3. Transient combustibles and ignition sources: In how far and how have transient combustibles and ignition sources (by e.g. hot works) been included in the fire analysis and what are the hypotheses related to their inclusion?  4. Radiological/criticality consequences: Please provide description for: a) Assessment of radiological consequences of a fire in the analysis and criteria and corresponding threshold values applicable in the success criteria. b) Radiological confinement measures during a fire. c) Criticality: How has the criticality aspect been taken into account in the analysis and the impact on the fire protection features. d) How have the radiological hazards (radiological, criticality) been taken into account in the development of the fire brigade procedures (onsite, offsite brigades)?  5. Analytical methods: a) For the installations that do not provide enough detail on the tools and models used in the fire analysis, please provide a more detailed description.  b) In cases where computational tools have been used within fire safety analyses, provide information on the sensitivity and uncertainty analyses carried out.  6. Operating Experience: Provide a detailed description on if and how the operating experience from both (i) fires and (ii) other events (whether reportable or not) with degradation or failure of fire protection features in the installation analysed – and, as far as available, also from other nuclear installations – is considered in the fire analysis.  7. Results and revisions of the Fire Safety Analyses, additional analyses: Please provide details about: a) Treatment of modifications and changes in the installations as well as updates of the analysis should be addressed. b) Following the accident at the Fukushima NPP, stress tests were defined for European NPP. Has there been followed a similar approach regarding beyond-design-basis fire events for fuel fabrication facilities in your country?  8. Strengths/weaknesses: In cases that no strengths and weaknesses have been explicitly mentioned in the NAR, please confirm that neither strengths nor weaknesses have been identified. | 1. DiD a) For Nuclear Fuel Plant Pitesti, the requirements for conducting fire safety analyses (FSA) refer to Fire Hazards Analysis (FHA). Probabilistic fire risk analysis (called Fire PSA) is not applied to NFP Pitesti.  NFP Pitesti has under development the Fire Hazard Analysis (FHA), in accordance with national regulatory requirments and IAEA SSR-4. The combination of fires and others events has been included in the Final Safety Report of NFP Pitesti as the maximum credible accident. This consists in the occurrence of an earthquake-type event which generates the rupture of the hydrogen supply pipe of the sintering furnaces, leading to the initiation of its explosion. The scenario involves the initiation of a fire, generated by the rupture of the methane gas pipe coincident with the occurrence of an electrical short circuit. The maximum credible accident has been selected based on the qualitative what-if analysis of events - a set of postulated initiation events with real range of probabilities and significant radiological consequences.  b) FHA is under development. The detection and alarm systems are fixed on the ceilings/walls of the buildings.The fire protection features for suppression (e.g. fire hydrants) are in accordance with the national requirements provided in the seismic design code (normative P-100-1/2013).  2. Fire resistance/fire hazard rating: a)The fire resistance rating (minimum allowed fire resistance) of fire compartments and fire hazard rating is determined in accordance with the provision of national legislation (Normative P118-99) (over 840 MJ/m2 for high fire risk, between 420-840 MJ/m2 for medium fire risk and under 420 MJ/m2 for low fire risk).  Constructive elements (4-6 hours fire resistant walls and 1.5 -2 hours fire resistant doors are provided for the separation of rooms / spaces with high and very high risk of fire from other spaces with medium and low risk of fire, in accordance with national requirements regarding the fire safety of buildings (Normative P118-99). 3. FHA is under development - currently it does not consider the transient combustible. Being an ultra-conservative analysis, FHA takes into account the maximum permanent combustibles and all possible ignition sources.  4. Radiological/criticality consequences: a)FHA is under development, an assessment of radiological consequences for each area/compartment will be included. Moreover, in the Final Safety Report of NFP Pitesti, a set of postulated initiating events, with severity levels covering the radiological consequences (conservative), were selected in order to satisfy the dose criteria specified in the regulations issued by regulatory body (CNCAN). The analysis of the maximum credible accident (a complex, comprehensive accident, characterized by a high degree of severity in terms of radiological consequences and frequency of occurrence) consisting in the occurrence of an earthquake-type event, which generates the rupture of the hydrogen supply pipe of the sintering furnaces, leading to the initiation of its explosion, shows that in the most unfavorable scenario from the point of view of radiological consequences, the legal limits of total doses for the operating personnel and the population are not exceeded. The total effective dose equivalent (TEDE) for professional workers is 8.17 mSv at a distance of 10 m in the first 24 hours from event, below the lower limit of the 20-100 mSv interval provided for situations of emergency in the regulations in force. At the limit of the urgent protective action-planning zone (UPZ), established at 1 km (approximate distance of the residential area), the TEDE value is 0.23 mSv, in the first 24 hours from event. The maximum value of TEDE at UPZ, for a person from the population, calculated for 30 days from the beginning of the emission, is 0.49 mSv, below the maxim value of dose provided in Annex 4 from NSN-24 regulation for class 2 events (Design Basis Accidents) and even below class 1 events (Anticipated Operational Occurrences). b) Will be provided in FHA. Automatic shutdown of the ventilation system in case of fire.  c) In NFP Pitesti, the only nuclear material admitted is uranium dioxide, of natural or depleted isotopic composition. In accordance with the results included in the Final Safety Report, regardless of the confirguration (state and geometry) of natural uranium, the criticality is not reached even under credible accident conditions (local flooding, e.g., following the failure of the industrial water installation). d) As the nuclear facility NFP Pitesti shares the same site with Institute for Nuclear Research (INR), which operates TRIGA research reactor, the Post-Irradiation Examination Laboratory and the Radioactive Waste Treatment Station, the radiological hazards have been taken into account in the development of the fire brigade procedures (onsite, offsite brigades). 5. Analytical methods a) No computational tools will be used within FHA. FHA for NFP Pitesti will be based on internationally recognized methodologies, applicable to nuclear fabrication facilities. Fire protection engineering calculations based on formulas, graphs, tables or correlations from national and international norms and guidelines will be used. b) Not applicable 6. Operating Experience: The FHA is under development. NFP Pitesti has not experienced significant fire-related events since it was commissioned to date. If relevant operating experience from other facilities will be found applicable, it will be considered. 7. Results and revisions of the Fire Safety Analyses a) NFP Pitesti has under development (with deadline for completions in June 2024) the first FHA using the applicable regulatory and IAEA SSR-4 requirements. FHA will be revised to include any modifications and changes in the facility as well as to update the analysis.  b) A similar approach to beyond-design fire events has not been followed for fuel fabrication facilities. 8. Strengths/weaknesses: The FHA is still under development. |
| **RO-E-1438** | FSA | **RO** | **Fire safety analysis** | **Assumptions (TS 02.3)** | **Fuel fabrication facilities** | **Pitesti Plant** | • §2.3.4 (p.27): indicates that the legal limits for operating personnel and population are not exceeded. For workers a limit of 20-100 mSv is mentioned for emergency situations, but for the public no values are given (only indicated that dose is below max for DBAs and AOOs without specifying these max values). It would be good to indicate the values for these limits. |  | The maximum value of the effective dose for the most exposed person outside the site, calculated for 30 days from the start of the emission, for all expected routes of exposure is 0.5 mSv for class 1 events (Anticipated Operational Occurrences) and 20 mSv for class 2 events (Design Basis Accidents) |
| **RO-E-1439** | FSA | **RO** | **Fire safety analysis** | **Assumptions (TS 02.1)** | **NPP** | **Cernavoda NPP Unit 1** | (p 19, ch 2.1.6.1.) Time schedule for the gap analysis and the resulting measures? Update of the FHA and the FSSA? |  | The GAP Analysis will be finished at the end of April. The action includes also the update of FHA and FSSA. For the U1, the FHA and FSSA will be updated in 2024 for the Refurbishment project. |
| **RO-E-1440** | FSA | **RO** | **Fire safety analysis** | **PSR and modifications resulting from deterministic and probabilistic fire safety analyses** | **NPP** | **Cernavoda NPP Unit 1** | (p 19, ch 2.1.6.1.) What is the time schedule for the gap analysis and the resulting measures and for the updates of the FHA and the FSSA? |  | The GAP Analysis will be finished at the end of April. The action includes also the update of FHA and FSSA. For the U1, the FHA and FSSA will be updated in 2024 for the Refurbishment project. |
| **RO-E-1441** | FSA | **RO** | **Fire safety analysis** | **Licensee and regulatory experience** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic/general]: 1. Screening criteria used in the fire analysis for those NPP that have not explicitly identified these.  2. Defence in Depth (DiD): Regarding the level of fire DiD and the assumptions in the Fire Safety Analyses (FSA) the following questions arise: a) Has the failure of the fire protection means (features such as structures, systems and equipment, but also human failures in active fire protection) been taken into account in the fire analysis for the safety demonstration of the fire protection structures, systems and components (SSCs)? b) Both in the deterministic and probabilistic FSA, under which assumptions is this failure considered: full burnout in the fire area and failure of all SSC therein, functions of failure probability for the different SSCs, no damage due to the fire? c) Under these considerations, do you consider your Fire PSA conservative or realistic? d) Is the single failure criterion considered in the fire analysis? If it is, on which regulatory basis and how is it considered? e) Are the spurious actuation of signals by a fire and the false operation of fire protection SCCs considered in the analyses? In what way? f) Provide information on which combinations of fires and other events have been included in the fire analysis with their justification. Please refer to Appendix I of the IAEA SSG-64 to address possible combinations of events. g) With regard to these combinations of fires with other events in the analysis, is the failure of the fire protection features (for detection or suppression) caused by combined hazards – such as earthquake and consequential fire or a fire occurring coincidentally with a long-lasting external flooding – considered? What are the qualification requirements ensuring their required function during and after these events? h) Consideration of the different Plant Operational States (POSs) and/or operating status and modes in the deterministic FSA.  3. Fire resistance/fire hazard rating: The fire resistance rating of fire compartments, or fire hazard level, is often determined based on the fire load density (MJ/m²) in every fire area or compartment accounting for both permanent and transient fire loads and potential ignition sources. a) Provide details on the rationale followed. b) Fire load criteria values may differ amongst facilities and countries depending on the regulatory framework. How are these respective criteria justified? c) Are they justified knowing that fires in nuclear facilities are generally under-ventilated?  4. Qualification of cables: As far as qualified cables (typically FRNC) are available, in how far are they taken into account as fire load and fire source? How is the qualification of those cables been considered in the fire analysis and for what objective? In how far are protected cables (e.g., protected by protective coatings) considered as contributors to fire propagation in the fire analysis?  5. Transient combustibles and ignition sources: In how far and how have transient combustibles and ignition sources (by e.g. hot works) been included in the fire analysis and what are the hypotheses related to their inclusion?  6. Direct fire effects: Are direct fire effects (either by smoke, pressure, temperature, soot, etc) onto SSCs important to safety considered in the fire analysis (including reliability of human actions, fire pressure effects on fire doors, fire overpressure effects on cascade flow and pressure gradients of the dynamic confinement system, …)? Some detailed information about the regulatory requirements applicable and the way such effects are taken into account regarding design/conception/construction/modifications would be appreciated.  7. Electrical fires: Have electrically induced fires (including fires by high-energy arcing faults, HEAF) been considered in the fire analyses?  8. Fire Brigade: How have the response times of the fire brigade (onsite, offsite brigades) been taken into account in the fire analysis? This question is more relevant in those installations that do not have a dedicated onsite fire brigade.  9. Radiological consequences of fires: Please provide more details about the methods of addressing the radiological consequences of the fires in the fire analysis and the radiological criteria of acceptance and the corresponding threshold values applicable.  10. Analytical methods: a) For the installations that do not provide enough detail on the tools and models used in the fire analysis, please provide a more detailed description.  b) In cases where computational tools have been used within fire safety analyses, provide information on the sensitivity and uncertainty analyses carried out. c) The use of calculation tools is growing. What are your review processes to identify the needs and advantages/disadvantages of adopting such tools? What are the outcomes of these prospects? d) How are you facing to this (understanding of the corresponding studies by the stakeholders)?  11. Operating Experience: Provide a detailed description on if and how the operating experience from both (i) fires and (ii) other events (whether reportable or not) with degradation or failure of fire protection features in the installation analysed –and, as far as available, also from other nuclear installations– is considered in the fire analysis.  12. Additional analyses: Following the accident at the Fukushima NPP, stress tests were defined for European NPP. Has there been followed a similar approach regarding beyond-design-basis fire events for nuclear power plants in your country?   13. Results of the Fire Safety Analyses, revisions and actions: Please provide details about: a) A more elaborated description of the results of the analysis since for some plants the description is not very detailed. b) Please provide results for the fire contribution to CDF / LRF / LERF. c) The process carried out to update the fire analysis and the reasons for that. d) The procedure and responsibilities to design and establish compensatory measures when non-conformities or weaknesses have been identified. e) The use of the fire analyses by the regulator. f) The influence of international reviews on the Fire Safety Analysis.  14. Strengths/weaknesses: In cases that no strengths and weaknesses have been explicitly mentioned in the NAR, please confirm that neither strengths nor weaknesses have been identified. | 1. Screening criteria include the combustible load, potential for fire spread and the safety importance of the plant equipment located in the respective areas. All the areas in which safety-related equipment is located and all the areas with significant combustible loads have been included in the fire safety analyses.  2.  a) The active protection systems have not been credited in the deterministic fire safety analyses.  Fire PSA scenarios were developed considering ignition sources, combustibles, targets and failure of the fire protection features for mitigation, including human interactions failure.  b) In the deterministic fire safety analyses, it is considered that all the cables and equipment are destroyed by the fire (full burnout). Probabilistic FSA considers failure of all SSCs in the fire area and potential for propagation. A bounding fire ignition frequency was determined for each initial fire area, consisting of the sum of frequencies of individual ignition sources inside the area. Damage to all PSA targets (both fire sensitive components and cables) inside the area was assigned. In addition, the potential for fire propagation outside the area boundaries was considered.  c) Modelling of the fire scenarios could be considered conservative, based on the Fire PSA assumptions, results and insights.  d) The single failure criterion is taken into account in the Fire Safe Shutdown Analysis and in the Fire Hazard Analysis, in accordance with the provisions of regulatory requirements and industrial standards (CAN CSA N293).  e) The negative impact of fire extinguishing agents has been considered in the design of the fire suppression systems. In the deterministic FHA, the action of fire protection systems is not credited. In the Fire PSA, Fire Scenario Damaged Equipment Vectors were developed based on predicted damage to equipment (both fire temperature impact and fire suppression impacts on equipment were taken into account) in the fire impacted zones. Damage to equipment was derived either conservatively (damage to all equipment and cables inside the area) or more detailed assumptions were used.  f) No combinations of events have been considered in the deterministic FHA and FSSA or in the Fire PSA.   g) In the Fire PSA, potential for fire induced by secondary effects of seismic events was analyzed and the following steps have been performed:  - Reviewing the design requirements for fire protection against the effects of an earthquake;  - Identification of the vulnerable areas to earthquake induced fires;  - Identification of the key areas important to safety and, for these locations, assess the firefighting capability using permanent and temporary equipment to extinguish fires after an earthquake;  - Identification of the mitigating actions or long-term strategies to ensure that post Safe Shutdown Earthquake fires can be extinguished.  h) Only full power operation is considered in the deterministic fire safety analyses. Consideration of shutdown states will be taken into account in the revision and update of the deterministic FHA.  3. a) Based on the fire load density, the maximum temperature reached and the duration of the fire are assessed, in accordance with the applicable standards.  b) For the FHA, the fire load criteria have been used in accordance with standards and guidelines from ISO (International Organization for Standardization) and IPSN (Institut de Protection et de Surete Nucleare). c) For the FHA, it was considered that the analyses are realistic, even conservative (due to reduced air inlet it may not be possible for the entire quantity of combustible material to burn).   4. In the deterministic FHA all the cables were assumed to be damaged by fire if not protected by metallic conduits.   5. Transient combustibles and ignition sources have not been explicitly addressed in the FHA, because these are strictly controlled through the plant procedures.  6. In the deterministic safety analyses (FHA and FSSA) it was conservatively assumed that, in case of fire in a fire compartment or area, all the equipment in that compartment or area will be damaged by fire. The regulations require the direct effects of fire to be considered in the analyses, without providing more specific or detailed information or guidance.   7. Electrical fires have been considered as initiating events in the deterministic and probabilistic fire safety analyses.   High -energy arcing fault (HEAF) describe a sustained discharge of electric current across a gap between two conductors with different voltages. This type of electrical failure is typically observed in switching equipment with voltages of 440V and higher. The most common causes of arcs include worn contacts in electrical equipment, damage to insulation, break in a cable and loose connections. No special consideration for HEAF has been done when assigning fire frequency for initiating events in PSA. It is supposed this fire induced mechanism is considered in the fire frequency database used for Fire PSA initiating events quantification.   8. Cernavoda NPP has a dedicated military fire brigade on-site. In the FSSA, it is assumed that the fire brigade for Cernavoda Unit 1 and 2 is capable of performing effective and sustained intervention through implementation of the fire attack plan within 15 minutes after notification of a fire event. In the FHA no action is credited for extinguishing fires.   9. Radiological consequences of fires have not been assessed as part of the deterministic fire safety analyses. The radiological safety criteria are applicable to all events and combinations of events, regardless of the initiating event. In the deterministic safety analyses for the nuclear power plant there have not been identified any events initiated by fires that could lead to radiological releases.   10.  a) The information has been provided in Section 2.1.2. Key assumptions and methodologies of the national report. The assumptions in the FHA with regard to fire load density, fire severity, fire duration – temperature curves and maximum temperature reached were in accordance with ASTM, ISO-834 and guidelines from IPSN (Institut de Protection et de Surete Nucleare). b) No computational tools were used in the deterministic FHA.  For Fire PSA, a set of Fire PSA model sensitivity analysis were performed to calculate the risk impact of various improvements and the influence of selected modelling assumptions. Based on an evaluation of Fire PSA results and sensitivity analysis performed, the sensitivity issues were identified and assessed.  c) For Fire PSA, fire modelling worksheet were developed based on EPRI/NUREG/NRC methodology (e.g. Fire PRA Methodology for Nuclear Power Facilities, Fire-Induced Vulnerability Evaluation (FIVE), Fire Modelling Guide for Nuclear Power Plant Applications, etc.) and used for fire compartment ignition source identification, walkdown, compartment fire frequency, heat release rate and severity factor, HRA calculations, etc. The actual Fire PSA model development and quantification has been performed using EPRI Risk and Reliability (R&R) software tools. We are looking forward to make transition to the new Phoenix Architect software tools and use FRANX tool for creation and calculation of scenario-specific models (to enable the mapping of spatial or scenario-specific effects on the PSA model), also developed by EPRI. d) More experience-sharing would be welcome on this aspect, highlighting the current state-of-the-art in fire safety analyses, analytical methods and tools, with examples of good practices.   11. No significant fire events occurred at Cernavoda NPP that would be relevant for fire safety analyses. The relevant fire events from the external operating experience have been taken into account in the fire safety analyses and fire protection measures and any new applicable operating experience in this area is analyzed and used.   12. The results of the detailed evaluations performed post-Fukushima show that both Cernavoda NPP units fulfil the nuclear safety requirements, ensuring a safety margin for response against extreme external hazards that can lead to station blackout (SBO) or to the loss of the ultimate heat sink (UHS). Plant response in such abnormal conditions is ensured by emergency operating procedures and severe accident management guidelines for a variety of events, including design extension conditions that could be induced by fire. However, a separate analysis specifically for beyond-design-basis fire events has not been required and performed.  13. a), b), c) – this information is provided in the report in section 2.1. Cernavoda Nuclear Power Plant and more specifically in section 2.1.4. Main results / dominant events (licensee´s experience). The updates of the analyses are mentioned in the report in section 2.1.5. Periodic review and management of changes. The living PSA of the plant including Fire PSA is updated as necessary to reflect the current design and operational features and it is used for design verification, assessment of potential changes to the plant design or operation, PSA reliability database updating, training programs and assessment of changes to the plant licensing basis.  The PSA review process is governed by dedicated internal procedure “PSA & EOOS Risk Monitor Updating and Configuration Control”.  d) The licensee has internal processes, verified and inspected by the regulator, to resolve non-conformities and to implement improvements to the fire protection. Examples of such actions are provided in the report in section 2.1.5.2. Implementation status of modifications/changes.  e) The regulator uses the fire safety analyses to inform the regulatory inspection program and to focus the inspections on fire protection on the most risk-significant areas and equipment.   f) Cernavoda NPP received international reviews on PSA studies. In addition to these, it receives periodical safety reviews of the operational fire protection as part of WANO and OSART missions and as part of the insurers’ inspections.   14. Strengths and weaknesses have been mentioned in the report in section 2.1.6.1. Overview of strengths and weaknesses identified. |
| **RO-E-1442** | FSA | **RO** | **Fire safety analysis** | **Assumptions (TS 02.2)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | Are there any plans for probabilistic fire safety analysis? |  | Currently there are no definite plans for performing probabilistic fire safety analyses. These are not required by regulations for research reactors. |
