ENSREG
European Nuclear Safety Regulators Group

EU Peer Review Report
Implementation of Armenian Stress Test
National Action Plan

November 2025

Contents

1 INTRODUCTION and BACKGROUND 3

2 PROCESS OF PEER REVIEW FOR ARMENIA 3

2.1 Peer review of the updated NAcP 4
2.2 Experience in Armenia 4
2.3 Site Visit 4
2.4 Peer Review Report Structure 4

3 ASSESSMENT OF THE STRUCTURE OF THE UPDATED NATIONAL ACTION PLAN 5

4 ASSESSMENT OF THE CONTENT AND STATUS OF IMPLEMENTATION OF THE UPDATED NATIONAL ACTION PLAN 5

4.1 Natural Hazards 5
4.2 Loss of Safety Systems 7
4.3 Severe Accident Management 8

5 PEER REVIEW CONCLUSIONS 9

- APPENDIX PRT ASSESSMENT OF ARMENIAN NAcP .. 12
- ANNEX LIST OF WALKDOWN SITES 66
- LIST OF ABBREVIATIONS 67

1 INTRODUCTION and BACKGROUND

The purpose of this document is to record the results and conclusions of the peer review of the updated National Action Plan of the Armenia Nuclear Power Plant (ANPP). Such document was provided by the Armenian Nuclear Regulatory Authority (ANRA) in March 2025 (as published on the European Nuclear Safety Regulators Group, ENSREG webpage). An ENSREG peer review mission took place on 24-28 November 2025, with the objective of assessing the progress in the implementation of the recommendations of the EU (European Union) stress test.

The EU stress tests were born following the 2011 Fukushima accident. After which, Europe took the lead in carrying out comprehensive risk and safety assessments ("stress tests") of Nuclear Power Plants (NPPs). The stress tests aimed at assessing how NPPs will withstand extreme external events. The EU stress tests have been carried out in a transparent manner with identification of feasible ways for safety improvements. Their objective was to contribute to a more robust nuclear safety framework worldwide and to enhance public confidence in the safety of nuclear power. The results of the EU stress tests provided important technical insights for safety improvements that have been implemented in all 17 participating countries to achieve a higher level of nuclear safety.

At the time of the original EU stress tests in 2012 a number of non-EU countries, expressed their interest in following the same peer review process but were not ready to join and immediately submit a report. The European Commission (EC) indicated its willingness to support the peer review process in collaboration with ENSREG when a country would be ready. Armenia confirmed on 23 June 2011 its willingness to undertake on a voluntary basis this comprehensive risk and safety assessments (stress test), in accordance with the specifications agreed by the EC and ENSREG. Following, Armenia stepped into the process in 2015 with the submission of the nuclear operator's report, the review of this by the national regulator (ANRA) and the submission of the national report (NR).

It is emphasised that a stress test exercise remains a targeted exercise, which reviews the safety of certain aspects of a NPP in accordance with the stress test specifications. A stress test and the implementation of follow-up actions should not be used to justify or authorize the safe operation of a NPP nor its long-term operation (LTO). Such authorisations must be in line with the procedures prescribed in the national law and under the full responsibility of the national regulatory authorities.

2 PROCESS OF PEER REVIEW FOR ARMENIA

After the submission of the documentation in 2015, the peer review of the Armenian NR was completed in 2016. The first step was a desktop peer review of the NR that led to a questions and answers session with ANRA. The second step consisted of a visit by a team of experts to Armenia, including to the ANPP. Following which, the peer review team (PRT) issued a report with an assessment of the NR and recommendations for the enhancement of nuclear safety in the ANPP.

In 2017, ANRA submitted a National Action Plan (NAcP), translating the recommendations of their NR and of the stress test peer review report into concrete actions together with a timeline for implementation. Peer reviews of the NAcP, including a desk review, a questions and answers session and a mission to Armenia took place in 2019. In 2020, the PRT published a report assessing the implementation of the NAcP and its supplementary recommendations.

Since the previous stress test peer review in 2019, several updates on the progress of implementation of the NAcP were provided in informal meetings. In March 2025, a formal update on the implementation of the NAcP was submitted ("Updated NAcP"). Similarly to 2019, peer review of the NAcP implementation was organised in 2025, which included a desk review with a questions and answers session, and a verification mission to Armenia (including to the ANPP on 24-28 November 2025).

2.1 Peer review of the updated NAcP

Peer review of the updated Armenian NAcP commenced after receipt of the document from ANRA in March 2025. The objective of the peer review was to evaluate the progress made in the implementation of the actions identified in the NR (2015) and in the NAcP (2017), and since the last peer review mission of the NAcP (2019).

As with the national stress test report and the previous peer review of the NAcP, the review started with a desk review, and with questions prepared by a team of experts. The team of eleven experts was nominated by the ENSREG Stress Test Board Chair, while the EC provided a rapporteur to assist the team. This review led to over 100 questions, focused on the progress in the implementation of the NAcP, submitted to ANRA on 12 September 2025. ANRA subsequently provided written responses to the experts' questions on 31 October 2025, ahead of the on-site mission.

The second stage of the peer review exercise was a visit by the PRT to Armenia, with follow-up enquiries undertaken at the offices of ANRA and a verification visit at the ANPP in Metsamor, on 24-28 November 2025.

2.2 Experience in Armenia

The PRT reported a positive experience during their mission in Armenia. A reduced team, composed by eight experts accompanied by an EC rapporteur, took part in the mission to Armenia. The duration set for the mission was appropriate, allowing adequate time to engage with counterparts and conduct a site visit to resolve any technical queries. This thorough engagement empowered the team to develop an informed assessment of the updated Armenian NAcP.

Staff from ANRA and ANPP were readily available and fully supportive as the team sought to get a good understanding of the Armenian NAcP and the country's progress with implementation of the PRT recommendations. There were no issues with interpretation or translation, as the majority of the Armenian counterparts spoke English and were readily able to interact with the team and answer their questions. In the instances where language assistance was required, interpretation services were provided by the Armenian counterpart to ensure effective communication. On 24 November a preparatory meeting was held at the ANRA headquarters, with participation of ANRA as well as ANPP representatives. During the meeting, the objectives and agenda of the peer review visit were summarized, general status of the implementation of the NAcP was discussed, organization of the ANPP visit including walkdowns was agreed upon, and technical discussions of NAcP recommendations in 3 topical groups started.

2.3 Site Visit

The site visit to the ANPP in Metsamor took place on 25-26 November and was highly informative. This visit was a crucial part of the mission, providing an essential opportunity to review the necessary documentation, assess the physical condition and placement of new or upgraded equipment, and to gather addition technical details relevant to the NAcP implementation. The team members were granted access to all requested areas of interest in the plant. A comprehensive list of the visited sites is provided in the Annex. Upon request, selected technical reports drawings, procedures and other documents were made available to the team. The PRT was also able to engage directly with experts at the plant to seek clarifications as necessary.

2.4 Peer Review Report Structure

Based on the on-site visit and desk review, the PRT prepared the peer review report on 27-28 November, including discussion of its content with the Armenian counterparts. They adhered to the reporting template adopted by ENSREG for the "EU Peer Review Report Implementation of Armenian Stress Test National Action Plan November 2019", where chapters aligned to the 2012 stress tests template, and covered the following topics:

i) Assessment of the Structure of the NAcP

ii) Assessment of the Content and Status of Implementation of the NAcP

iii) Peer Review Conclusions.

The main body of the report provides sufficient level of detail regarding the results of the peer review, accompanied by a short summary of the findings for each of the three topic areas of the NAcP, which are described in the following paragraph. In the Appendix, a detailed table in line with the format of the NAcP itself is presented. The table summarizes all relevant peer review conclusions and is to be regarded an integral part of the report. This table records for each recommendation the status of implementation as observed in the previous peer review in 2019, the progress made since 2019, followed by a short evaluation of the current status as assessed by the PRT. Furthermore, the table offers additional recommendations for completing the proposed safety improvements.

3 ASSESSMENT OF THE STRUCTURE OF THE UPDATED NATIONAL ACTION PLAN

ANRA developed the NAcP on behalf of Armenia in 2017 to address the findings of the EU stress tests, incorporating also safety conclusions from the Convention on Nuclear Safety of 2012. For the updated NAcP of 2025 a format similar to the 2019 NAcP was utilized to effectively show the progress on the implementation of the stress test recommendations. The updated NAcP follows the structure recommended by ENSREG, organizing the recommendations in the following topics:

- Topic I - External hazards,
- Topic II- Loss of safety systems
- Topic III- Severe accident management and emergency preparedness.

4 ASSESSMENT OF THE CONTENT AND STATUS OF IMPLEMENTATION OF THE UPDATED NATIONAL ACTION PLAN

4.1 Natural Hazards

General

The Armenia NAcP comprises 29 actions related to topic 1 (earthquake, flooding, extreme weather and volcanic impacts). The review additionally identified two recommendations from the “EU Peer Review Report of the Armenian Stress Tests”, which are not listed in the NAcP but are addressed by other actions by the Armenian counterpart. The comprehensive results of the review and recommendations on how to achieve the aims of the 31 actions are listed in the “Annex – Table of Actions”. Out of these, the PRT identified 7 actions which have high priority (6.1.0, 6.1.1, 6.1.3, and 6.1.6 to 6.1.9).

The updated NAcP complies with the ENSREG requirements, outlining measures intended to improve nuclear safety at the ANPP and providing a transparent overview of the actions planned alongside their implementation schedule. The content of the updated NAcP is complete, addressing all major safety improvements recommended in the above-mentioned sources. Most of the information given in the updated NAcP is detailed and comprehensible, with sufficient explanations provided during the plant visit and discussion with ANRA and ANPP.

Overall, the PRT acknowledges significant progress since the 2019 NAcP review in measures to protect the installations from external hazards.

Earthquake

It is evident that the seismic robustness of ANPP has been improved in recent years. As a results, a seismic Probabilistic Safety Assessment (PSA) conducted in 2023 showed a reduction in the contribution of earthquake to the total Core Damage Frequency (CDF) compared to the results of the 2015 Seismic PSA (SPSA). This is a consequence of various measures implemented to retrofit relevant SSCs (Structures, Systems, and Components) and to recalculating seismic fragilities.

A program for evaluating the seismic safety of the ANPP on a Horizontal Peak Ground Acceleration (PGA_H) of 0.42 g has been pursued in the past years (Actions 6.1.1, 6.1.3, 6.1.6, 6.1.7, 6.1.8). In the framework of a program of seismic improvements a Safe Shutdown Equipment List (SSEL-2), which includes all components that must meet the requirement to withstand the updated seismicity level of PGA_H = 0.42 g, was compiled. This SSEL-2 contains, in addition to the previous SSEL, the Spent Fuel Pool (SFP) cooling system of Unit 1, the fire-fighting system, relevant I&C (Instrument and Control), and any other SSCs including civil structures relevant to achieve safe shut down. However, it was noted that the SSEL-2 list was based on operational experience rather than on a systematic approach, as also identified during the International Atomic Energy Agency (IAEA) SEED (Site and External Events Design Review Service)[1] mission. Seismic fragilities expressed by HCLPF (High Confidence of Low Probability of Failure) values were calculated for most of the SSCs on the list. However, fragility calculations and seismic upgrades, which may possibly result from these calculations, are still to be completed for a moderate number of SSCs (including civil structures).

The PRT, also, noted that seismic reinforcements are still necessary for some previously identified SSCs. Additionally, it is unclear whether non-safety related SSCs, which can impair the functionality of SSCs (important to safety) upon their seismically induced failure, have comprehensively been analysed. In addition to the compilation of the SSEL-2 and fragility calculations, significant efforts were undertaken to calculate Floor Response Spectra (FRS) based on numerical models of the civil structures housing the SSCs. In the context of the seismic upgrading program, the PRT was informed that upgrades are to be made to the target of PGA_H=0.5 g to provide some margin. The value was proposed by ANPP and agreed upon by ANRA. The outlined approach is highly appreciated. The PRT, however, stresses that the upgrading program shall not be restricted to SSCs on the SSEL-2 but also consider relevant SSCs that need to meet the requirement of the new seismicity level with PGA_H=0.42g. This may cause additional efforts for Seismic Safety Class 1 SSCs which are not included in the SSEL-2.

Finally, the ANPP recently completed the installation of seismic instrumentation at the plant, which is now equipped with 9 seismometers, recording ground motion on the site in the free field, different buildings and at different elevations. The PRT regards this approach as a good and recommendable practice.

Flooding

By 2025, all the PRT recommendations related to external flooding mentioned in the NR and self-identified by ANRA have been addressed (actions 6.1.13 to 6.1.20). Several hardware modifications were implemented, primarily concentrated on strengthening of barriers against propagation of flooding to civil structures housing SSCs (volumetric protection) and improving the drainage system of the DGS (Diesel Generator Station) building. ANPP has also developed additional means to monitor

[1] The SEED mission of the IAEA is a peer review service designed to assist Member States in ensuring the safety of nuclear installations through comprehensive assessments of site selection, design, and safety evaluations.

water accumulation in the DGS basement and installed a pump to drain the basement in case of emergency.

Extreme weather

Concerning extreme weather, the EU stress tests and ANRA identified nine actions (6.1.21 to 6.1.29). All except one have been completed to date. The remaining action is related to protection from lighting and is scheduled to be completed by the end 2026.

Volcanism

In respect to volcanism, all the recommendations of the PRT related to the EU stress-test were implemented. The ANPP developed response plans to respond to potential volcanic activities and maintains communication with relevant organisations to utilize early warning in case of volcanic activity.

4.2 Loss of Safety Systems

Topic 2 – Loss of Safety Systems (Station Blackout and Loss of Ultimate Heat Sink) in the NAcP includes a series of recommendations that were implemented in phases as individual actions. The prioritization of these actions was largely based on proposals from Section 6 of the ENSREG Action Plan, dated 25 July 2012.

The Armenian NAcP incorporated 12 recommendations originating from the Armenian National Stress Test Report (2015), thereby integrating all recommendations issued by ANRA into the NAcP.

During the peer review of the National Stress Test Report conducted in 2016, the ENSREG PRT endorsed these recommendations and added four recommendations aimed at enhancing safety measures of Station Blackout (SBO) and Loss of Ultimate Heat Sink (LUHS). These additional measures were fully integrated into the Armenian NAcP.

In total, the NAcP defined 20 actions to implement recommendations from:

- Country-specific documents (National Stress Test Report and Peer Review Mission Report),
- General guidance from ENSREG and the IAEA.

The correlation between specific activities and their respective recommendations is clear and traceable. However, due to frequent overlaps between country-specific and general recommendations, some activities are linked to multiple recommendations simultaneously.

Since the NAcP was developed after the Peer Review Mission in June 2016, its first version was issued in 2017, the progress achieved in implementing individual safety improvement actions from 2019 to 2025 appears well-documented and comprehensive. An example is the delivery and commissioning of the new mobile diesel generators.

However, the conceptual framework and technical provisions for managing a SBO were not fully established in the early stages of implementation. As a result, the current SBO measures show a degree of overlap across several technical solutions. While these provisions provide multiple independent options to cope with SBO conditions, they also increase the diversity of equipment and technical arrangements, which raise the effort required to ensure appropriate surveillance and maintenance.

The PRT recommends assessing the overall effectiveness of the SBO measures to confirm the validity of the implemented measures and to avoid further duplications. The plant currently lacks an overarching strategy defining a consistent sequence of actions, ensuring timely deployment of

equipment within the established SBO coping time, and facilitating updates to operating, maintenance, and emergency operating procedures.

Following a comprehensive walkdown and verification of supporting documentation, the tasks as originally defined have been confirmed as completed. Only a few tasks remain to be finalized; however, based on the evaluation of their current progress, there is reasonable assurance that the remaining tasks will be completed in 2026.

4.3 Severe Accident Management

Within the Severe Accident Management topic, there are 22 items subdivided into several areas in the NAcP and corresponding to different components of accident management. It should be noted that many items regarding severe accident management are delayed and still require significant effort for completion.

