Answers to questions and comments raised to TPR II NAR of Poland

Code / part, page of NAR	Question	Answer
PL-T-37 / 01- General Information, page 10	The report refers that in the event of a fire in the MARIA RR reactor's "internal services, all services functioning within NCBJ, except for the reactor facility itself, and the entire technical structure of the facility can be utilized" while "if necessary, forces and resources from the Fire Brigade, Police, and other services, both from the Otwock county and the Mazowieckie Voivodeship, will be dispatched" What are the specific criteria for requesting support from the Fire Brigade?	**The main criterion for calling up the State Fire Brigade in order to request their support is a situation in which the fire spreads to such an extent that the Facility Emergency Group (OGA) is unable to control the fire using its own forces and means.** **The State Fire Brigade is alarmed by the Emergency Dispatcher of the Nuclear Facility (DAOJ) at the request of the Emergency Facility Manager (KAO).**
PL-T-38 / 01- General Information, page 17	Beyond the harmonisation with the EU legislation what other international standards does the licensee apply concerning fire protection?	**Currently, only national rules integrated with EU rules apply. Other international provisions are not applied due to the lack of requirements in this area.**
PL-T-39 / 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..)?	**As regarding of the WENRA Issue S reference levels (SRLs) for research reactors related to topic: "Protection against Internal Fires" - the analysis showed compliance of 10 (out of a total of 19) of the SRLs with national regulations. Another 4 SRLs were not reflected in Polish law (Category C: SRLs considered as not be implemented), while the**

		rest 5 SLRs were considered as partially met (Category B).
PL-T-40 / 02-Fire Safety analyses, 21	Area of improvement: What is the frequency of trainings for state and voluntary fire brigades?	**There are no specific regulations obliging state fire brigade units to undergo training regarding nuclear facilities.** **Nevertheless, at least once every 2 years, joint practical exercises are held in the reactor facility combining participation of the OGA group and the state fire brigades, each time followed by theoretical training combined with a tour of the MARIA reactor facility.** **Moreover, depending on the needs of the State Fire Service, every few years the NCBJ Training Department conducts a radiological protection course according to a separately developed training program. The last such course took place in June 2021.**
PL-T-41 / 02-Fire Safety analyses, 24	What qualifications should the employees and external companies possess to carry out non-standard fire-hazardous work? How are these qualifications determined?	**Employees of external companies, in accordance with applicable regulations, must have current periodic Occupational Health and Safety (OHS – in polish: BHP) training, which also covers fire protection. Moreover, in justified cases, at the request of the MARIA reactor management, the Fire Prevention Department conducts separate fire protection training for external companies. In the**

		controlled area, work by external companies is carried out under the supervision of the reactor staff.
PL-T-42 / 03.2-Active fire protection, 32	How does the operator ensure proper coordination between the plant personnel and the offsite response group in the event of combined action in the RR area?	**After the arrival of the State Fire Service brigades, the Emergency Manager of the nuclear facility (KAOJ) provides the fire brigade commander with a report on the situation and actions taken. Thereafter they remain in constant and direct contact.** **The commander of the State Fire Service, in consultation with the KAO in charge of the emergency operation at the R2 reactor facility, orders extending fire extinguishing lines to the interior of the R2 reactor facility. Depending on the location of the fire and therefore the routes of fire extinguishing lines, KAO orders opening appropriate doors, gates or windows in the buildings.** **During fire extinguishing operations and when removing its effects in the R2 reactor facility, employees of the Internal Security Service provide special protection of the strict protection zone.**
PL-T-43 / 03.2-Active fire	Does the operator use any particular system for the accreditation of internal staff concerning fire fighting/extinguishing tasks?	**Members of the Facility Emergency Group are notified by the Facility Emergency Manager (KAOJ) and they participate in the fire-fighting operation. Other employees are obliged to leave the building and gather in the**

protection, 32		**hall in front of the guardhouse ((MARIA Alarm Station - MAS) and follow further instructions of KAO. Each employee has an ID with assigned permissions to move around the reactor facility.**
PL-T-44 / 03.3-Passive fire protection, 36	During the refurbishment of the RR, were any improvements made to the by-design features of the building concerning the minimisation of radioactive releases due to fire events?	**Installation penetrations existing in the fire separation walls were sealed and some power cables were replaced with non-flammable ones. All renovations and modernizations in the reactor are carried out in accordance with applicable industry requirements.**
PL-C-373 / 01-General Infortion, 12	If needed water for firefighting could be gained from the Świder River. Could Poland please elaborate if using this river is possible at each time of the year - especially under dry and hot weather conditions in summer and are there special precautions for maintenance of accessibility?	**Water collection from the Świder River is possible all year round. There are no special safeguards on the riverbank, but the Fire Brigade units are able to create a water drawing point on the Świder River at any chosen location using available equipment.**
PL-C-374 / 02-Fire Safety analyses, 18	It is stated that the fire safety analyses were conducted using probabilistic methods. Could Poland please give more information on the analysis methods. What kind of probabilistic methods were used, was the full scope PSA performed? What were the major findings?	**Fire safety analyses for the MARIA reactor mainly use probabilistic analysis calculated with help of the SAPHIRE program according to the event tree and fault tree methodology used in probabilistic safety analysis (PSA). SAPHIRE is an integrated suite of IT tools developed by the US Nuclear Regulatory Commission. This program is widely used both by organizations operating nuclear reactors and by regulatory institutions.**