| **RO-E-1443** | FSA | **RO** | **Fire safety analysis** | **Assumptions (TS 02.2)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | 1 - Can you please provide information on the plant operating states considered in fire safety analysis? [page 20][Section 2.2][assumption 2/] 2 - The NAR states that "Minor fires that may occur in the area of safety related equipment will be extinguished with portable extinguishers". Have these actions been comfirmed by exercise or training? [page 21][Section 2.2.2][assumption 2/] |  | 1. In the deterministic FSA, all operating states of the reactor and its auxiliary facilities were taken into account. 2. Training and exercises for fire protection are performed periodically. |
| **RO-E-1444** | FSA | **RO** | **Fire safety analysis** | **PSR and modifications** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | to ch. 2.2.5, p. 22: Any there any plans for updating the FHA from 2013? |  | An action will be established for updating the FHA for the TRIGA research reactor. |
| **RO-E-1445** | FSA | **RO** | **Fire safety analysis** | **PSR and modifications** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | To p. 22, Section 2.2.7, topic 3/: How often is a PSR required by the Romanian regulation?  To p. 20, Section 2.2.5, topic 1/: Can you provide information on fire safety improvements based on the results from the PSR in 2013? |  | The improvements based on the review performed in 2013 are mentioned in the report in section 2.2.6. Licensee’s experience of fire safety analyses. A full PSR has not been completed. Actions for implementing a PSR are ongoing. |
| **RO-E-1446** | FSA | **RO** | **Fire safety analysis** | **Licensee and regulatory experience** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | 1 - How often is the periodic inspection related to fire protection in the scope conducted? Please outline the insights from the oversight activities if any [page 22][Section 2.2.7] [topic 2/] |  | CNCAN performs annual inspections at the TRIGA research reactor and these include fire protection aspects. No significant findings have resulted from these inspections, apart from the action to update the FHA. |
| **RO-E-1447** | FSA | **RO** | **Fire safety analysis** | **Licensee and regulatory experience** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic/general]: 1. Fire safety objectives: Not clearly stated. In particular, clarification is requested regarding the purpose of the deterministic fire risk assessment: has it been carried out with the purpose of protecting the lives of operators or of preventing nuclear accidents?  2. Defence in Depth (DiD): Regarding the level of fire DiD and the assumptions in the Fire Safety Analyses (FSA) the following questions arise: a) Has the failure of the fire protection means (features such as structures, systems and equipment, but also human failures in active fire protection) been taken into account in the FSA for the safety demonstration of the fire protection structures, systems and components (SSCs)? b) Both in the deterministic and probabilistic FSA, under which assumptions is this failure considered: full burnout in the fire area and failure of all SSC therein, functions of failure probability for the different SSCs, no damage due to the fire? c) Under these considerations, do you consider your Fire PSA (if applicable) conservative or realistic? d) Could you provide (in case a Fire PSA is performed) results in terms of CDF / LRF / LERF? e) Is the single failure criterion considered in the fire analysis? If it is, on which regulatory basis and how is it considered? f) Are the spurious actuation of signals by a fire and the false operation of fire protection SCCs considered in the fire analyses? In what way? g) Provide information on which combinations of fires and other events have been included in the fire analysis with their justification. Please refer to Appendix I of the IAEA SSG-64 to address possible combinations of events. h) With regard to these combinations of fires with other events in the analysis, is the failure of the fire protection features (for detection or suppression) caused by combined hazards –such as earthquake and consequential fire or a fire occurring coincidentally with a long-lasting external flooding– considered? What are the qualification requirements ensuring their required function during and after these events? i) Consideration of the different Plant Operational States (POSs) or of the operative status and modes in the deterministic FSA.  3. Fire resistance/fire hazard rating: The fire resistance rating of fire compartments, or fire hazard level, is often determined based on the fire load density (MJ/m²) in every fire area or compartment accounting for both permanent and transient fire loads and potential ignition sources. a) Provide details on the rationale followed. b) Fire load criteria values may differ amongst facilities and countries depending on the regulatory framework. How are these respective criteria justified? c) Are they justified knowing that fires in nuclear facilities are generally under-ventilated?  4. Transient combustibles and ignition sources: In how far and how have transient combustibles and ignition sources (by e.g. hot works) been included in the fire analysis and what are the hypotheses related to their inclusion?  5. Direct fire effects: Are direct fire effects (by smoke, pressure, temperature, soot, etc.) onto SSC important to safety considered in the fire analysis? Some detailed information about the regulatory requirements applicable and the way such effects are taken into account regarding design/conception/construction/modifications would be appreciated.  6. Fire Brigade: How have the response times of the fire brigade (onsite, offsite brigades) been taken into account in the fire analysis? This question is more relevant in those installations that do not have a dedicated onsite fire brigade.  7. Radiological consequences of fires: Please provide more details about the methods of addressing the radiological consequences of the fires in the fire analysis and the radiological criteria of acceptance and the corresponding threshold values applicable.  8. Analytical methods: a) For the installations that do not provide enough detail on the tools and models used in the fire analysis, please provide a more detailed description.  b) In cases where computational tools have been used within fire safety analyses, provide information on the sensitivity and uncertainty analyses carried out. c) The use of calculation tools is growing. What are your review processes to identify the needs and advantages/disadvantages of adopting such tools? What are the outcomes of these prospects? d) How are you facing to this (understanding of the corresponding studies by the stakeholders)?  9. Management of temporary modifications and their impact on fire safety: A lot of temporary modifications are implemented at research reactors for performing experiments. These temporary modifications for experiments may increase fire loads in compartments, limit access to compartments or buildings, or even impact sequences of fire events if any. Could you please specify: a) Are, and how are the modifications (including those for incorporation of new experimental devices, launching new laboratories, etc.) considered in the fire safety analysis and the periodic safety review (PSR) updates? b) Is any fire safety analysis/assessment of temporary modification for experiments conducted before implementation (to assess the impact on the fire safety of the reactor)? c) Updates of the FSA and PSR: criteria and periodicity for their review. d) Sources to derive new modifications: FSA and PSR and their updates, operating experience, new regulation, etc.  10. Operating Experience: Provide a detailed description on if and how the operating experience from both (i) fires and (ii) other events (whether reportable or not) with degradation or failure of fire protection features in the installation analysed –and, as far as available, also from other nuclear installations– is considered in the fire analysis.  11. Additional analyses: Following the accident at the Fukushima NPP, stress tests were defined for European NPP. Has there been followed a similar approach regarding beyond-design-basis fire events for research reactors in your country? Please provide details.  12. Strengths/weaknesses: In cases that no strengths and weaknesses have been explicitly mentioned in the NAR, please confirm that neither strengths nor weaknesses have been identified. | 1. The deterministic fire risk assessment was carried out with the aim of preventing nuclear accidents and protecting the lives of operators. Internal procedures for personal intervention in different emergency situations have the role of preparing by simulating different postulated events. The purpose of the deterministic assessment of the center's risk was to ensure that the TRIGA research reactor meets the nuclear safety conditions. Safety is defined to achieve the nuclear conditions, the measures aimed at preventing accidents or reducing the consequences of accidents, as a result of the protection of workers and the population against the dangers that are associated with the ionizing radiation of nuclear installations.  2.  a) In the Fire Safety Analysis (FSA) the means of protection against fires at the TRIGA Reactor consisting of fire extinguishers and hydrants were included. Demonstration of fire protection safety of structures, systems and components (SSC) is carried out by periodic verification of these means: • Annually, in the case of fire extinguishers and hydrants according to internal standards and procedures, checks are carried out by an authorized company; • Periodically, in the case of hydrants, the private fire service (ICN firefighters) ensures the functionality of the hydrants. • Annually, fire drills are carried out in different rooms of the reactor building according to standards and procedures to simulate the reaction of the reactor intervention group and the ICN firefighters. These simulations have the role of preparing the reaction of the works staff in case of a scenario that could happen at the TRIGA reactor. The type of fire extinguishers used and their location in the plan was made taking into account the rooms where combustible materials are stored and the rooms where there are electrical and electronic equipment and devices. The number of fire extinguishers located on each level has been established to ensure quick and easy access to a spare one in case the fire extinguishers located in the area of the outbreak do not work.  b) The assumptions that have been considered show total burning in the fire zone and ignore the operation of SSCs in each room containing systems with nuclear safety functions or combustible materials. Assumptions that were considered: 1. The ignition of the chamber of the irradiation capsules and that of the heat exchangers and the pumps of the primary cooling circuit leads to the thermal collapse of the pipes of the primary cooling circuit with the loss of the ability to evacuate the heat produced in the active zone of the TRIGA SSR-14MW reactor and to the malfunction the primary cooling system; 2. The fire of the reactor hall leads to the possibility of impurity of the water in the pool through the combustion products that can come off from the burnt roof, it can lead to the loss of the supply of instrumental and compressed air used to regulate the reactor and to the sealing of the port of the irradiated fuel transfer channel to the pool storage; 3. The burning of the space intended for the components of the purification system leads to the loss of the functional availability of this system with the loss of water quality in the reactor pool and water quality is no longer ensured at the level required to achieve the performance of the active area; 4. The burning of the chamber for the collection of liquid radioactive waste leads to the loss of local control of the level of radioactivity with the local radioactive contamination of this space. 5. A fire in the 0.4 kV TP5 power station can lead to the loss of power supply to consumers in the reactor building. In this situation, the safety functions are ensured by supplying them with electricity from the accumulator batteries via the inverter. 6. A fire in the reactor control room can lead to the loss of reactor operability. The emergency shutdown of the reactor is carried out on the principle of actuation in the absence of electric current and occurs independently of the actions of the operators. 7. A fire in the control room of the auxiliary installations does not affect the operation of the safety systems. 8. A fire in the DC and AC switchboard room can lead to loss of power to loss of control systems. In this situation, considered the most serious, the reactor stops automatically (due to the lack of power supply to the control rods, which causes them to fall), the cooling of the active zone is done by the normal cooling pumps, and the isolation flaps mounted on the systems ventilation are closed (by automatic mechanical actuation in the absence of voltage). However, the analysis shows that a fire in the considered spaces does not lead to dangerous implications from the point of view of the nuclear reactor's safety, its shutdown and isolation and further cooling of the active area being ensured.  c) Fire PSA has not been required and has not been performed for the research reactor.  d) Fire PSA has not been required and has not been performed for the research reactor.   e) The single failure criterion has been considered in the design of the reactor systems. At the TRIGA reactor, systems are designed in accordance with the US NRC regulatory requirements 10 CRF Part 50, Appendix A – General Design Criteria for Nuclear Power Plants ( Criterion 21, 22, 24, 25, 26, 29, 35, 38 and 44). These regulatory requirements are included also in the Romanian regulations.   f) Spurious actuation of fire protection was considered in the design of the fire protection systems.   g) No combinations of events have been considered in the FHA.  h) No combinations of events have been considered in the FHA.  i) In the deterministic FSA, all operating states of the reactor and its auxiliary facilities were taken into account.  3.  a) The FHA estimated the consequences of a possible fire in one of the following rooms (0.4 kV Power Station; Reactor Control Room; Auxiliary Installations Control Room or Direct Current and Alternating Current Switchboard Room). Thus, the analysis of thermal loads resulting from the summation of the contribution of electrical insulating materials, furniture and finishes in the rooms where the electrical and automation systems with security functions are located reveals reduced thermal rooms, below 400 MJ/m2 and estimated fire durations below 20 de minute, the estimated temperatures being below 500 degrees C.   b) In Romania, the classification of fire risk in buildings is done according to the P118-1999 norm, and for nuclear targets it is done according to the NSN-09 regulation. Thus it was established that the fire risk is determined by the heat load density (q\_i) established by calculating q\_i= S\_Q/A\_S , (S\_Q=∑\_(i=1)^n▒〖Q\_i M\_i 〗, where S\_Q- the thermal load; Q\_i- the internal calorific value of the material which is determined according to SR EN ISO 1716:2010, revised in 2018 and which replaces the STAS 8790-81 standard; M\_i- the mass of combustible materials of the same type, located in the space under analysis and n- the number of materials of the same type located in the space under analysis, and A\_S- the sum of the floor areas of the rooms that make up the space under consideration). Depending on the heat load density (q\_i) we classify the fire risk in a room as follows: q\_i<420 MJ/m^2 – low fire risk q\_i>420 MJ/m^2 but <840 MJ/m^2 – average fire risk q\_i>840 MJ/m^2 – high risk of fire  c) In the rooms of interest that are also subject to ventilation systems in case of fire, the smoke detectors connected to the warning and alarm central have a safety role and stop the ventilation system to avoid the spread of the fire from one room to another. These rooms with a heat load density of approximately 400 MJ/m^2 are considered rooms with a low fire risk and thus a possible fire cannot affect the piping/filters of the ventilation system, which does not cause the spread of the outbreak and the contamination of the ambient environment through the chimney.   4. Transient fuels and ignition sources were addressed in the analysis taking into account the internal procedures and national legislation. Transient fuels are placed in rooms isolated from the rooms that contain systems with nuclear safety functions and according to the regulations the right extinguisher is chosen for each class of fire and for sources of ignition (e.g. hot work) the use of specific protective equipment for each work and a work permit is required with fire and extinguisher type fire extinguishing means.  5. The direct effects of fire have been taken into account in the design of the reactor safety systems. This is required by the regulations, but without specific details or guidance on the implementation.  The reactor building is equipped with smoke sensors linked to the warning center so any direct effect of the fire (smoke, temperature, soot, etc.) in the rooms containing important SSC are permanently monitored. Page no. 19 of 36 describes the detection system related to the reactor building and its subsequent modifications.   6. The response times of the Private Service for Emergency Situations were established following the response to interventions/exercises respecting the RATEN-ICN Intervention Plan for the TRIGA REACTOR. Following the exercises and technical-tactical applications, a response time of up to 20 minutes emerged. The preliminary steps to an intervention are: -Telephone announcement to the internal emergency number/central detection alarm; -Equipping and moving the fire brigade to the site; -Fire recognition and analysis; -Deployment of the pre-intervention device; -Firefighters action to limit/liquidate the fire outbreak.  7. Radiological consequences of fires have not been assessed as part of the deterministic fire safety analyses. The radiological safety criteria are applicable to all events and combinations of events, regardless of the initiating event. In the deterministic safety analyses for the nuclear research reactor there have not been identified any events initiated by fires that could lead to radiological releases.   8. a) Information has been provided in the report in section 2.2. TRIGA Research reactor.  b) No computational tools have been used.  c) More experience-sharing would be welcome on this aspect, highlighting the current state-of-the-art in fire safety analyses, analytical methods and tools, with examples of good practices. d) The existing FHA study is basic and does not use any computational tools. It provides an assessment of the risks based on the fire loads.   9.  a) The analysis performed did not take into account possible changes in fire loads in the spaces/rooms at the TRIGA reactor. If modifications (including those for incorporation of new experimental devices, launching new laboratories, etc.) would be performed, the FHA would be revised and updated.  b) No fire safety reviews/assessments of temporary changes have been carried out for pre-implementation experiments, because there were no modifications that could change the assumptions in the FHA.   c) No updates to the FSA have been performed in the last 10 years. A PSR has not yet been performed. Actions are ongoing to performing a PSR for the research reactor.   d) A review of the FSA will be performed according to national and international regulations and standards.  10. No significant fire events occurred at the research reactor that would be relevant for fire safety analyses. The relevant fire events from the external operating experience have been taken into account in the fire safety analyses and fire protection measures and any new applicable operating experience in this area will be analyzed and used.   11. No analysis has been performed for beyond-design-basis fire events.  12. No strengths have been identified. Weaknesses include the fact the fire hazard analysis performed in 2013 has not been revised and updated and the fact that the CNCAN regulations include specific provisions on fire hazard analyses only for nuclear power plants. The fire protection regulations are in process of being revised and will be applicable to all nuclear installations. |
| **RO-E-1448** | FSA | **RO** | **Fire safety analysis** | **Assumptions (TS 02.5)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** | p.31: What is considered the minor offsite impact? p.31: Which fire resistance tests of the waste drums are you relying on. Have 6h fire tests been performed with the drums? |  | 1. Analyses have been performed to determine the dispersion into the atmosphere of the radioactivity released during a fire and it was calculated that for a fire with a duration of 6 hours, the activity released would be of 77 mCi (2,85 x 109 Bq). This means the radiological impact is significant only for the radioactive storage area and would not lead to off-site releases exceeding the legal limits.  The duration of 6 hours assumed for the fire is conservative, because the fire brigade can intervene in 15 minutes to extinguish the fire.  2. Fire resistance tests performed for the drums have demonstrated that when exposed to a direct fire there could be partial carbonization of the contents of the drum, without sustaining the fire or propagating it to other drums. |
| **RO-E-1449** | FSA | **RO** | **Fire safety analysis** | **Licensee and regulatory experience** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** |  | [generic/general]: 1. Defence in Depth (DiD): Regarding the level of fire DiD and the assumptions in the Fire Safety Analyses (FSA) the following questions arise: a) Has the failure of the fire protection means (features such as structures, systems and equipment, but also human failures in active fire protection) been taken into account in the fire analysis for the safety demonstration of the Fire Protection structures, systems and components (SSCs)? b) Is the single failure criterion considered in the fire analysis? If it is, on which regulatory basis and how is it considered? c) Provide information on which combinations of fires and other events have been included in the fire analysis with their justification. Please refer to Appendix I of the IAEA SSG-64 to address possible combinations of events. d) With regard to these combinations of fires with other events in the analysis, is the failure of the fire protection features (for detection or suppression) caused by combined hazards –such as earthquake and consequential fire or a fire occurring coincidentally with a long-lasting external flooding– considered? What are the qualification requirements ensuring their required function during and after these events?  2. Applicability of PSA: According to the Technical Specifications of the TPR II, performance of Fire Probabilistic Safety Assessment is considered mandatory for NPPs. However, it would be useful to know if Fire PSA have been performed or are intended to be performed for the waste storage facilities.  3. Fire resistance/fire hazard rating: The fire resistance rating of fire compartments, or fire hazard level, is often determined based on the fire load density (MJ/m²) in every fire area or compartment accounting for both permanent and transient fire loads and potential ignition sources. a) Provide details on the rationale followed. b) Fire load criteria values may differ amongst facilities and countries depending on the regulatory framework. How are these respective criteria justified? c) Are they justified knowing that fires in nuclear facilities are generally under-ventilated?  4. Qualification of cables: As far as qualified cables are available, in how far are they taken into account as fire load and fire source? How is the qualification of those cables been considered in the fire analysis and for what objective? In how far are protected cables (e.g., protected by protective coatings) considered as contributors to fire propagation in the analysis?  5. Transient combustibles and ignition sources: In how far and how have transient combustibles and ignition sources been included in the fire analysis and what are the hypotheses related to their inclusion?  6. Direct fire effects: Are direct fire effects (by smoke, pressure, temperature, soot, etc.) onto SSC important to safety considered in the fire analysis? Some detailed information about the regulatory requirements applicable and the way such effects are taken into account regarding design/conception/construction/modifications would be appreciated.  7. Fire Brigade: How have the response times of the fire brigade (onsite, offsite brigades) been taken into account in the fire analysis? This question is more relevant in those installations that do not have a dedicated onsite fire brigade.  8. Radiological consequences: Please provide description for: a) Assessment of radiological consequences of a fire in the fire analysis and criteria and corresponding threshold values applicable in the success criteria. b) Radiological confinement measures during a fire.  9. Analytical methods: a) For the installations that do not provide enough detail on the tools and models used in the fire analysis, please provide a more detailed description. b) In cases where computational tools have been used within fire safety analyses, provide information on the sensitivity and uncertainty analyses carried out.  10. Operating Experience: Provide a detailed description on if and how the operating experience from both (i) fires and (ii) other events (whether reportable or not) with degradation or failure of fire protection features in the installation analysed – and, as far as available, also from other nuclear installations – is considered in the fire analysis.  11. Results and revisions of the Fire Safety Analyses and additional analyses: Please provide details about: a) The process carried out to update the fire analysis. b) Following the accident at the Fukushima NPP, stress tests were defined for European NPP. Has there been followed a similar approach regarding beyond-design-basis fire events for waste storage facilities in your country? c) Some countries mention that a periodic safety review is performed for waste storage facilities. It would be good to know more on the applicability and frequency of PSR for such facilities in your country in order to identify potential strengths.  12. Strengths/weaknesses: In cases that no strengths and weaknesses have been explicitly mentioned in the NAR, please confirm that neither strengths nor weaknesses have been identified. | 1. a) As described in section 2.5 of the national report, for the Cernavoda Solid Radioactive Waste Interim Storage Facility, a fire hazard analysis has not been performed, but a conservative deterministic analysis of a postulated fire has been included in the safety analysis report, as the maximum credible accident for this facility. Active fire protection was not credited in this analysis.  b) No.  c) No combinations of events were considered in this case.  d) No combinations of events were considered in this case.   2. Fire PSA has not been required and has not been performed for the waste storage facilities.  3. FHA has not been required and has not been performed for the waste storage facilities. As described in the national report, conservative safety analyses have been performed to determine the radiological consequences of postulated fires.   4. As described in the national report, conservative safety analyses have been performed to determine the radiological consequences of postulated fires. These analyses postulate fire irrespective of their probability of occurrence and consideration of cables is not necessary or applicable. The few cables present in these facilities are not safety related and do not constitute significant fire loads or fire sources.   5. Transient combustibles and ignition sources have not been included in the analyses for the radioactive waste storage facilities, because they are controlled and minimized by plant procedures.   6. Direct fire effects were considered only for the estimation of the radiological consequences of fires in radioactive waste storage facilities and do not impact any safety related structures or systems.  7. Cernavoda NPP has a dedicated military fire brigade on-site. The fire brigade for Cernavoda Unit 1 and 2 is capable of performing effective and sustained intervention through implementation of the fire attack plan within 15 minutes after notification of a fire event. The response time is validated through periodic exercises and fire drills.   8.  a) As described in section 2.5 of the national report, for the Cernavoda Solid Radioactive Waste Interim Storage Facility, a conservative deterministic analysis of a postulated fire has been included in the safety analysis report, as the maximum credible accident for this facility. The analyses have been performed to determine the dispersion into the atmosphere of the radioactivity released during a fire and it was calculated that for a fire with a duration of 6 hours, the activity released would be of 77 mCi (2,85 x 109 Bq). This means the radiological impact is significant only for the radioactive storage area and would not lead to off-site releases exceeding the legal limits. b) There are no confinement provisions.   9. No special computational models or tools have been used.   10. No specific operating experience has been used for these analyses.   11.  a) The analysis of the consequences of postulated fires for radioactive waste storage facilities are required to be updated only in case of design modifications to these facilities. b) Beyond-design-basis fire events for waste storage facilities have not been performed post-Fukushima, as the maximum credible accidents considered have been chosen with very conservative assumptions. c) PSRs have not yet been performed for the radioactive waste storage facilities but actions have been taken to ensure that PSRs will be specifically required and performed in the future.   12. A FHA will be required and performed for the Cernavoda Solid Radioactive Waste Interim Storage Facility in accordance with the new regulations. This was not highlighted as a weakness because a conservative analysis of the consequences of an unmitigated fire was performed. |