Organization and arrangements of the licensee to manage accidents, including interrelation between accident management and emergency planning

The ENSREG PRT concluded that there are reasonable human and technical resources for execution of the actions related to accident management and emergency planning. Initial and periodic refresher training programs are in place, which include emergency drills with adequate frequency, simulating conditions of potential emergencies caused by external natural hazards and radiologically harsh conditions in case of a severe accident. However, the PRT was not able to verify that during these exercises all relevant actions, such as water supply from fire engines, are regularly included.

In the area of organization and arrangements of the licensee (ANPP) to manage accidents the peer review of 2025 was focused on the following improvement actions:

- Implementation of measures to increase habitability of the rooms with post-accident monitoring system and emergency shutdown panel.
- Revision of off-site exercise programmes to broaden their scope and ensure coverage of all planned possible actions for design extension conditions.
- Deployment of an early warning system with 32 environmental radiation detectors around the ANPP and JRODOS software.
- Establishment of a new back-up emergency response centre for ANRA with back-up power and communication lines.
- Establishment of a new back-up emergency response centre for the ANPP, with back-up power and radiological filtering.
- Reviewing and updating national, regional, provincial, municipal and local emergency plans and conducting exercises to encourage greater coordination among the different organizations.

The current review concluded that the majority of the actions regarding organizational items were successfully implemented. However, it is noted that ANRA back-up Emergency Response Centre (ERC) is progressing with time delays. Significant delays are being encountered in the implementation of a new back-up ERC also of the ANPP and actions should be taken to accelerate its implementation.

Procedures and guidelines for accident management

Since 2016, significant progress in the area of Emergency Operating Procedures (EOP) and Severe Accident Management Guidelines (SAMG) has been made. However, these documents have not been approved and issued by November 2025. The symptom based EOP and SAMG packages covering all-

reactor operating modes, as well as accidents in the spent fuel pool, have been developed and validated. Their scope and format align with modern procedures developed for other VVER (Water Water Energetic Reactor) and PWR (Pressurised Water Reactor) reactors. Nevertheless, the preliminary review concluded that the description of the actions could benefit from including the specific coding of SSCs to reduce the possibility of incorrect implementation of the actions (Human Error/Factor). While significant progress was verified during the site visit, these documents are still not in use.

The PRT considers this of the highest priority issue among the items in Topic 3 and encourages the Armenian counterparts to increase their efforts in this field. While certain modifications are still in progress, this should not delay regulatory review and implementation of the new documents. Deployment of these documents, once regulatory approval has been achieved, would result in immediate increase in nuclear safety. Subsequent amendments and updates to the EOP and SAMG can be made as part of the normal updating practice.

Hardware provisions for severe accident management

The peer review report of 2016 identified several provisions with potential to be used in accident management, both for prevention and mitigation. Additionally, several new hardware improvements were proposed as essential means for the effective prevention and mitigation of severe accidents.

Implementation of some hardware provisions is done, such as the enhancement of the containment spray system, the enhancement of the Emergency Core Cooling System (ECCS), and improvement of the containment tightness. However, measures to mitigate hydrogen risk inside the containment as well as hydrogen propagation outside the containment, and measures to stabilize molten corium by external reactor vessel cooling and ensure emergency gas evacuation from the reactor vessel head are delayed.

Implementation of measures to allow for using mobile means for delivery of coolant to the Steam Generators (SGs), to the primary circuit and to the containment should continue as intended. In addition, it is advisable to consider implementation of additional dedicated means of the reactor coolant system depressurisation under severe accident conditions.

Further investigation and assessment of possible In-vessel-melt-retention strategies and related activities should be accelerated and prioritized.

Accident management for events in the spent fuel pools

At the time of the current peer review (November 2025) the team found the ability to prevent or mitigate accidents in the SFP significantly improved. This enhancement is due to installation of new injection lines and mobile equipment to supply water to the SFP under design extension conditions. Investigation is ongoing on how the water level in the SFP below the top of the spent fuel assemblies could be measured, which would provide significant information to the operators to mitigate the consequences of such scenarios.

5 PEER REVIEW CONCLUSIONS

This ENSREG peer review was conducted based on the NAcP of Armenia, issued in 2017, updated in 2019 and then further update of 2025. As already mentioned, the NAcP follows the structure suggested by ENSREG, and reflects the post-stress test ENSREG recommendations. Its format allows to evaluate in a structured way the status of implementation for each activity.

The ENSREG stress test and associated peer review process promotes self-assessment among national regulators and utilities to identify and implement enhancements in nuclear safety performance of NPPs. In accordance with agreed ENSREG principles, Armenia continues to be open and transparent in relation to all matters associated with the ENSREG peer review process, including developing and producing the requisite reports and making them publicly available when relevant.

The peer review visit to Armenia was considered as an essential step for performing a comprehensive, responsible, transparent and justified evaluation of the status of implementation of the NAcP. The PRT regards this mission and the openness of the counterparts during the mission as further confirmation of Armenia's transparency in nuclear safety matters, a commitment previously demonstrated by ANRA and ANPP through their willingness to undergo multiple international peer review missions.

The PRT based its evaluation on a significant volume of factual information, including the responses to questions prepared by experts before the mission, extensive discussions of all items of the NAcP during the mission, examination of several technical reports and procedures, and observation of the physical status of the implementation during plant walkdowns. The PRT is grateful to the staff of ANRA and ANPP for their assistance and support, which facilitated a very constructive and successful peer review of the updated NAcP.

It is clear that enhancing the design of the ANPP is a challenging task. Despite these challenges, it is recognised that Armenia has made progress in the safety enhancement of the plant since the previous mission in 2019. This progress has been achieved under conditions when, due to peculiarities of the design, the options of leveraging international experience were quite limited.

The PRT, also, observed that there is continuous communication on implementation of the NAcP between ANPP and ANRA and that the PRT is confident that the process of implementation of the safety recommendations is carefully oversighted by ANRA.

However, despite the significant progress made since the previous 2019 mission, there are still several items of the NAcP to be fully implemented. In many cases the delay in implementation is understandable due to existing technological difficulties and financial constraints. Nevertheless, the PRT encourages Armenia to make every effort to speed up the implementation, with priority corresponding to the safety significance of each individual item of the NAcP. The PRT made more specific recommendations in this regard, in their detailed comments contained in Appendix of this report. Moreover, a summary of these recommendations presented for each topic area is provided in Section 4.

The major overall conclusions of the team on the updated NAcP are the following:

1. The updated NAcP of Armenia was developed in line with the structure suggested by ENSREG and identifies all recommendations arising from the Armenian national report, the ENSREG Stress Test Peer Review Report, and other relevant documents. This document has been updated several times to reflect progress in implementing measures. ANRA properly ensured that all safety improvements identified in the NAcP were systematically ranked by safety significance and carried out within the implementation schedules appropriate to their classification. The PRT is satisfied with the structure and the update of the NAcP.
2. An integrated plan has been developed to implement the safety improvements required by the NAcP. This plan complements the plant's continuous safety upgrade program associated with the LTO of ANPP. The PRT considers the implementation plan adequate despite significant delays.

3. The follow-up review, associated with the on-site visit, confirmed that a significant amount of work has been completed. However, some measures remain ongoing at the ANPP to address actions identified during the stress test process.
4. Certain remaining open items for improvements are considered by the PRT as higher priority and should be advanced accordingly:
    a. Completing the seismic upgrade of ANPP to 0.42g. In this context, an updated SSEL-2 has been compiled that includes a more comprehensive list of SSCs as detailed in the Appendix. Relevant calculations and upgrading measures to achieve an adequate seismic robustness of SSCs should be continued.
    b. Developing a systematic approach to identify SSCs to review the completeness of the SSEL-2 list.
    c. Reviewing the conceptual framework and technical provisions established for managing a SBO event, with a focus on determining the adequacy and effectiveness of the updated procedures.
    d. Finalizing the deployment of symptom-based EOPs and SAMG, integrating newly acquired mobile equipment and provisions to minimize radioactive releases during severe accident scenarios. While modifications are still underway, subsequent revisions to these procedures can be incorporated through the established continuous updating process, facilitating the closure of several currently open tasks.
5. Overall, the team recognizes that significant efforts have been undertaken since 2019, and progress has been made to protect the installation from external hazards.

The PRT recommends that ANRA consider the recommendations above and seek to address them, as well as considering the evaluations of the PRT set out in the Appendix of this report which will support effective implementation of the NAcP. The progress in implementing the NAcP should be published on the ANRA website.

In summary the PRT highlights the effort of Armenia towards continuous improvement, the progress in the implementation of the stress tests recommendations and their transparency in the review process. However, the PRT calls for an acceleration of the remaining stress tests implementation and urges to maintain a comprehensive and systematic approach in the continuous review of nuclear safety.

- # APPENDIX PRT ASSESSMENT OF ARMENIAN NAcP

1. Earthquake

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.1.0 (PRT ch. 5.1.3. p. 23)	The PRT concluded that *"Comprehensive national regulatory requirements for seismic safety (as well as other hazards) are currently [as in 2016] not available and should be developed considering the WENRA (Western European Nuclear Regulators Association 2014) Reference Levels to strengthen the regulatory position and oversight."* ***Task:*** ***Develop comprehensive national regulatory requirements for seismic safety considering the WENRA (2014) Reference Levels***	This action has **high priority**. **Implementation 2019:** A new atomic law is currently under development in parallel with Armenia's national activities of harmonization with EU directives. ANRA announces that the new law will take the new Czech regulations as a model, which is in line with EU and WENRA requirements. The action should be completed in 2022-2023. **Implementation 2025:** ANRA informed that national legislation in this field includes: RA Government Decree № 708-N as of July 04, 2013 on approval of the Site Safety Requirements to New NPP Unit(s); RA Government Decree № 609-N as of May 12, 2005 on approval of the licensing procedure and licence form for site selection of nuclear installations; RA Government Decree № 1546-N as of December 13, 2012 on approval of Method on Seismic Hazard Assessment for New Nuclear Unit Site.

[2] The brackets indicate the sources of the respective action. Thereby means:

- NR: National Report - Stress Test for Armenian Nuclear Power Plant - July 2015,
- PRT: EU Peer Review Report of the Armenian Stress Tests" - June 2016,
- EU: ENSREG "Compilation of Recommendations and suggestions - Peer review of stress tests performed on European nuclear power plants", 26/07/2012
- CNS: Final Summary Report - 2nd Extraordinary Meeting of the Contracting Parties to the Convention of Nuclear Safety, 27-31 August 2012, Vienna, Austria
- NAcP: Number of Recommendation of the National Action Plan of Armenia (NAcP), Part I and II, 2017
- ch: chapter or number
- p: page

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		In addition, a draft of the updated Site Safety Requirements to New NPP Unit(s) was under revision in 2025. **Evaluation:** The PRT appreciates that the regulatory framework for the site selection and site safety of new NPPs is in place. In addition, ANRA informed on the ongoing activities to integrate the requirements of selected WENRA Safety Reference Level for existing reactors, including on the issue of external hazard, in the national regulatory framework. The respective reports can be found in relation to project: INSC/2024/436-156. The PRT acknowledges progress on the issues. **The PRT considers this action is not completed**, in line with ANRA assessment.
6.1.1. (NR p 150, NAcP 2.1.1)	Application of a combination of deterministic and probabilistic safety assessment to continue further seismic enhancement and identification of systems and components that may require further seismic improvement.	This action has **high priority**. **Implementation 2019:** ANRA, supported by NRSC (Nuclear and Radiation Safety Centre) and representatives of ANPP, declared that presently the ANPP copes in most SSCs important to seismic safety (the entire SSEL) with a PGA_H of 0.35g, except fire-fighting system, and SSCs which, upon their seismically induced failure, can impair the functionality of SSCs important to safety. Based on the PSHA (Probabilistic Seismic Hazard Analysis) carried out 2009 - 2011, the hazard level PGA_H = 0.42g will be considered as a new review-level earthquake (RLE[3]) in review of the future seismic PSA. ANPP developed a program to upgrade the seismic robustness to PGA_H = 0.42 g and submitted this program to ANRA. ANRA decided to let this program be reviewed by IAEA and received a statement by IAEA in 2019. An extended a SSEL is under preparation by ANPP. This extended SSEL shall contain, besides the old SSEL, among others, SFP cooling of Unit 1, the fire-fighting system, I&C, and SSCs which, upon their seismically induced failure, can impair the functionality of SSCs important to safety. The list shall also include storages for mobile equipment required for crisis management. The extended SSEL shall be completed and submitted to ANRA in 2020.

[3] The PRT notes that the term RLE is not used in the WENRA Safety Reference Levels which are expected to set the framework of the future upgrading (WENRA, 2014, Issues E and T; WENRA, 2016).

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		A PSA on the basis of PGA_H = 0.42 g and the updated SSEL will be completed by 2022. PSA results will be used to validate the selection of the SSCs being part of the extended SSEL. The hardware upgrade of the new extended SSEL to PGA_H = 0.42 g is planned to start in 2021. ANRA expects completion of the backfitting in 2024 provided that the updating program is approved early in 2020. **Implementation 2025:** ANPP continued to follow up the task to identify SSCs that may require further seismic improvement by a combination of deterministic and probabilistic safety assessment by (1) an updated Seismic PSA, (2) the compilation of a comprehensive SSEL and (3) a comprehensive seismic walkdown which addressed SSCs listed in the updated SSEL 2. For this task ANPP proposed to ensure that all SSCs on the SSEL should be resistant against PGA_H=0.5g (to cover 0.42 g with a margin). The 0.5 g value was agreed by ANRA. The seismic PSA (SPSA) 2015 revealed a contribution of seismic hazard to the CDF of 1.39×10^{-5}/year. According to the new PSA 2023, based on 0.42 g, the contribution of seismic hazards could be reduced to 9.107×10^{-6} /year. It was explained that both PSAs use the same site seismic hazard curves for the NPP site, derived in PSHA 2011. The SPHAs differ by the ground motion values used to derive fragility curves (PGA=0.35g and 0.42g, respectively). According to ANRA, the decrease of the contribution of seismic hazards is due to retrofitting DGS buildings (HCLPF increased from 0.44g to 0.7g), replacement of all four containment spray pumps in the boron compartment (HCLPF increased from 0.38g to 0.94g), implementation of new AKH-1,2 (HCLPF=1g), and seismic enhancement of fire-fighting system (minimum HCLPF for the elements of 0,5g). It was explained that, in addition, the re-calculation of fragilities of some SSCs which were performed in the framework of LTO during 2016-2018, revealed higher HCLPFs than those used in the 2015 Seismic PSA. ANPP developed the SSEL-2. The list underwent a review by IAEA[4] in 2024. IAEA concluded that the list was based on operational experience rather than on a systematic approach which would include the development of a scenario tree, SSCs safety functions and classification, and EOPs defining demand of equipment. The random samples seen by

[4] IAEA 2024: Mission Report External Events Safety Section Site and external events design (SEED) review mission on Armenian Nuclear Power Plant (Unit 2) Seismic Safety Assessment Program Milestone 1 – Elements. Metsamor, Armenia 10-18 July 2024

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		the PRT during the extended plant visit identified no SSCs missing from the list. However, the PRT took note that differences exist between Seismic Safety Class 1 and the SSEL-2, as the SSEL-2 includes both SSCs assigned to Seismic Safety Class 1 and 2. This finding aligns with IAEA stating discrepancies in SSC seismic categorization. During its walkdown, the PRT also observed that the impact of SSCs, whose seismic induced failure may impact (by spatial interaction, flooding, fire etc.) nearby seismically qualified items, could not always be justified during the mission. The PRT suggests analysing this issue further. A comprehensive seismic walkdown by CKTI Vibroseism in 2025 considered all equipment on the SSEL-2[5]. HCLPF values for all SSCs on SSEL are listed in an appendix. The walkdown was conducted and the HCLPF values calculated after retrofitting measures. HCLFP values were established during the walkdown based on available documentations. By leafing through the draft report, the PRT could confirm that minimum HCLPF values of 0.5g are indicated for all SSCs except for SSCs for which no justifying documentation existed. For these SSCs detailed calculations are necessary to confirm their robustness. In 2025, the ANPP developed a term of reference and announced a tender for these calculations. The deadline for completion was set to July 2026. The PRT took note that the SSEL-2 includes most SSCs assigned to Seismic Safety Class 1 and 2. In both cases, however, requirement was to fulfil the requirement of HCLPF≥0.42g. It was also explained that differences exist between Seismic Safety Class 1 and the SSEL-2. The PRT concluded that not all SSCs important to safety (i.e., those categorized Safety Class 1) may have been analysed. A second concern of the PRT was that it remained unclear if SSCs which, upon their seismically induced failure, can impair the functionality of SSCs important to safety, have been systematically identified. **Evaluation:** Earthquake can have a major impact on safety and the risks associated with the plant, as, for example, expressed by the CDF contribution. Seismic safety is principally determined by the weakest component within a safety train. It is therefore highly important that **all** SSCs of the SSEL are completely updated to cope at least with a PGA_H = 0.42, which

[5] CKTI-Vibroseism 2025: Report 01-1.03-34, Summary Report detailed seismic walkdown of ANPP Unit 2.