		For the identified postulated initiating events (PZI), event trees were created in the SAPHIRE program, mapping the course of emergency sequences. The nodes of the event tree play the roles of safety functions of the MARIA reactor activated in response to preceding events (to the analysed PZI respectively). **Direct and indirect effects were analysed on the basis of deterministic analysis of possible SEKW damages (SSC - safety-related systems, structures, and components) resulting from a given PZI. As part of the analyses for the MARIA reactor, no complex PSA analysis was carried out, but only the probability of PZI were determined as well as the probability that both internal and external events (including fires) may affect and obstruct the implementation of the safety functions.** **Results of the analyses:** **According to the analyses included in the ERBM (Operational Safety Report of the MARIA Research Reactor) and the Safety Classification, the postulated initiating events causing fires do not significantly affect nuclear safety and radiological protection. This is due to application of the defence in**

		depth principle together with redundancy and separation of security systems.
PL-C-375/ 02-Fire Safety analyses, 18	Poland refer MARIA reactor as a low risk facility. However, according to the technical specification for "research reactors, two categories are considered: - RRs with a higher risk profile: RRs with a thermal power ≥ 1 MWth as well as RRs with a thermal power < 1 MWth and with an important additional risk, - RRs with a lower risk profile: RRs with a thermal power < 1 MWth, which do not have any significant additional risk". Please verify the statement on the risk profile of MARIA (thermal power of 30 MW).	**In the light of the above-mentioned categorization, the MARIA Research Reactor should be treated as a research reactor with a higher risk profile.**
PL-C-376 / 02-Fire Safety analyses, 19	It is said that the direct and indirect consequence calculations to determine the specific impacts of a fire are not performed as part of the analyses for the MARIA reactor. Could Poland please explain, what was the subject of the fire analysis and what were the major findings?	**Direct and indirect effects were analysed on the basis of deterministic analysis of possible SEKW damages (SSC - safety-related systems, structures, and components) resulting from a given PZI. As part of the analyses for the MARIA reactor, no complex PSA analysis was carried out, but only the probability of PZI were determined as well as the probability that both internal and external events (including fires) may affect and obstruct the implementation of the safety functions.** **Results of the analyses:**

		According to the analyses included in the ERBM (Operational Safety Report of the MARIA Research Reactor) and the Safety Classification, the postulated initiating events causing fires do not significantly affect nuclear safety and radiological protection. This is due to application of the defence in depth principle together with redundancy and separation of security systems.
PL-C-377 / 02-Fire Safety analyses, 20	In the result of the fire hazard analysis that was performed as part of PSR, some upgrades and corrective actions were identified. What are the identified findings and what can be said about the status of their implementation? Could Poland please explain that.	**Two following observations were identified:** **1. Lack of detailed analysis of internal fires in ERBM.** **- proposed action: The ERBM should be supplemented with information obtained from the analysis.** **– scheduled date: Q3 2024.** **2. Lack of analysis of the impact of an external fire (increased temperature and smoke) on the functioning of the facility.** **- proposed action: An analysis of the impact of an external fire on the functioning of the facility should be performed. If new information important for nuclear safety and radiological protection (BJiOR) are obtained, the ERBM should be supplemented with the results of the analysis.** **– scheduled date: Q3 2024.**

PL-C-378 / 02-Fire Safety analyses, 21	- 2.6.1 How do you want to deal with the problem of more frequent training and cooperation between own emergency units and fire brigade (state and voluntary)?	**Currently, the Fire Department does not report the need to increase the number of training and joint exercises involving neither state (PSP) nor volunteer (OSP) fire brigades beyond those specified in the Agreement signed between NCBJ and KP PSP (District Command of the PSP in Otwock). NCBJ is willing to adapt to any suggestions of the Fire Service in the above-mentioned topic.**
PL-C-379 / 02-Fire Safety analyses, 21	- 2.6.1 Could Poland explain whether the fire brigade is called automatically or by the own emergency service? If not automatically who decides to call and when and why?	**The external Fire Brigade is called by the Emergency Service of the Nuclear Facility – namely Emergency Dispatcher (DAOJ) at the request of the Emergency Facility Manager (KAO), who decides on the call in a situation when Facility Emergency Group (OGA) is unable to conduct effective rescue and fire-fighting operations using its own forces and resources.**
PL-C-380 / 03.1-Fire prevention, 23	- 3.1.1 In the NAR, labelled areas are described to store flammable and hazardous materials. Could Poland explain whether these areas monitored separately or in a special way with special or additional detectors?	**These areas are monitored within the system using just standard sensors.**
PL-C-381 / 03.1- Fire prevention, 24	- 3.1.2 Could Poland explain are there further requirements for hot work permission like presence of fire extinguisher, after work visits to take care of smoldering fires, etc.?	**Yes, these requirements are specified in the NCBJ Fire Safety Instruction.**