| **RO-E-1450** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Fuel fabrication facilities** | **Pitesti Plant** | consolidating with p.64, §3.1.2.C: Please clarify how the maximum allowed load was determined, how this compares with the actual load, and the practice for the management of temporary fire loads. |  | The maximum load allowed was determined on the basis of fire walls resistence, fire loads (types and quantities), rooms/compartament area, ignition sources and related SSCs such that to keep fire risk as low as reasonably possible. |
| **RO-E-1451** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Fuel fabrication facilities** | **Pitesti Plant** |  | [generic] o Management of fire loads Describe the types of permanent and transient fire loads in the facilities?  How is the inventory of fire loads (transitional and permanent) systematically documented (e.g. computer system) and managed (tasks and responsibilities) during operation and decommissioning (if any what is the difference)? How is analysed whether the change on fire loads affects fire risk? How is the existing knowledge of the inventory used during daily activities? What are the limits and practices on permanent and transient loads, which items are excluded? Describe the inspection programme for fire loads, roles and (independent) responsibilities and frequency. What are the lessons learned and corrective actions taken? o Management of ignition sources What types of hot works are managed in the installations? What are the roles and responsibilities and the way they are regulated and listed? Describe the details of the approaches (as documented in procedures) to systemically permit and control hot works, including the types of additional (temporary) measures in fire prevention and firefighting. Is it different during decommissioning? Describe in some detail the programme of (independent) inspections related to hot works including the purpose (before, during, after the work). o Management of the hydrogen risk (not relevant for all facilities) Describe all the elements of the management of hydrogen risk (such as limiting amount, separate storage, pipe routing etc….).  Describe events and lessons learned or external experience used to modify the management of hydrogen and the related modifications. | oManagement of loads: \*The types of fire loads in NFP Pitesti include wood, fiberboard, rubber, paper, textile, plastic, mineral oils, nylon, polystyrene, polyethylene.  \*The inventory of fire loads is periodically documented in fire studies and analyses. In NFP Pitesti, the inventory of fire loads was documented in the study "Identification, Evaluation and Control of Fire Risks – Nuclear Fuel Manufacturing Plant" developed in 2012 and will be revised in Fire Hazard Analysis, currently under development (deadline June 2024). The inventory of fire loads (transitional and permanent) is montly monitored in all spaces from Nuclear Fuel Plant, based on checklist.  \*The risk of fire as a result of fire loads was analyzed in the study "Identification, Evaluation and Control of Fire Risks – Nuclear Fuel Manufacturing Plant" developed in 2012 and will be revised in Fire Hazard Analysis. Any change on fire loads will involve the revision of FHA.  \*The knowledge of the inventory are used to establish proper measures to control the ignition sources around fire loads and to ensure the compliance with fire safety requirments.  \* The limits and practices on fire loads are according to national legislation (over 840 MJ/m2 for high fire risk, between 420-840 MJ/m2 for medium fire risk and under 420 MJ/m2 for low fire risk). Flame retardant impregnation treatment materials and laying cables in steel pipes are excluded.  \*The inspection programme for fire loads includes verification, by the fire safety responsable, of the thermal loads (based on the checklist) in all areas of the facility. Montly inspections are performed so that every building on the site is checked at least twice a year.  o Management of ignition source  \*The hot works managed in Nuclear Fuel Plant Pitesti involve the sintering process of at a temperature of about 1700°C in hydrogen atmosphere. During process, the UO2 green pellets are transformed in high density ceramic pellets with a density practically twice the green pellet. The sintering process is controlled, sintered UO2 pellets are cooled in furnances before being removed, with industrial-type cooling water at a controlled temperature (50°C ± 10°C). Cooling water is provided in a closed circuit by means of the cooling water recirculation system for the furnance cooling and pellets cooling.  The furnances work in hydrogen atmosphere to prevent oxidation of the pellets and of the furnace electrical resistances. The gas panel controlled by the furnace automation, achieves hydrogen flow inlet in furnaces. Hydrogen is burned as it comes out of the furnace. Inserting and removing the plates with the pellets is done through a curtain of flame fueled with methane. Nitrogen is used for purging the sintering furnaces imposed by changing the atmosphere in the furnace (air/hydrogen, hydrogen/air), for starting/stopping the furnaces and for separating the atmosphere from the furnace and the outside during the cycle of feeding/evacuating pellets into/from the furnace. In the event of power loss, the hydrogen flow is automatically shut off and the nitrogen supply system automatically opens and allows the nitrogen to enter into the furnace, followed by automatic ignition of the flame curtain. Also, on loss of hydrogen flow below the process setpoint, the furnace gas supply is automatically switched from hydrogen to nitrogen. The process is controlled, the operations are performed according to the operating procedures and trained, qualified and authorized personnel.  \*Fire detection and alarming systems, hydrogen and methane gas leak detection systems have been installed in the areas where the sintering furnaces are located. The furnances are operated in accordance with applicable operating and maintenance procedures. The measures for fire prevention and firefighting in the sintering furnances areas are also established in specific procedures.  \*Inspections performed by the fire protection officer in order to verify the compliance with procedures, inspections including visual examinations and functional tests of the fire detection and alarm systems, hydrogen and methan gas detection systems at various intervals throughout the year (montly inspections for visual examinations, based on checklist twice a year, once a year for systems testing).  o Management of the hydrogen risk \*In NFP Pitesti, the management elements of hydrogen risk involves:  • Hydrogen detection systems and anti-Ex equipments/components installed in the areas with hydrogen atmoshere (sintering furnaces, hydrogen production station - electrolysis chamber). • The central unit of the hydrogen detection system is connected with the central unit of the fire detection and alarm system. • Hydrogen storage consisting in 6 vertical cylindrical tanks and four batteries of 12 cylinders with hydrogen is surrounded with a safety fence, with controlled access. • The hydrogen supply is provided with control valves that close in case of loss of energy supply; simultaneously, the nitrogen supply valves open to allow hydrogen to be purged from the furnaces. \*The NFP Pitesti has not experienced hydrogen related events since it was commissioned and no major anomaly has been found during the inspections made within the facility. Consequently, there are no internal or relevant external hydrogen related events used to modify the management of hydrogen. |
| **RO-E-1452** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Fuel fabrication facilities** | **Pitesti Plant** | p..70, §3.3.1.2.C : Fire resistance of walls and doors is not the same (doors always less than the walls), nothing is said about fire resistance of penetration seals. And in §3.3.2.C pipes of ventilation systems are 90 min fire resistant (thus also less than the walls they pass through). To clarify, what is the minimal required fire resistance based on and why is the fire resistance of doors or penetrations (compared to walls) not identified as a weakness? |  | There is an internal procedure for tracking the penetration seals through the fire resistant walls and a register in which the penetrations are recorded. The fire resistance of penetration seals (fire resistant foam) is similar to the fire resistance of doors (120 minutes/2 hours). §3.3.2.C Misunderstanding (erroneous drafting) fire resistance of 90 min refers to the flaps. The fire resistance of the doors and penetrations is in accordance with the thermal load density according to the legislation (P118-99 standard/normative). |
| **RO-E-1453** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Fuel fabrication facilities** | **Pitesti Plant** | How are the fire classes for fire barriers defined? Are air damper as resistant as the wall/door of the fire compartment in which they are included? |  | Fire classes for fire barriers are established in accordance with national legislation (Normative P118-99). The air damper/penetration seals resistance is as strong as the door resistance of the fire compartment (2 hours). |
| **RO-E-1454** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Fuel fabrication facilities** | **Pitesti Plant** |  | [generic] o Compartmentation How is the risk taken into consideration? How is propagation of fire prevented/delayed/mitigated? How are ventilation systems divided among trains/ compartments? What improvements could be achieved to older existing facilities? What limitations are there to do that and what are the alternative measures to cope with that? How is the management concerning fire compartmentation performed as the facility is growing? How are the fire loads linked to fire compartmentation and fire rating of barriers? | o Compartmentation \*The fire risk is taken into consideration by the amount of the combustible materials and the ignition sources. \*The propagation of fire is prevented, delayed and/or mitigated by the rapid firefighting of the emergency response team (own staff, using the extinguishers and hydrants) until the arrival of on-site and off-site fire brigades, separation of high fire risk spaces and their provision with fire-resistant walls and doors equipped with automatic closing system, safety distances between buildings and installations, individual ventilation system per each area, remote shutdown of the ventilation system, fire dampers on the ventilation ducts when the ducts pass through the fire-resistant walls, fire-resistant materials are used to seal wall gaps around cable ducts, turn off the electricity supply.  \*Each production area has its own ventilation system independent of the ventilation systems in other areas, sharing the three exhausting stacks. The ventilation systems are designed such that to not contribute to the propagation of a fire and to limit release of radioactive material into the environment in case of fire (automatic closure in case of fire, fire dampers). \*The potential ignition sources (electrical components, pipes ets ) are subject to periodic inspections by competent/authorized personnel, maintenance programs etc. \*The management concerning fire compartmentation is performed taking into account the fire risks (fire loads, igntion sources), in accordance with the legislative requirments (National normative regarding the fire safety of buildings P118-99). NFP Pitesti established and implemented a programme for the control of modifications to the facility for all safety aspects. The management system is applied at all stages in the preparation and performance of the modifications to ensure that all applicable safety requirements and criteria are satisfied. \*The fire loads are linked to the fire compartmentation and fire rating of barriers such that to limit the spread of fire and smoke. Constructive elements (4-6 hours fire resistant walls and 1.5 -2 hours fire resistant doors are provided for the separation of rooms / spaces with high and very high risk of fire from other spaces with medium and low risk of fire, in accordance with national requirements regarding the fire safety of buildings (Normative P118-99). |
| **RO-E-1455** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Fuel fabrication facilities** | **Pitesti Plant** | p.70 §3.3.2.C : The confinement strategy should be clarified. How is the remote shutdown of the ventilation system initiated in case of fire (automatically/manually, via fire detection system, alarm to control room, ..)? It is not clear what is to be understood by 'shutdown of the ventilation system': the whole ventilation system of the building or just the part in the concerned zone with fire? Shutdown of the air inlet, the extraction or both sides? It seems that fire dampers are only triggered by fuses, which would mean that air inlet/extraction to/from the fire zone would only be isolated if enough heat reached this fire dampers. |  | The ventilation system can be stopped remotely by manually pressing the opening buttons related to each production hall |
| **RO-E-1456** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Fuel fabrication facilities** | **Pitesti Plant** |  | [generic] o Maintenance/Access/Inspection of fire dampers (not relevant for all facilities) What are types and frequencies of testing/inspection of fire dampers? How is this applied to (nearly) inaccessible dampers? What insights have been gathered and improvements of the dampers or test/inspection have been made? | \*Visual inspection performed by the fire protection officer based on checklist twice a year. There are no inaccesible dampers in NFP Pitesti. \*Not applicable. Fire dampers with fusible link are used. The damper closes after the melting of the thermal fuse. After the closing of the damper, it is mechanically locked in the closed position and can only be opened manually to replace the thermal fuse. |
| **RO-E-1457** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Licensee and regulatory experience** | **Fuel fabrication facilities** | **Pitesti Plant** |  | [generic] o NPP: Ageing management of fire passive and active SSC  Describe which fire active and passive SSCs are covered by the aging management program.  Describe in general the preventive actions to minimize and control ageing degradation on fire protection. Describe specifically how the aging management program covers/considers fire barriers, fire extinguishing system and the firewater distribution network.  Describe in general the monitoring and trending of ageing effects on FP SSC? Which kind of deficiencies of active and passive FP SSCs in scope of aging management program were identified in last 10 years?  Describe how these deficiencies were corrected (e.g. what kind of replacement, improvement or modifications? o OPEX on fire events How do you classify and report on fire related events? Are smouldering events reported? How and to what extent is information on these fire events shared and/or discussed national and international level? If applicable: what are the current fire safety related topics that are discussed on national level? Is there an exchange with conventional industry? Can you provide information on events related to fire at your facilities which led to (significant) improvements of fire protection within your country (causes, improvements and relevant lessons learned)? Same question for external experiences (national, international, other industries). | o Ageing management of fire passive and active SSCs  \*NFP Pitesti has developed an aging management program, in accordance with the regulatory body (CNCAN) requirments (NSN-17). The active fire safety related SSCs included in the aging management program are:  - the fire detection and alarm system: ensures the detection and alarming of fires in NFP areas. - the hydrogen and methan gas detection system: ensures the detection and alarming of hydrogen and methane gas leaks in the area of the sintering furnaces .   The pasive fire safety related SSCs are: - Firewater reserve system: provides the water reserve necessary for intervention in case of fire. The firewater reserve is provided from two tanks used to supply the drinking water, domestic water and fire water.   - Diesel generators: ensures the supply of electricity for hydrogen and methane detection system at the sintering furnaces and for the fire detection and alarm system.  All the safety related SSCs are included the preventive maintenance program and the components that require are periodically replaced. The NFP Pitesti preventive maintenance program takes into account the technological process conditions, operating cycles, actual degradation in the installation and service life, testing, surveillance and inspection programs, and the replacement strategy for those SSCs that may be replaced (according to suppliers' recommendations or operating experience). o OPEX on fire events \*NFP Pitesti developed and implemented, within the Integrated Management System, a systematic process for the identification, reporting, collection, recording, sorting, processing, analysis and documentation of internal and relevant external operating experience in accordance with the Romanian Regulatory requirments and international standards (IAEA SSR-4). Fire related events are classified based on the provisions of operating experience procedures. Specific procedures has been developed, including procedure for reporting significant events.  Fire events are reported to the public service - Inspectorate for Emergency Situations- in accordance with the provisions of national fire protection law no. 307/2006.  \*Fire events are reported to the Inspectorate for Emergency Situations (public service) in accordance with the provisions of national fire protection law no. 307/2006. Fire events classified as significant events are reported to the Regulatory Body in acordance with the provisions of norms on nuclear safety. Fire safety related procedures have been also updated to improve safety.  • A fire started inside the dust collector of the desusting system from the Zy-4 clads chamfering area. The dedusting system has been replaced with a new one, better suited to ensure fire safety.  • Nuclear Fuel Plant Pitesti uses the external operating experience and lessons learned reported in the international system jointly managed by the IAEA and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA), Fuel Incident Notification and Analysis System (FINAS). From a fire event occurred in a low activity glove boxes located in an on-site laboratory room of Rokkasho Safeguards Center in Japan, reported in IAEA/NEA FINAS database, the following lessons and corrective actions have been taken to prevent the occurence of similar event: - Analysis of how chemicals are handling and storage (from compativility point of view to avoid exothermic chemical reactions). The analysis concluded that safety protocol is not described/documents in specific procedure. A specific procedure regarding the storage and handling of chemical agents (safety protocols in chemical hoods) has been developed. - Updating of the procedure for fire safety in chemical laboratories in accordance with current practices. |
| **RO-E-1458** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **NPP** | **Cernavoda NPP Unit 1** | page 34/Section 3.1.2.A/3/How is explosion protection (Ex zone, Ex equipment...) in connection with ATEX directives considered? |  | Explosion protection is ensured in compliance with the provisions in the directives 2014/34/UE, 94/9/CE, ATEX 137, ATEX 118. The studies for explosion risk for all the relevant areas are reviewed periodically. The Ex zones are marked as such and procedures for access and work in these areas are implemented. Independent inspections on compliance with the explosion protection rules are conducted by the national competent authorities and specialized institutes (in addition to the inspections performed by the nuclear regulator). |