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		result from the latest PSHA. According to ANRA's regulatory decision PGA_H = 0.42 g now is the basis for the reassessment and backfitting. The PRT concludes that large progress has been made to identify SSCs important to safety which may require further seismic improvement to meet the requirement of withstanding PGA_H =0.42g. The process so far was restricted to SSCs on the SSEL 2 list which were investigated in a dedicated seismic walkdown. For a modest number of SSCs the decision is still open and expected for July 2026. In the remote consultation with ANRA in April 2024 ANRA explained that, after consultation with IAEA, the level of 0.2 g was kept as the design basis. The new hazard level of 0.42g for the 10^{-4}/year occurrence frequency, is used for retrofitting SSCs necessary for ensuring safe shutdown (SSEL). The decision about a possible necessary seismic upgrade of modest number of SSCs of the SSEL 2 is still open and evaluations of SSCs important to safety which are not part of the SSEL 2 are still pending. **The PRT considers this action not completed**. ANRA envisaged that the action will be completed by July 2026.
6.1.2. (NR p. 150, NAcP 2.1.2)	Installation of additional fuel tank with capacity of 50–100 tons or upgrading existing tank to meet relevant seismic requirements to provide an emergency power supply for a period of 72 hours. **Task:** ***To ensure emergency power supply for a period of 72 hours.***	**Implementation 2019:** The upgrade of the existing tanks has been implemented on basis of RLE (PGA = 0.35g). Improvement of the seismic robustness on basis of a PGA_H =0.42g is open. Completion of the upgrade is part of the general upgrading program to increase seismic resistance of ANPP to 0.42 g (see Action 6.1.1.). **Implementation 2025:** The PRT took note that fuel tanks, piping, pumps delivering the fuel to the Emergency Diesel Generator (EDG) building, and the housing of these pumps are part of the SSEL 2 and that measures are on the way to calculate the seismic resistance of these SSCs. The calculations will form the basis for the decision as to whether the components need to be upgraded. ANPP already identified the need to strengthen the supports of the pipeline between the two external fuel tanks and the fuel pumps. This is planned in 2026. In the meantime, ANPP would plan to transfer fuel from the two large external tanks to the EDG building using fuel trucks. **Evaluation:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		The PRT teams considers this action of upgrading the existing fuel tanks to meet the requirement of withstanding PGA_H =0.42g **not completed**, in line with ANRA assessment.
6.1.3 (NR p. 150 PRT ch. 5.1.3, EU 3.1.2, NAcP 2.1.3, 2.3.1, 2.2.5)	Seismic margin evaluation of the fire extinguishing system and implementation of measures to reinforce the system. ***Task:*** ***To ensure seismic resistance of the fire extinguishing systems***.	This action has **high priority.** **Implementation 2019:** Implementation of the measures to upgrade the fire-fighting system to a resistance for PGA_H = 0.42 g is in progress. Calculations for the necessary upgrading have been completed. ANPP declares that the hardware upgrade shall be completed in 2021. **Implementation 2025:** The fire extinguishing system has a high safety relevance. The fire-fighting system was previously not qualified for seismic loads. Backfitting of the hardware was planned to PGA_H = 0.42 g. During the plant visit the PRT was able to see the fire water pumping station, the retrofitting of the building housing the equipment and a number of random samples of the fire detectors, fire extinguishers and the related piping in various parts of ANPP. During the walkdown the PRT observed that numerous improvements of the seismic robustness were implemented. This was not fully the case with respect to piping of the fire extinguishing system, e.g., in the turbine hall. The PRT suggests evaluating if parts of the piping require smaller distances between support structures and suitable support constructions increasing the stiffness of pipes and therefore limiting the lateral movement of pipes. In addition, a systematic evaluation of non-safety related structures, systems and components, whose seismic-induced failure may impact SSCs of the fire-fighting system, is recommended (see 6.1.1). A full assessment of the robustness of the observed equipment is, however, beyond the scope of the PRT visit. **Evaluation:** **The PRT agrees with ANRA's assessment that the action is completed**, provided that additional analyses as suggested above will be resolved in the frame of action 6.1.1.
6.1.4.	Analysis of impact of explosion of the nitrogen recipients and the hydrogen storage tanks	**Implementation 2019:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
(NR p. 150, NAcP 2.1.4)	***Task:*** ***To determine the consequences in case of explosion of nitrogen recipients and hydrogen tanks.***	To perform a detailed analysis, it was originally planned to announce a tender in June 2019. The announcement is now postponed to 2020. The new timeline is to include the financing of the measure in the financing plan for 2020. The completion date of upgrading measures which might become necessary according to the analysis is open. **Implementation 2025:** ANRA explained that the strength of DGS walls during explosion of storage tanks are proven. According to the analysis the shock wave of a hydrogen explosion in storage tanks do not affect the performance of the BZOV-1,2 (Demineralized water tanks). An explosion of compressed air, low- and high-pressure nitrogen would also have no impact on BZOV-1,2. **Evaluation:** **The PRT agrees with ANRA's assessment that the action is completed**.
6.1.5. (NR p. 150, NAcP 2.1.5)	Investigation of possible consequences in case of seismic induced flooding in Turbine Hall (TH), impact of safety-related systems in TH and their interaction with adjacent compartments. ***Task:*** ***To determine the possibility of damage to the safety system in the turbine hall.***	**Implementation 2019:** Deepening of the overflow channel has been implemented. The investigation of possible consequences in case of seismic induced flooding in TH is completed and submitted to ANPP. It is under review. The recommendations of the report will be implemented in 2020. **Implementation 2025:** Seismic induced flooding of the TH endangers adjacent safety-relevant compartments and therefore considerably increases the nuclear risk emanating from earthquakes. Flooding therefore must be prevented by appropriate precautionary measures. ANPP will replace the doors and carry out analysis of the operability of cables located at a level from -3.6 to -3.03 in cable tunnels no. 60 and 61 by the end of 2026. **Evaluation:** **The PRT considers this action not completed**, in line with ANRA assessment.
6.1.6.	Completion of the program for seismic upgrading of I&C	This action has **high priority**.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
(NR p.150, EU 3.1.5 NAcP 2.1.6, 2.3.2)	equipment and seismic monitoring system. **Task*:*** ***Modernization of seismic monitoring systems.***	**Implementation seismic monitoring 2019:** In the frame of the seismic monitoring network the surrounding of ANPP is monitored by six stations in 50 km radius. Data is provided to ANRA and ANPP. ANPP is further equipped with a seismic recording system which includes two independent channels, each consisting of 3 stations. The system automatically generates SCRAM in case ground acceleration exceeds 50 cm/s² (0.05 g). The seismic monitoring system of ANPP is currently out of operation and renewal of the system is planned for 2021. The terms of references are available to ANRA. **Implementation upgrading I&C 2019:** ANRA supported by ANPP declares that currently all parts of I&C are qualified for seismic loads of 0.35 g, while upgrading the seismic resistance of ANPP to PGAH = 0.42g I&C components are to be upgraded as well. A list of I&C systems will be prepared in parallel to the development of the extended SSEL list (see Action 6.1.1.). This action and upgrading of the I&C hardware will be completed in accordance with Action 6.1.1. **Implementation seismic monitoring 2025:** ANPP requires sufficient and reliable ground motion data. Such data are important for monitoring local ground acceleration and for developing advanced programs for seismic protection. ANPP installed 9 monitoring stations on site which started recordings from June 2024. Stations are located in the free field, at the foundation of reactor, in the boron compartment, and at the 10 m, 14.7 m, 21,1 m level of the reactor building. An additional station is located in the city of Metsamor. Stations record PGA, ground velocity and CAV. This network is designed to validate ground motion prediction equations, site effects, and floor response spectra. The first data from 5 earthquakes revealed ground accelerations at the site (free field) which are significantly lower than those predicted by the ground motion prediction equations used in the PSHA 2010. Since installation, 3 earthquakes with M=4-5 in distances less than 50 km were recorded (M4,9 within 36 km distance). The PRT regards the implemented on-site seismic monitoring system as a best practice. **Implementation upgrading I&C 2025:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		The seismic robustness of I&C equipment is important for the safe function of the entire plant in case of a seismic event. An appropriate seismic upgrading to cope with a PGA=0.42g is therefore necessary. ANRA supported by ANPP declared that all parts of I&C are part of the SSEL 2 and therefore qualified for seismic loads of 0.5g (see action 6.1.1). The plant visit confirmed that the I&C of main control room and emergency control room as well as all electrical cabinets seen by the PRT were exceptionally well anchored, confirming the assessment by IAEA[4]. **Evaluation seismic monitoring:** **The PRT agrees with ANRA's assessment that the action is completed.** **Evaluation upgrading I&C:** **The PRT agrees with ANRA's assessment that the action is completed.** The PRT, however, recommends additional efforts to verify that cable trays in their current state do not compromise the safety of the laid cables.
6.1.7. (PRT ch. 5.1.2.4, NAcP 2.2.1)	Safety demonstration of adopted hazard value of 0.42 g derived from the PSHA 2011 as an updated DBE (Design Basis Earthquake[6]) for the existing ANPP shall be updated accordingly.	This action has **high priority**. **Implementation 2019:** The seismic robustness of the plant has been continuously improved in recent years. In particular most of the SSCs of the SSELs now cope with PGA_H of at least 0.35 g (see Action 6.1.1). However, the PSHA 2011 showed that the safety-critical SSCs of the plant should be designed against PGA_H of 0.42 g. According to ANRA's regulatory decision PGA_H = 0.42 g now is the basis for the reassessment and backfitting of SSCs important to safety. ANRA informed that an upgrading program has been prepared by ANPP and submitted to ANRA that an extended SSEL is currently under development. It is expected to be submitted to ANRA for approvement in 2020. This extended SSEL will contain, besides the currently valid SSEL, among others, SFP cooling of Unit 1, the fire-fighting system, I&C, and SSCs which, upon their seismically induced failure, can impair the functionality of SSCs important to safety. ANRA expects completion of the backfitting in 2024 provided that the updating program is approved early in 2020.

[6] Note that the PRT agreed that this term should be better reflect by RLE for existing plants.

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		Implementation 2025: ANPP developed a Safe Shutdown Equipment List (SSEL-2). See 6.1.1 for details. A safety demonstration of meeting the requirement to withstand seismic loads up to 0.5g[7] is scheduled for all SSCs which are part of the SSEL-2 list. The PRT took note that FRS were calculated for different elevations and several nodes in each level of buildings[8]. Calculations are based on modelling the building response to an updated PGA_H of 0.42. The calculated FRS indicated ground motion spectra that exceed the free field acceleration significantly. The draft report is on the seismic walkdown by CKTI-Vibroseism in 2025[5] contains HCLPF values for most of the SSCs on SSEL in an appendix (see 6.1.1). **Evaluation:** By leafing through the report by CKTI-Vibroseism the PRT could confirm that minimum HCLPF values of 0.5g are indicated for all SSCs except for SSCs for which no justifying documentation existed. However, it appeared remarkable that a large number of SSCs met the requirement exactly to the point of 0.5g. The PRT was further unable to clarify if the indicated HCLPFs envelope the demand for seismic stability derived from the FRS. As explained in 6.1.1 and 6.1.3, seismic resistance to withstand the 0.42g requirements has so far not been demonstrated for all SSCs listed in the SSEL 2 and all SSCs categorized as Seismic Safety Class 1. **The PRT considers this action not completed**, in line with ANRA assessment.
6.1.8. (PRT ch. 5.1.3, NAcP 2.2.2)	Verification of seismic protection of the RDGS (Redundant Diesel Generator Station) building and computational analyses taking	This action has **high priority**. **Implementation 2019:** The RDGS building is housing the safety relevant emergency diesel generators. The action shall ensure that the building is capable to withstand seismic events with PGA_H = 0.42 g.

[7] This is in line with the RLE of PGA=0.42g plus a margin decided by ANPP and confirmed by ANRA.

[8] Risk Engineering 2019: Floor response spectra of unit 2 of the Armenian NPP for earthquake with PGA 0.42 g Final Report Generation of floor response spectra for the structures of the ANPP Volume 1 Reference Number REL-1246-FR-EN-001-0.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
	into account for the current status. ***<u>Task:</u>*** ***Determination of seismic resistance of RDGS.***	Necessary calculations are scheduled to be completed in 2019, upgrading of the building would be completed in 2020, if necessary. **Implementation 2025:** The RDGS building is housing the safety relevant emergency diesels. The earthquake-proof design of this building has high safety relevance due to the importance of the emergency diesel in the event of an earthquake. The building must meet high seismic requirements. Basis of the verification should therefore be PGA_H = 0.42 g. During the plant visit it was confirmed that the EDG building is part of SSEL 2. The building was strengthened by X-bracings in all walls (up to the roof) and horizontally in the roof level. **Evaluation:** In agreement with ANRA, **the PRT considers this action** (retrofitting of the building structure) **completed**. However, the PRT noted possibilities for further improvements. The PRT suggests: to ensure that the crane above the EDGs does not pose a danger by falling from the crane track and damaging the EDGs; to the ANPP to improve the state of cable trays and the doors of some electric cabinets which could contact electric components and, by producing shorts, pose a potential fire hazard.
6.1.9. (PRT ch. 5.1.3, NAcP 2.2.3, 2.2.6)	Review the seismic robustness of all SSCs, mobile equipment, and buildings housing such SSCs or used as storages for mobile equipment required for crisis management for DB (Design Basis) and BDB (Beyond Design Basis) events. ***<u>Task:</u>*** ***To ensure seismic resistance of mobile equipment intended for the BDBA (Beyond Design Basis Accident) management.***	This action has **high priority**. **Implementation 2019:** Implementation of stationary SSCs, buildings housing such SSCs or used as storages for mobile equipment required for crisis management is covered by Actions 6.1.1 and 6.1.7. Up to now neither mobile equipment nor connection points for quick connections of mobile devices are available. Mobile equipment is foreseen to be available in 2020. The same schedule applies to connection points. **Implementation 2025:** The mobile EDGs, refueling tank and load bank are mounted on truck trailers parked on a concrete surface outdoors. ANPP announced that a designated truck for moving the trailers in case of emergency would be available soon. **Evaluation:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		At the site visit, the PRT could confirm that the mobile equipment could not be compromised by the collapse of structures in their vicinity. However, the PRT recommends checking the stability of the trailers and their support so that tipping over during strong ground motion can be excluded. In addition, this investigation should also examine the occurring slippage distances due to the earthquake loads to increase the distances between the mobile EDGs accordingly (if necessary). **The PRT considers this action closed** pending the assessment of their stability.
6.1.9A (PRT ch. 5.1.1.4. p. 19 PRT ch. 5.1.3. p. 24)	The PRT suggested complementing the PSHA 2011 by reviewing (1) Mmax and (2) assessments of active faults which are located close to the site (Sardarapat, Northwest, Yerevan Fault). ***<u>Task:</u>*** ***Review critical input parameters of the PSHA 2011 (maximum magnitude, fault parameters)***	The action is not included in the NAcP although it was proposed in the Stress Test County Report (page 23). **Implementation 2019:** In a written reply to questions raised by the PRT, ANRA stated that it regards this issue solved by the assessment of uncertainties of the main parameters for the mentioned faults, developing alternative seismotectonic models, applying logic trees and performing sensitivity analysis. ANRA explains that NORATOM performed additional field investigations on these faults after completing the PSHA 2011. These investigations were initiated upon recommendations by IAEA experts. **Evaluation:** In the Stress Test County Report (page 23), the PRT explained the importance of the assumed maximum magnitudes (Mmax) and fault parameters for the reliability of hazard assessments. **The PRT** found these issues satisfactory addressed in studies completed after the PSHA 2011, thus the **team considers this action closed**, in line with ANRA assessment.