PL-C-382 / 03.1-Fire Fire prevention, 26	- 3.1.4.2 Could Poland explain are these inspections unannounced for the licencee and how often are these inspections done?	**Fire protection inspections take place every two years. As a rule, these inspections are announced, although the law allows for such an inspection to be carried out without prior notice.** **Typically, PAA tries to conduct a fire inspection together with the Fire Department. Last such combined inspection took place 3 years ago. However, recently the Fire Brigade did not provide PAA with information about the date of its inspection, therefore last year PAA carried out an independent inspection.**
PL-C-383 / 03.1-Fire Fire prevention, 26	One of the identifies weaknesses was "mess and disorder resulting from leaving residues from some work, including flammable materials, in inappropriate places (fire escapes, rooms subject to fire load restrictions)" that the inspectors claimed about. What actions are foreseen (or already implemented) to improve the work organisation and the safety culture attitude of the reactor personnel?	**The mentioned disorder resulted from the modernization works carried out in the reactor. Appropriate actions were implemented to tidy up all places. Persons responsible for supervising work in the reactor were trained with particular attention to fire safety, while the person responsible for maintaining order inside the facility (the building administrator) was replaced.**
PL-C-384 / 03.1- Active fire protection, 27	It is stated that in accordance with the requirements of the expertise, and in agreement with the Provincial Headquarters of the State Fire Service in Warsaw, the fire alarm system from the reactor building does not automatically transmit notification to the Fire Service or any other external services. What is the procedure to notify the external fire brigade(s)? Will all different external fire units in Otwock and Warsaw be announced at the	**The external Fire Brigade is called by the Emergency Service of the Nuclear Facility – namely Emergency Dispatcher (DAOJ) at the request of the Emergency Facility Manager (KAO), who decides on the call in a situation when Facility Emergency Group (OGA) is unable to conduct effective rescue and fire-**

	same time in case of a fire incident? Could you consider an automatic notification in order to reduce the reaction time?	**fighting operations using its own forces and resources.** **Firstly, the State Fire Service in Otwock is notified, which always in such a case informs the Provincial Rescue Coordination Station in Warsaw (WSKR) about the incident. Depending on needs, WSKR sends additional forces and resources from Warsaw. Automatic notification is not justified due to the presence of an OGA group on site carrying out autonomous activities. Moreover, before sending the units, the person receiving the notification must have detailed information about the incident, which is not possible with automatic notification.**
PL-C-385 / 03.1- Active fire protection, 30	Could Poland please give more information regarding the "user" who is in charge to perform the daily and monthly inspection of the fire alarm system? Who is "the user" clearly? Is this information documented?	**Daily inspections are always carried out by Emergency Dispatcher of the Nuclear Centre (DAOJ) who operates the system controller panel and who is on duty 24 hours a day. Monthly and quarterly inspections are carried out by a conservator (NCBJ employee). Quarterly inspections and system repairs are documented and appropriate reports are prepared.**
PL-C-386 / 03.1- Active fire	In case of the major repairs, the affected hydrants are marked with a "NOT FUNCTIONING" sign. Are there any further notifications, e.g. how far and in which direction the functioning	**There are no additional notifications. Hydrants are placed in visible places in corridors and staircases and marked accordingly. Regular users of the facility who**

protection, 30	hydrant may be found? Do you consider other alternative solutions, e.g. installing a bypass line?	**are authorized to operate them know well the location of internal hydrants. Moreover, their location is visible on the facility plan always included in the Fire Safety Instructions.**
PL-C-387 / 03.1- Active fire protection, 31	During the quarterly inspection, the activation of at least one detector or manual fire alarm in each fire zone should be checked. How do you ensure that all the detectors will be frequently checked during these inspections (and not always the same one is triggered)?	**Each element of the fire alarm system is assigned an identification number in the fire control panel. These elements are checked out one by one according to the list. The inspection of each of them is noted down by the conservator and the test result is recorded in the system.**
PL-C-388 / 03.1- Active fire protection, 36	- 3.2.3.3 If there are busses used for evacuation are these busses available 24/7 (always fuelled, enough drivers, maintained, etc.) or is there an alarm chain and evacuation needs more time? If yes, how long does it take?	**The Motor Transport Company owns 20 buses each one equipped with seats for 50 people and 10 smaller buses for up to 30 people. During drivers' working hours, the time needed to carry out an evacuation reaches up to 30 minutes in the worst case - i.e. this is the time necessary for drivers to return after transporting employees to their places of residence. However, please take into account that most employees use their own individual transport, and the estimated number of employees to be evacuated by buses will not exceed 300 people for the entire NCBJ centre.** **Out of working hours, there are no more than 100 people on the premises. To evacuate them, it is possible to call the drivers registered in the reserve (7 people), and the**