| **RO-E-1459** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **NPP** | **Cernavoda NPP Unit 2** |  | [generic] o Management of fire loads Describe the types of permanent and transient fire loads in the facilities?  How is the inventory of fire loads (transitional and permanent) systematically documented (e.g. computer system) and managed (tasks and responsibilities) during operation and decommissioning (if any what is the difference)? How is analysed whether the change on fire loads affects fire risk? How is the existing knowledge of the inventory used during daily activities? What are the limits and practices on permanent and transient loads, which items are excluded? Describe the inspection programme for fire loads, roles and (independent) responsibilities and frequency. What are the lessons learned and corrective actions taken? o Management of ignition sources What types of hot works are managed in the installations? What are the roles and responsibilities and the way they are regulated and listed? Describe the details of the approaches (as documented in procedures) to systemically permit and control hot works, including the types of additional (temporary) measures in fire prevention and firefighting. Is it different during decommissioning? Describe in some detail the programme of (independent) inspections related to hot works including the purpose (before, during, after the work). o Management of the hydrogen risk (not relevant for all facilities) Describe all the elements of the management of hydrogen risk (such as limiting amount, separate storage, pipe routing etc….).  Describe events and lessons learned or external experience used to modify the management of hydrogen and the related modifications. | o Management of fire loads is described in the national report in section 3.1.2.A Overview of arrangements for management and control of fire load and ignition sources.  The establishment in a controlled manner of temporary/permanent storage areas resulted from the need to store materials/equipment of any type used in operation and maintenance activities, when: - The materials used in a work activity are combustible - The materials/equipment cannot be placed in the work area because their size can prevent the access of operators for installation routines/maneuvers; - The space intended for the work area is insufficient for the storage of all materials / equipment. - The materials intended for a work are transported to the area before the installation of the work area based on an approved work permit. Emergency equipment (cabinets, containers, stretchers, resuscitation kits with oxygen, first aid kits, etc.) are exempted from controlled storage. Also, the storage of waste that can only be temporarily stored in specially arranged spaces, before being processed as waste, is exempted. Wood fiber and/or flammable materials are not allowed to be permanently stored in safety-related areas. The inventory of all fire loads is maintained by keeping current records of all temporary and permanent modifications and ensuring these do not affect the assumptions in the fire safety analyses. This is managed through the configuration control process, which includes a checklist for each permanent and temporary modification, to ensure adequate review by qualified personnel specialized in fire safety analyses. This verification is also performed as part of the risk assessment for each activity. No combustible materials are allowed to be deposited in any plant area without an approval based on the review of compliance with the fire safety analysis assumptions and requirements for the respective area. Strict rules, specifications and controls are established in this regard for the various plant areas. In order to exercise control over the risk of fire, two types of controlled areas for combustible materials are established: Area A - the area of the power plant where important systems for nuclear safety are located, where the storage of combustible materials is prohibited, except for situations where storage is indispensable. In this area, combustible materials will not be left unattended (a member of the work team must remain in the area) or combustible materials will be removed when work is stopped. Permanent storage is not allowed in Zone A. Requests for temporary storage in area A, in the spaces included in the Fire Hazard Analysis for Unit 1 and Unit 2, respectively, are evaluated from the point of view of thermal load. Using specific calorific powers for different types of materials, the thermal load is determined for each amount of fuel material. These are summed up resulting in the total thermal load introduced. Regardless of the calculated total thermal load, the combustible materials introduced into the work area will not exceed the following quantities: 50 kg of fireproof wood, 10 kg of paper, cardboard or plastic, 20 liters of oil and 1 kg of vaseline, 1 liter of flammable solvent (for painting works, the amount of paint based on flammable solvents will not exceed 10 liters). Requests for storage are always evaluated in relation to other existing storages or works in the same location that can change the contribution of the thermal load. If the total thermal load does not exceed 10,000 Mj, and the surface of the room is at least 100 square meters, the evaluation will not continue and the storage request will be approved. The value of 10,000 Mj is the equivalent of the thermal load represented by the quantities of combustible materials accepted for a work in Zone A. Compared to the surface of 100 m2, it results in a thermal load density of 100 MJ/m2 corresponding to a low fire risk level . If the thermal load exceeds 10,000 Mj or the surface of the room is below 100 sqm, the evaluation continues using the data from the Fire Risk Analysis for each room - thermal load, room surface, thermal load density. The new heat load density is calculated and compared to the initial risk level. If the low (below 420 Mj/m2) or medium (between 420 Mj/m2 and 840 Mj/m2) fire risk level is not exceeded, the storage request is approved. Changing the level of low or medium fire risk leads to the rejection of the storage request, the applicant having to reduce the quantities of combustible materials or change the location of the storage. If the initial risk level from the Fire Hazard Analysis is high (greater than 840 Mj/m2), the additional heat load brought by temporary storage increasing the risk even more, the storage request is rejected. Zone B - any other zone in the plant where important systems for nuclear safety are not located and where the storage of combustible materials is allowed. In this area, combustible materials can be left in the perimeter of the work area, unattended, during the meal break, but will be removed at the end of the work or the work schedule. If you work in shifts, it is not necessary to withdraw combustible materials. The request for storage in Zone B is preliminarily evaluated by those responsible for fire protection to assess the impact on work safety and fire safety conditions, after which they are sent to the engineer responsible for fire protection from the Design and Technical Support Department for impact assessment thermal load on the Fire Hazard Analysis. If the technical evaluation is favorable, the request for permanent storage is approved. Regardless of the calculated total thermal load, the combustible materials introduced into the work area will not exceed the following quantities: 100 kg of wood, 10 kg of paper, cardboard or plastic, 200 liters of oil and 10 kg of vaseline, 5 liters of flammable solvent (for painting works, the amount of paint based on flammable solvents will not exceed 20 liters). All the plant areas and the associated storage areas are checked as follows: - Daily, by the supervisory staff from the maintenance department, heads of sections/services, heads of workshops. They carry out daily, by rotation, inspections in the field according to an approved program. - At least once a month by area managers, shift supervisors/section heads or their delegates. These inspections are completed by documenting an inspection report of the area. - Quarterly, by mixed shift supervisor teams – in charge of the area or Head of Section – in charge of the area. The results of the quarterly inspections will be recorded in a report and will be sent to the Production Director, Chief Engineer of the Maintenance and Repair Department, Chief Operating Engineer. Also, the storage areas are checked during management inspections in the plant. The requirements for the creation of the storage area are verified, the area must be physically demarcated and signposted, the materials must be ordered by type and size in the storage area, no materials other than those listed in the temporary storage application should be stored in the area, the "Storage request form for temporary installation of materials" to be mounted inside the storage area. Additionally, as part of the routines they perform, any operator who finds a deficiency in the storage areas, will complete a work order and issue an abnormal condition report if the deficiency was not previously identified and reported. Inspection of fire loads and fire protection passive and active measures is also part of the regular inspections of the plant operators (at least once every shift).  O Management of ignition sources has been described in the national report in section 3.1.2.A Overview of arrangements for management and control of fire load and ignition sources. Any activity that requires the use or involves the production of an ignition source is considered hot work. Any source generating heat in sufficient quantity to ignite combustible/flammable materials is considered an ignition source. Any hot work carried out in Cernavodă NPP premises is performed only on the basis of a fire work permit. For work with fire carried out in workshops whose object of activity is the execution of work of this kind, as well as for the normal use of gas bulbs in the laboratory, a permit to work with fire is not required. The Fire Work Permit is the written document that certifies the implementation of specific technical and organizational measures, necessary for the safe execution of fire works. The Fire Work Permit issued for fire work carried out on the plant site is valid on the date of admission, until the end of the work shift. The Fire Work Permit form contains: -Persons with responsibilities in issuing, holding, executing, admitting and closing it. - Clear description of the fire work to be performed, including its location and the equipment used. - The fire protection measures to be taken before, during and after the work with fire. - Persons with responsibilities in checking working conditions and the fulfillment of fire protection measures. •When issuing the Fire Work Permit, the issuer together with the leader of the work team goes to the site to identify fire hazards and assess the fire risks associated with the work with fire. •When necessary, the leader of the department responsible for the work establishes additional fire prevention and protection measures to carry out the work safely. • The leader of the department responsible for the work approves the Fire Work Permit by signature. After the approval of the Fire Work Permit, the implementation of the fire prevention and protection measures provided for in the Fire Work Permit can begin. • The implementation of each fire prevention and protection measure in the Fire Work Permit will be recorded by the person who implemented the measure. • The prevention personnel move to the work area to check the working conditions and the work equipment used in the work with fire. • The prevention staff signs the Fire Work Permit and registers it in the Register of Fire Work Permits only when they find that the working conditions and fire prevention and protection measures necessary for the safe conduct of fire work are met. After registering the permit, the prevention staff informs the Cernavodă Special Fire Brigade about the fire work to be carried out. - The leader of the work team ensures that the fire protection requirements established in the Fire Work Permit are met and instructs the members of the work formation regarding the work they have to perform and the fire protection measures; also, he ensures that the nominated workers confirm by signature that they meet the requirements of the fire work. - When all the conditions are met and if there is no unforeseen change in the working conditions that could impact or cancel the fire prevention and protection measures, the entrant signs the Fire Work Permit for admission to work with fire. - After admission to work with fire, no changes are accepted in the Fire Work Permit. - The supervisor of the work with fire (the work team leader or another person designated in this regard) ensures the permanent supervision of the flame, the spread and trajectories of sparks or particles of incandescent materials and the intensity of the heat flow. - Changing the composition of the work team by replacing the workers and/or the foreman nominated in the Fire Work Permit will automatically lead to the invalidation of the Fire Work Permit, which will be closed and returned to the applicant. A new Fire Work Permit will be issued for the continuation of fire work with other contractors. - Fire works will be stopped if the following are to take place in the vicinity of the work area: the transfer of flammable liquids, spray painting, the release of flammable substances through the ventilation of a process system, any other situations considered by the worker/team leader/ inspection and oversight personnel as incompatible with fire works. - After finishing the work with fire, the team leader will inform the prevention staff. He will move to the work area and, together with the foreman, will inspect the place where the fire work was carried out, as well as the adjacent spaces and those located at lower or higher elevations. - If, following the inspection of the work area and adjacent areas, conditions are identified that constitute a fire hazard, the prevention staff will request the head of work to bring the work area to fire safety conditions and will inform the admission about this situation. When they consider that the work area is safe, the prevention staff and the foreman will confirm by signature the closure of the Fire Work Permit. Also, the prevention staff will inform the Cernavodă Special Fire Brigade about the closure of the Fire Work Permit. Specific prevention and protection measures for fire work (verified before admission to work with fire by specialized prevention personnel) The use of fire is not allowed at distances less than 40 m from places with a risk of explosion: combustible gases and liquids, flammable vapors, explosives, etc., respectively 10 m from combustible materials or substances: wood, paper, textiles, asphalt cardboard, bitumen, oil, etc., without being supervised and secured by appropriate measures. During fire work, combustible materials will be removed at a safe distance of at least 10 m or will be covered with fire blankets if they cannot be removed. The work area will include, as far as possible, safety distances. If this is not possible, screens will be installed. For work with fire on equipment/installations through which flammable substances are circulated, it is necessary that they be stopped, isolated, depressurized, purged, inerted. Fire work on ventilation systems will only be carried out after the system has been shut down and dust and/or other combustible accumulations have been cleaned. Oxyacetylene welding/cutting equipment shall be checked prior to each job to ensure tightness of joints, integrity of hoses and pressure regulators and presence of flame arrestors fitted to the burner. Oxygen and acetylene hoses must be in one piece. Joints between two or more pieces of hose for the purpose of increasing the length of the hose are not permitted. Whenever welding/cutting is stopped during work, the oxygen and acetylene supply shall be shut off and the torch shall be placed in a safe position to avoid accidental release of gases. When work is stopped, the oxyacetylene welding/cutting equipment is brought to a safe state by closing the valves of the gas cylinders, discharging the remaining gases on the hoses and tightening the hoses. The stationing of oxyacetylene welding/cutting equipment in technological spaces for a duration longer than one work shift is allowed only during planned/unplanned shutdowns, and in this situation the oxygen and acetylene supply will be interrupted, and the burner will be placed in a safe position to avoid accidental release of gases. For oxyacetylene welding/cutting work, only one oxygen or acetylene cylinder is allowed for each workstation. It is forbidden to store spare cylinders in the technological spaces. Oxygen and acetylene cylinders will be secured on a special cart. It is not allowed to introduce cylinders into technological spaces and tie them to structures, equipment or any other means of work. All equipment and devices for the execution of fire works are maintained and checked in accordance with the supplier's instructions.  During the works with fire, no flammable liquid transfer or spray painting activities will be carried out in their vicinity. Where necessary (closed spaces, ex areas, equipment/facilities through which flammable substances are circulated, etc.), the concentration of O2(%) and flammable gases (% LEL) will be monitored. The portable multigas detector available in the warehouses will be used for this monitoring. If necessary, the atmosphere testing is done both before the start of the work and during the course of the work, with the frequency mentioned in the permit to work with fire. In order to determine whether a fire work generates a fire hazard, the prevention staff will carefully examine the area taking into account the following: the type of fire work, the existence of combustible/flammable materials in the immediate vicinity of the work within a radius of 10 meters, the possibilities of ignition of combustible materials, work equipment. It will also be taken into account that the ignition of combustible materials under the action of open fire can be done by direct or indirect effects.  Checking during fire work Every day, upon taking over the shift, the shift leader of the prevention staff ensures that all previously registered fire work permits are closed and organizes the periodic verification in the field of the fire work carried out during the work shift. They will mainly pursue: - possession of the permit to work with fire for the activity carried out; - the use of the work equipment mentioned in the permit to work with fire; - maintaining the fire prevention and protection measures established by the fire work permit. When, during field checks, deviations from the permit to work with fire or situations that may constitute a fire hazard are found, the prevention staff will interrupt the work with fire and inform the admissions officer.  Verification at the closing of the permit to work with fire The permit to work with fire is terminated in the following situations: - at the end of the working hours; - at the end of the work with fire; - when the work is interrupted by fire as a result of the impossibility of continuing the work; - when the work with fire is interrupted as a result of the impossibility of complying with the fire prevention and protection requirements stipulated in the fire work permit.  To close the permit to work with fire, the prevention staff, together with the leader of the work team, inspects the place where the work with fire was carried out, as well as the adjacent spaces and those located at lower or higher levels, as follows: • a check every 30 minutes for: works with fire that involve welding methods other than oxyacetylene or electric welding; welding/cutting and polishing/cutting with an abrasive disc that are carried out in spaces where in the building configuration there are no technological gaps, penetrations or combustible materials in the joints between double walls; works with fire where there are no combustible materials within a radius of 10 meters. • two checks, one every 30 minutes and one every 60 minutes for: fire works carried out in areas where the building configuration implies the existence of technological gaps, penetrations, the existence of combustible materials in the joints between double walls; works with fire in the vicinity of which there are combustible materials that cannot be removed before the execution of the work, within a radius of 10 meters. If, following the inspection of the work area and adjacent areas, conditions are identified that constitute a fire hazard, the prevention staff will request the leader of the work team to bring the work area to fire safety conditions and will inform the work control responsible personnel about this situation.  o Management of the hydrogen risk The location of the technical gas storage was made taking into account the observance of the minimum distances imposed, compared to the general plan objects located in the vicinity (the potable water pumping station and the potable water tanks). The surfaces allocated to the storage of the containers-hydrogen cylinders are separated by an explosion-resistant wall, compared to those allocated to the storage of the N2 and CO2 cylinders. In the electrolysis station, an explosion-proof wall is provided between the storage tanks and the rest of the station. The hydrogen system is designed according to ASME - Boiler and Pressure Vessel Code, Section VTH, Division 1, Pressure vessels. The international operating experience used for the management of hydrogen has been incorporated in the existing design and operational arrangements. |
| **RO-E-1460** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **NPP** | **Cernavoda NPP Unit 1** | page 42/Section 3.3.1.2A/1,2,4/ It is written the following sentence "The fire protection barriers must fulfill their function in the event of a fire, maintaining their stability, tightness and thermal insulation capacity for the prescribed time, depending on the density of the thermal load. Therefore, any penetration of the barriers must not affect their fire resistance. The penetrations of the barriers for the passage of cables and pipes must be sealed". Were there any non-compliances regarding design of fire barriers, stability, access routes for firefighting identified? |  | In the fire safety analyses, no non-compliances have been identified in the design of fire barriers, stability and access routes for fire fighting. However, if routine inspections would identify non-compliances with the design requirements and safety analyses assumptions, abnormal condition reports would be issued and corrective actions implemented. |
| **RO-E-1461** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic] o Compartmentation How is the risk taken into consideration? How is propagation of fire prevented/delayed/mitigated? How are ventilation systems divided among trains/ compartments? What improvements could be achieved to older existing facilities? What limitations are there to do that and what are the alternative measures to cope with that? How is the management concerning fire compartmentation performed as the facility is growing? How are the fire loads linked to fire compartmentation and fire rating of barriers? | The risk is taken into consideration based on fire loads, possible ignition sources and safety-related systems, in accordance with the design provisions. Fire safety analyses have been performed and revised periodically, as described in the national report.   Fire propagation is prevented in accordance with the fire safety design provisions (use of non-combustible materials, separation, use of fire barriers, isolation of ventilation etc.) and by active fire suppression where required.   Examples of fire safety improvements, implemented and planned, have been mentioned in the national report.   Fire compartmentation and fire rating of barriers are established by design and reassessed in design modifications, taking into account the expected fire loads (which have to be kept as low as reasonably achievable). |
| **RO-E-1462** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **NPP** | **Cernavoda NPP Unit 1** | page 46/Section 3.3.2.1.A/1/ In next sentence is written "Ventilation systems are provided for all buildings where safety-related SSC are located". Which buildings and SSCs are without ventilation systems"?   /Section 3.3.2.1.A/2/ How are the ventilation systems in fire compartments separating redundant trains?  /Section 3.3.2.1.A/2/Describe how the loss of ventilation (because of fire) influence the operability of SSC important to safety? Describe scenarios in which the ventilation can be lost and what are consequences?   /Section 3.3.2.1.A/3/ Describe the case where a ventilation system serves more than one fire compartments to prevent the spread of fire? |  | There are no technical areas or buildings without ventilation systems.  The ventilation systems automatically switch the redundant equipment when the one in service has stopped due to a technical failure.  The HVAC systems are electrically interlocked with the fire detection system and will automatically stop when a fire is detected, as power supply will be stopped. Where HVAC ducting passes through penetrations in fire compartments, there are fire dampers provided which automatically close when the temperature reaches 74 degrees C, as the melting of the thermal fuses activates the closure of the dampers’ blades. |
| **RO-E-1463** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic] o Maintenance/Access/Inspection of fire dampers (not relevant for all facilities) What are types and frequencies of testing/inspection of fire dampers? How is this applied to (nearly) inaccessible dampers? What insights have been gathered and improvements of the dampers or test/inspection have been made? | Modifications to the installation / resizing of the inspection viewports were developed and implemented to facilitate access to the fire dampers on the ventilation systems. There are currently no inaccessible fire dampers on the ventilation system. The fire dampers have a semiannual or at least annual maintenance program. The fire dampers located on the ventilation ducting have a preventive maintenance program that includes the following activities: - visual checks of the inside of the fire damper (cleanliness, integrity, no blockages) - fuse status check - actuate the flap in the closed or open position to confirm its operation - identified deficiencies are remedied. These maintenance activities are carried out every year. |
| **RO-E-1464** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Licensee and regulatory experience** | **NPP** | **Cernavoda NPP Unit 1** | page 43/Section 3.4.A/1/ Did you have OSART and WANO missions?...What were lessons learnt from OSART and WANO missions?  Please provide information about significant fire events and the derived operating experience of at least the last ten years. The information for each event should contain: description of the event, causes, consequences and improvements. |  | Cernavoda NPP has received several OSART and WANO missions. The last WANO peer review mission, received in 2023, considered fire protection as a strength of the plant. In the last 10 years of operation there have been no fire events. |
| **RO-E-1465** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Licensee and regulatory experience** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic] o NPP: Ageing management of fire passive and active SSC  Describe which fire active and passive SSCs are covered by the aging management program.  Describe in general the preventive actions to minimize and control ageing degradation on fire protection. Describe specifically how the aging management program covers/considers fire barriers, fire extinguishing system and the firewater distribution network.  Describe in general the monitoring and trending of ageing effects on FP SSC? Which kind of deficiencies of active and passive FP SSCs in scope of aging management program were identified in last 10 years?  Describe how these deficiencies were corrected (e.g. what kind of replacement, improvement or modifications? o OPEX on fire events How do you classify and report on fire related events? Are smouldering events reported? How and to what extent is information on these fire events shared and/or discussed national and international level? If applicable: what are the current fire safety related topics that are discussed on national level? Is there an exchange with conventional industry? Can you provide information on events related to fire at your facilities which led to (significant) improvements of fire protection within your country (causes, improvements and relevant lessons learned)? Same question for external experiences (national, international, other industries). | o NPP: Ageing management of fire passive and active SSC  Monitoring of fire passive SSCs behavior is performed through direct visual examination of passive protection barriers against fire. Up to present a formal Aging Management Program has not been implemented for Fire Passive SSCs. When degradation is detected, a Work Order is issued, the Fire Protection Systems Unavailability Permit is initiated and the deficiencies are fixed with priority. All the fire barriers that have deficiencies or could be affected due to a modification have a Fire Protection Systems Unavailability Permit and are monitored in the Fire Protection Systems Unavailability application. The deficiencies identified in the last 10 years in the passive fire-protections were due to wear and tear, in the case of the penetrations, the damage to the fire-resistant finish, and in the case of the doors, the failure of the closing mechanism. The deficiencies identified were fixed with priority, but no improvements/ modifications were identified that could eliminate them.   o OPEX on fire events  Any fire-related event or with the potential for fire, manifested in any location of the power plant, regardless of the extent or impact, is considered an abnormal condition and is identified, recorded, evaluated, classified and analyzed according to the licensee’s procedures, with the objective of establishing actions (corrective, preventive, improvement) to prevent recurrence. The following types of events manifested in the protected area of the plant, in buildings/at equipment with safety or production impact, are always classified as important and investigated, being reported to the regulatory authority and in the IRIS - Industry Reporting and Information System system, in accordance with the guide INPO 19-002: a. events that result in visible flames or signs/traces of burning (eg: charring); b. events that do not fall under point a, but which required intervention for manual extinguishing or the triggering of an automatic extinguishing system (including smoldering fires); c. events such as electric arc, short circuit or atmospheric discharge that fall under points "a" or "b" above and which result in visible (observable) damage to the affected equipment and/or adjacent equipment. Relevant operating experience from both the nuclear industry and from other industries are analyzed for applicability and the lessons learned are used to improve safety.   The licensee has implemented a program for the use of operating experience in current activities of any nature. The main source of information is represented by the events discussed in the COG (CANDU Owners Group). The events discussed in COG come from various sources in the industry, but the most important are from the member plants COG, WANO and INPO. Also, information transmitted by CANDU Energy (the reactor designer) and IAEA IRS and from other non-nuclear installations are reviewed, for generic implications. All events reviewed in the WSM are published in the groups on the COG website. The information published on the COG website and also the WANO website are checked daily to extract any events considered potentially applicable. Also, internal events are reported to COG and WANO, according to the criteria for reporting defined by these organizations.  There have been no events related to fire at Cernavoda NPP which led to improvements of fire protection. External operating experience has been used to improve design and operational features of fire protection. |