2. Volcanism

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.1.10	Establish design bases for ballistic projectiles and tephra fallout, i.e., those volcanic phenomena for	**Implementation 2019:**

(PRT ch. 5.4.2.4, 5.4.3 NAcP 2.2.4, 2.2.8, 2.2.10)	which protection is possible. Some effects of tephra fallout (loading of structures, effects on ventilation) may be enveloped by protection against other hazards (snow load, protection against dust storms). **Task*:*** ***To determine the negative consequences at ANPP during tephra fall.***	ANPP completed a report on the possible impact of volcanic hazards on ANPP. The report is in accordance with IAEA SSG-21 (safety Standards Guidelines) and includes assessments of the contribution of volcanic hazards to CDF. The report will be submitted to ANRA for approval in 2019. As a result, filters for the air intake of the EDGs will be installed to prevent blocking by tephra or volcanic ash (see action 6.1.21). **Implementation 2025:** The PRT regarded as important to determine the existing protection and to further improve protection of the plants against volcanic effects against which protective measures are possible. CDFs have been calculated for all possible volcanic hazards, showing that the contribution of volcanic hazards to CDF is about 10^{-6}/year. The document "Response Plan of JSC "ANPP" to Nuclear and (or) Radiation Accidents (Internal Emergency Plan of the ANPP)" MA.ATD.41.SChS-001 will be updated with the following article: In the event of volcanic activity accompanied by tephra and pyroclastic projectiles, all forces and means will be arranged to clear roads, driveways, roofs of buildings and structures. **Evaluation:** The update of document MA.ATD.41.SChS-001 entered into force on 24.03.2025 by notification № SChS-15. The PRT note also that the resolution of action 6.1.21 on the protection of the EDG air intake from dust will increase the robustness of EDG air intake against tephra fallout and volcanic ash. **The PRT considers this action closed,** in line with ANRA assessment**.**
6.1.11 (PRT ch. 5.4.2.4, 5.4.3 NAcP 2.2.4) **6.1.12** (PRT ch. 5.4.2.4, 5.4.3	**6.1.11.** ANPP to develop response plans/procedures to respond to potential volcanic activity at Ararat, Aragats, and the Shamiram plateau **6.1.12.** To develop monitoring measures of these capable volcanoes in the framework of the national civil protection programs	**Implementation 2019:** Action 6.1.11 will be implemented together with action 6.1.10, Action 6.1.12. will be implemented in the context of the development and updating of the national civil protection programs under the responsibility of the Ministry of Emergency Situations of the Republic of Armenia. **Implementation 2025:** 6.1.11: According to the report developed by NRSC, the input of volcanoes on the core damage is 9.176×10^{-7}/year. Out of this, the volcanic hazards against which it is not possible to take protective measures are 7.3×10^{-7}/year, the remaining probability is due to the impact of tephra. The protection measure is cleaning of tephra from the roofs of the TH and the reactor hall.

NAcP 2.2.4)	**Task*:*** ***Establishment of volcanic hazard monitoring system for ANPP.***	The plant procedure MA.ATD.41.SChS-001 "ANPP response plan to nuclear and (or) radiation accidents (internal emergency plan of ANPP)" was updated accordingly requiring removing tephra after volcanic activity. 6.1.12: The NPP relies on information and activities carried out by the Institute of Geology to monitor volcanoes. **Evaluation:** 6.1.11: Plant procedures were developed to mitigate volcanic hazards for which protective measures are possible. **The PRT regards this action closed**, in line with ANRA assessment. 6.1.12: **The PRT regards the action closed**, in line with ANRA assessment**.**

3. Flooding

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.1.13. (NR p. 151, PRT ch. 5.2.3, EU 3.1.3 NAcP 2.1.7, 2.2.7, 2.3.3)	Equip the emergency doors of the staircases of DGS basement areas with a border to ensure that water ingress to the basement can be excluded. ***Task:*** ***To exclude ingress of water in the basement compartments of DGs from the outside.***	**Implementation 2019:** All the stairwells of emergency doors of the DGS basement have been protected with 20 cm-high concrete borders. According to the calculations, in case of heavy rain fall the water level at the DGS site would be maximum 15 cm high. Borders with height of 20 cm would exclude the ingress of rainwater into the DGS basement compartments. This action has been completed in 2016. **Evaluation:** This action is in general in line with the PRT recommendation. Based on the site visit, **the PRT considers this action closed.**
6.1.14. (NR p. 151, PRT § 5.2.3,	Foresee mobile equipment devoted to water pumping out from DGS and its basement. **Task*:***	**Implementation 2019:** According to the original design, only a passive (gravitational) drainage system with not alarm was in place in the DGS building. New fixed GNOM pumps have been installed into each EDG compartment with new water level measurement and corresponding alarm in main control room.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
NAcP 2.1.7, 2.2.9) **6.1.15.** (NR p. 151, NAcP 2.1.7) **6.1.16.** (NR p. 151, NAcP 2.1.7)	***To exclude flooding of the DGS basement compartments.*** Equip DGS with alarms indicating occurrence of water level in basement area with output of light signals in Main Control Room (MCR), central control panel and DGS operator room. Develop a procedure for operators for the case of water inflow in the DGS basement area.	The plant has put additional fixed means in place to reduce the likelihood of water accumulation in the DGS basement, and this improves the situation. However, mobile water pumping means are not yet in place. **Implementation 2025:** Following feedback from the PRT in 2019, the plant installed a second water level detection in the EDG basements. During its walkdown, the PRT observed that the plant installed 20 cm steps around the staircase entrances to the EDG basement, to prevent or limit water intrusion from outside to the EDG basements. The team also observed the additional drainage pumps installed, which can be started from the ground floor level. **Evaluation:** **The PRT considers this action closed**, in line with ANRA agreement.
6.1.17. (NR p. 151, NAcP 2.1.8)	Seal the gaps to the turbine hall (TH) from the surrounding area and barriers on the way of water flow to the turbine hall gates ***Task:*** ***To exclude ingress of water in the turbine hall from the outside.***	**Implementation 2019:** 15-20 cm high borders are made in front of all external doors to prevent ingress of water in the TH. According to a recent study, this border height is sufficient to cope with flooding caused by rainfall corresponding to a 10^{-5}/year non exceedance probability. This action has been completed in 2016. **Evaluation:** During the plant visit it was clarified that one large door has at the moment a lower border due to temporary operational reasons. Water ingress through this TH door was conservatively considered in the study and it was demonstrated that it does not lead to any impact on safety. Another potential pathway was observed without protective border, but as it leads to a large spreading surface the study concluded that due to high absorption potential of the soil, water would penetrate the soil without water ingress to the TH through this pathway.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		The PRT concludes that this self-identified **action** is in line with the NR and **can be closed.**
6.1.18. (NR p. 151, EU 3.1.3, NAcP 2.1.9, 2.3.3)	Replacing doors located between TH and boron unit in order to resolve the issue related to water penetration from TH to boron units ***Task:*** ***To exclude the ingress of water from the turbine hall into the boron room.***	**Implementation 2019:** The doors at "-3.6" elevation have been replaced by a waterproof wall. This action has been completed in 2016. **Evaluation:** **The PRT concludes that this identified action** is in line with the NR and **can be closed.**
6.1.19 (NR p. 151, PRT §5.2.3, NAcP 2.1.10, 2.2.8, 2.2.10)	Enhancement of reliability of drainage system in order to prevent water penetration from TH to cable tunnels **Task*:*** ***To prevent the likelihood of water ingress from the turbine hall into cable tunnels.***	**Implementation 2019:** In the existing design, the cable tunnels at around "-2.0" elevation are sealed and sewerage pipes from these tunnels in the turbine are equipped with check valves to prevent potential water ingress from the basement of the TH to the tunnels. To complement this, a procedure has been written to solve any unexpected water accumulation in the cable tunnel. **Evaluation:** this self-identified action is in line with the NR. **The PRT considers this action closed.**
6.1.20. (NR p. 151, EU 3.1.7 NAcP 2.1.11, 2.3.4)	Safety margin assessment in terms of rainfall flooding of ANPP site and calculations aimed to prove that protection measures are enough to prevent impact of mudflows on ANPP systems **Task*:***	**Implementation 2019:** The topography of the ANPP area reduce the likelihood of rainfall and mudflows impact on ANPP systems. Based on this, the initial ANPP design did not include a specific analysis of the impact of rainfall or mudflows. The need for a specific analysis was concluded in the frame of the stress tests. A specific analysis was conducted, and the final report is available from summer 2019. It concludes that the drainage system will fail for a rainfall corresponding to a 10^{-5}/year non-exceedance probability. For the corresponding rainfall profile, no water would enter buildings that contain safety related

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
	To perform analysis of impact of rainfall and mudflows on ANPP systems.	equipment. The analysis shows that about 22.6 m^3 of rainwater could enter the TH but without any consequence on safety. A separate analysis of mudflow scenarios has been tendered and is about to start. This study is expected to be concluded in 2021. This action is partly completed. **Implementation 2025:** The report NRSC-RT-ANPP-001/18-002 "Report on the Assessment of the Intensity of Rainfall Leading to a Failure of the Industrial and Stormwater Drainage System of the ANPP Site" has been completed. Considering the NSRC reports ANPP developed a schedule of inspections (walkdowns) to check the state of pipelines and manholes of the industrial sewerage and oil-contaminated wastewater systems. **The PRT considers this action completed,** in line with ANRA assessment.

4. Extreme Weather

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.1.21 (NR p. 152, PRT ch. 5.3.3 NAcP 2.1.12)	Develop and implement measures aimed to protect DG (Diesel Generator) from dust, including improvement of DG compartments leak-tightness and/or installation of special air filtering at DG air intake system. **Task*:*** ***To protect DG from dust at dust storm***	**Implementation 2019:** To prevent potential dust ingress, windows and doors openings of the DGS compartments have been sealed. After some delay, in the frame of the OSA (On-site Assistance) programme, Krsko NPP specialists visited ANPP to study the issue of installation of special air filters on the DG air intake system and to collect the necessary information. A draft report has been issued with recommendations on installing filters on the DG air intake line. This draft report is under discussion and is expected to be finalised around February 2020. A tender will then be launched for supply of the filter. Full implementation of the corrective actions is expected to be completed by 2021. This action is ongoing.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		Implementation 2025: Filters are installed instead on DG rooms windows, and the rest of the windows are reinforced with a film to prevent glass from breaking. The plant concluded based on analyses that the addition of other filter measures is no longer needed and that the existing filters are sufficient to protect the EDG against dust. **Evaluation:** **The PRT considers this action closed.**
6.1.22 (NR p. 152, PRT ch. 5.3.3 NAcP 2.1.13)	Implement measures aimed to remove snow from TH building roof in case of snow accumulation. **Task*:*** ***To exclude the likelihood of collapse of the roof of the turbine compartment during extreme snowfall.***	**Implementation 2019:** As part of the annual autumn-winter order covering ANPP transition to winter conditions, an action to remove snow from the roof in case of heavy snow fall has been included. Relevant plant personnel have been briefed on this topic. **This action is complete.** **Evaluation:** This self-identified action is in line with the NR. **The PRT considers this action closed.**
6.1.23. (NR p. 152, PRT ch. 5.3.3 NAcP 2.1.14, 2.2.11)	Re-evaluation of the air temperature which could lead to freezing of outlet pipes of demineralized water tanks (BZOV). Depending on the results of this, additional measures could be necessary for protection of BZOV pipes against extremely low temperatures **Task*:***	**Implementation 2019:** An updated assessment of the minimum temperature corresponding to a non-exceedance probability of 10^{-4}/year has been completed in 2019 and it leads to a value of -41°C. Based on this, an assessment of the robustness of the BZOV has been performed, and recommendations have been issued. Accordingly, corrective actions (mainly thermal insulation and tightening of the compartment) have been completely implemented during the summer 2019 outage. **Evaluation:** This action in general is line with the PRT recommendation. During the plant visit, some parts of the pipes in the BZOV compartment of unit 2 were found not protected by thermal insulation and this was corrected directly by the plant. **The PRT considers this action closed.**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
	To exclude the likelihood of freezing pipe at BZOV exit.	
6.1.24. (NR p 152, PRT ch 5.3.3 NAcP 2.1.15, 2.2.12)	Check adequacy of SG emergency feed diesel pump exhaust pipe robustness against external hazards. **Task*:*** ***To exclude the likelihood of collapse of the exhaust pipe in case of strong winds.***	**Implementation 2019:** Following the verification performed, a risk of collapse of the exhaust pipe in case of strong wind was identified. As a result, the exhaust pipe was fixed with steel cables. The end of the exhaust pipe has been covered with a fine mesh to prevent penetration of large particles in the pipe. **This action has been completed in 2017.** **Evaluation:** **This action is in line with the NR and can be closed.**
6.1.25 (NR p. 152, PRT ch. 5.3.3 NAcP 2.1.16)	Implement measures aimed to protect DG auxiliary systems (e.g. HVAC) against external hazards (e.g. combination of seismic and low temperatures hazards). **Task*:*** ***To protect DG auxiliary systems against external hazards.***	**Implementation 2019:** The task has taken some delay and is scheduled to be completed after completing measures included in action 6.1.28 (FSA-NPP project). The contract for conducting PSA calculations for critical combinations of external hazard factors has been signed in autumn 2019. The report on these calculations is expected to be concluded by end 2020. Following this report, recommendations for corrective actions might be issued and (if any) they would be expected to be implemented in 2021. This action is pending. **Implementation 2025:** The PRT was able to see the system ensuring the “hot stand-by” mode of the EDGs during the plant visit. The ANPP confirmed that the equipment is seismically qualified. **Evaluation:** **The PRT regards the action closed**, in line with ANRA assessment, provided the timely replacing the lower doors of the electric cabinets by robust doors in the EDG building.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.1.26 (NR p. 152, PRT ch. 5.3.3 NAcP 2.1.17)	Implement detailed analysis for lightning impact on ANPP. **Task*:*** ***To identify possible consequences of a lightning strike at ANPP.***	**Implementation 2019:** The tender covering this detailed analysis will be announced in 2020. The contract will include a reassessment of the lightning hazard and a comparison with the lightning protections included in the design. Following the detailed analysis, corrective actions (if any) would be expected to be implemented in 2021. This action is pending. **Evaluation:** Though this self-identified action is in line with the NR, its implementation has not started yet. The PRT recommends completing this action in a timely manner. **Implementation 2025:** The results of detailed analysis for lightning impact on ANPP presented in the NSRC report. According to the conclusion of the report it is necessary to implement the following corrective measures: • Lightning protection of the DGS buildings must be brought into line with the design No. 04572-14-E16. • At the Water Pumping Station building, which accommodates Channels I and II of the Essential Service Water System (ESWS), it is necessary to restore the lightning protection grids and connect them to the building's grounding circuit. **Evaluation:** Implementation of measures scheduled by the last quarter of 2026. **The PRT considers this action not completed,** in line with ANRA assessment.
6.1.27 (NR p. 152, PRT ch. 5.3.3	Review external hazards screening process taking into account information reflected in stress-test report and PSA model for external hazards. **Task*:***	**Implementation 2019:** The tendering has been done, and the contract has been signed in autumn 2019. The contract covers updating the meteorological hazard selection process considering the info mentioned in the external hazard PSA and stress tests recommendations (10^{-4}/year non exceedance probability, in combination with the updated hazard curves as defined in action 6.1.29). This task is expected to be finalised by end 2020. This action is pending. **Implementation 2025:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
NAcP 2.1.18)	***To revise the list of external Initiating Events for external hazards.***	Review of the report NRSC-RT-ANPP- 004/19-001 with consideration of updated hazard curves was completed in 2025. **Evaluation:** **The PRT considers this action completed,** in line with ANRA assessment.
6.1.28 (NR p. 153, PRT ch. 5.3.3 EU 3. 1.8 NAcP 2.1.18, 2.3.5)	To complement PSA by critical combinations of external hazards identified within FSA-ANPP project. **Task*:*** ***To perform PSA calculations for critical combinations of external hazards factors.***	**Implementation 2019:** The tendering has been done and the contract for conducting PSA calculations for critical combinations of external hazard factors has been signed in autumn 2019. This task is expected to be finalised by end 2020. Following this report, recommendations for corrective actions might be issued and they would be expected to be implemented in 2021. This action is pending. **Implementation 2025:** The NRSC report of 2019 supplemented the PSA with critical combinations of external hazards identified within the FSA-ANPP project. Combinations of external hazards were identified and integrated into the PSA model. The work was carried out with consideration of the recommendations of the EU experts to the stress test report. The overall frequency of core damage due to combinations of external events is 1.15×10^{-6}/year. Based on the analyses carried out within the external event PSA, the following recommendations were developed: • Measures to protect the suction pipelines of the ASN and DNP SG from extremely low temperatures were completed in 2019. • Measures to protect the DGS room and DGS air intakes from increased dust concentrations were completed and air filters were installed on the window openings in the DGs rooms. • A measure to ensure ventilation in the 6 kV switchgear room was completed and a P-7 ventilation system was installed. **Evaluation:** **The PRT regards the action,** identified by ANRA, **closed** in line with ANRA assessment**.**
6.1.29	To review hazard curves for different hazards taking into	**Implementation 2019:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
(NR p. 153, PRT ch. 5.3.3 NAcP 2.1.18, 2.3.5)	account updated meteorological data (up to 2018).	This action has been delayed. The tendering has been done and the contract for conducting PSA calculations for critical combinations of external hazards factors has been signed in autumn 2019. This task is expected to be finalised by end 2020. Following this report, recommendations for corrective actions might be issued and, if any, they would be expected to be implemented in 2021. Updated hazard curves are already available for minimum temperature and rainfall in the frame of respectively actions 6.1.23 and 6.1.20. This action is pending. **Implementation 2025:** New hazard curves have been developed, extending to an exceedance probability of 10^{-5}/year. **Evaluation:** **The PRT considers the action,** identified by ANRA, **closed** in line with ANRA assessment**.**