		time of their arrival at NCBJ is estimated at approx. 20-30 minutes.
PL-C-389 / 03.4- Licensee's experience, 40	One of the weakness identified is that only alternative solutions specified in the Fire Protection State Expertise are implemented. Could Poland explain if the implemented alternative solutions are adequate to fulfil current regulatory requirement on the fire protection? If there are some gaps identified, please elaborate on the corrective actions and the plan for its implementation.	**Yes, the Fire Protection State Expertise specifies only adequate replacement solutions, which are appropriate to meet current fire protection regulatory requirements.**
PL-E-1418 / FSA, Assumptions (TS 02.2)	- 2.3, p19 [Installation specific question] It is stated in the NAR that a PSA is performed. What is the fire contribution ? Do you consider your Fire PSA to be conservative/realistic on a scale from 1-3 with 1 conservative, 3 realistic and 2 in between? Do you consider spurious actuation due to fire? In your Fire PSA, do you use failure probabilities for SSCs being part of the fire protection features, or do you merely use general assumptions, e.g a complete burnout of the fire compartment and the failure of all SSC in that compartment, or assumptions that fire doors / fire dampers remain always functional?	**As part of the analyses for the MARIA reactor, no complex PSA analysis was carried out, but only the probability of postulated initiating events (PZI) were determined as well as the probability that both internal and external events (including fires) may affect and obstruct the implementation of the safety functions. The methodologies used for this purpose were those applied for PSA analyses. These analyses were performed using conservative assumptions. Direct and indirect effects were analysed on the basis of deterministic analysis of possible SEKW damages (SSC - safety-related systems, structures, and components) resulting from a given PZI.**
PL-E-1419 / FSA,	Fire safety analysis [Installation specific question]: 1 - It is stated that "comprehensive probabilistic fire safety analyses were not conducted due to the low risk to nuclear	**Taking into account the graded approach, full probabilistic fire safety analyses were omitted due to the low threat to nuclear safety and**

Assumptions (TS 02.2)	safety and radiological protection posed by fires in the MARIA reactor". Does in mean that a Level 1 PSA has been performed or just risk assessment for compatibility or something else? How was the "low risk for nuclear safety" from fires defined? [page 19][Section 2.2][Assumption 5/]	**radiological protection caused by fires in the MARIA reactor. Direct and indirect effects were analysed on the basis of deterministic analysis of possible SEKW damages (SSC - safety-related systems, structures, and components) resulting from a given PZI. According to the analyses included in the ERBM (Operational Safety Report of the MARIA Research Reactor) and the Safety Classification, the postulated initiating events causing fires do not significantly affect nuclear safety and radiological protection. This is due to application of the defence in depth principle together with redundancy and separation of security systems.**
PL-E-1420 / FSA, PSR and modifications (TS 02.2)	Fire safety analysis [Installation specific question]: 1 - Could you please give an overview of corrective actions in organisational aspects of fire protection identified in the PSR in 2019? [page 20]Section 2.5.1][topic 1/ 2/] 2 - The information on fire upgrades and fire safety analysis upgrades before the establishment of NCBJ have not been provided. Were any upgrades of fire protection implemented in the period from commissioning to 2011 and how were they managed in the safety analysis? [page 20][Section 2.6.1][topic 1/]	**<u>Reply to 1:</u> Two following observations were identified:** **1. Lack of detailed analysis of internal fires in ERBM.** **- proposed action: The ERBM should be supplemented with information obtained from the analysis.** **– scheduled date: Q3 2024.** **2. Lack of analysis of the impact of an external fire (increased temperature and smoke) on the functioning of the facility.** **- proposed action: An analysis of the impact of an external fire on the functioning of the**

		facility should be performed. If new information important for nuclear safety and radiological protection (BJiOR) are obtained, the ERBM should be supplemented with the results of the analysis. **– scheduled date: Q3 2024.** **<u>Reply to 2:</u> Existing documentation regarding modernizations of the fire protection and fire safety analyses performed before the establishment of NCBJ is fragmentary, but due to the national regulations in force at that time, no significant activities were carried out then. In the 1980s, there was a permanent CO2 gas fire extinguishing device at the MARIA reactor facility, which was dismantled in the early 1990s in the wake of a fatal accident at the Temellin nuclear power plant in the Czech Republic. In its place, a fire alarm system was installed, which now, after modernization, functions as a modern addressable system with point and line detectors.**
PL-E-1421 / FSA, Licensee and regulatory experience	Fire safety analysis [Installation specific question]: 1 - How often is the periodic inspection related to fire protection in the scope conducted? [page 22][Section 2.7.2] [topic 2/]	**Inspection of hand-held fire extinguishing equipment: once every six months.** **Testing the capacity and pressure of the hydrant network: once a year.**

		Inspection of the fire alarm system: once a quarter. **Inspection of emergency evacuation lighting: once a year.** **Checking the patency of escape and fire routes: on an ongoing basis.**
PL-E-1422 / FSA, Licensee and regulatory experience	Fire safety analysis [general question]: 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?	**<u>Reply to 1:</u> The purpose of fire safety is to ensure nuclear safety and radiological protection and to protect employees. Deterministic analyses, on the other hand, are analyses presenting the consequences of fires in a facility.** **<u>Reply to 2 a):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 2 b):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 2 c):</u> Complete PSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law). Instead the PSA methodologies were used to calculate**