| **RO-E-1466** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | Please provide more information on the practise of temporary fire load management. |  | Procedures are in place to prevent the accumulation of combustible materials in areas where SSC important to safety are located. It is not allowed to increase the fire load in safety-related areas as a permanent modification. For temporary modifications, if the increase in fire load cannot be practically avoided, supplementary monitoring/ fire watch and additional protection means have to be in place for the duration of the work.  Strict procedures are enforced for the control of work and equipment that could constitute ignition sources. |
| **RO-E-1467** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | It is mentioned that procedures are in place to prevent the accumulation of combustible materials in areas where SSC important to safety are located. Also, procedures are enforced for the control of work and equipment that could constitute ignition sources. Are there specific criteria to implement those procedures? |  | There are no specific criteria. It is strictly forbidden to store combustible materials in the Reactor Hall and Irradiation Devices Room. |
| **RO-E-1468** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic]: o Management of fire loads Describe the types of permanent and transient fire loads in the facilities?  How is the inventory of fire loads (transitional and permanent) systematically documented (e.g. computer system) and managed (tasks and responsibilities) during operation and decommissioning (if any what is the difference)? How is analysed whether the change on fire loads affects fire risk? How is the existing knowledge of the inventory used during daily activities? What are the limits and practices on permanent and transient loads, which items are excluded? Describe the inspection programme for fire loads, roles and (independent) responsibilities and frequency. What are the lessons learned and corrective actions taken? o Management of ignition sources What types of hot works are managed in the installations? What are the roles and responsibilities and the way they are regulated and listed? Describe the details of the approaches (as documented in procedures) to systemically permit and control hot works, including the types of additional (temporary) measures in fire prevention and firefighting. Is it different during decommissioning? Describe in some detail the programme of (independent) inspections related to hot works including the purpose (before, during, after the work). o Management of the hydrogen risk (not relevant for all facilities) Describe all the elements of the management of hydrogen risk (such as limiting amount, separate storage, pipe routing etc….).  Describe events and lessons learned or external experience used to modify the management of hydrogen and the related modifications. | o Management of fire loads Permanent and transient fire loads are described in the report in section 3.1.B. Fire prevention. In the reactor building there are rooms intended for installations with a role in nuclear safety and which have the same load density throughout the operation period to reduce the risk of fire and rooms that do not involve nuclear safety and which can be used for the temporary storage of some materials. Depending on the nature of the transient material, the storage space for it is chosen. The existing facilities in each room are considered to be permanent fire loads (e.g. electrical equipment; computer system; battery; command desk; etc.) and transient materials are considered transient fire loads and are used to upgrade performance of current facilities or growing new facilities (e.g. gas cylinders; alcohol; metals; solid materials; etc.)  The inventory of fire loads is known, in accordance with the design and operational documentation and modifications are not allowed to increase the fire hazards.  A procedure is in place for the assessment of permanent and temporary modifications with regard to impact on compliance with the fire safety analyses and fire protection. Inventory of fire loads (transitional and permanent) are systematically documented by registers and managed by people (e.g. for chemical liquid materials – the chemist notes in the register, the name of the substance, which person took that substance, what quantity of substance he took and date and time, and that person signs the register.)  It is strictly forbidden to store combustible materials in the Reactor Hall and Irradiation Devices Room.  The inspection program has the role of checking periodically (every 1-2 hours) the installations in operation to check the condition of the installations and prevent possible fires (e.g. leaks of flammable materials; temperature of electrical equipment).  o Management of ignition sources Hot works are Welding, Warming, Brazing. These hot processes have the role of making devices (instrumented fuel elements, irradiation devices), to repair some mechanical defects (pipe welds), etc. If these works are to be carried out in special controlled premises, a fire work permit is not required. For any other area of the installation, fire work permits are required for these activities.   For works that require a work permit, Annex A from a specific procedure is used: Annex A – The logic of the chain of actions  Step 1. Announcing open fire work. Step 2. Announcing fire prevention and extinguishing measures. Step 3. Checking compliance with fire prevention and extinguishing measures. Step 4. Issuing the permit to work with fire. Step 5. The validity period of the permit to work with fire. Step 6. Registration and archiving of the permit to work with fire.  Independent inspections of hot works:  For works that require a fire work permit, Table A, B and C from the specific procedure for hot work are used. Table A – Measures for the preventions and extinguishing of fires that must be ensured before working with an open fire. (e.g. surrounding the place with panels; removal of combustible materials and substances, equipping with appropriate first aid means; etc.) Table B – Measures for the preventions and extinguishing of fires that must be ensured during working with an open fire. (e.g. permanent and careful supervision of the flame, the dispersion and the paths of the sparks; collecting the remains of electrodes in special vessels with sand and water; the discharge of carbide from the generator in case of interruption of work for a longer period, ensuring the works with means of intervention on the spot (fire extinguishers, internal hydrants, external hydrants or technical assistance with the presence of the special vehicle and the intervention group if it’s necessary) Table C – Measures for the preventions and extinguishing of fires that must be ensured after working with an open fire. (e.g. the detailed verification of the place where the work was performed; safety storage of the equipment used in the hot work; etc.)  o Management of the hydrogen risk Collected hydrogen in the delay tank is continuously evacuated through ventilation system. There have been no internal operating experience events related to hydrogen management. |
| **RO-E-1469** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | How are the fire classes for fire barriers defined? |  | The building resistance structure is made up of: a) prefabricated reinforced concrete pillars, provided with support brackets; b) prefabricated floor caissons, almost square in shape, rest at the corners on the pillar consoles; c) frame tiles and longitudinal connecting beams, cast monolithically on site, the assembly thus forming a rigid plate; d) certain floor areas were made of monolithic reinforced concrete, as the prefabricated elements did not correspond. The materials used are: • Plain concrete B 50 in the foundation blocks; • Reinforced concrete B 150 in glass foundations; • Reinforced concrete B 250 in prefabricated elements; • Reinforced concrete B 300 in monoliths; • Reinforced concrete B 200 in monolithic elements. The cable passages through the floors and walls at the entrance to the panels, cabinets and cells were sealed with protective pipes, metal tubes and seals to avoid the spread of possible fires. Also, where the free length of the route exceeds 25 m, fireproof separations (fireproof plugs) have been provided. |
| **RO-E-1470** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic]: o Compartmentation How is the risk taken into consideration? How is propagation of fire prevented/delayed/mitigated? How are ventilation systems divided among trains/ compartments? What improvements could be achieved to older existing facilities? What limitations are there to do that and what are the alternative measures to cope with that? How is the management concerning fire compartmentation performed as the facility is growing? How are the fire loads linked to fire compartmentation and fire rating of barriers? | The risk of a fire was taken into account based on the existing thermal loads in the room related to the reactor. The design and operational measures implemented are aimed to prevent fires.  Structures important for nuclear safety have been designed to withstand the effects due to internal and external hazards, including fire events. There is no danger of explosion in the rooms where the systems and components of the installation are located. Fire resistant materials were used for the construction and installations (concrete, reinforced concrete, steel sheet, etc.). The following ventilation/air conditioning systems were provided for the reactor building: - The ventilation/air conditioning installation related to the reactor hall, CV1; - The mechanical ventilation installation related to the solid radioactive waste storage, and purification installation, CV2; - The air ventilation system related to the radioactive liquid waste storage, CV3; - The ventilation installation related to the laboratories, CV5; - The air ventilation system related to the storage room, CV6; - Taking into account the nuclear security conditions, the design of the ventilation/air conditioning system took into account: - grouping of rooms according to nuclear zoning; - ensuring the circulation of air, within the same ventilation system, from the rooms with a lower risk of contamination to the rooms with a higher risk of contamination by ensuring the negative pressure in the rooms, depending on the nuclear zoning, thus avoiding the leakage of contaminated air from rooms to outside; - ensuring air evacuation through active charcoal filters in the event of an accident in the reactor hall; - ensuring the automatic switching of the ventilation system of the reactor hall from normal mode to emergency mode; - ensuring the automatic switching from the equipment in operation to the spare equipment, in case of failure of the equipment in operation; - the adoption of open circuit schemes in order to avoid the recirculation of contaminated air. - The following technological requirements were also considered: - ensuring optimal temperature and humidity in reactor hall; - removal of excess heat from technological equipment, in order to ensure the operating conditions of technological installations and equipment. - Thus, ventilation schemes were adopted for: - the reactor hall, the irradiation capsule room, the heat exchanger room; - the radioactive waste storage circuit. In case of fire event occurrence ventilation system will be stopped manual by pressing the red button “OVI” - “Stop Ventilation in case of Emergency” located into the Reactor Control Room.  Improvements measures have been implemented for the active fire protection, as described in the national report.  The management concerning fire compartmentation performed as the facility is done by providing separate the rooms depending on the load density and the purpose of use of the installation. Each laboratory or office or room serves a specific purpose. The load densities related to each room have been analyzed. Depending on the purpose each room serves, the rooms most exposed to a potential fire with a high load density, which determines a major risk, are the laboratories and the archive with documents, while the rooms with role involving nuclear safety have a low load density that determines a minor risk of a fire. |
| **RO-E-1471** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | Specify the dispositions implemented for iodine filter protection in case of fire? How are the maintenance and integrity check performed on the fire dampers? How is the ventilation stopped if a fire occurs? (manual or automatic closure) : P62: "The ventilation system related to the main building of the reactor stops in case of fire, to prevent the spread of smoke and fire and to increase passive fire protection |  | In case of fire event, the indication on the central control panel of the ventilation system will be signaled in red (when the danger of fire is reported, it is not possible to command the ventilation unit) the fire command being given by the fire warning unit. The ventilation system in the area affected by the fire is also interrupted to reduce the oxygen level and the affected installations are stopped. In case of fire event occurrence ventilation system will be stopped manually by pressing the red button “OVI” - “Stop Ventilation in case of Emergency” located into the Reactor Control Room or automatically shutdown of the installation and isolation of the hall piping through dampers. No specific provisions have been implemented for the protection of iodine filters in case of fire.  Maintenance and integrity checks for fire dampers: Visual Inspection – once every 6 months; Fire Simulation Test – every year. |
| **RO-E-1472** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic]: o RR : ventilation management in case of fire Describe the ventilation management in case of a fire ?  Explain on what criteria is the ventilation stopped and/or are the fire dampers closed? And is this manually or automatically? o Maintenance/Access/Inspection of fire dampers (not relevant for all facilities) What are types and frequencies of testing/inspection of fire dampers? How is this applied to (nearly) inaccessible dampers? What insights have been gathered and improvements of the dampers or test/inspection have been made? | In case of fire event, the indication on the central control panel of the ventilation system will be signaled in red (when the danger of fire is reported, it is not possible to command the ventilation unit) the fire command being given by the fire warning unit. The ventilation system in the area affected by the fire is also interrupted to reduce the oxygen level and the affected installations are stopped. In case of fire event occurrence ventilation system will be stopped manually by pressing the red button “OVI” - “Stop Ventilation in case of Emergency” located into the Reactor Control Room or automatically shutdown of the installation and isolation of the hall piping through dampers. Maintenance and integrity checks for fire dampers: Visual Inspection – once every 6 months; Fire Simulation Test – every year. |
| **RO-E-1473** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Licensee and regulatory experience** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic]: o OPEX on fire events How do you classify and report on fire related events? Are smouldering events reported? How and to what extent is information on these fire events shared and/or discussed national and international level? If applicable: what are the current fire safety related topics that are discussed on national level? Is there an exchange with conventional industry? Can you provide information on events related to fire at your facilities which led to (significant) improvements of fire protection within your country (causes, improvements and relevant lessons learned)? Same question for external experiences (national, international, other industries). | Any event detected by the central alarm detected by the central alarm is reported and verified. If the trigger signal was false, call the fire brigade located on the site. All alarms are recorded in the register. If it is not a false alarm, the intervention group take all the steps necessary to facilitate the fire brigade’s access to act against the fire. Smouldering events are also required to be reported and recorded.  No fire events have occurred as part of the internal operating experience. External operating experience is used whenever available and relevant. |
| **RO-E-1474** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** | Some topics for the "Fire Prevention" are not present (see List of detailed contents for the TS - annex 2), in particular: NAR section 3.1.3.1 Overview of strengths and weaknesses" NAR section 3.1.3.2 Lesson learned from events, reviews fire safety related missions etc." NAR section "3.1.3.3 Overview of actions and implementation status" NAR section 3.1.4.1 Overview of strengths and weaknesses in the fire prevention" NAR section "3.1.4.2 Lessons learned from inspection and assessment on the fire prevention as part of its regulatory oversight" *Please provide missing information on the above.*  NAR Section 3.1D pag. 73-->How the following topics have been taken into consideration, in relation to fire prevention: the combustible material (fire load), ignition source (ignition temperature) and oxygen (concentration)?  NAR section 3.1.1.D pag.73 -> Could you provide more information on design considerations and means of intervention?  NAR Section 3.1.2.D pag.73 -> Are there hydrogen detectors in the system? |  | It was mentioned in the report that no strengths or weaknesses have been identified. However, we can consider as a weakness the fact that the FHA has not been required and performed. We can also consider a strength the fact that due to the fire protection measures implemented for the entire Cernavoda NPP site, there have been no fire events. This is an example of feedback provided by the NuclearPools Insurers’ Visit in 2019: - Good fire management systems in place by design; highly professional staff - Housekeeping is good  - Good use of intumescent and fire protection coating (some maintenance required)  - Good use of fixed fire suppression systems  - Good distribution of portable fire extinguishers which are all being replaced periodically.   There were no events, external reviews or safety related missions concerning the Intermediate Dry Spent Fuel Storage Facility of Cernavoda NPP.   There are no actions under implementation concerning the fire protection for the Intermediate Dry Spent Fuel Storage Facility of Cernavoda NPP. However, CNCAN is revising the regulation and will required the performance of a FHA.   In the report, it was mentioned that CNCAN has not identified any major issues with regard to the fire protection of the dry spent fuel storage. CNCAN is updating its specific nuclear safety regulation on fire protection and will extend its scope to cover all nuclear installations, including spent fuel and radioactive waste management facilities and more detailed inspections will be performed to ensure compliance with the new regulatory requirements. Also, any specific issues arising from the TPR will be fed back into the inspection and review processes and more detailed verifications will be performed.   Section 3.1D of the national report, on page 73, concerning the Cernavoda NPP Intermediate Dry Spent Fuel Storage Facility, specified that all the materials used in the construction of the dry spent fuel storage facility are not combustible. There are no ignition sources. There are no hydrogen detectors necessary. The applicable administrative and organisational fire protection issues are the same for all nuclear installations and facilities on the Cernavoda NPP site.  Within the Cernavoda NPP Special Fire Department, a sufficient number of military fire-fighters personnel are active, working on shifts and having available fire trucks and CBRN trucks. The same firefighting personnel, as mentioned in the section 3.2.3.2.A, is responsible for the response to a fire event that may occur on any of the installations and facilities on the Cernavoda NPP site. |
| **RO-E-1475** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] o Management of fire loads Describe the types of permanent and transient fire loads in the facilities?  How is the inventory of fire loads (transitional and permanent) systematically documented (e.g. computer system) and managed (tasks and responsibilities) during operation and decommissioning (if any what is the difference)? How is analysed whether the change on fire loads affects fire risk? How is the existing knowledge of the inventory used during daily activities? What are the limits and practices on permanent and transient loads, which items are excluded? Describe the inspection programme for fire loads, roles and (independent) responsibilities and frequency. What are the lessons learned and corrective actions taken? o Management of ignition sources What types of hot works are managed in the installations? What are the roles and responsibilities and the way they are regulated and listed? Describe the details of the approaches (as documented in procedures) to systemically permit and control hot works, including the types of additional (temporary) measures in fire prevention and firefighting. Is it different during decommissioning? Describe in some detail the programme of (independent) inspections related to hot works including the purpose (before, during, after the work). o Management of the hydrogen risk (not relevant for all facilities) Describe all the elements of the management of hydrogen risk (such as limiting amount, separate storage, pipe routing etc….).  Describe events and lessons learned or external experience used to modify the management of hydrogen and the related modifications. | For the Cernavoda NPP Intermediate Dry Spent Fuel Storage Facility, all the materials used in the construction of the dry spent fuel storage facility and stored in it are not combustible.   There are no ignition sources and no hot works for this facility. No transient fire loads are applicable or allowed for this facility.   There are no hydrogen sources for the Cernavoda NPP Intermediate Dry Spent Fuel Storage Facility. |
| **RO-E-1476** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** | Some topics for the "Passive fire Protection" are not present (see List of detailed contents for the TS - annex 2), in particular: fire spreading (barriers)" (and related subparagraphs) *Please provide the missing information on the above.* |  | For the Cernavoda NPP Intermediate Dry Spent Fuel Storage Facility, all the materials used in the construction of the dry spent fuel storage facility and stored in it are not combustible.   The MACSTOR System consists of storage modules located outdoors in the storage site, and equipment operated at the spent fuel storage bay for preparing the spent fuel for dry storage.   Each MACSTOR-200 module is a parallelepiped structure made of reinforced concrete, which embeds 20 metallic storage cylinders positioned vertically. Once filled, the cylinder is covered with a reinforced concrete shield plug and a welded metallic cover plate, both of which are seal-welded to the upper flange of the storage cylinder.   The modules are air cooled, by natural convection.  There are no other passive fire protection means than the reinforced concrete walls that form the structure of the storage facility. There are no combustible materials and no ignition sources. |
| **RO-E-1477** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] o Compartmentation How is the risk taken into consideration? How is propagation of fire prevented/delayed/mitigated? How are ventilation systems divided among trains/ compartments? What improvements could be achieved to older existing facilities? What limitations are there to do that and what are the alternative measures to cope with that? How is the management concerning fire compartmentation performed as the facility is growing? How are the fire loads linked to fire compartmentation and fire rating of barriers? | For the Cernavoda NPP Intermediate Dry Spent Fuel Storage Facility, all the materials used in the construction of the dry spent fuel storage facility and stored in it are not combustible.   The MACSTOR System consists of storage modules located outdoors in the storage site, and equipment operated at the spent fuel storage bay for preparing the spent fuel for dry storage.   Each MACSTOR-200 module is a parallelepiped structure made of reinforced concrete, which embeds 20 metallic storage cylinders positioned vertically. Once filled, the cylinder is covered with a reinforced concrete shield plug and a welded metallic cover plate, both of which are seal-welded to the upper flange of the storage cylinder.   The modules are air cooled, by natural convection.  There are no other passive fire protection means than the reinforced concrete walls that form the structure of the storage facility. There are no combustible materials and no ignition sources. |