5. Station black out and loss of ultimate heat sink

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
6.2.1 **6.2.2** (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.1, 3.2.3)	Provision of mobile DGs for charging batteries during SBO. Implement a new electrical scheme for charging batteries from DAR (Diesel Auxiliary Reserve, Additional Emergency Cooling System) system and/or the portable diesel generator. ***Task:***	This action has **high priority**. **Implementation 2019:** The final implementation of the activity is still pending. The technical concept and specification have been prepared. Temporary solutions as an alternative safety related measure are installed. **Implementation 2025:** All four 0.4 kV mobile diesel generators (two rated at 900 kVA and two at 275 kVA) were procured and delivered to the site in 2024. Each unit successfully passed the factory acceptance tests (FAT) and site acceptance tests (SAT). In November 2025, ANPP personnel conducted a validation test, which involved connecting the mobile diesel generators (MDGs) via flexible cables to the designated 0.4 kV connection points located near the plant's electrical rooms.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
	To provide battery charging during the loss of power to NPP.	These connection points can be manually linked to the newly installed rectifier for battery charging and to the inverter that ensures Uninterruptible Power Supply (UPS) of Alternating Current (AC) to vital consumers, such as dedicated motor-operated valves, pumps, and I&C cabinets. The plant presented photo documentation from the validation test of mobile diesel MDGs. The test confirmed that the MDGs can be connected within one hour. Based on the manufacturer's instructions, the plant developed an operating procedure for the use and maintenance of the MDGs. Surveillance tests are scheduled monthly, with start-up and operation at 30% load using a dedicated load device. Plant personnel have been trained to deploy cables and connect the MDGs to the permanently installed connection points. As a next step, the plant plans to permanently install cables between the MDGs and the connection points to eliminate the need for cable deployment during an SBO event. This action is planned in 2026. Concerning Task 6.2.2, the plant confirmed that existing connection scheme for charging station batteries from DAR will remain temporarily functional even if the 0,4kV MGDs have been procured, installed, and prepared for connection to the 1st category DC power distribution system. However, the station blackout emergency procedures still need to be updated to include instructions for using the new MDGs. Currently, the EOP only address connecting the DAR, which, if available, can supply power to essential SBO loads. If the DAR is unavailable (e.g., due to malfunction or seismic damage), the plant can connect to alternative mobile equipment, specifically the 0.4 kV MDGs, to maintain continuity of DC (Direct Current) and UPS power supply to SBO-designated equipment. **Evaluation:** Although the mobile EDGs have been delivered and commissioned, this task will only be considered completed after the station blackout procedure is updated, and plant personnel are informed and trained on the proper use of the MDGs. **The PRT considers this action not completed.**
6.2.3 (NR ch. 7.2.4	Replace all reversible motor generators (ODGs) with modern inverters with less energy losses. **Task*:***	**Implementation 2019:** The implementation of the measure is still pending. The technical concept is already prepared. **Implementation 2025:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
PRT ch. 6.2.4 NAcP 3.1.1)	***To reduce load on the station accumulator battery***	The reversible motor-generators have been replaced with modern static inverters in both safety trains of the first category power supply (Class 1). The new inverters consume less power, compared to the original motor-generator sets. The inverters were manufactured by EKRA (Russia) and classified as Safety Class (SC) 2 under the Russian rules, which corresponds to International Electrotechnical Commission (IEC) Safety Class 1. The inverters incorporate a digitally controlled system, but there is no inbuilt software. The inverters meet requirements provided in IEC 61850 standard for communication networks and systems in substations, defining protocols and a data model for power system automation, and IEC 61000 series on electromagnetic compatibility. **Evaluation:** Following the walkdown and verification of supporting documentation, **the PRT considers this action closed,** in line with ANRA assessment.
6.2.4 (NR ch 7.2.4 PRT ch 6.2.4 NAcP 3.1.1)	Develop and implement additional measures to extend the operating time of reversible motor generators (ODGs) in an inverter mode that will lead to increase the time to provide I&C AC power supply. ***Task:*** ***To extend ODG operation in the inverter regime to 72 hours.***	**Implementation 2019:** The implementation of this measure is still pending. **Implementation 2025:** As stated in 6.2.3 the reversible motor-generators have been replaced with modern static inverters in both safety trains of the first category power supply (Class 1). The new inverters consume less power than the original MG sets, which extends battery capacity to approximately 12 hours without charging during a SBO event. This provides sufficient time to restore battery charging from the plant's EDGs, the DAR, or the 0.4 kV mobile diesel generators (MDGs), ensuring long-term continuity of DC power supply (e.g., up to 72 hours) to the dedicated consumers required during SBO conditions. **Evaluation:** Following the walkdown and verification of supporting documentation, **the PRT considers this action closed**, in line with ANRA assessment.
6.2.5 (NR ch. 7.2.4	Implement two new separate lines for make-up of the coolant inventory in SFP from a mobile source (e.g., fire pumps or diesel	**Implementation 2019:** The implementation of this measure is still pending. **Implementation 2025:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
PRT ch. 6.2.4 NAcP 3.1.2, 3.2.4)	pumps) and external water sources for SFPs emergency cooling. **Task*:*** ***To provide cooling of the spent fuel pool in emergencies.***	The plant has installed two new independent lines to allow make-up of coolant inventory in the spent fuel pool (SFP) from mobile sources (e.g., fire pumps or diesel pumps) and external water sources for emergency SFP cooling. Additionally, a new analysis titled SFP Cooling Following the Loss of Offsite Power (ENCO FR (16) 63) was developed under EU project A1.01/10 – EuropeAid/130412/C/SER/AM to determine the time to uncover the SFP during an SBO event. The plant also prepared an EOP for alternative SFP cooling using mobile pumps. Currently, this alternative cooling is achieved by connecting a firefighting pump to an external piping. A future improvement is planned to procure an additional petrol-driven pump dedicated to SFP cooling. Depending on procurement progress, the implementation is expected at the end of 2026. Because the existing SFP water level measurement system cannot provide reliable readings following a loss of the SFP cooling function, the plant plans to procure a new measurement device capable of ensuring accurate water level indication across the entire height of the SFP. The installation of the SFP water level measurement is envisaged in 2026. Reliable indication is essential for operators to initiate corrective actions as specified in the EOP, thereby fully supporting the intended safety functions. **Evaluation:** Following the walkdown and verification of supporting documentation, two new independent lines for supplying coolant inventory to the spent fuel pool (SFP) from a mobile source have been implemented. **The PRT team consider this action closed**, in line with ANRA assessment Nevertheless, the plant is encouraged to pursue its acquisition of a dedicated petrol-driven pump, thereby removing the need to utilize the firefighting pump for this function.
6.2.6 (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.4,	Increase the reliability of the refueling process from emergency diesel fuel tank or to foresee measures to install additional fuel capacity in terms of seismically qualified and reliable fuel tank.	This action has **high priority**. **Implementation 2019:** The operator stated that the activity has been implemented. PRT recommended implementation of additional actions. **Implementation 2025:** The ANPP has decided to seismically reinforce the external emergency diesel fuel tank. This external tank has been qualified for a PGA of 0.35 g. A new analysis is underway to demonstrate that the external tank can withstand, with high

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
3.2.1)		confidence, the RLE of 0.42 g PGA. However, the plant informed the PRT that the connecting pipeline supplying diesel fuel to the EDGs has not yet been seismically reinforced. It has been confirmed during the walkdown, that the fuel pipeline supplying diesel fuel from the external emergency diesel fuel tank to the EDGs has not yet been seismically reinforced, however, a design to seismically reinforce this pipeline has been ordered. As a compensatory measure, the plant maintains its own mobile tank (cisterna), which can be connected to the main tank to pump diesel fuel and deliver it to the EDG building in case the pipeline is damaged. A manual isolation valve on the letdown line of the fuel tank remains closed, ensuring that if a break occurs downstream of the pipeline, diesel fuel will not leak from the tank. **Evaluation:** Following the walkdown and verification of supporting documentation, the seismic reinforcement of the external emergency diesel fuel tank has been made. The seismic reinforcement of the diesel fuel pipeline yet to be done; the implementation is scheduled for 2026. Once the seismic reinforcement of the diesel fuel pipeline is completed, this task could be confirmed as completed and formally closed, considering that the plant has temporary compensatory measure in place (refiling EDG day tanks from the two large external tanks, using fuel truck). However, at the current moment, **the PRT team consider this action not completed,** in line with ANRA assessment.
6.2.7 (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.4)	Implement the sequential start-up program of diesels for "cold" shutdown and refueling modes. ***Task:*** ***To enhance the reliability of power supply in "cold shutdown" and "refueling" modes.***	**Implementation 2019:** The measure has been implemented.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
6.2.8 (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.5, 3.3.4, 3.3.6)	Perform new analysis and implement appropriate operator action for all emergency states, which may arise in case of loss of the primary ultimate heat sink, combined with station black out. ***Task:*** ***To specify the operator's actions to recover the loss of water to ECCS in emergency situations.***	**Implementation 2019:** The activity has been implemented. **Implementation 2025:** The plant prepared a report titled "Justification for the Implementation of Autonomous Alternative Means of Water Supply" (UB.ETD.45.OYAB-124). The report concluded the following: • The existing steam generator (SG) water supply pumps (fire engine) do not allow maintaining the reactor facility in hot standby. • The proper use of the SG make-up pumps requires cooling at a normal flow rate through BRU-A (steam dump valves to atmosphere), and the secondary circuit pressure reduced to 10 kgf/cm². • After reducing the primary circuit pressure to 95 kgf/cm², water supply to the primary circuit can be initiated. To prevent violation of the temperature difference criterion between the primary circuit and the pressurizer, gas should be periodically removed from the pressurizer through R-5 to the pressurizer relief tank. To meet these requirements, the plant plans to procure two new petrol-driven pumps: • One pump for controlled water charging from the emergency demineralized water storage tanks to the SGs, without the need to depressurize the SGs, ensuring the cooling rate does not exceed the temperature criterion between reactor coolant system (RCS) and pressurizer. • One pump for charging into the RCS to provide additional reactivity margin by injecting borated water and maintaining RCS inventory (which decreases as temperature drops). **Evaluation:** Following verification of supporting documentation, the **PRT considers this action closed**. Nevertheless, the plant is encouraged to proceed with the proposed technical solution, which includes the installation and commissioning of two petrol-driven pumps, along with corresponding updates to the relevant procedures in the EOPs.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
6.2.9 (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.6, 3.2.2)	Provision of mobile DGs for power supply of safety system. ***Task:*** ***Provide with power supply to the safety systems in case of failure of standard power supply systems.***	This action has **high priority**. **Implementation 2019:** The final implementation of the activity is still pending. The technical concept has been prepared. **Implementation 2025:** In response to the PRT 2019 recommendation regarding the lack of diversity among the EDGs and DAR DGs (same type, same building, same age), the plant received, within the framework of the INSC project (project number), one 6 kV mobile diesel generator (DG) with a power output of 2750 kVA. This mobile DG can be connected to either of the two 6 kV safety buses and has sufficient capacity to supply essential 6 kV safety loads during a SBO or a loss-of-coolant accident (LOCA) concurrent with a common-cause failure (CCF) of the safety EDGs and DAR. In September 2025, ANPP personnel conducted a validation test involving the connection of the 6 kV mobile DG via flexible cables to the designated pre-installed 6 kV connection points located near the entrance to the plant's electrical rooms. These connection points can be manually linked to the newly installed 6 kV distribution cabinets. Photo documentation from the validation test was presented to the PRT. The test confirmed that the 6 kV mobile DG can be connected within one and half (1.5) hour. Based on the manufacturer's instructions, the plant developed an operating procedure for the use and maintenance of the 6 kV mobile DG. Surveillance tests are scheduled annually, including start-up and operation at 100% load with synchronization to the grid. Plant personnel have been trained to deploy cables and connect the mobile DG to the permanently installed connection points. As a next step, the plant plans to permanently install cables between the mobile DGs and the connection points to eliminate the need for cable deployment during an SBO event. However, the station blackout procedures still need to be updated to include instructions for using the new MDGs. Currently, the EOP only address connecting the DAR, which, if available, can supply power to essential SBO loads. If the DAR is unavailable (e.g., due to malfunction or seismic damage), the plant can connect alternative mobile equipment, specifically the 6 kV MDGs, to allow connecting the safety loads as well as maintain continuity of DC and UPS power supply to SBO-designated equipment. **Evaluation:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
		Although the mobile EDGs have been delivered and commissioned, this task will only be considered completed after the station's blackout procedures are updated, and plant personnel are informed and trained on the proper use of the MDGs. **The PRT considers this action not completed.**
6.2.10 (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.7)	Assure MCP (Main Circulation Pump) seals long-term (more than 24 hours) operation in case of cooling failure. ***Task:*** ***To prevent leaks through the MCP seals.***	**Implementation 2019:** The implementation has not started yet. **Implementation 2025:** In response to the PRT's 2019 concern regarding maintaining the operating condition of the RCP (Reactor Circulation Pump, also refereed as MCP) seal unit for an extended period, particularly during an SBO event, the plant established specific requirements for personnel actions. If the RCP sealing water, normally supplied by a dedicated pump from Unit 1, is unavailable during SBO, operators are required to immediately close the manual valves on the controlled leakage lines (valves 2P-30/1÷6 located in partially serviced room A-102/2) and on the discharge lines from hydrocyclones (valves 2P-50/1÷6 and 2P-51/1÷6 located in serviced room A-102/2). The purpose of these actions is to prevent hot water flow through the RCP seal unit, ensuring that its temperature increases only gradually due to heat transfer from the primary circuit. The plant confirmed that operating personnel can close all six manual valves within one hour in accordance with corresponding operating instructions. **Evaluation:** Following verification of supporting documentation, **the PRT considers this action closed**, in line with ANRA assessment.
6.2.11 (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.8)	Provide for mobile pumps for ESWS make-up from Circulation Water Channel. The measure has been implemented in 2017 (see activity 6.2.8).	**Implementation 2019:** The activity has been already implemented.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
6.2.12 NR ch. 7.2.4 EUPRT ch. **6.2.4** NAcP 3.1.9)	Develop and implement additional measures to use a large reserve of service water in the inlet and outlet channels, as an alternative heat sink. The measure has been implemented in 2017 (see activity 6.2.8)	**Implementation 2019:** The activity has been already implemented.
6.2.13 (NR ch. 7.2.4 PRT ch. 6.2.4 NAcP 3.1.10)	Implement autonomous alternative means for make-up of SGs 1-6 of the Unit 2. ***Task:*** ***To ensure the possibility of SG make-up in case of a failure of standard systems.***	**Implementation of 2019:** The implementation of the measure is still pending. The technical concept is already prepared. **Implementation of 2025:** This task is closely related to the proposed solution in Task 6.2.8 "Justification for the Implementation of Autonomous Alternative Means of Water Supply" (UB.ETD.45.OYAB-124). **Evaluation:** Following verification of supporting documentation, the PRT acknowledges that the solution proposed in Task 6.2.8 satisfies the implementation of the Task 6.2.13. Completion of task 6.2.13 depends on the delivery, installation, and commissioning of two petrol-driven pumps, as well as updates to relevant procedures, aligning with the results of task 6.2.8. **The PRT considers this action not completed,** in line with ANRA assessment.
6.2.14 **6.2.15** (NR ch 7.2.4	Implement analysis of circuit diagram for consumers power supply (from DAR). Develop and implement activities aimed at minimizing personnel	**Implementation 2019:** The implementation of the measure is still pending. The technical concept is under development. **Implementation 2025:** Although the new MDGs have been delivered and commissioned, the DAR will continue to serve as a temporary redundant power source, capable of supplying selected consumers directly in the event that one of the 6 kV busbars