	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.	**probability of postulated initiating events (PZI) and risk of safety function failure.** **<u>Reply to 2 d):</u> Complete PSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law). Instead the PSA methodologies were used to calculate probability of postulated initiating events (PZI) and risk of safety function failure.** **<u>Reply to 2 e):</u> No, it is not considered.** **<u>Reply to 2 f):</u> In accordance with applicable national law, automatic fire extinguishing systems are not required at the MARIA research reactor facility.** **<u>Reply to 2 g):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 2 h):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 2 i):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for**

	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.	**research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 3 a):</u> The maximum fire loads in individual fire zones are determined by national regulations. Thus, the fire load density is:** **• Building R2-A: not determined (part classified in the ZL III category)** **• Building R2-B: PM < 500MJ/m2** **• Building R2-C: PM < 500MJ/m2** **• Building R2-D: PM < 500MJ/m2** **• The zone including the generator rooms with converters and the boiler room: PM < 500MJ/m2.** **<u>Reply to 3 b):</u> The maximum permissible fire loads in individual fire zones are determined by national regulations.** **<u>Reply to 3 c):</u> The maximum permissible fire loads in individual fire zones are determined by national regulations.** **<u>Reply to 4:</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law). These threats are taken**

	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)?	**into account in the NCBJ's Fire Safety Instructions.** **<u>Reply to 5:</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 6:</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 7:</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 8 a):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 8 b):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 8 c):</u> Low requirements and improvement activities (PSR, inspections, internal and external audits) are aimed at carrying out analyses. Conclusion of such an**

	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.	**analysis may indicate on the use of given methods and tools.** **<u>Reply to 8 d):</u> A safety policy is applied in the MARIA reactor, which also covers fire safety.** **<u>Reply to 9 a):</u> Each time before new experiment is conducted, the so-called One-off (one-use) instruction is prepared. Safety analyses are part of this preparation, including fire analysis if applicable.** **<u>Reply to 9 b):</u> Each time before new experiment is conducted, the so-called One-off (one-use) instruction is prepared. Safety analyses are part of this preparation, including fire analysis if applicable.** **<u>Reply to 9 c):</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law). Whereas, PSR is carried out in accordance with the currently applicable permit once every 4 years.** **<u>Reply to 9 d):</u> Law requirements and improvement activities (PSR, inspections, internal and external audits) are aimed at carrying out analyses. Conclusion of such an analysis may indicate on the implementation of given modification.**

	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.	**<u>Reply to 10:</u> Complete FSA analyses have not been carried out for the MARIA reactor (for research reactors they are not required by the Polish Atomic Law).** **<u>Reply to 11:</u> Even before the accident at the Fukushima nuclear power plant, fire analysis that went beyond the design assumptions were carried out in the MARIA reactor.** **<u>Reply to 12:</u> Both strengths and weaknesses have been identified in NAR.**
PL-E-1423 / PFP, Fire prevention/ Passive fire protection	Fire prevention/Passive Fire Protection [Installation specific question]: Please provide more information on the practise of temporary fire load management [Section 3.1].	**Polish law does not require taking into account temporary fire load management.**
PL-E-1424 / PFP, Fire prevention/ Passive fire protection	Fire prevention/Passive Fire Protection [Installation specific question]: It is mentioned buildings and reactor installations were designed according to old standards. (page 41) Which old standards were used and what is the improvement plan in the short term? [Section 3.1].	**The standards applicable in Polish law were applied. In the document "Fire Protection State Expertise" carried out for the MARIA reactor, modernizations were proposed to adapt the solutions to the applicable law.**
PL-E-1425 / PFP, Fire prevention/	Fire prevention/Passive Fire Protection [general question]: 1. Management of fire loads	**<u>Reply to 1 a):</u> There is a constant fire load in the Maria R2 reactor facility.** **The fire load density is as follows:**

Passive fire protection	a) Describe the types of permanent and transient fire loads in the facilities? b) 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)? c) How is analysed whether the change on fire loads affects fire risk? d) How is the existing knowledge of the inventory used during daily activities? e) What are the limits and practices on permanent and transient loads, which items are excluded? f) Describe the inspection programme for fire loads, roles and (independent) responsibilities and frequency. What are the lessons learned and corrective actions taken? 2. Management of ignition sources: a) What types of hot works are managed in the installations? What are the roles and responsibilities and the way they are regulated and listed? b) 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	**• Building R2-A: not determined (part classified in the ZL III category)** **• Building R2-B: PM < 500MJ/m2** **• Building R2-C: PM < 500MJ/m2** **• Building R2-D: PM < 500MJ/m2** **• The zone including the generator rooms with converters and the boiler room: PM < 500MJ/m2.** **The basic combustible materials found in the facility are as follows:** **• paper: heat of combustion = 16 MJ/kg** **• PE, PP foil and products: heat of combustion = 42MJ/kg** **• PVC and PU products: heat of combustion = 25MJ/kg** **• OOP and ON oils: heat of combustion = 44MJ/kg.** **The facility is not expected to contain fire-hazardous or flammable materials that could cause the fire load density to exceed 500 MJ/m2.** **<u>Reply to 1 b):</u> The assumed limit is taken as the maximum fire load density assigned to a given facility. The facility is not expected to**