| **RO-E-1478** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** | Some topics for the "Passive fire Protection" are not present (see List of detailed contents for the TS - annex 2), in particular: NAR section 3.3.2 Ventilation system" (and related subparagraphs) *Please provide the missing information.* |  | For the Cernavoda NPP Intermediate Dry Spent Fuel Storage Facility, all the materials used in the construction of the dry spent fuel storage facility and stored in it are not combustible.   The MACSTOR System consists of storage modules located outdoors in the storage site, and equipment operated at the spent fuel storage bay for preparing the spent fuel for dry storage.   Each MACSTOR-200 module is a parallelepiped structure made of reinforced concrete, which embeds 20 metallic storage cylinders positioned vertically. Once filled, the cylinder is covered with a reinforced concrete shield plug and a welded metallic cover plate, both of which are seal-welded to the upper flange of the storage cylinder.   The modules are air cooled, by natural convection.  There are no other passive fire protection means than the reinforced concrete walls that form the structure of the storage facility. There are no combustible materials and no ignition sources. |
| **RO-E-1479** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] o Maintenance/Access/Inspection of fire dampers (not relevant for all facilities) What are types and frequencies of testing/inspection of fire dampers? How is this applied to (nearly) inaccessible dampers? What insights have been gathered and improvements of the dampers or test/inspection have been made? | The modules are air cooled, by natural convection. There are no fire dampers. |
| **RO-E-1480** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Licensee and regulatory experience** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] o OPEX on fire events How do you classify and report on fire related events? Are smouldering events reported? How and to what extent is information on these fire events shared and/or discussed national and international level? If applicable: what are the current fire safety related topics that are discussed on national level? Is there an exchange with conventional industry? Can you provide information on events related to fire at your facilities which led to (significant) improvements of fire protection within your country (causes, improvements and relevant lessons learned)? Same question for external experiences (national, international, other industries). | The applicable administrative and organisational fire protection issues are the same for all nuclear installations and facilities on the Cernavoda NPP site. Please see the answers provided on OPEX for Cernavoda NPP. |
| **RO-E-1481** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** | Section 1.1.3.3; P.3-4. Please explain whether solid radioactive waste interim storage facility is designed only for storage of low and intermediate radioactive waste or also to high radioactive waste, as it is stated that structure no. 3 (Quadricell) is a concrete structure for highly contaminated pieces of equipment. Section 3.1.2.E; P.75. Please provide information about fire loads and the different types of potential ignition sources of the facility. What are the permissible limits for permanent and temporary fire loads and how are they determined? Section 3.1.3.2.E; P.76. Please provide more detailed information about several improvements implemented in the area of hot works preparation and authorization. |  | There is no high radioactive waste stored in the Quadricell. The applicable administrative and organisational fire protection issues are the same for all nuclear installations and facilities on the Cernavoda NPP site. For management of fire loads and ignition sources, please see the answers provided for Cernavoda NPP on the generic questions. For the waste storage there are no additional fire loads that would exceed the conservative assumptions made in the deterministic safety analysis for a fire event, as mentioned in the report. The improvements that have been implemented in the area of fire work preparation and authorization are applicable for all the the nuclear installations and facilities on the Cernavoda NPP site, are not specific for the storage facilities and simply refer to a stricter administrative control, using as reference the best practices recommended in international standards. |
| **RO-E-1482** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Fire prevention (TS 3.1)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** |  | [generic] o Management of fire loads Describe the types of permanent and transient fire loads in the facilities?  How is the inventory of fire loads (transitional and permanent) systematically documented (e.g. computer system) and managed (tasks and responsibilities) during operation and decommissioning (if any what is the difference)? How is analysed whether the change on fire loads affects fire risk? How is the existing knowledge of the inventory used during daily activities? What are the limits and practices on permanent and transient loads, which items are excluded? Describe the inspection programme for fire loads, roles and (independent) responsibilities and frequency. What are the lessons learned and corrective actions taken? o Management of ignition sources What types of hot works are managed in the installations? What are the roles and responsibilities and the way they are regulated and listed? Describe the details of the approaches (as documented in procedures) to systemically permit and control hot works, including the types of additional (temporary) measures in fire prevention and firefighting. Is it different during decommissioning? Describe in some detail the programme of (independent) inspections related to hot works including the purpose (before, during, after the work). o Management of the hydrogen risk (not relevant for all facilities) Describe all the elements of the management of hydrogen risk (such as limiting amount, separate storage, pipe routing etc….).  Describe events and lessons learned or external experience used to modify the management of hydrogen and the related modifications. | Please see the answers provided for Cernavoda NPP on the generic questions, as the arrangements described are applicable to all activities on the Cernavoda NPP site. For the radioactive waste storage facility there are no hydrogen risks. |
| **RO-E-1483** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** | Section 3.3.1.E; P.77. Please provide information how access routes for firefighting are maintained. Section 3.3.1.E; P.77. Please provide information about fire compartmentation of radioactive waste storage. |  | The intervention paths are permanently kept free. If the blocking of an intervention route is absolutely necessary, this is done only after establishing another intervention route and notifying the fire brigade.  The Solid Radioactive Waste Interim Storage Facility consists of three above ground structures: - Structure no. 1 (concrete warehouse) - Structure no. 2 (concrete cylindrical cells) - Structure no. 3 (concrete cubes - Quadricell). The Structure no. 1 is a concrete building warehouse in which are located stainless steel drums of 220L, containing compactable and noncompactable solid radioactive waste (Type 1 and Type 2), which can be stacked on four levels. The Structure no. 2 is a concrete structure which consists of cylindrical concrete cells dimensioned to accommodate spent filter cartridges resulted from plant operation. Inside the concrete cells there are metallic cells with bottom and cover designed to avoid spreading of contamination. The Structure no. 3 (Quadricell) is a concrete structure for large and highly contaminated pieces of equipment. It consists of eight concrete cubes which can be removed together with the waste content. Currently, the structure does not contain any waste. The 3 storage structures are not divided into fire compartments. |
| **RO-E-1484** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Prevention of fire spreading (TS 3.3.1)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 2** |  | [generic] o Compartmentation How is the risk taken into consideration? How is propagation of fire prevented/delayed/mitigated? How are ventilation systems divided among trains/ compartments? What improvements could be achieved to older existing facilities? What limitations are there to do that and what are the alternative measures to cope with that? How is the management concerning fire compartmentation performed as the facility is growing? How are the fire loads linked to fire compartmentation and fire rating of barriers? | The Solid Radioactive Waste Interim Storage Facility consists of three above ground structures. The 3 storage structures are not divided into fire compartments and have no fire barriers.  Only the defined quantities of materials are stored and there are no modifications allowed that could impact on the conservative assumptions in the safety analysis.  Fire propagation is prevented by the control of transient material and avoidance of ignition sources. Fire response is ensured by the fire brigade.   Only natural ventilation is provided.   No modifications have been identified as necessary. If there would be modifications needed, these would be analyzed in accordance with the licensee’s procedures for configuration management, which include an assessment of the impact on fire safety analyses and fire protection measures. |
| **RO-E-1485** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** | Section 3.3.2.E; P.77; (5). Since there is natural ventilation, please indicate what measures are planned to prevent the spread of fire through it. |  | In the event of a fire, it will be extinguished using the fire hydrants in the area or the equipment of the emergency vehicles / fire trucks of the on-site fire brigade. |
| **RO-E-1486** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Ventilation systems (TS 3.3.2)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 2** |  | [generic] o Maintenance/Access/Inspection of fire dampers (not relevant for all facilities) What are types and frequencies of testing/inspection of fire dampers? How is this applied to (nearly) inaccessible dampers? What insights have been gathered and improvements of the dampers or test/inspection have been made? | Only natural ventilation is provided for the waste storage facility. There are no fire dampers. |
| **RO-E-1487** | PFP | **RO** | **Fire prevention/Passive Fire Protection** | **Licensee and regulatory experience** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** |  | [generic] o OPEX on fire events How do you classify and report on fire related events? Are smouldering events reported? How and to what extent is information on these fire events shared and/or discussed national and international level? If applicable: what are the current fire safety related topics that are discussed on national level? Is there an exchange with conventional industry? Can you provide information on events related to fire at your facilities which led to (significant) improvements of fire protection within your country (causes, improvements and relevant lessons learned)? Same question for external experiences (national, international, other industries). | The operating experience arrangements are the same for all the installations on the Cernavoda NPP site. Please see the answers on the same generic questions for the NPP. |
| **RO-E-1488** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic] • Please clarify what is the robustness against earthquake of the fire detection system and alarming system. • How does the fire detection system allow to locate precisely the location of fires? Is the fire detection system addressable or not?  • Please describe the strategy and criteria for selecting rooms where to install fire detectors in rooms. In which types of rooms are no fire detectors installed?  • What is the ability of the fire detection system to function in case of loss of power? What is their emergency power supply arrangements, criteria and autonomy (how long can they work without power?)?  • Please provide detail of the safety class of the fire detection systems. | The fire detection panel is earthquake secured.  The fire detection system is addressable with few exceptions where there are “analogue” detectors but only connected to an addressable module witch can be easily identified.  The design of the fire detection system and the location of fire detectors is based on the fire hazards for the plant equipment and rooms.  The design for the fire detection system for Unit 2 has not changed since first installation of fire detection system. The BOP of Unit 1 has been refurbished in 2014 and in the future refurbishment of NSP Unit 1 takes in to consideration all rooms that are enclosed (rooms that have walls, floor and roof) as well as areas that are partly enclosed. The fire detection system is powered from a class 2 uninterrupted power supply.  The fire detection system has also a battery group in the main panel with an autonomy of 24 hours.   The system is classified 1(d) (the function of detecting fire which can damage the nuclear safety systems) and 2(d) (role in the support of the management of severe accidents). |
| **RO-E-1489** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **NPP** | **Cernavoda NPP Unit 1** | • Please provide more details on the fire detection systems key features / technology used and their cable failure arrangements. • Please clarify the approaches to assure that the fire detection and alarm systems are capable to withstand the relevant hazard conditions, in particular their resistance level against earthquake (considering the relatively high regional seismicity). • Please provide more details on how independence between fire detection systems in adjacent compartments is achieved • (p.18) Chapter 2.1.5.2 of the NAR provides a long list of decided improvements to fire detection and suppression. To be clarified which are already implemented and which not . |  | The fire detection system contains fire resistant cables trough steel conduits. The fire detection system from NSP has fire retardant cables, which are to be replaced starting with the planned outage of Unit 1 in 2024.  The fire detection panel is earthquake secured in the Main Control Room (MCR) and all cables and detectors are fixed with metal fixing system, which are well anchored to be secured in case of earthquake.  The fire detection systems are designed to allow the identification of the rooms/areas where a fire may occur and the connections to the fire detectors are done through 2 communication paths; in case of a cable defect or detector failure, the entire loop has a back-up communication. Each area and each building have also a separate pannel (Reactor building and Service building have a panel, Diesel Generator rooms have a panel, Turbine building has a panel and Electrical building has a panel).  Many of the improvements of the fire detection system for the nuclear buildings will start in the planned outage of Unit 1 in 2024, with a few exceptions:  - Replacement of the fire detection system from NSP U1 – in progress; - Installation of smoke and temperature detectors at the turbine bearings; already implemented  - Automatic extinguishing and switching off the power transformers based on a 2 out of 2 logic (2 fire detection lines) in accordance with Romanian regulations; already implemented - Installation of a repeater panel in Secondary Control Room, Unit 1, for situations where the Main Control Room becomes unavailable (modification in progress);  - Installation of IR detectors in EPS (Emergency Power Supply) room in Unit 1 (modification in progress); - NSP Fire Detection refurbishment and the provision of VESDA detectors in the SCA); in progress; - Improvements in Fire Alarm Systems, such as addition of fire detectors for all unattended areas, manual pull stations, strobe lights for high noise areas, and improvement in sounding alarms; implemented for BOP and in progress for NSP U1. |
| **RO-E-1490** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **NPP** | **Cernavoda NPP Unit 1** | Page 37-38 Section 3.2.1A Topic 1 - Please provide detail of the safety class of the fire detection systems. |  | The system is classified 1(d) (the function of detecting fire which can damage the nuclear safety systems). |
| **RO-E-1491** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **NPP** | **Cernavoda NPP Unit 1** | Section 3.2.1.2 Absence of requirements for seismic resistance of the fire alarm system. |  | According the design manual of the fire detection system there is no requirement for seismic qualification, however the fire detection panel and the fire detection element are earthquake secured.  The new regulations that will come in force in 2024 will require seismic qualification of the fire alarm system. |
| **RO-E-1492** | AFP | **RO** | **Active fire protection** | **Fire suppression (TS 3.2.2)** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic] • Please clarify what is the robustness against earthquake of the fire suppression systems. • Please provide detail of the safety class of the fire suppression systems. • Please clarify what can be adverse effects of fire water? Has this been assessed? What could be the adverse consequences of fire water system actuation or break? • Please clarify the emergency power arrangements for fire suppression. • Please clarify the balance between fixed fire extinguishing and manual firefighting. What strategy has been applied? What are the main principles? Clarify how accessibility considerations during manual firefighting has been considered in this strategy. | Portable extinguishing systems are positioned on seismically qualified supports in areas where seismically-qualified systems are located. Fire protection systems are designed so that, in the event of an earthquake, they do not affect seismically qualified systems and are capable of extinguishing fires caused by an earthquake.  The system is classified 1(d) (the function of detecting fire which can damage the nuclear safety systems) and 2(d) (role in the support of the management of severe accidents).   The fire system is a pressurized system at 10 bar, serving manual and automatic extinguishing systems, through a network of pipes. In the network outside the buildings, cracks may appear in the fire pipes with a minor impact on the operation of the system because it consists of a ring network on which many isolation valves are placed, thus allowing the isolation of the defect and the repair. As a major impact, spurious actuation of the automatic extinguishing systems or cracks in the fire pipes that could cause a possible flood may occur inside the buildings. Internal flooding event scenarios resulting from such failures are analysed and are addressed by abnormal operating procedures. In the industrial standard on fire protection of CANDU-type NPPs and in the nuclear safety design guide for fire protection, it is required to evaluate the following potential negative effects of extinguishing agents on equipment and structures: - Flooding; - Short-circuiting of electrical connections; - Effects of cooling; - Lack (elimination) of oxygen; - Pressurization; - Collection of residues; - Corrosion products. The evaluation is carried out both for normal operation and for the spurious actuation. In case of spurious automatic actuations, warning signals are sent to the MCR (Main Control Room) either by the fire detection system or by the fire protection system. For the areas where internal fire water pipes are located, where cracks may appear, there are internal procedures for checking the installation on each shift by the area operator (the inspection procedures FIG-field inspection guide contains specific provision for verifications of the fire detection and fire suppression systems).  Fire water is provided by the Fire Water Pumping Station which is composed of 9 electric pumps and 1 diesel motor pump. In case the electricity supply fails, the safety function and compensatory measure for the loss of electric pumps is the diesel engine pump that is fed with diesel fuel from a tank next to the Fire Water Pumping Station building. This pump starts automatically when the system pressure reaches 6.5 bar. This motor pump provides all the water required by design (560 m3/h).  Regarding the balance between the fixed extinguishing means controlled automatically and the manual firefighting with supply from the fire hydrants inside the buildings, this is ensured by placing the fire hydrants on all elevations of the plant so that an efficient extinguishing can be ensured from at least two hydrants. The location of the fixed fire extinguishing systems and of the hydrants was established in the design phase and accessibility for manual firefighting is ensured. |
| **RO-E-1493** | AFP | **RO** | **Active fire protection** | **Fire suppression (TS 3.2.2)** | **NPP** | **Cernavoda NPP Unit 1** | (p.39) “Fire extinguishing systems with sprayed water and automatic sprinkler systems are provided in plant areas and compartments where there is a substantial risk of fire.” Where is this exactly? Is the reactor building equipped with fixed automatic or distance-operable extinguishing system?  • (p.39) “Fire extinguishing systems with INERGEN are used for computer rooms and other areas where water extinguishing systems are not suitable for use.” Clarify whether all safety-class I&C rooms are protected by this or something else? Are the main control room and the SCA protected by this? How are electrical equipment protected more broadly?  • Please clarify key design characteristics of the fire extinguishing provisions including seismic resistance. • (p.18) Chapter 2.1.5.2 of the NAR provides a long list of decided improvements to fire detection and suppression. To be clarified which are already implemented and which not •(p.39) No fire hydrants yet installed in the Reactor Building of Unit 1. “Internal fire hydrants and piping will be installed during refurbishment”. When is this planned exactly? " "• (p.8) “As regards the consideration of combinations of fire events and earthquake events, such combinations have not been considered in the analysis, because the design of the plant is such that systems or components containing large quantities of flammable liquids or gases are seismically qualified or have been separated from essential safety related systems by a qualified barrier.” This does not seem to be a very robust approach, as demonstrated by international operating experience feedback. The fire detection and fire suppression functions would still need to be ensured in this scenario.  • (p.39) No fire hydrants yet installed in the Reactor Building of Unit 1. “Internal fire hydrants and piping will be installed during refurbishment”. (When is this planned exactly?) As indicate on p.18, a large number of other significant improvements to fire detection and suppression are also still pending implementation. " • (p.38) The site has a high-capacity backup diesel-driven pump to supply (filtered) water from the Danube to the site fire water ring network.  • (p.39) “Fire extinguishing systems with sprayed water and automatic sprinkler systems are provided in plant areas and compartments where there is a substantial risk of fire.” Where is this exactly? Is the reactor building equipped with fixed automatic or distance-operable extinguishing system?  • (p.39) “Fire extinguishing systems with INERGEN are used for computer rooms and other areas where water extinguishing systems are not suitable for use.” Clarify whether all safety-class I&C rooms are protected by this or something else? Are the main control room and the SCA protected by this? How are electrical equipment protected more broadly?  • Please clarify key design characteristics of the fire extinguishing provisions including seismic resistance. • (p.18) Chapter 2.1.5.2 of the NAR provides a long list of decided improvements to fire detection and suppression. To be clarified which are already implemented and which not •(p.39) No fire hydrants yet installed in the Reactor Building of Unit 1. “Internal fire hydrants and piping will be installed during refurbishment”. When is this planned exactly? 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" • (p.38) The site has a high-capacity backup diesel-driven pump to supply (filtered) water from the Danube to the site fire water ring network.  • (p.39) “Fire extinguishing systems with sprayed water and automatic sprinkler systems are provided in plant areas and compartments where there is a substantial risk of fire.” Where is this exactly? Is the reactor building equipped with fixed automatic or distance-operable extinguishing system? • (p.39) “Fire extinguishing systems with INERGEN are used for computer rooms and other areas where water extinguishing systems are not suitable for use.” Clarify whether all safety-class I&C rooms are protected by this or something else? Are the main control room and the SCA protected by this? How are electrical equipment protected more broadly? • Please clarify key design characteristics of the fire extinguishing provisions including seismic resistance. • (p.18) Chapter 2.1.5.2 of the NAR provides a long list of decided improvements to fire detection and suppression. To be clarified which are already implemented and which not •(p.39) No fire hydrants yet installed in the Reactor Building of Unit 1. “Internal fire hydrants and piping will be installed during refurbishment”. When is this planned exactly? |  | The reactor buildings are not equipped with fixed automatic or distance-operable extinguishing systems for fire protection. Unit 2 has fire hydrants in the reactor building and for Unit 1 these will be installed during the refurbishment outage.  Fixed automatic extinguishing systems for fire protection are installed in the Turbine Buildings, Electrical Bays, several rooms in the Service Buildings, Chiller Buildings, Standby Diesel Generator Buildings, Emergency Power Supply Buildings and Power Transformers.   