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
PRT ch 6.2.4 NAcP 3.1.12, 3.2.2)	manual actions to activate the DAR system. ***Task:*** ***To minimize the personnel's actions when commissioning DAR.***	becomes unavailable (e.g., due to fire or other damage). In this context, following the commissioning of the MDGs, the original intent of this measure has been fulfilled. **Evaluation:** Based on the verification of supporting documentation, **the PRT considers this action closed,** in line with ANRA assessment.
6.2.16 (NAcP 3.3.5, EU 3.2.5)	The enhancement of instrumentation and control. Examples include separate I&C and/or power sources to enable monitoring of essential parameters under any circumstances for accident management and the ability to measure specific important parameters based on passive and simple principles. **Task:** ***To ensure monitoring of essential parameters in the accident management conditions.***	**Implementation of 2019:** This action has been already implemented.
6.2.17 (NAcP 3.3.16, EU 3.2.16)	The establishment of regular programs for inspections to ensure that a variety of existing and additional equipment and mobile devices are properly installed and maintained, particularly for temporary and mobile equipment	**Implementation 2019:** The implementation of the measure is still pending. **Implementation 2025:** This task is closely related to Tasks 6.2.1, 6.2.2, and 6.2.9. Although MDGs of different voltage and power ratings have been delivered and commissioned at the plant, their full integration into operating, maintenance, and emergency operating procedures is still pending.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
	and tools used for mitigation of BDB external events. **Task*:*** ***To ensure conditions for maintaining mobile equipment for elimination of beyond design basis accidents in working condition.***	Based on the manufacturer's instructions, the plant has developed operating procedures for the use and maintenance of MDGs. Surveillance tests are scheduled monthly for the 0.4 kV MDGs and annually for the 6 kV MDG. Plant personnel have been trained to deploy cables and connect the MDGs to the permanently installed connection points. However, the procedures for coping with SBO events still need to be updated to include instructions for using the new MDGs. Currently, the EOP only addresses connecting the DAR, which, if available, can supply power to essential SBO loads. If the DAR is unavailable (e.g., due to malfunction or seismic damage), the plant can connect alternative MDGs to provide power supply to SBO-designated equipment. **Evaluation:** Following verification of supporting documentation, the task, as originally defined to ensure conditions for maintaining mobile equipment, has been confirmed as completed. All mobile diesel generators (MDGs) have been successfully commissioned, and the corresponding operating and maintenance procedures have been prepared. **The PRT considers this action closed.** However, the plant still needs to fully implement the training program for operating personnel on the proper use of MDGs and update the SBO procedures accordingly.
6.2.18 (NAcP 3.3.17, EU 3.2.17)	The performance of further studies in areas where there are uncertainties. Uncertainties may exist in the following areas: • The integrity of the SFP and its liner in the event of boiling or external impact. • The functionality of control equipment (feedwater control valves and SG relief valves, main steam safety valves, isolation condenser flow path, containment isolation valves as	This item is of **high priority.** **Implementation 2019:** For this measure neither a concept nor implementation activities have been specified by now. According to the NAcP, the studies should be performed until the end of 2022. **Implementation 2025:** In 2019, the PRT recommended "Developing an overall concept and technical solution to address an SBO event." This concept, once developed, was intended to provide a systematic approach for managing a complex SBO scenario, including identifying necessary measures, equipment, timing, and improvements to existing operating procedures and EOP. The plant concluded that "The task will be resolved after the delivery of mobile equipment to ANPP in accordance with the technical requirements for this equipment." However, the concept was only developed for addressing SBO in the spent fuel pool (SFP), as documented in ENCO FR (16) 63 – Analysis of SFP Cooling Following the Loss of Offsite Power. This concept has been implemented by technical

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
	well as depressurization valves) during the SBO to ensure that cooling using natural circulation would not be interrupted in a SBO (this is partially addressed in recommendation 3.2.10).	means as well as new EOP addressing loss of cooling functions in the SFP. The EOP are supported with technical justification as well as supporting safety analysis. **Evaluation:** Following verification of supporting documentation, **the PRT considers this action closed,** in line with ANRA assessment.
6.2.19 (NAcP 3.3.8, EU 3.2.8)	The enhancement of ventilation capacity during SBO to ensure equipment operability. ***Task:*** ***To provide temperature conditions for operability of the safety important systems.***	**Implementation 2019:** The implementation of the measure is still pending. **Implementation 2025:** This task addressed the concern of controlling ambient temperature during an SBO event in critical areas such as the MCR, the remote shutdown panel, and other locations where equipment important to safety could be susceptible to elevated temperatures. To resolve this issue, two analyses were prepared: • Analysis of the adequacy of existing ventilation systems in the emergency boron supply room (Report A-132035pm). • Analysis of the adequacy of cooling and ventilation systems in the rooms associated with the modernization of the main building of EETU (Rack of Electrical Devices), the Diesel Generator Station (DGS) building, and the block of structures on the open switchgears (Report A-135597). Based on these analyses, the plant identified specific areas and measures, including the installation of additional equipment to maintain temperature control in vital locations during an SBO. These measures include: • A new redundant ventilation system for the MCR, equipped with iodine filters and powered from the first category (UPS). • A new ventilation system for a remote shutdown panel (not yet implemented, envisaged in 2026). • New cooling systems installed in the boron compartment at Unit 2, where high-pressure and low-pressure core cooling pumps, as well as four containment spray pumps, are located. The purpose of this ventilation system is to maintain temperature control in the boron compartment during a LOCA, as such conditions would indirectly

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
		heat the entire compartment. Elevated temperatures could negatively affect the performance of safety-related equipment in this area. **Evaluation:** The ventilation system for the MCR has been completed. The installation of the new ventilation system for remote shutdown panel, which will be similar to the ventilation system of MCR, is in progress; a supplier has been identified, and the implementation is envisaged in 2026. The ventilation system for the boron compartment at Unit 2 has been installed, tested, and is scheduled to enter normal operation by the end of 2025. Following the walkdown and verification of supporting documentation, significant progress has been observed in completing the remaining activities, such as finalizing the ventilation system for the remote shutdown panel and commissioning the boron compartment ventilation system. Based on this verification, **the PRT considers this action closed**, in line with ANRA assessment, provided that the planned installation of the boron compartment ventilation is timely completed as scheduled.
6.2.20 (NAcP 3.3.12, EU 3.2.12)	The verification of assured flow paths and access under SBO conditions. Ensure that the state in which isolation valves fail and remain, when motive and control power is lost, is carefully considered to maximize safety. Enhance and extend the availability of DC power and instrument air (e.g. by installing additional or larger accumulators on the valves). Ensure access to critical equipment in all circumstances, specifically when	**Implementation 2019:** As stated in the NAcP update 2019, the implementation of this measure is in the planning phase and the study activities should be finalized by the end of 2020. **Implementation 2025:** The electrical turnstiles are part of the plant's physical protection system. Their power supply is provided by independent, redundant battery-backed sources. In the event of an emergency requiring personnel movement, or in case of electrical disturbances, the access control system can be released in a controlled manner to ensure personnel have access to safety-related equipment. **Evaluation:** Following discussions with the plant and verification of the adopted measures, the **PRT considers this task closed.**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and evaluation of action
	electrically operated turnstiles are interlocked. ***Task:*** ***To provide access to the safety systems equipment in all circumstances, in case of blocking of electrical turnstiles.***	

6. Severe Accident Management

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.3.1 NAcP 4.1.1. PRT 7.2.4. 7.3. 8. NR 7.2.5.(1) EU 3.3.2 .- 3.3.12. 3.3.16 NAcP 4.3.3. 4.3.4.	Development of a full set of severe accidents management guidelines covering also SFP ***Task:*** ***To ensure management of severe accidents.***	**Implementation 2019:** The SAMG package covering the full-power and low-power reactor operating modes (including shutdown modes with the reactor sealed) has been developed. The SAMG package for shutdown modes with open reactor as well as accidents in 2 spent fuel pools is under development. The package considers the strategies for prevention of the loss of physical barriers and for mitigation of releases of fission products up to the recovery of the unit to controlled stable conditions. Development of strategies is based on relevant severe accident analysis. Certain hardware improvements aimed at supporting effectiveness of the SAMG have been implemented (e.g. improvements of the spray system) others (improvements of the ECCS system) are planned for the future. Validation of SAMG was carried out in October 2016, using discussion method. SAMG were submitted for independent verification to an expert organization. After verification, the comments will be incorporated, followed by additional validation and staff training. The SAMG correspond to existing configuration of the plant equipment. In accordance with the current licensing conditions full implementation of SAMG is planned upon completion of the hardware modifications in 2021. **Implementation 2025:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
4.3.5. 4.3.6. 4.3.7. 4.3.8. 4.3.11. 4.3.12. 4.3.16. 4.4.3.		Modernisation of the plant in frame of LTO-2 is an unavoidable process, so SAMG would need to be updated to comply with new plant configuration. Tendering procedure for the update and review of the new version of the SAMG has been launched and the completion of the review is expected in the fourth quarter of 2026. In April 2025, the "HAEK" CJSC/ANPP signed a contract with "Armatom" LLC for the following activities: 1. Updating the existing SAMG (bringing it into compliance with the current Unit configuration) and issuing a new version. 2. Updating the technical justifications for the SAMG and issuing a new version. 3. Updating the analytical justifications for the SAMG and issuing a new version. 4. Developing guidelines for the spent fuel pools and for the shutdown reactor, including their technical and analytical justification documents. The contract is valid until December 31, 2026. **Evaluation:** SAMG, when implemented in the plant operation, will represent a key factor for effective mitigation of progression and consequences of severe accidents. It is noted that significant progress has been made towards implementation of SAMG in operation of the plant, but the process seems decelerated since 2019. Necessary steps were initiated for full implementation of SAMG (SAMG submitted for verification). Further on, full scope validation and training for all staff potentially involved in accident management will be organized, once the SAMG are finalized and approved. For these activities it could be mentioned that advanced tools for training, such as multifunctional simulators, would increase efficiency of training. The schedule established for implementation of SAMG in plant operation is behind the original schedule. The possible finalization of the guidelines depends on various factors, such as the implementation of safety related modifications (e.g. commissioning of mobile diesel generators and pumps, investigation of possible In-Vessel Melt Retention strategies, etc.). ANPP is encouraged to accelerate the development of remaining SAMG and implementation of a full package of SAMG. Due to ongoing process of safety upgrading of the plant, regulatory approval of any relevant change in plant configuration should be conditioned by parallel updating the SAMG to ensure consistency. In addition, the PRT was not able to verify that the fire brigade regularly practices the necessary actions during severe accidents regarding supplying water to the various nuclear safety significant components (primary circuit, SG, SFP, etc).

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		Based on this observation the PRT encourages the ANPP to include these specific actions in relevant regular exercises to ensure that all parties are familiar and practiced in their roles under such conditions. **The PRT considers this recommendation not completed,** in line with ANRA assessment
6.3.2 NAcP 4.1.2. 4.2.1. 4.4.1. PRT 7.2.4. 7.3 NR 7.2.5.(2)	Modernization of Emergency Core Cooling System to ensure long time operation and reliable compensation of higher leak rate. Introduction of alternative low-pressure core cooling system with independent power supply and water sources ***<u>Task:</u>*** ***To increase the Maximum Design Basis Accident (MDBA) with primary circuit leak to DN100mm pipeline break (Diameter Nominal).***	This item **is high priority.** **Implementation 2019:** A number of actions towards modernization of the ECCS system have been taken as follows: 1. The ECCS modification basic lay-out was developed and approved. 2. Preliminary safety justification was performed. 3. Hydraulic calculations for the ECCS new lay-out were performed. 4. Detailed working documentation for ECCS pipeline cut-in unit into the main circulation pipelines were developed. 5. The design for the system I&C was developed. 6. The detailed documentation for construction and erection activities on equipment and pipelines in boron unit and SG compartment is under development. 7. The low pressure ECCS pumps are manufactured and are on the ANPP site. The modifications will include changing the injection points, and installation of low pressure ECCS pumps. Modernized ECCS is designed to control LOCA up to the diameter 100 mm at any position, and surge line 200 mm LOCA. Full implementation is planned 2020, or 2021 at the latest. **Implementation 2025:** ECCS modification is completed. Within the framework of the LTO-2, the regulatory body has issued a requirement to modernize the ECCS to compensate for a 200 mm diameter leak anywhere in the primary circuit. A contract has been signed with a relevant organization to determine the optimal ECCS configuration by calculation methods to meet the regulator's requirements. **Evaluation:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		Modernization of the ECCS has a high safety significance both for prevention and mitigation of a severe accident including its ex-vessel stage (pouring coolant on the molten corium to slow-down concrete attack). The ECCS modernization when implemented will significantly enhance the scope of design basis accidents controlled by the system and thus strengthen the prevention of transition into a severe accident. In addition, if maintained operable, the system will also facilitate stabilization of molten corium and reduce the radioactive releases after potential ejection of corium from the vessel to the reactor cavity. For this objective, operability of ECCS following a SBO accident would need to have an independent electric power supply, which can be provided by the new SBO diesel generator. There is also a dedicated hydro plant to provide electricity in case of a need. Other means for coolant injection (like mobile diesel pumps, already planned by the NPP) were also considered. Possible separation of individual ECCS trains should not be left out of any consideration, although at present it seems to be hardly achievable. The implementation of the action has progressed satisfactorily, and the high attention devoted to the implementation is appreciated. **The PRT considers this recommendation closed.**
6.3.3 NAcP 4.1.3. 4.2.3. 4.3.10. PRT 7.2.4. 7.3 NR 7.2.5.(3) EU 2.3. 3.3.1	Comprehensive analysis of hydrogen generation and implementation of measures to reduce hydrogen explosion probability. Implementation of measurement of hydrogen concentration in containment ***<u>Task:</u>*** ***To reduce hydrogen exposure probability at BDBA***	This item **is high priority.** **Implementation 2019:** The analysis of potential hydrogen accumulation in containment is included in the 2020 financial plan. Strategies for hydrogen mitigation using available means are covered in SAMGs. The final decision regarding this issue requires additional analysis. The analyses will be followed by corresponding decisions on measures for monitoring the hydrogen concentration and implementation of countermeasures against hydrogen explosions. The action should be implemented by 2021. PRT notes that reference to hydrogen exposure means hydrogen explosion. **Implementation 2025:** As a part of the PSA-2 work, the amount of generated hydrogen and its distribution in the hermetic compartment and adjacent rooms were determined. The plant then established the necessary recombination capacity of Passive Autocatalytic Recombiners (PARs) and identified their potential locations in the containment. In addition, the plant is going to install hydrogen detectors and monitoring system in the areas of hydrogen accumulation to provide information for additional mitigating actions. Based on the assessment that were carried out for the justification of the measures, currently overall 19 PARs are planned to be installed in all areas of the containment (although the exact