	prevention and firefighting. Is it different during decommissioning? c) Describe in some detail the programme of (independent) inspections related to hot works including the purpose (before, during, after the work). 3. Management of the hydrogen risk (not relevant for all facilities): a) Describe all the elements of the management of hydrogen risk (such as limiting amount, separate storage, pipe routing etc.…). b) Describe events and lessons learned or external experience used to modify the management of hydrogen and the related modifications.	**contain fire-hazardous or flammable materials that could cause the fire load density to exceed 500 MJ/m2. During the walk-down in the MARIA reactor facility, explant workers pay attention to eliminate the excessive concentration of flammable materials in individual fire zones.** **<u>Reply to 1 c):</u> Changing the fire load does not affect the fire risk status because the fire load does not exceed the values described above..** **<u>Reply to 1 d):</u> The existing knowledge of the inventory used is taken into account on the usual basis. Furthermore, training on the equipment used is carried out periodically.** **<u>Reply to 1 e):</u> The limitation is the maximum fire load density assigned to a given facility. The facility is not expected to contain fire-hazardous or flammable materials that could cause the fire load density to exceed 500 MJ/m2.** **<u>Reply to 1 f):</u> Existing regulations do not oblige to conduct reviews in this area. Supervision is performed by the Facility Emergency Manager (KAOJ).** **<u>Reply to 2 a):</u> Work using open flame includes welding and cutting metal elements. They are carried out mainly in workshop conditions,**

		and in other parts of the facility during renovations. These works are carried out in accordance with the guidelines of the Fire Safety Instruction, developed on the basis of the relevant regulations of the Minister of the Interior and Administration. **<u>Reply to 2 b):</u> The worker carrying out renovation works using open fire applies for permission from the head of the Fire Prevention Department to carry out the work. He is obliged to secure the place where they are performed using fire-fighting equipment. and monitor this area for 2 hours after completion of the work.s** **<u>Reply to 2 c):</u> Before issuing a Permit, the Head of the Fire Prevention Department checks the method and quality of fire protection. The person supervising the work is obliged to carry out inspections after 15 minutes, 1 hour and 2 hours after their completion. The purpose of the control is to prevent fire from starting and spreading.** **<u>Reply to 3 a):</u> Not applicable.** **<u>Reply to 3 b):</u> Not applicable.**

PL-E-1426 / PFP, Fire prevention/ Passive fire protection	Fire prevention/Passive Fire Protection: How are the fire classes for fire barriers defined? [Section 3.3.1].	**The fire resistance of building elements constituting fire barriers is determined by the symbols REI (R-fire load-bearing capacity, E-fire tightness, I-fire insulation).** **For example, REI 60 means 60-minute fire resistance of a given element.**
PL-E-1427 / PFP, Fire prevention/ Passive fire protection	Fire prevention/Passive Fire Protection [general question]: 1. Compartmentation: a) How is the risk taken into consideration? b) How is propagation of fire prevented/delayed/mitigated? c) How are ventilation systems divided among trains/ compartments? d) 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? e) How is the management concerning fire compartmentation performed as the facility is growing? f) How are the fire loads linked to fire compartmentation and fire rating of barriers?	**Reply to 1 a): The risk is assessed based on the fire load and the type of threat occurring in a given fire zone.** **Reply to 1 b): The fire is detected at an early stage using the fire alarm system. Fire spread can be delayed or completely extinguished using hand-held fire extinguishing equipment and internal hydrants. Fire barriers, i.e. ceilings, walls and fire doors, prevent the spread to another fire zone. with appropriate fire resistance.** **Reply to 1 c): The ventilation system uses fire dampers with the same fire resistance as the building element (wall, ceiling) through which the ventilation duct passes.** **Reply to 1 d): In older facilities, alternative solutions are used (e.g. fire alarm system, additional emergency exits) determined by an expert opinion on the state of fire protection for a given facility, prepared by fire protection and construction experts, approved by the**

		Provincial Commander of the State Fire Service in Warsaw. **<u>Reply to 1 e):</u> The fire load is not increased, but if the area of a given fire zone is increased beyond that required by the regulations, then building elements with appropriate fire resistance will be used to create an additional fire zone.** **<u>Reply to 1 f):</u> In a given fire zone, the fire load cannot exceed the values specified in the expert opinion - in most zones up to 500 MJ/m2. The fire resistance of the partitions was determined based on the fire load and fire resistance class of individual buildings constituting the MARIA reactor facility.**
PL-E-1428 / PFP, Fire prevention/ Passive fire protection	Fire prevention/Passive Fire Protection [general question]: Specify the dispositions implemented for iodine filter protection in case of fire? [Section 3.3.2].	**The filter room is equipped with a fire detector. This room is equipped with handy fire extinguishing equipment.**
PL-E-1429 / PFP, Fire prevention/ Passive fire protection	Fire prevention/Passive Fire Protection [general question - Section 3.3.2]: 1. RR : ventilation management in case of fire a) Describe the ventilation management in case of a fire ? b) Explain on what criteria is the ventilation stopped and/or are the fire dampers closed? And is this manually or automatically?	**<u>Reply to 1 a):</u> The ventilation maintaining negative pressure in the MARIA reactor hall operates independently of the fire alarm system. It is turned on and off by the operator on duty at the reactor control room. Other ventilation systems equipped with fire**