Fire extinguishing systems with INERGEN are used for the main control rooms, for the control equipment rooms, for the rooms of the stations’ digital control computers, for the rooms with emergency communication means.   The electrical equipment is designed and protected in accordance with the international standards, including the industrial standards for electrical systems and for fire protection for NPPs (e.g. Canadian Standards Association (CSA) N293 standard “Fire Protection for Nuclear Power Plants”). For each revision of these standards, the licensee performs a gap assessment, identifies and implements the practicable safety improvements.  The fire extinguishing systems are not seismically qualified.   Clarifications on the status of the fire safety improvements have been provided in the answers to a previous question.  The installation of the internal fire hydrants in the reactor building of Unit 1 will be implemented during the refurbishment outage (estimated period 2027-2028).   Based on the Fire Hazard Analyses performed during the early design stages of both Cernavoda NPP Units, measures have been taken to minimize the fire ignition sources and combustible material for the vital areas. These analyses have been supplemented with Fire Probabilistic Safety Assessment performed for each unit during the operation stage and Fire Safe Shutdown analysis. These studies confirm that the design is robust.  Fire detection will remain available in case of earthquake and manual fire suppression means are credited in this event.  However, any relevant operating experience feedback and new requirements from the international standards will be used to identify and implement further safety improvements.   The installation of the internal fire hydrants in the reactor building of Unit 1 will be implemented during the refurbishment outage (estimated period 2027-2028).   Clarifications on the status of the fire safety improvements have been provided in the answers to a previous question.   Yes, the site has a high-capacity backup diesel-driven pump to supply (filtered) water from the Danube to the site fire water ring network.  The reactor buildings are not equipped with fixed automatic or distance-operable extinguishing systems for fire protection. Unit 2 has fire hydrants in the reactor building and for Unit 1 these will be installed during the refurbishment outage.  Fixed automatic extinguishing systems for fire protection are installed in the Turbine Buildings, Electrical Bays, several rooms in the Service Buildings, Chiller Buildings, Standby Diesel Generator Buildings, Emergency Power Supply Buildings and Power Transformers.   Fire extinguishing systems with INERGEN are used for the main control rooms, for the control equipment rooms, for the rooms of the stations’ digital control computers, for the rooms with emergency communication means.   The fire extinguishing system is classified in safety categories 1(d) and 2(d); based on post-Fukushima stress test analyses, it is credited also in the management of severe accidents as it can be used for water make-up with the fire trucks (for example, to provide moderator make-up, to ensure fuel cooling during severe events and to provide cooling water to Spent Fuel Bay during severe events).  Fire extinguishing systems are not seismically qualified for design basis earthquake.  The design of the fire extinguishing systems was based on Canadian industrial standards for fire protection and Romanian nuclear safety regulations.   Regarding the accessibility of manual extinguishing: In the case of the unavailability of the automatic fire extinguishing systems, the extinguishing intervention is ensured by the crews of the Cernavoda Special Fire Brigade on the site, which activates the internal/external hydrants and which is equipped with technical means of intervention (special intervention vehicles, hoses, fire extinguishers, etc).  A supply line is installed on site, outside the spent fuel bay area, for emergency water makeup to the bays by connection with the fire main hydrants of the fire protection system. If station fire water is not available, fire trucks loaded with water or mobile pumps taking water from various locations, such as the fore-bay, fire water tanks, de-mineralized water tanks or deep underground water wells, can provide the makeup water to the bays via hose connections.   As part of the response to the WANO SOER 2011-02 Recommendation following the Fukushima accident (and also as part of the EU Stress Tests), walk-downs and inspections of important equipment needed to mitigate fire and flood events were performed at Cernavoda NPP to identify any equipment whose function could be lost during seismic events. The inspections confirmed the design robustness and good material condition regarding the fire barrier preservation pertaining to the vital areas. The strategy and mitigation actions for fire suppression in the vital areas have been confirmed. The use of portable fire extinguishers located in the vicinity of seismically qualified equipment is efficient and can be used even by operating crew if a fire occurs at any time following a safe shutdown. If the plant fire water is not available, the ultimate water make-up source used will be fire trucks filled with water from various places (forebay, fire water tanks, demineralized water tanks or high depth wells on-site). |
| **RO-E-1494** | AFP | **RO** | **Active fire protection** | **Fire suppression (TS 3.2.2)** | **NPP** | **Cernavoda NPP Unit 1** | Page 38-39 Section 3.2.2A Topic 1 - no detail of the safety class of the fire suppression systems or the standards to which they were designed. There is not much detail on the suppression system characteristics such as the layout or coverage of the systems. Has consideration been given to the accessibility of the facilities for manual fire fighting? Please could more detail or clarification be provided in these areas? |  | The reactor buildings are not equipped with fixed automatic or distance-operable extinguishing systems for fire protection. Unit 2 has fire hydrants in the reactor building and for Unit 1 these will be installed during the refurbishment outage.  Fixed automatic extinguishing systems for fire protection are installed in the Turbine Buildings, Electrical Bays, several rooms in the Service Buildings, Chiller Buildings, Standby Diesel Generator Buildings, Emergency Power Supply Buildings and Power Transformers.   Fire extinguishing systems with INERGEN are used for the main control rooms, for the control equipment rooms, for the rooms of the stations’ digital control computers, for the rooms with emergency communication means.   The design of the fire extinguishing systems was based on Canadian industrial standards for fire protection and Romanian nuclear safety regulations.   Regarding the accessibility of manual extinguishing: In the case of the unavailability of the automatic fire extinguishing systems, the extinguishing intervention is ensured by the crews of the Cernavoda Special Fire Brigade on the site, which activates the internal/external hydrants and which is equipped with technical means of intervention (special intervention vehicles, hoses, fire extinguishers, etc).  A supply line is installed on site, outside the spent fuel bay area, for emergency water makeup to the bays by connection with the fire main hydrants of the fire protection system. If station fire water is not available, fire trucks loaded with water or mobile pumps taking water from various locations, such as the fore-bay, fire water tanks, de-mineralized water tanks or deep underground water wells, can provide the makeup water to the bays via hose connections.   As part of the response to the WANO SOER 2011-02 Recommendation following the Fukushima accident (and also as part of the EU Stress Tests), walk-downs and inspections of important equipment needed to mitigate fire and flood events were performed at Cernavoda NPP to identify any equipment whose function could be lost during seismic events. The inspections confirmed the design robustness and good material condition regarding the fire barrier preservation pertaining to the vital areas. The strategy and mitigation actions for fire suppression in the vital areas have been confirmed. The use of portable fire extinguishers located in the vicinity of seismically qualified equipment is efficient and can be used even by operating crew if a fire occurs at any time following a safe shutdown. If the plant fire water is not available, the ultimate water make-up source used will be fire trucks filled with water from various places (forebay, fire water tanks, demineralized water tanks or high depth wells on-site). |
| **RO-E-1495** | AFP | **RO** | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic] • How far is the external fire brigade located? What is the intervention time needed in case of a fire inside the reactor hall outside normal working hours? How much time is needed, from the moment of fire detection, until actual firefighting starts in the field (i.e. considering need for presence of RP escort, security/access formalities, personal protection equipment for entering radiological controlled zone, etc.). • What is the minimum staffing of the nearest off-site fire brigade? Can they respond to simultaneous fires inside and outside the NPP? Are there maximum or average times for arrival to the fire location for this brigade? • What criteria are applied for calling or not the off-site fire brigade? Is this done every time a fire is detected? • How much time is needed between a fire alarm and presence of the onsite first intervention team at the location? Same question for the onsite second intervention team (if any) or the onsite fire brigade (if any). What are the actual times measured during recent unannounced drills and exercises? Is there any regulatory requirement for this? • If not yet explained in the report, please clarify whether there is a fire brigade on site? If not yet done, please clarify how it is equipped (protection clothes and equipment, vehicules, ...). • Please clarify whether the onsite first intervention teams / onsite fire brigades have other day to day duties that could impact their availability for firefighting duties. | Starting with April 2022, a military fire department unit, the Cernavoda NPP Special Fire Department (Brigade), was operationalized at the Cernavoda NPP site, with a permanent work schedule (24/7). Their location is within the protected area of the plant, near the fire water pumping station. A sufficient number of military fire-fighters personnel are active in this department, working on shifts and having available fire trucks and CBRN trucks. The time standards for firemen to respond to a fire alarm are 2 minutes from the fire alarm for alerting and equipping, 7 minutes from the fire alarm to establish the control point of the intervention and 15 minutes from the fire alarm to access the area incident and deployment of intervention devices. These times were confirmed during fire drills. Extinguishing actions begin after the MCR (Main Control Room) confirms de-energization of the area. For fire support actions, the NPP emergency response team is assembled, made up of NPP personnel (operators, maintainers, technicians). Their response time depends on the location of the response team members in the field.  In the event that external support would be needed to extinguish a fire, the on-site brigade can request and receive support from the military fire brigade units from the city of Cernavoda (2 km), respectively the one from Medgidia (25 km).  The unit on the site, the Cernavoda Special Fire Department, operates with a staff of 74 firefighters, organized in 3 shifts (15 firefighters per shift). They are equipped with 3 special fire trucks, with which they intervene only in fires on the NPP site. Firefighters from the city of Cernavoda respond to fires outside the NPP site.  Intervention time is of maximum 15 minutes from the fire alarm to access the area incident and deployment of intervention devices. The time were was confirmed during fire drills.   The on-site unit, the Cernavoda Special Fire Department, responds to any fire alarm on the NPP site. External support would be requested by the extinguishing intervention commander in case of large-scale events, if the response capacity of the Cernavoda Special Fire Department would be exceeded.   The equipment of the military firefighters is provided by Cernavoda NPP, including the individual protection equipment for intervention, consisting of boots, firefighter suits, firefighter gloves, firefighter helmet, SCBA self-contained breathing apparatus. The emergency vehicles are equipped with all the necessary emergency accessories, including aluminized suits for heavy penetration. For self-contained breathing apparatus, the NPP provides 100 spare cylinders, which are recharged by authorized NPP personnel with the help of two air compressors.  The Special Fire Department on the Cernavoda NPP site exclusively carries out fire containment and extinguishing activities for the plant and has no other duties that could impact their availability for firefighting duties. The separate NPP response team is made up of NPP shift personnel (operators, maintainers, technicians) who carry out normal activities during the working hours. |
| **RO-E-1496** | AFP | **RO** | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **NPP** | **Cernavoda NPP Unit 1** | • Clarify balance between fixed fire extinguishing and manual firefighting (there is almost no info about manual or portable fire extinguishers). Please also clarify how accessibility is ensured during manual firefighting (ventilation strategy, …). • Clarify firefighting capabilities, responsibilities and organisation, including criteria for deploying onsite and offsite firefighting resources, how coordination is achieved between the plant personnel and the offsite resources, where are the external brigades located and what is their capacity, how much time is needed for the external brigades to reach the place of fighting on site, etc. The NAR mentions that there is a professional firefighting brigade onsite but with few details, and no info about whether the onsite brigade is big enough for all scenarios or not. • Clarify how the firefighting strategy takes into account possible damaged offsite and onsite roads and infrastructure (earthquake, ...), making access difficult. |  | For manual firefighting, a variety of extinguishers, fire hose cabinets, external hydrants and foam equipment are available throughout the plant in all the buildings, areas and rooms (with the exception of the reactor building of Unit 1 where there are no fire hydrants and only manual and portable extinguishers are provided). The response to extensive fires is provided by the Fire Brigade equipped with three fire trucks. Where necessary, the ventilation strategies for smoke removal are implemented by the specialized fire fighters.   Starting with April 2022, a military fire department unit, the Cernavoda NPP Special Fire Department (Brigade), was operationalized at the Cernavoda NPP site, with a permanent work schedule (24/7). Their location is within the protected area of the plant, near the fire water pumping station. A sufficient number of military fire-fighters personnel are active in this department, working on shifts and having available fire trucks and CBRN trucks.  The unit on the site, the Cernavoda Special Fire Department, operates with a staff of 74 firefighters, organized in 3 shifts (15 firefighters per shift). They are equipped with 3 special fire trucks, with which they intervene only in fires on the NPP site. Firefighters from the city of Cernavoda respond to fires outside the NPP site. Intervention time is of maximum 15 minutes from the fire alarm to access the area incident and deployment of intervention devices. The time were was confirmed during fire drills.  The on-site unit, the Cernavoda Special Fire Department, responds to any fire alarm on the NPP site. External support would be requested by the extinguishing intervention commander in case of large-scale events, if the response capacity of the Cernavoda Special Fire Department would be exceeded. In the event that external support would be needed to extinguish a fire, the on-site brigade can request and receive support from the military fire brigade units from the city of Cernavoda (2 km), respectively the one from Medgidia (25 km).  For situations where the access to the site could be hindered due to extreme meteorological conditions, natural disasters (earthquakes, flooding, etc.) or other traffic restrictions, Cernavoda NPP has agreed a protocol with the Constanta County Inspectorate for Emergency Situations, Police County Inspectorate, National Roads and Bridges Company, County Roads and Bridges Company and Territorial Structure for Special Problems of Constanta County to ensure the provision of the necessary support in an emergency (transportation of Cernavoda personnel, fuel supplies, clearing the access routes to the site etc.). |
| **RO-E-1497** | AFP | **RO** | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **NPP** | **Cernavoda NPP Unit 1** | Page 39-41 Section 3.2.3A Topic 1 and 5 - Do the on-site fire brigde require support from an off-site fire brigade and, if so, what are the criteria for contacting them and what training do they receive regarding the plant layout etc.? With what frequency are exercises and drills held? |  | The on-site unit, the Cernavoda Special Fire Department, responds to any fire alarm on the NPP site. External support would be requested by the extinguishing intervention commander only in case of large-scale events, when the response capacity of the Cernavoda Special Fire Department could be exceeded. The request is made through the Main Control Room. Firefighters on site perform fire drills according to the licensee planning (minimum 20 drills per year). Firefighters from outside the site regularly carry out joint exercises with the brigade on site to familiarize themselves with the site. |
| **RO-E-1498** | AFP | **RO** | **Active fire protection** | **Licensee and regulatory experience** | **NPP** | **Cernavoda NPP Unit 1** |  | [generic] • Please clarify whether you have any interesting operating experience feedback from testing fire detection and suppression systems. • Please clarify what key learnings have been taken into account from past fire events in other NPPs. | Based on the internal operating experience, the fire protection systems and equipment have fulfilled their design functions adequately. Preventive maintenance programs were applied that ensured good long-term functioning and timely corrective maintenance. Functional tests were performed in accordance with the legal requirements in Romania and according to the manufacturer's recommendations.  Regarding the use of external operating experience from the testing of fire detection and suppression systems, several external abnormal condition reports were analysed (a few examples are provided below):  - WER MOW 2020-0268 – Fluorescent Light Fixture Fire in the Service Building - actions are in progress to replace fluorescent light fixtures with LED; - WER TYO 2022-0561 - Wolsong-3 - Spurious Fire Alarms Due to Change of Type of Flame Detectors in Standby Diesel Generator Area – no actions are needed, but the information is useful in case design changes are initiated in the future; - Office of Enterprise Assessments (EA) - Lessons Learned from Targeted Reviews of Fire Protection Programs at Department of Energy Nuclear Facilities – although no changes to procedures or equipment are needed, the information is useful as part of continuous training and experience gathering. |
| **RO-E-1499** | AFP | **RO** | **Active fire protection** | **Licensee and regulatory experience** | **NPP** | **Cernavoda NPP Unit 1** | For a site with a relatively high regional seismicity, how are the lessons learned in the field of fire safety from past international events (such as the Kashiwazaki-Kariwa earthquake) taken into account? |  | The lessons learned from the Kashiwazaki-Kariwa earthquake were reviewed based on the reports issued by the IAEA. Since that time, many improvements have been made in Cernavoda NPP based on newer standards, revised and updated safety analyses including PSA, recommendations from external review missions and actions imposed through regulatory requirements.   The latest evaluation of the seismic protection is described extensively in the Stress Test reports post-Fukushima: https://www.ensreg.eu/EU-Stress-Tests/Country-Specific-Reports/EU-Member-States/Romania and in Romanian National Report for the Convention on Nuclear Safety, 9th edition, August 2022, https://www.iaea.org/sites/default/files/22/08/romania\_nr\_9th\_cns\_.pdf  and National Report of Romania for the 2nd Extraordinary Meeting under the Convention on Nuclear Safety (May 2012) http://www.cncan.ro/assets/Informatii-Publice/06-Rapoarte/RO-National-Report-for-2nd-Extraordinary-Meeting-under-CNS-May2012-doc.pdf |
| **RO-E-1500** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic] • Please clarify what is the robustness against earthquake of the fire detection system and alarming system.  • How does the fire detection system allow to locate precisely the location of fires? Is the fire detection system addressable or not?  • Please describe the strategy and criteria for selecting rooms where to install fire detectors in rooms. In which types of rooms are no fire detectors installed?  • What is the ability of the fire detection system to function in case of loss of power? What is their emergency power supply arrangements, criteria and autonomy (how long can they work without power?)? | Important constructions from the point of view of nuclear safety have been designed with a strong earthquake resistance. Fire detection system and alarming system consists of detectors and alarm buttons that are fixed / placed on the walls / ceiling so that they are not affected by a possible earthquake.  Each detector is located in a room and the central alarm receives a signal indicating in which room there is a potential fire. All alarms are sent both to the existing alarm station at the reactor and to the one in the fire brigade, their history being noted in a register.  The strategy and selection criteria of the rooms where detectors were installed were established according to the involvement of the installations in those rooms in the nuclear safety of the reactor, in order to manage and avoid a possible emergency situation (fire with radiological implications). Also, the results of the FHA have been taken into account.   If the fire detection system is cut off from the general power supply, it will run on its own batteries. The charger and accumulator are parts of the central alarm. The central alarm requires 12V direct current, 7Ah to operate 24 hours and requires half an hour to recharge. |
| **RO-E-1501** | AFP | **RO** | **Active fire protection** | **Fire suppression (TS 3.2.2)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic] • Please clarify what is the robustness against earthquake of the fire suppression systems.  • Please provide detail of the safety class of the fire suppression systems.  • Please clarify what can be adverse effects of fire water? Has this been assessed? What could be the adverse consequences of fire water system actuation or break?  • Please clarify the emergency power supply arrangements for fire suppression.  • Please clarify the balance between fixed fire extinguishing and manual firefighting. What strategy has been applied? What are the main principles? Clarify how accessibility considerations during manual firefighting has been considered in this strategy. | Important constructions from the point of view of nuclear safety have been designed with a strong Earthquake resistance. Fire suppression systems consists of interior hydrants placed in the walls of each floor and fire extinguishers placed on all levels of the building and at the entrance to the rooms with security functions. There is no automatic extinguishing system dedicated to every room.  The installation being a research reactor, in every room/room/laboratory/office there is electrical or electronic equipment that can be damaged if water is used so it was decided not to implement an automatic water-based system.  The compartmentalization of the equipment, related to the safe operation of the reactor, on different levels in spaces and rooms with low load densities determines a small risk of fire. However, in the event of a fire at the reactor, the intervention group from the reactor will notify and assist the firefighting group with fire extinguishing means, the opening of access routes. |
| **RO-E-1502** | AFP | **RO** | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic] • How far is the external fire brigade located? What is the intervention time needed in case of a fire inside the reactor hall outside normal working hours? How much time is needed, from the moment of fire detection, until actual firefighting starts in the field (i.e. considering need for presence of RP escort, security/access formalities, personal protection equipment for entering radiological controlled zone, etc.).  • What is the minimum staffing of the nearest off-site fire brigade? Can they respond to simultaneous fires inside and outside the NPP? Are there maximum or average times for arrival to the fire location for this brigade?  •What criteria are applied for calling or not the off-site fire brigade? Is this done every time a fire is detected?  • How much time is needed between a fire alarm and presence of the onsite first intervention team at the location? Same question for the onsite second intervention team (if any) or the onsite fire brigade (if any). What are the actual times measured during recent unannounced drills and exercises? Is there any regulatory requirement for this?  • If not yet explained in the report, please clarify whether there is a fire brigade on site ? If not yet done, please clarify how it is equipped (protection clothes and equipment, vehicules, ...).  • Please clarify whether the onsite first intervention teams / onsite fire brigades have other day to day duties that could impact their availability for firefighting duties. | On the RATEN-ICN research reactor site is located the nearest fire service dedicated to emergencies that take place on this site.  However, if external help would be needed, the nearest fire station is approximately 4 kilometers from the Reactor. The intervention time required in the event of a fire inside the reactor hall outside normal working hours is a maximum of 15 minutes. The time required from the moment of fire detection until the actual start of fire extinguishing is 5 minutes.  The Mioveni fire brigade is the closest group of firefighters outside the RATEN-ICN site. This detachment can simultaneously respond to fires both inside and outside the Reactor. There are no average or maximum times set up for this brigade to arrive, but they are located at 4 km away from the reactor site. If the fire on the RATEN-ICN site would be very strong and the private service that serves the installations on the site cannot cope with the means available to extinguish the fire, then the Mioveni fire department is called. If the fire brigade from outside the site is called, the fire brigade related to the RATEN-ICN site is subordinate to the fire brigade from Mioveni. The fire brigade captain provides coordination.  The time required between a fire alarm and the presence of the first response team on the scene is 2 minutes. The preliminary steps to an intervention (fire brigade) are: • Telephone announcement to the internal emergency number/central detection alarm REACTOR-fire brigade post; • Equipping and moving the fire brigade to the site; - 2 minutes • Fire recognition and analysis; 1-2 minutes • Deployment of the pre-intervention device; 2-3 minutes  • Firefighters action to limit/liquidate the fire outbreak. 5-10 minutes Requirements on the response times are estabolished in national regulations.  There is a fire brigade on the RATEN ICN site equipped with protective equipment and the special fire fighting vehicle.  The on-site fire brigade ensures site-wide checks on the fire protection systems and assists with open fire work. Their assigned duties cannot impact on the firefighting duties. |