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		number may change depending on the exact type of the PARs), while hydrogen and oxygen detectors will be installed in the dedicated areas to provide information for additional mitigating actions. Following this effort, Technical Specifications have been drafted for procurement of the PARs and Hydrogen Monitoring System (HMS). Using the technical specifications, the EC will launch a tender in 2026 for the PARs and HMS procurement. The equipment supply is expected in 2027. **Evaluation:** Hydrogen explosion is one of the challenges potentially endangering containment and its systems and thus it is of high safety significance. The calculations have shown that hydrogen detonation and/or deflagration during the in-vessel phases of severe accidents can be avoided with 19 PARs, while during the ex-vessel phase, hydrogen detonation is avoided due to the lack of oxygen in the containment. The PRT concluded that the use of hydrogen and oxygen detectors may provide further mitigative measures for the avoidance of hydrogen detonation, for example through limiting the use of the spray system at peak hydrogen concentration times. Implementation of these items of the NAcP should be given high priority and should be pursued as soon as possible. **The PRT considers this action not completed**, in line with ANRA assessment.
6.3.4 NAcP 4.1.4. 4.2.4. 4.3.2. PRT 7.2.4. 7.3 NR 7.2.5.(4)	Modernization of the Spray System including implementation of interlocks to reduce the risk of depth sub atmospheric pressure and reduce oxygen inflow from outside. It is recommended to foresee measures to supply spray system components using mobile DG equipment. It is also recommended to implement feasibility study for adding alternative sprays with independent source of energy (using a diesel driven spray pump)	This item is of **high priority.** **Implementation 2019:** Significant steps were taken towards modernization of the spray system to enhance its performance. The system already installed consists of 2 independent channels with 4 new high capacity seismically resistant pumps. Interlocks were implemented to prevent deep under pressure in the containment. Potential for sump clogging was considered in the design, including replacement of the insulation. Another planned way for enhancement is use of alternative sprays with a diesel driven spray pump. The documentation was developed for cut-in fitting in the discharge pipeline of the spray system for future connection of the pipeline from mobile diesel pump for water supply from B-8/1 to sprinkler nozzles. The fitting has been already manufactured and delivered to the ANPP. The overall solution is subject to future regulatory authorization. **Implementation 2025:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
	and water (borated water storage tank of Unit 1) should be done. ***<u>Task:</u>*** ***To increase the MDBA with the primary circuit leak to DN100mm***	As a part of the modification of the spray system, appropriate interlocks and personnel actions were introduced (closing the spray water valves without shutting down the spray pumps and without interrupting the performance of other spray system safety functions) to prevent the establishment of unacceptable under pressure in the containment. **Evaluation:** Modernization of the spray system is a high priority item, due to its effect for washing out fission products from the containment atmosphere under severe accident conditions. Implementation of the actions was scheduled in stages: Stage I to 2019 was implemented as intended, and it is considered as satisfactory. Stage II, using mobile means for spraying, is under implementation. Similarly, as in case of ECCS, ensuring electric power supply from existing SBO diesel-generator (although not fully diverse) provides important enhancement for operability of the system under SBO severe accident conditions. Due to the containment leak tightness improvement, the current challenge is mainly due to under-pressure that may exist in the containment for a longer period, due to the use of spray system and the rapid steam condensation in the containment. This challenge, however, has been addresses by the interlocks implemented. **The PRT considers this recommendation closed,** in line with ANRA assessment.
6.3.5 NAcP 4.1.5. PRT 7.2.4. NR 7.2.5.(5) EU 3.3.1	Feasibility study and development of measures aimed at maintaining melting fuel inside RPV (Reactor Pressure Vessel) via external cooling of the reactor vessel	**Implementation 2019:** Besides planned enhancement of the ECCS system no specific actions aimed at maintaining molten corium in the reactor vessel were determined by the plant until now. The Scientific and Technical Centre developed a preliminary study to investigate feasibility of such measure. Although not listed as a specific item in the NAcP, importance of the reactor coolant system depressurization is recognized as one of the key measures for severe accident management. Different considerations were given to using existing means for depressurization. In addition to the POSRV (Pilot Operated Safety Relief Valve) there are several primary circuit pressure discharge lines as follows: • Primary circuit coolant discharge to bubbler through the POSRV bypass with diameter of 25 mm. • Coolant discharge through the routine primary circuit drainage to primary circuit make-up deaerator or tanks 4,5 or B-3/2 through pipeline with diameter of 50 mm. • Pipelines of emergency gas removal from primary circuit through valves 2R-30/1-6. The valves are controlled from the MCR.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		• Also, for pressure discharge from primary circuit the lines of air removal from 2RCP/1-6 and 2SG/1-6 by primary circuit could be used. **Implementation 2025:** According to the document "Feasibility study for the development and implementation of measures to localize melted fuel inside the reactor by cooling the reactor vessel from the outside", the experience of the Loviisa and Paks NPPs could be used to justify implementation of the RPV external cooling at ANPP Unit 2, since the geometry and materials of the RPV and flow channels are similar for all the mentioned reactors. The following steps will be implemented: • Study experience of other NPPs on implementation of the external RPV cooling. (2025). • Assess the feasibility of implementing options specified in the NRSC report "(2025). • Select preferable option and perform feasibility study (2027). • Develop design and implement selected option (2030). An inquiry has been sent to all nuclear power plants via the World Association of Nuclear Operators Moscow Centre (WANO Moscow centre) regarding implemented reactor pressure vessel cooling systems. The plant has not received responses to the inquiries yet. The actions to follow in case of failure of this strategy will be determined in the next revision of the SAMG. The first version of the SAMG is planned to include reactor cavity flooding as a possible IVMR measure without detailed instructions on its achievements. Once the exact strategy is developed, the SAMG will be updated with the detailed instructions. **Evaluation:** Implementation of activities on feasibility study and development of activities on IVRM through external cooling of the reactor vessel has been postponed to 2025. The PRT concluded that increased efforts should be made to investigate and develop a viable IVMR strategy and depressurization of the primary circuit under severe accident conditions. Based on the discussions between the PRT and Armenian counterparts it was concluded that further organizations (such as

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		WANO Paris Centre, EC or the VVER-440 operating organizations directly) could be approached to obtain more information about the possible solutions. During the discussions between the PRT and representatives of the regulatory body as well as the licensee, it was noted that among the existing primary circuit depressurization lines there were no depressurization means dedicated to severe accident conditions. It is therefore advisable (in accordance with ENSREG stress test recommendations) to consider implementation of additional, primary circuit depressurization means dedicated to severe accident conditions. **The PRT considers this recommendation not completed,** in line with ANRA assessment.
6.3.6 NAcP 4.1.6. 4.2.2. 4.3.10. PRT 7.2.4. 7.3. NR 7.2.5.(6) EU 2.3. 3.3.1	Further improvement of containment tightness. A detailed analysis of possibility of hydrogen accumulation in rooms outside the containment ***<u>Task:</u>*** ***Minimization of releases from the containment into the environment.***	**Implementation 2019:** The NPP on-site assistance team prepared preliminary detailed analysis for identification of potential hydrogen accumulation in the rooms outside the containment. The study identified the potential pathways for propagation of hydrogen outside the containment as well as possible measures to mitigate the effects. The study concluded that this issue cannot be ignored, but more detailed investigation is needed. After comments from the plant staff, the current study will be updated. Containment leak rate is still very large. Implementation of measures for further improvements of the containment tightness is ongoing, and its continuation is planned. **Implementation 2025:** The containment leak rate has been reduced to 87,6%/24h during the 2025 outage. ANRA considers the first part of the issue as completed. Currently, improved sealing systems of hermetic doors and hatches is under implementation until 2026. This will further improve containment tightness and the possibility of local leak testing (via a pressure measurement in the space between the double rubber sealings of the hermetic doors and hatches, which allows identification of a possible leak before the integral leak tightness test is commenced). At this stage, the results of calculations on the appearance of the hydrogen in the adjacent rooms have been obtained and an analysis of the obtained results is being carried out for the need to develop additional measures. **Evaluation:** Containment leak tightness is an issue of high safety significance. The predefined goal of a leak rate under 100%/day has been achieved. However, activities to further reduce this value are ongoing and planned to be continued throughout the lifetime of the plant.

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		Furthermore, during the discussions the PRT noted that the number of calculations and assessed scenarios for hydrogen accumulation seems adequate. However, due to the still relatively high leakage rate of the containment further investigation and corresponding measures for hydrogen mitigation may be necessary in rooms adjacent to the containment where sufficient oxygen could be available during the ex-vessel phase of the severe accident scenarios. **The PRT considers this recommendation closed** and encourages the continuous improvement of the containment tightness throughout the lifetime of the facility.
6.3.7 NAcP 4.3.2. 4.4.1.	Implement possibility to feed primary circuit from additional means (diesel pumps) ***Task:*** ***To provide with the possibility to make-up the primary circuit during beyond design basis initiating events.***	**Implementation 2019:** The required analyses justifying feasibility of the use of additional means to feed the primary circuit were performed, the terms of reference were developed and in November 2019 submitted to ANRA. For injection, mobile diesel pumps (not yet available) delivering borated water from the 800 m^3 borated coolant tank are planned. The technical specification for purchasing the necessary equipment was developed. **Implementation 2025:** In selecting diesel pumps, the licensee conducted calculations to assess the scenarios in which these pumps would be used. The licensee has also established the specific characteristics required for the pumps to effectively manage or mitigate accidents sequences. In November 2025, specialists from the ANPP participated in the site acceptance testing of the mobile pumps to be supplied as part of the EC assistance program. Since some of the pumps did not achieve the rated parameters, the pumps needed to be modified. Re-testing is planned for February-March 2026 and, depending on the test results, the delivery of the equipment can be expected in April - May 2026. After the delivery and installation of the pumps, relevant changes will be introduced in the SAMG/ EOP presumably in 2027. **Evaluation:** Mobile diesel pumps can offer additional means for various needs, such as the primary circuit make-up, SG feedwater supply, coolant delivery to the SFP, ESWS, etc. For this, the associated conditions must also be fulfilled (such as a sufficient time for the strategy implementation, reliable depressurization of the primary circuit, pre-installed fixed connecting points, adequate instructions and guidance available, etc.). In general, mobile means are considered key

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		contributors to safety enhancement of the plant. From the PRT evaluation of the current status, it is expected that the indicated schedule can be achieved. **The PRT considers this recommendation not completed**, in line with ANRA assessment.
6.3.8 NAcP 3.1.2. 4.4.2. EU 3.2.10	Perform analysis of SFP 1 and 2 cooldown and based on results implement additional measures. The aim of calculations is the time frame for fuel in case of loss of cooling and possibility of DGSL (Diesel Generator Load Sequencer) to ensure startup of 1NRB-1 and NZB (Spent Fuel Pool Filling Pump) pumps. **Task*:*** ***To determine the time of damage to spent nuclear fuel in the spent fuel pool upon loss of the spent fuel pool cooling systems.***	**Implementation 2019:** The analysis of time margins to uncover fuel in the SFP has been performed in the frame of development of the symptom based EOP for spent fuel pool. The calculations included conditions associated with complete core off-loading. In compliance with the "Analytical justification of the symptom-oriented EOP. Procedures of Units 1,2 SFPs" the flow rate 83.22 m3/h is sufficient to prevent coolant boiling in SFP in a recirculation mode. Each of the pumps 2NBO (Boron Suction Pump)-1,2; 2,1NZB; 1NBO-1 and NChK (Clean Condensate Pump) separately can provide sufficient flow rate. However, these pumps are not available in case of SBO. For compensation of coolant evaporation, 6 m3/h is sufficient. For next year, there are plans to use mobile diesel pumps (2 pumps to be purchased) with feeding from the circulation channel. Use of fire trucks is also planned. The connection points should be still installed. **Implementation 2025:** Temperature and level measurement data of both SFP are available in MCR. 1NRB-1 and NZB pumps could be powered from the DAR system. Connection points for SFP makeup from fire engines or other alternative water supply sources have been installed and regularly tested. Fire engines are available at the ANPP fire brigade (with an arrival time of approximately 3 to 5 minutes). After receiving mobile diesel pumps, additional means for SFP makeup will be made available. The selection of mobile pumps was done based on calculations on SFP water evaporation rates. **Evaluation:** The action as originally intended is considered as implemented. Means for preventing fuel damage in the SFP are available, and after installation of connection points may be considered adequate. Further enhancement of measurements of coolant parameters (level, temperature, chemistry, radioactivity) in the SFP needs to be considered, in accordance with IAEA Safety Standard (SSR-2/1, Rev. 1) updated after Fukushima Daiichi accident. Currently, the SFP water level measurement is only extended up to 800 mm below the top of the spent fuel assemblies in the upper SFP level. It means that once the water level reaches this point (and the top of the spent fuel assembly gets uncovered), no further information is available on the actual water level. The lack of SFP water level

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		information can affect operators' understanding of the situation and result in incorrect mitigation actions. The PRT has understood that this issue is currently under investigation, but it faces significant challenges due to the extreme radiation levels that the instrumentation must be able to reliably withstand under severe accident conditions. Nevertheless, based on the discussions the PRT concluded that possible solutions may have been already identified and the PRT encourages ANRA to require the timely implementation of this measure. **The PRT considers this recommendation closed**, in line with ANRA assessment
6.3.9 NAcP 4.4.3. PRT 7.2.3. 7.2.4. NR 7.2.4.(6)	Develop full set of the Emergency Operating Procedures (EOP). ***Task:*** ***To ensure accident management.***	This item is of **high priority.** **Implementation 2019:** Symptom-based EOP have been developed and validated during their development. Training was also provided as a part of the validation process. The EOP correspond to existing configuration of the plant. Review of the symptom-based EOP was already performed by the expert organization. Currently the implementation of the comments is ongoing, and it is a condition for regulatory approval. Consistency between the symptoms and the procedures was verified by the experts' review. Operator training and implementation of EOP will be carried out after review of EOP by the regulator. **Implementation 2025:** Drafting of the new version of the EOP has been completed. The tendering procedure for the update and review of the new version of the SAMG has been completed. Completion of the review is expected in the fourth quarter of 2026. **Evaluation:** Symptom-based EOP, when implemented in the plant operation, represent a key factor for prevention of severe accidents. The action, in accordance with the regulatory licencing conditions, was planned to be fully implemented by 2021. The symptom-based EOP have been developed and validated, but have not been approved by the ANRA, and the operators were not trained. During the site visit, the PRT was provided with the draft versions of the EOP and the SAMG. After a preliminary review, the PRT concluded that the structure and content of these documents seem to be symptom-oriented and in line with international good practices. As a possible amendment, the PRT suggested including the exact identification of SSCs in the description of the actions to minimize possible misunderstandings and incorrect actions from the operators. The existing descriptions of actions seem generic and does not include details on the

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		implementation, as for example the exact coding of connection points of mobile equipment or information on the fire engines to supply power and water to specific systems. The PRT, finally, concluded that several plant modifications are still ongoing. This should not affect the approval and issuance of the new symptom-based EOP. Further modifications to the EOP and SAMG can be done later, once all ongoing and planned modifications are finished. However, the timely validation, approval and then implementation of these documents would immediately result in enhancement of nuclear safety. **The PRT considers this recommendation not completed,** in line with ANRA assessment.
6.3.10 **6.2.13** NAcP 4.3.2. 4.4.1. 3.1.10. 3.3.1 3.3.6 3.3.11 3.3.13 3.4.1 PRT 6.2.4.(8) NR 7.2.4.(9)	Implement additional independent means for make-up of SGs 1-6 by diesel pumps. The action is common also for Topic 2. **Task*:*** ***To ensure the possibility of SG make-up in case of a failure of standard systems.***	**Evaluation:** The issue was considered to be in the scope of Topic 2 and therefore was moved to 6.2.13.
6.3.11 NAcP 4.4.1. PRT	Develop and implement measures to prevent window damage of EDG building in case of extreme wind load.	**Implementation 2019:** The sticky film covering the window glass of EDG building is understood as easy fixing aimed to prevent formation of glass pieces which could injure personnel attending the EDG area. It is also noted that the damage of the EDG building