	2. Maintenance/Access/Inspection of fire dampers (not relevant for all facilities) a) What are types and frequencies of testing/inspection of fire dampers? How is this applied to (nearly) inaccessible dampers? b) What insights have been gathered and improvements of the dampers or test/inspection have been made?	**dampers. are connected to the fire alarm system (SSP).** **<u>Reply to 1 b):</u> During the second stage alarm sent by the SSP, the fire dampers are closed automatically. The reactor control room operator on duty has the ability to control them independently of the SSP. The scenarios described in the procedure "Contingency plan for the MARIA reactor facility", 06-ZR include the possibility of turning off or partially turning off ventilation.** **<u>Reply to 2 a):</u> Fire damper inspections are carried out once a quarter during tests of the fire alarm system. Hard-to-reach fire flaps. they do not occur in the MARIA reactor facility.** **<u>Reply to 2 b):</u> No improvements were necessary.**
PL-E-1430 / PFP, Fire prevention/ Passive fire protection	Fire prevention/Passive Fire Protection [general question]: 1. OPEX on fire events a) How do you classify and report on fire related events? Are smouldering events reported? b) 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	**<u>Reply to 1 a):</u> Fire-related incidents are classified and reported in accordance with the Fire Safety Instruction. Fires are reported to the State Fire Service, but cases of smoldering are not reported.** **<u>Reply to 1 b):</u> Fires, which are emergency conditions, are reported, in accordance with the procedure Emergency plan for the MARIA**

	are discussed on national level? Is there an exchange with conventional industry? c) 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).	**reactor facility, No. 06-ZR, to the CEZAR Radiation Emergency Center. It is beyond the scope of NCBJ to share and/or discuss this issue at national and international levels.** **Reply to 1 c): Improving fire protection in the country is not within the scope of NCBJ.**
PL-E-1431 / AFP, Active fire protection	Active fire protection [general question] - 3.2.1: 1. Please clarify what is the robustness against earthquake of the fire detection system and alarming system. 2. How does the fire detection system allow to locate precisely the location of fires? Is the fire detection system addressable or not? 3. 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? 4. 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?)?	**Reply to 1: Due to the very low probability of an earthquake (no requirements in Polish law), the above issue was not considered.** **Reply to 2: The system is addressable. If a fire is detected, the exact location of the detector sending the signal (building number, room number) appears on the system control panel.** **Reply to 3: The rooms for installation of the fire detectors are determined by the regulations and the system designer, in consultation with the fire protection expert.** **Fire detectors are not installed in rooms where there is high radiation during normal operation of the MARIA reactor. High levels of radiation interfere with their proper functioning.** **Reply to 4: The fire detection system control panels have an independent battery power**

		supply that is able to keep the system fully operational for 72 hours.
PL-E-1432 / AFP, Active fire protection	Active fire protection [general question] - 3.2.2: 1. Please clarify what is the robustness against earthquake of the fire suppression systems. 2. Please provide detail of the safety class of the fire suppression systems. 3. 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? 4. Please clarify the emergency power supply arrangements for fire suppression. 5. 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.	**Reply to 1: There are no stationary fire extinguishing systems in the MARIA reactor facility.** **Reply to 2: There are no stationary fire extinguishing systems in the MARIA reactor facility.** **Reply to 3: . There are no stationary fire extinguishing systems in the MARIA reactor facility.** **Reply to 4: There are no stationary fire extinguishing systems in the MARIA reactor facility.** **Reply to 5: There are no stationary fire extinguishing systems in the MARIA reactor facility.**
PL-E-1433 / AFP, Active fire protection	Active fire protection [general question] - 3.2.3: 1. 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,	**Reply to 1: The unit of the State Fire Service of the State Fire Service is located 10 km away, the unit of the Volunteer Fire Department of the Volunteer Fire Department is located 2 km away. The intervention time of the State Fire Service is approximately 10 minutes. After the arrival of the Fire Brigade,**

	security/access formalities, personal protection equipment for entering radiological controlled zone, etc.). 2. 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? 3. What criteria are applied for calling or not the off-site fire brigade? Is this done every time a fire is detected? 4. 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? 5. 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, ...). 6. 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.	**the decision of the Facility Emergency Manager determines whether the Fire Brigade will take action immediately or with some delay, depending on the radiation threat.** **<u>Reply to 2:</u> The minimum staffing of a duty shift in the nearest State Fire Service unit is approximately 15 firefighters. They can respond to fires both outside and inside the facility. Maximum and average travel times do not apply to Fire Brigade units. The Fire Department intervenes immediately after being called.** **<u>Reply to 3:</u> The Fire Department is called when the OGA Facility Emergency Group is unable to conduct effective rescue and fire-fighting activities. The decision to call is made by the Facility's Emergency Manager. These criteria are met every time.** **<u>Reply to 4:</u> The OGA Group is the only internal intervention team that takes action immediately after the fire alarm is activated. The time needed to be fully ready for action - after putting on special clothes (special clothes used in the Fire Service were purchased) and respiratory protection equipment (breathing apparatus and masks) is min. 5min. During the last exercise, the**