| **RO-E-1503** | AFP | **RO** | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **Research reactor** | **TRIGA Research Reactor in Pitesti** | Please could you elaborate on the organisation of the fire brigade |  | The on-site fire brigade is staffed with professional firefighters (private service based on a contract), working in shifts, to ensure the fire intervention. The fire brigade is equipped with a water-foam-powder-CO2 firefighting vehicle. |
| **RO-E-1504** | AFP | **RO** | **Active fire protection** | **Licensee and regulatory experience** | **Research reactor** | **TRIGA Research Reactor in Pitesti** |  | [generic] • Please clarify whether you have any interesting operating experience feedback from testing fire detection and suppression systems.  • Please clarify what key learnings have been taken into account from past fire events in other NPPs or research reactors. | There is no specific operating experience relevant for being mentioned in this context. |
| **RO-E-1505** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] • How does the fire detection system allow to locate precisely the location of fires? Is the fire detection system addressable or not?  • Please describe the strategy and criteria for selecting rooms where to install fire detectors in rooms. In which types of rooms are no fire detectors installed?  • What is the ability of the fire detection system to function in case of loss of power? What is their emergency power supply arrangements, criteria and autonomy (how long can they work without power?)? | Fire detection provisions have not been considered necessary for the dry spent fuel storage facility. Fire detectors are installed only in the administrative building in the vicinity of the dry spent fuel storage. Alarm buttons are installed in the administrative building and alarms are displayed in the Main Control Room of the Unit 1 of the NPP. |
| **RO-E-1506** | AFP | **RO** | **Active fire protection** | **Fire suppression (TS 3.2.2)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] • Please clarify what can be adverse effects of fire water? Has this been assessed? What could be the adverse consequences of fire water system actuation or break?  • Please clarify the emergency power arrangements for fire suppression.  • Please clarify the balance between fixed fire extinguishing and manual firefighting. What strategy has been applied? What are the main principles? Clarify how accessibility considerations during manual firefighting has been considered in this strategy. | No automatic fire suppression systems are installed the dry spent fuel storage facility for the storage modules. |
| **RO-E-1507** | AFP | **RO** | **Active fire protection** | **Fire suppression (TS 3.2.2)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** | (TS 3.2.1.2.) Types, main characteristics and performance expectations , Pag. 73 ---> Considering that no automatic suppression systems are in place, please clarify whether other extinguishing systems are in place (e.g. manual/portable fire extinguishers). ---> Clarify whether at least an external (yard fire hydrants) fire extinguishing system is provided |  | External fire hydrants are installed. Manual / portable fire extinguishers with dry powder are provided. |
| **RO-E-1508** | AFP | RO | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** | Clarify what documents and procedures are needed to conduct fire fighting. |  | There are pre-fire plans established for all the areas, taking into account the specific aspects of systems, structures, chemicals, access paths, hazards etc. |
| **RO-E-1509** | AFP | RO | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] • How far is the external fire brigade located? What is the intervention time needed in case of a fire inside the reactor hall outside normal working hours? How much time is needed, from the moment of fire detection, until actual firefighting starts in the field (i.e. considering need for presence of RP escort, security/access formalities, personal protection equipment for entering radiological controlled zone, etc.).  • What is the minimum staffing of the nearest off-site fire brigade? Can they respond to simultaneous fires inside and outside the NPP? Are there maximum or average times for arrival to the fire location for this brigade?  • What criteria are applied for calling or not the off-site fire brigade? Is this done every time a fire is detected?  • In case the off-site fire brigade(s) are called, what are the respective responsibilities among all actors? Who takes the lead? How is coordination ensured?  • How much time is needed between a fire alarm and presence of the onsite first intervention team at the location? Same question for the onsite second intervention team (if any) or the onsite fire brigade (if any). What are the actual times measured during recent unannounced drills and exercises? Is there any regulatory requirement for this?  • If not yet explained in the report, please clarify whether there is a fire brigade on site ? If not yet done, please clarify how it is equipped (protection clothes and equipment, vehicules, ...). | Cernavoda NPP has always had a fire brigade on site, but before 2022 it was private (not military. Starting with April 2022, a military fire department unit, the Cernavoda NPP Special Fire Department (Brigade), was operationalized at the Cernavoda NPP site, with a permanent work schedule (24/7). Their location is within the protected area of the plant, near the fire water pumping station. A sufficient number of military fire-fighters personnel are active in this department, working on shifts and having available fire trucks and CBRN trucks.  The unit on the site, the Cernavoda Special Fire Department, operates with a staff of 74 firefighters, organized in 3 shifts (15 firefighters per shift). They are equipped with 3 special fire trucks, with which they intervene only in fires on the NPP site. Firefighters from the city of Cernavoda respond to fires outside the NPP site. Intervention time is of maximum 15 minutes from the fire alarm to access the area incident and deployment of intervention devices. The time were was confirmed during fire drills.  The on-site unit, the Cernavoda Special Fire Department, responds to any fire alarm on the NPP site. External support would be requested by the extinguishing intervention commander in case of large-scale events, if the response capacity of the Cernavoda Special Fire Department would be exceeded. In the event that external support would be needed to extinguish a fire, the on-site brigade can request and receive support from the military fire brigade units from the city of Cernavoda (2 km), respectively the one from Medgidia (25 km).  For situations where the access to the site could be hindered due to extreme meteorological conditions, natural disasters (earthquakes, flooding, etc.) or other traffic restrictions, Cernavoda NPP has agreed a protocol with the Constanta County Inspectorate for Emergency Situations, Police County Inspectorate, National Roads and Bridges Company, County Roads and Bridges Company and Territorial Structure for Special Problems of Constanta County to ensure the provision of the necessary support in an emergency (transportation of Cernavoda personnel, fuel supplies, clearing the access routes to the site etc.). |
| **RO-E-1510** | AFP | **RO** | **Active fire protection** | **Licensee and regulatory experience** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** |  | [generic] • Please clarify whether you have any interesting operating experience feedback from testing fire detection and suppression systems. | The spent fuel storage has no fire detection and no automatic fire suppresion systems. |
| **RO-E-1511** | AFP | **RO** | **Active fire protection** | **Licensee and regulatory experience** | **Spent fuel storage - dry** | **Cernavoda Spent Fuel Dry Interim Storage** | Please provide additional information regarding the "Licensee and regulatory experience". |  | We do not have any particular or specific experience in this topic that is relevant for being mentioned, in addition to what has already been included in the report. |
| **RO-E-1512** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** |  | [generic] • How does the fire detection system allow to locate precisely the location of fires? Is the fire detection system addressable or not?  • Please describe the strategy and criteria for selecting rooms where to install fire detectors in rooms. In which types of rooms are no fire detectors installed?  • What is the ability of the fire detection system to function in case of loss of power? What is their emergency power supply arrangements, criteria and autonomy (how long can they work without power?)? | The fire detection system is addressable and display the zones/locations in case of detection.  The fire detection system is powered from a class 2 uninterrupted power supply, also the fire detection system has also a battery group in the main panel with an autonomy of 24 hours. |
| **RO-E-1513** | AFP | **RO** | **Active fire protection** | **Fire detection and alarm (TS 3.2.1)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** | /1/ The waste storage facility on the NPP site is described in Ch. 2.5 of the NAR (PDF p. 33). Active fire protection is covered on less than one dedicated page of the NAR (PDF p. 79+). Much information asked for in the Tec. Spec. is missing. Please provide additional information in accordance with Technical Specification. |  | Detection: The fire detection and alarm system from Cernavoda Solid Radioactive Waste Interim Storage Facility (DIDSR) represents a fire detection loop of the fire detection and warning panel that serves the Tubine Building related to U1 and ensures fire surveillance in the area. The fire detection loop in DIDSR is composed of the following detection elements: fire detectors and alarm buttons. Alarm elements: siren with strobe light warnings to provide optical audio signals. Fire and fault alarms in the area are picked up both locally (on the operating console by the panel serving the turbine building) and in the Main Control Room U1 (on the operating console related to the BOP area installed in the fire detection panel in MCR Unit 1). Also, the panel located in the non-operational contour of the Control Room forms and transmits the unified fire and fault signal for their signaling in the operational area of the Control Room by activating a Contact Input (CI) and a dedicated alarm window. The signal is relayed to the Fire Brigade, located in the Unit 0 area. The fire detection system in the DIDSR area is designed in accordance with the requirements of P118/99 (national fire protection regulation applicable to all industrial facilties), NP086-05 and NFPA /2001, and the lines and structure of the fire detection system are designed according to the zoning and organizational aspects of the building, so that the indication of a fire alarms originating from fire detection elements (detectors, buttons, etc.) to specify the exact location of the fire. The wired structure of the fire detection system consists of "flame retardant" type cables protected by galvanizing protection pipes according to the standards and norms at the time of construction. However, taking into account the requirements of the new standards in the field and good international practice, the licensee initiated an internal action for ensuring that electrical cables that are fire resistant for 90 minutes are used for the detection systems in all new projects and in all modifications/repairs carried out on existing detection and alarm systems. Power supply: The fire detection and fire alarm panels in the Turbine U1 building that serve DIDSR are powered by Class III-220V ac energy. The panel mentioned above is provided with spare buffer batteries. In case of loss of the primary power source, the batteries will provide 24Vdc in the system for a sufficient period (24 hours) to allow the restoration of the primary source, without loss of performance, even in alarm conditions.  In case of fire at DIDSR, an alarm is activated and a signal on the panel in MCR U1, then the operators identify the location from the operating console (in this case DIDSR). The DIDSR fire detection and warning system is operated by qualified operators (qualification obtained on the basis of a dedicated training courses) based on the operating manual for the system. In addition, it should be mentioned that the soft isolation of some detectors or some areas to facilitate smoke-generating works is carried out on the basis of a "Fire Protection Systems Unavailability Permit". The detectors to be isolated and the related compensatory measures are listed in the permit. The permit is approved by the RSE (responsible system engineer) / firefighters and approved by the Shift Supervisor. System maintenance and fire detection testing are defined according to the requirements of the Romanian regulations and the manufacturer's Maintenance Manual. The test and maintenance program is defined as follows: - Daily check of the fire detection system from the panel in the control room of unit 1 Note: If there are indications of a defect, a Work Request is initiated to identify the cause and fix it (corrective maintenance); - Monthly verification of the fire detection system by performing the RSE walk-down procedure; - Annual check of the system based on the defined maintenance program (check of fire detection lines, electronic cards and sources and battery capacity test); For DIDSR there are no changes to be implemented. Extingushing systems: The fire protection system provides water for all fire categories from the classical and nuclear side for Units 0, 1 and 2 (including DIDSR), through a common, ring network. The fire water system uses (filtered) water extracted from the Danube. The fire water pumping station that supplies water for Units 0, 1, 2 (including DIDSR) is located at Unit 0 and consists of nine electric pumps of different capacities and one high-capacity (reserve) diesel motor pump. Water is supplied from the external network to the external fire extinguishing systems (external hydrants, connections for powering the fire engines), but also to the fire extinguishing systems that serve the buildings belonging to the U0, U1, U2 and DIDSR units. Internal fire extinguishing systems consist of: - Automatic fire extinguishing systems; - Manual fire extinguishing systems; The solid waste storage area DIDSR is fed by a single pipe from the main fire ring and the area is protected against fire by two external hydrants. |
| **RO-E-1514** | AFP | **RO** | **Active fire protection** | **Fire suppression (TS 3.2.2)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** |  | [generic] • Please clarify what can be adverse effects of fire water? Has this been assessed? What could be the adverse consequences of fire water system actuation or break ?  • Please clarify the emergency power supply arrangements for fire suppression.  • Please clarify the balance between fixed fire extinguishing and manual firefighting. What strategy has been applied? What are the main principles? Clarify how accessibility considerations during manual firefighting has been considered in this strategy. | The Solid Radioactive Waste Interim Storage Facility (DIDSR) does not have an automated fire extinguishing system. There are no adverse effects foreseen in the fire brigade intervention for manual fire fighting.  Fire water is ensured from the the fire water pumping station) which consists of nine electric pumps of different capacities and one high-capacity (reserve) diesel motor pump. Water is supplied from the external network on the site to the external fire extinguishing systems (external hydrants, connections for powering the fire engines), but also to the fire extinguishing systems that serve the buildings belonging to the U0, U1, U2 and DIDSR units. The solid waste storage area DIDSR is fed by a single pipe from the main fire ring and the area is protected against fire by two external hydrants. For DIDSR there are no active fixed automatic extinguishing systems provided. |
| **RO-E-1515** | AFP | **RO** | **Active fire protection** | **Administrative and organisational fire protection issues (TS 3.2.3)** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** |  | [generic] • How far is the external fire brigade located? What is the intervention time needed in case of a fire inside the reactor hall outside normal working hours? How much time is needed, from the moment of fire detection, until actual firefighting starts in the field (i.e. considering need for presence of RP escort, security/access formalities, personal protection equipment for entering radiological controlled zone, etc.).  • What is the minimum staffing of the nearest off-site fire brigade? Can they respond to simultaneous fires inside and outside the NPP? Are there maximum or average times for arrival to the fire location for this brigade?  • What criteria are applied for calling or not the off-site fire brigade? Is this done every time a fire is detected?  • In case the off-site fire brigade(s) are called, what are the respective responsibilities among all actors? Who takes the lead? How is coordination ensured? • How much time is needed between a fire alarm and presence of the onsite first intervention team at the location? Same question for the onsite second intervention team (if any) or the onsite fire brigade (if any). What are the actual times measured during recent unannounced drills and exercises? Is there any regulatory requirement for this?  • If not yet explained in the report, please clarify whether there is a fire brigade on site ? If not yet done, please clarify how it is equipped (protection clothes and equipment, vehicules, ...).  • Please clarify whether the onsite first intervention teams / onsite fire brigades have other day to day duties that could impact their availability for firefighting duties. | Details on the fire brigade have been provided in the answers to the generic questions for the NPP. The same fire brigade is assigned for the whole Cernavoda NPP site. |
| **RO-E-1516** | AFP | **RO** | **Active fire protection** | **Licensee and regulatory experience** | **Waste** | **Radioactive waste storage related to Cernavoda Units 1** |  | [generic] Please clarify whether you have any interesting operating experience feedback from testing fire detection and suppression systems. | We do not have any particular or specific experience in this topic that is relevant for being mentioned, in addition to what has already been included in the report. |

**II – Answers to Qs by countries**

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| **RO-C-390** | Czech Republic | **RO** | **01-General information** |  | Is there legal framework for classifying fire equipment into nuclear safety related classes and a methodology for determining whether or not a fire system has an effect on nuclear safety? | Yes, requirements on safety classification are included in mandatory regulations and they incorporate also the WENRA safety reference levels on safety classification. |
| **RO-C-391** | Czech Republic | **RO** | **02- Fire safety analyses** |  | If not legally required, is such a safety classification of fire equipment performed by NPP as a result of analysis or for the purpose of ageing management? | Safety classification is legally required and the fire protection systems are safety classified (categories 1(d) and 2(d), corresponding to class 4 / the lowest safety class in other jurisdictions). |
| **RO-C-392** | Czech Republic | **RO** | **03.1 - Fire prevention** |  | How and at what intervals are realized inspections/revisions of fire safety equipment installed in sections/cells inaccessible during the Unit power operation? | For fire safety equipment installed in sections/cells inaccessible during the full power operation are inspected in the planned outages that are conducted every 2 years for each of the NPP units and also in case of unplanned unit shutdowns when conditions allow inspection of areas inaccessible at full power. |
| **RO-C-393** | Czech Republic | **RO** | **01-General information** |  | How is investigated the causes of fires in NPPs and which organization determines the official cause of the fire (NPP commander or FB inspectorate)? | The causes of fires are investigated by the licensee in accordance with the investigation and analysis procedures that apply for the investigation of all abnormal operational occurrences and events. In addition, independent investigations may be conducted by the national authorities, including the nuclear regulator CNCAN; however, fully independent investigations would be conducted only for significant events that have consequences. |
| **RO-C-394** | Germany | **RO** | **02- Fire safety analyses** | **23** | How does Romania maintain the subcriticality in your facility in case of a fire? | The Fire Safe Shutdown Analysis (FSSA) and the Fire PSA demonstrate that safe shutdown can be achieved and maintained for all events, including fire events and there are no problems in ensuring subcriticality. |
| **RO-C-395** | Germany | **RO** | **02- Fire safety analyses** | **29** | Does Romania has an event reporting system to generate experience feedback and lessons learned from events that occur in the Nuclear Fuel Manufacturing Plant? | Yes, there are national nuclear safety regulations on the reporting of events and on the use of operating experience feedback that apply also to the Nuclear Fuel Manufacturing Plant and these requirements are also included in the license conditions. |
| **RO-C-396** | Germany | **RO** | **04 - Overall assessment and general conclusions** | **78** | Does Romania share operatinal feedback in the international community for example in the IAEA FINAS Database? | Yes, Romania participates in the IAEA FINAS Database. |
| **RO-C-397** | Poland | **RO** | **03.2 - Active fire protection** | **39; 54** | What are the types of extinguishing agents used in Romanian nuclear installations: HFC, FM-200, Novec 1230 or other? | In the reactor building of Cernavoda NPP Unit 1 there are portable fire extinguishers with CO2. In the reactor building of Cernavoda NPP Unit 2 there are portable fire extinguishers with CO2 and fire hydrants. For the rest of the building and installations there are fire hydrants, fixed automatic extinguishing installations with water, INERGEN, extinguishers with dry powder, with CO2, with clean agents, with foam. The fire trucks are equipped with water and AFFF foam. |
| **RO-C-398** | Poland | **RO** | **03.1 - Fire prevention** | **10; 11; 12; 14; 18; 20; 34; 66** | Have steps been taken for full implementation of halogen-free cables in Romanian nuclear installations? | In the radiological area there are only cables that are halogen free. |

**III – Answers to Qs by TPR Team & EC**

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| **RO** | **01-General information** | **§1.2** | The NAR in §1.2 presents the regulatory framework. If not yet clearly mentioned in the NAR, could you indicate whether the WENRA SRLs for NPPs, and RRs (if relevant for your country), which are used as reference for this topical peer review on 'fire protection' (as per the Technical specification) are binding or not in your country? If they are not binding, what is the status of the SRLs (non-binding, guidance, advisory..)? | All the WENRA SRLs for NPPs and RRs are legally binding for NPPs, RRs and also for other nuclear installations where applicable. Most of the SRLs have been explicitly included in nuclear safety regulations on various topics and these are periodically revised and updated to take into account changes in the SRLs. In addition, new requirements have been included in April 2023 in the general regulation for licensing nuclear installations (NSN-22) that make all current WENRA SRLs and IAEA safety standards legally binding. |
| **RO** | **03.2 - Active fire protection** | **p.32, 49** | Obsolescence and the ability to obtain qualified replacement and spare parts are primary concerns in the nuclear industry. For the operating NPP Cernavoda 1, 2 and Triga Research reactor, please explain the policy and implementation experience for obtaining and retaining a supply and replacement of essential spare parts and consumables such as sensors important for all the different types of fire and smoke detection equipment in use. What steps have been taken to ensure availability of replacement sensors/consumables in the expected lifetime of the NPPs? | NPP: The availability of spare parts is required in the regulations on maintenance (NSN-16) and on ageing management (NSN-17). Spare parts for the existing systems are still available and this is a consideration taken into account also for the systems planned to be refurbished. However, the obsolescence management is currently being reassessed for long-term operation, for all systems (including fire protection systems) based on regulatory dispositions and on recommendations from external reviews (such as the IAEA pre-SALTO missions). RR: Spare parts are still available. However, a reassessment will be required based on the new requirements introduced in the revision of the nuclear regulation on fire protection which previously applied only to NPPs and whis is updated to cover all nuclear installations. |