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5.3.2.2 NR 4.2.1.	***Task:*** **T*o exclude DG failure in extreme weather conditions***	window glass is not likely because according to the wind rose in the ANPP area, the wind main direction is from the north-west to south-east, i.e., almost in parallel with the windows surface. **Evaluation:** **The PRT team considers this action closed**.
6.3.12 NAcP 4.3.9. 4.3.12. 4.4.1. PRT 7.2.1. NR 6.2.4. 6.2.5. EU 3.2.9	Implement measures to increase habitability of the Post accident monitoring system and Emergency Shutdown Panel.	This item is of **high priority.** **Implementation 2019:** Terms of reference for improvement of habitability of rooms of Post Accident Monitoring System (PAMS) and emergency shutdown panel (ESP) were developed in early 2019. This included habitability means providing normal environmental conditions (ventilation, filtering, heating, air conditioning) in the mentioned room as necessary for actions by operating personnel. Implementation includes installation of a new ventilation centre. Funding of the action (including hardware) is negotiated assuming EC funding. If the funding through EC fails, internal resources of the plant will be utilized. The issue is expected to be resolved as a condition for the next licence to be issued in 2021. **Implementation 2025:** The functional requirements to ESP/PAMS Heating, Ventilation and Air Conditioning (HVAC) system are reflected in the document "Technical specification for ensuring habitability of remote shutdown panel and post-emergency monitoring system". As a part of increasing the habitability of the ESP room, it is planned to install HVAC system that will ensure normal environmental conditions for operating personnel in case of deviation from normal operation and/or accidents. The system foresees a two-train configuration with HEPA and charcoal filters for removing radioactive particles and aerosols. Tendering procedure is launched, and the implementation is scheduled for 2027. **Evaluation:** The action is considered very important for accident management in case of non-habitability of the main control room. The PRT encourages ANRA to require the accelerated implementation of the action. During the walkdown, the PRT noted that the radiation conditions on the route from the MCR to the ESP room may be challenging during an accident and this may require further investigation. The operators can be protected from inhalation of radioactive materials in the air during transfer from the MCR to the ESP, due to the personal protective equipment available at the MCR, but not against external exposure and contamination of their clothes and equipment. The route itself is more or less freely

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		exposed to contamination released to the TH and the environment during accidents. Therefore, the operators may suffer high doses or be contaminated during the transfer, and this contamination could be carried into the ESP room and jeopardize the habitability in the process. Therefore, specific assessment on the relocation procedure between MCR and ESP room could be carried out to investigate if there is a need for further actions. **The PRT considers this recommendation not completed,** in line with ANRA assessment.
6.3.13 NR 2.1.2.1. 2.2.4.(2) EU 2.3. 3.3.1	Implement system for gas removal from reactor head.	This item is of **high priority.** **Implementation 2019:** The OKB Gidropress was given the terms of reference as necessary for development of a justification of the emergency gas removal system (EGRS). The justification of this measure is a condition for the regulatory permit for implementation of the subsequent activities. OKB also received a document with the expertise carried out by Scientific and Technical Centre regarding the ANPP suggestions on emergency gas removal from the reactor head. The issue is to decide by the plant in which plant states (design basis accidents or design extension conditions) the system is designated to function. **Implementation 2025:** Installation of the reactor emergency gas removal is included in the LTO-2 program, and work is currently underway to justify the installation and use of this system. The implementation is scheduled for 2026. **Evaluation:** Possibility for gas removal from the reactor vessel head is important as one of the means for depressurization of the reactor coolant systems under severe accident conditions and thus for prevention of the high-pressure core melt scenarios. It could also be used to direct the generated hydrogen onto the PARs and thus increase their hydrogen removal efficiency. The objectives of the design of the system should be clarified as soon as possible. Compared to the previously stated deadline the implementation is delayed and should be accelerated. During the site visit and the review of the available plans and equipment it was identified that the Licensee designed, installed pipelines and procured the necessary equipment for the installation of emergency gas removal, however it is currently unclear if this function would have significant benefits in transient sequences. The PRT concluded that it

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		should be investigated if this line and design modifications could be used to depressurize the primary circuit under severe accident conditions to ensure that high energy RPV failure can be avoided. **The PRT considers this recommendation not completed,** in line with ANRA assessment.
6.3.14 NAcP 4.3.1 PRT 8 EU 3.3.1	The incorporation of the WENRA reference levels related to severe accident management (SAM) into national legal frameworks and ensure their implementation in the installations as soon as possible.	**Implementation 2019:** It was discussed and clarified in the discussion that implementation of technical measures reflecting the substance of WENRA reference levels (molten corium stabilization, hydrogen mitigation in the containment, hydrogen monitoring system, reliable depressurization of the reactor coolant system and containment overpressure protection) are covered and discussed under other actions of the NAcP and thus not necessarily needs to be repeated separately. **Evaluation:** Updating of relevant national legislation is covered under the project of harmonization of national legislation with EU directives. **The PRT considers this recommendation closed.**
6.3.15 NAcP 4.3.14 EU 3.3.14	Rescue teams and adequate equipment to be quickly brought on site in order to provide support to local operators in case of a severe situation. ***Task:*** ***To provide assistance to ANPP in the management of beyond design basis accident***	**Implementation 2019:** The issue of availability of rescue teams and adequate equipment in due time has been adequately addressed at the national (National Plan for Protection of the Population during a Nuclear and/or Radiological Emergency at ANPP) as well as at international (agreement №08/87 of 04/19/2013 between ANPP, WANO and Rosenergoatom) level. **Evaluation:** It was verified, that duties of different governmental bodies (army, police, Ministry of Health, etc.) as well as local municipalities in case of emergency are covered in the National Plan for Protection. The activities are coordinated by the Ministry of Emergency Situations. In the plan the measures for protection of the public and transportation means for evacuation are also covered. The action can be considered as implemented. Improvements need to be considered to purchasing modern heavy vehicles for potential removal of debris and releasing access routes following extreme external event. **The PRT considers this recommendation closed.**
6.3.16 NAcP	Development of Level 2 PSA as a tool for the identification of plant	**Implementation 2019:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
4.3.15. PRT 7.1.3. EU 3.3.15	vulnerabilities, quantification of potential releases, determination of candidate high-level actions and their effects and prioritizing the order of proposed safety improvements. ***Task:*** ***To develop PSA Level 2.***	PSA Level 2 has been already developed as required but after evaluation considered by ANPP specialists as inadequate due to weaknesses in the plant model and in analyses of severe accidents. **Implementation 2025:** The action has been completed. **Evaluation:** The level 2 PSA of the ANPP has been finished. The results are utilized in various safety improvements and in an iterative manner with the development of the EOPs and SAMGs. The PRT has concluded that no further action is required and encourages ANRA and the licensee to continue this currently applied practice. **The PRT considers this recommendation closed.**

7. Emergency Preparedness

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.5.1 NAcP 5.2.1.	Revision of off-site exercise programs to increase the scope and reflect NPP plus external infrastructure simultaneous problems and blending mobile resources into planning and drill programs. ***Task:*** ***Practical development of interconnected actions of external organizations in the event of an accident at ANPP.***	**Implementation 2019:** The off-site emergency exercise programmes have been developed, including coordination between plant and external human and technical resources. For development of external drill programmes, the calculations of severe accidents are used, which were prepared in the process of the PSA Level 2 elaboration, as well as analyses of severe accident consequences presented in the Safety Analysis Report (SAR). The programmes drills take into account the consequences of severe accidents. **Evaluation:** The action can be considered as implemented. The plant should be encouraged to continue the exercises as established, utilizing any updated analytical results. **The PRT considers this recommendation closed,** in line with ANRA assessment.

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
6.5.2 NAcP 5.2.1.	Performing of longer-term exercises to reflect the challenges of extreme events **Task*:*** ***Practical development of interconnected actions of external organizations in the event of an accident at ANPP.***	**Implementation 2019:** Emergency exercises, including long-term exercises are organized regularly. These exercises reflect the challenges of extreme external events, in particular earthquakes or external flooding. Similarly, harsh radiological consequences of severe accidents are also addressed in the exercises. **Evaluation:** The actions can be considered as implemented. The plant should be encouraged to continue the implementation as established. **The PRT considers this recommendation closed.**
6.5.3 NAcP 5.2.2.	Deployment of early warning system with 20 detectors around ANPP and JRODOS software.	**Implementation 2019:** Hardware (server) of the JRODOS system was already delivered to ANRA, now being in the stage of installation. 32 stations with the detectors will be delivered early 2020. At present, the design documents are reviewed and preparation for installation of stations continues. **Implementation 2025:** The JRODOS system with 32 monitoring stations has already been installed and it is in operation. A manual for the use of the JRODOS system has also been developed. It constitutes one of the ANRA's Emergency Centre's instructions of — EP-RP-06. A group of users of the system has been trained. **Evaluation:** The item has been completed; the system is installed and used as intended. The PRT concluded that no further action is needed. Nevertheless, the PRT would like to highlight that special attention should be paid to ensure the continuous availability and adequate number of experts trained in the use and maintenance of the system. **The PRT considers this recommendation closed.**
6.5.4 NAcP 5.2.3	Establishment of new back-up Emergency Response Centres for ANRA with back-up power, communication lines.	**Implementation 2019:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		Decision about proper location of the centre has been made (location in the main building of Armatom company). JRODOS, as well as NPP safety parameters on-line display will be available there. Communication lines are established. The parameters are already available in the main ANRA emergency centre. **Implementation 2025:** A governmental regulatory authority has allocated an area for a new ANRA office building to also include a reference radiochemical laboratory and Emergency Response Centre (ERC). Implementation is scheduled for 2027. **Evaluation:** The implementation is progressing, and a full implementation is expected in 2027. According to the discussions between the PRT and ANRA a "bunker" type of ERC is planned for ANRA, within a 35 km range from the NPP. Specific construction standards apply for the building, (e.g.: radiation level should be limited to 1/500 of the external radiation level). Back-up power sources will be installed to ensure continuous operation. Information to the ERC will be provided via direct communication cables from the ANPP further increasing its reliability. The PRT considers the solution adequate and encourages ANRA to pursue it implementation. **The PRT considers this recommendation not completed**, in line with ANRA assessment.
6.5.5 NAcP 5.2.3 PRT 7.2.1 NR 6.1.3.3(b)	Establishment of new back-up Emergency Response Centres for ANPP, with back-up power, environmental radiological filtering, etc. **Task*:*** ***Management of severe BDBA in case of loss of crisis centre at ANPP site.***	**Implementation 2019:** Establishment of the ERC was included in the long-term goals and objectives of the NPP. The technical requirements to the ANPP Emergency Crisis Centre have been developed. The ANPP management plans to establish the Emergency Crisis Centre by the end of 2023. **Implementation 2025:** Design of the new ANPP back-up ERC building and design of equipment installation have been completed. The construction period will take approximately 18 months after which the installation of equipment and furniture and development of documentation will take place. **Evaluation:**

Action (Source[2]:)	Text of action in NAcP (Part III)	Implementation and Evaluation of action
		According to the information provided by the plant, the implementation of these measures is significantly delayed. According to the discussions between the PRT and representatives of the ANPP, construction of the back-up ERC should be completed in 2026, and the commissioning of the facility will be finished by April 2027. According to the current plans, continuous data exchange capability is planned to be maintained between the ANPP, the Emergency Crisis Centre of ANPP, the Emergency Response Centre of ANRA, the National Crisis Centre of the RA Ministry of Internal Affairs Rescue Service, and the WANO-MC Regional Crisis Centre. **The PRT considers this recommendation not completed**, in line with ANRA assessment.
6.5.6 NAcP 5.2.4	Reviewing and updating national, regional, provincial, municipal and local emergency plans and conducting exercises to encourage greater coordination among the different organizations.	**Implementation 2019:** The Ministry of Emergency Situations was contacted to take over the issue. Complete answer from the Ministry to all listed items is still pending. **Implementation 2025:** Exercises in ANPP and ANPP-ANRA, ANPP-ANRA-rescue service, as well as national level exercises are periodically carried out. **Evaluation:** Implementation of this action is beyond the control of ANPP as well as ANRA. **The PRT considers this recommendation closed.**

• ANNEX LIST OF WALKDOWN SITES

Control zone

- Reactor hall, and spent fuel pool
- Boron compartments
- Emergency core cooling system
- Sprinkler system on reactor building

Emergency diesel building

- Emergency upgraded doors
- GNOM-10 pumps
- Basement
- Emergency diesel generator fuel and oil tanks
- Venting system of battery room
- Emergency diesel generators
- Diesel generator fuel storage, emergency diesel tank and transfer pump

Main steam isolation valves (seismically reinforced)

Turbine building

- Reinforced water tanks
- Simulator
- Turbine hall
- Emergencies accumulator batteries room
- Inverters room
- Breaker room
- Connection points for emergency diesel generators
- Ventilation room (for main control)
- Main control room
- Remote shut down panel
- Make up pumps
- Mobile diesel generators (6 and 0.4 kV)

• LIST OF ABBREVIATIONS

AC	Alternating Current
ANPP	Armenian Nuclear Power Plant
ANRA	Armenian Nuclear Regulatory Authority
BDB	Beyond Design Basis
BDBA	Beyond Design Basis Accident
BZOV	Demineralised Water Tank
CDF	Core Damage Frequency
DAR	Diesel Auxiliary Reserve (Additional Emergency Cooling System)
DB	Design Basis
DBA	Design Basis Accident
DBE	Design Basis Earthquake
DC	Direct Current
DG	Diesel Generator
DGS	Diesel Generator Station
DGSL	Diesel Generator Load Sequencer
DN	Diameter Nominal
EC	European Commission
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EETU	Rack of Electrical Devices
EGRS	Emergency Gas Removal System
ENSREG	European Nuclear Safety Regulators Group
EOP	Emergency Operating Procedures
ERC	Emergency Response Centre
ESP	Emergency Shutdown Panel
ESWS	Essential Service Water System
EU	European Union
FRS	Floor Response Spectra
g	standard value of the gravitational acceleration (9,81 m/s^2)
HCLPF	High Confidence of Low Probability of Failure
HMS	Hydrogen Monitoring System
HVAC	Heating, Ventilation, and Air Conditioning
I&C	Instrumentation and Control
IAEA	International Atomic Energy Agency
IVMR	In-Vessel Melt Retention
LOCA	Loss of Coolant Accident
LUHS	Loss of Ultimate Heat Sink
LTO	Long term operation
MCP	Main Circulation Pump (also RCP)
MCR	Main Control Room
MDBA	Maximum Design Basis Accident
NAcP	National Action Plan
NBO	Boron Suction Pump
NCHK	Clean Condensate Pump

NPP	Nuclear Power Plant
NR	(Stress Test) National Report
NRSC	Nuclear and Radiation Safety Centre
NZB	Spent Fuel Pool Filling Pump
ODG	Reversible Motor Generator
OSA	On-site Assistance
PAMS	Post Accident Monitoring System
PAR	Passive Autocatalytic recombiners
PGA	Peak Ground Acceleration
PGA_H	Horizontal Peak Ground Acceleration
POSRV	Pilot Operated Safety Relief Valve
PR	Peer Review
PRT	Peer Review Team
PSA	Probabilistic Safety Assessment (also known as PRA)
PSHA	Probabilistic Seismic Hazard Analysis
PWR	Pressurised Water Reactor
RCP	Reactor Circulation Pump (also MCP)
RCS	Reactor Coolant System
RDGS	Redundant Diesel Generator Station
RLE	Review Level Earthquake
RPV	Reactor Pressure Vessel
SAM	Serious Accident Management
SAMG	Severe Accident Management Guidelines
SAR	Safety Analysis Report
SBO	Station Blackout
SFP	Spent Fuel Pool
SG	Steam Generator
SG FWDP	Steam Generator Feed Water Diesel Driven Pump
SSC	Structures, Systems and Components
SSEL	Safe Shutdown Equipment List
SSG	Safety Standard Guidelines
TH	Turbine Hall
UPS	Uninterruptible Power Supply
VVER	Water Water Energetic Reactor
WANO	World Association of Nuclear Operators
WANO-MC	WANO Moscow centre
WENRA	Western European Nuclear Regulators Association