		measured time was 7 minutes. There are no requirements in this regard. **<u>Reply to 5:</u> This is explained in the report. NCBJ does not have a Company Fire Brigade.** **<u>Reply to 6:</u> OGA group members have other daily duties, but are always on site at the MARIA reactor facility.**
PL-E-1434 / AFP, Active fire protection	Active fire protection: Sections 3.2.2.1, 3.2.2.2 - Characteristics of the fire water supply piping (water consumption, which provides the water supply), information on fire extinguishers and their types are missing. Please provide the related information. [Section 3.2].	**The water capacity of internal hydrants is min. 1 dm3/s, pressure min. 0.2 MPa, hose diameter 25 mm, range 33 m. Water is supplied from the NCBJ water supply network. 6 kg powder fire extinguishers, 5 kg CO2 fire extinguishers (snow), 50 kg powder fire extinguishers and 25 kg powder fire extinguishers were used.**
PL-E-1435 / AFP, Active fire protection	Active fire protection [general question] - 3.2.3: • 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.	**Tests of fire protection devices. constituting the equipment of the MARIA reactor facility are carried out without any disruptions because they are modern devices and so far fully operational.** **The experience of others in this area was not used. The MARIA reactor facility is constantly modernized in terms of construction (division into fire zones, installation of fire barriers), fire protection equipment is successively replaced with a new one. Except for minor incidents for which there was no need to call**

		the Fire Service, no fires have been recorded in the MARIA reactor facility since the establishment of NCBJ.
PL-S-130 / 01.2- General Information, page 16	Are the current valid WENRA Safety Reference Levels for Research Reactors included in the national regulations? And are they already applied in the safety assessment, if not, when will they be applied?	**As regarding of the WENRA Issue S reference levels (SRLs) for research reactors related to topic: "Protection against Internal Fires" - the analysis showed compliance of 10 (out of a total of 19) of the SRLs with national regulations. Another 4 SRLs were not reflected in Polish law (Category C: SRLs considered as not be implemented), while the rest 5 SLRs were considered as partially met (Category B).**
PL-S-131 / 03.1- Fire prevention, page 23	How many incidents/failures of fire detection and alarm components, fire extinguishing systems, fire barriers and ventilation systems have occurred in the considered nuclear facilities to date? --Can trends be observed over the last decades?	**In addition to replacing several damaged detectors and adjusting the door closers on fire doors, there were no other serious failures related to devices currently installed.**
PL-S-132 / 03.1- Fire prevention, page 23	Are the components of fire extinguishing systems, fire alarm systems and fire dampers in the ageing management program included? If yes, since when? What are the results, how many ageing effects have occurred in these components? Are there any trends to be observed?	**Fire protection system components are not covered by the MARIA reactor aging program.**
PL-S-133 / 03.1.3- Fire prevention, page 24	A typical cause of internal fires is a short circuit in an electrical component or due to ageing cable insulation. Have fires already occurred due to this cause? How are fires from this cause prevented?	**There were no fires in the reactor facility due to these causes. Such fires are prevented by performing the required inspections of electrical equipment and testing the insulation resistance of electrical circuits.**

		Moreover, a costly modernization has recently been carried out, consisting in replacing the basic power supply systems and cabling of the MARIA reactor.
PL-S-134 / 03.5 - Regulator's assessment, page 40-41	"The most important weaknesses of active fire protection were also identified: • lack of automatic extinguishing systems wherever there is a risk of fire that could threaten critical infrastructure for nuclear safety and radiological protection, and at the same time, the possible operation of automatic extinguishing systems would not affect the safety functions of SSCs (Structures, Systems, and Components), • the system of automatic fire detectors is unable to report the location of the fire, • lack of internal specialized fire brigade unit." When will these major weaknesses be resolved?	**In accordance with applicable national law, automatic fire extinguishing systems are not required at the MARIA reactor facility.** **The automatic fire detector system is addressable, so it is able to determine the place of fire (building number, floor number, room number, detector number).** **There are no plans to establish a Company Fire Brigade unit at NCBJ in the near future.**
PL-S-135 / 03.5 - Regulator's assessment, page 41	"The most important weakness of passive fire protection was also identified: • the construction building and reactor installations were designed using old standards and technical solutions. Some improvements are possible but they need modernization efforts." Are these modernisation efforts being made? If so, when?	**Actions recommended in the expert opinion on the state of fire protection are taken on an ongoing basis, including: construction of a modern addressable fire detection and alarm system, construction of a new emergency evacuation lighting installation, division into fire zones by, among others, replacement of door parts with fire-resistant doors. Moreover, a costly modernization has recently been carried out, consisting in replacing the basic**

		power supply systems and cabling of the MARIA reactor.