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Nuclear Safety, Security and Safeguards in Ukraine

Report by the Director General

Summary

- The Board of Governors, in its resolutions GOV/2022/17, GOV/2022/58 and GOV/2022/71, requested the Director General to continue to closely monitor the situation regarding nuclear safety, security and safeguards in Ukraine and regularly report formally to the Board on these matters. This report provides a summary of the situation in Ukraine regarding nuclear safety, security and safeguards. It covers the period from 1 September to 14 November 2023 and is based on information made available to the Agency, and verified by the Agency, during this period. This report covers the progress made by the Agency in responding to Ukraine's requests to provide technical support and assistance in re-establishing, as appropriate, a sound nuclear safety and security regime at its nuclear facilities and in activities involving radioactive sources.
- This report also summarizes relevant aspects of the implementation of safeguards in Ukraine under the Agreement Between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons and the Protocol Additional thereto under the current circumstances.

Recommended Action

- It is recommended that the Board of Governors take note of this report.

Nuclear Safety, Security and Safeguards in Ukraine

Report by the Director General

A. Introduction

1. At the Board of Governors meeting in September 2023, the Director General provided the Board of Governors with a detailed report entitled *Nuclear Safety, Security and Safeguards in Ukraine* (document GOV/2023/44), covering the period from 31 May to 31 August 2023.

2. On 12 October 2022, the United Nations (UN) General Assembly adopted resolution A/RES/ES-11/4, declaring that, inter alia, the “attempted illegal annexation” of four regions of Ukraine on 4 October 2022 had no validity under international law.¹ The Agency complies with this resolution.

3. On 17 November 2022, the Board of Governors adopted resolution GOV/2022/71², on the safety, security and safeguards implications of the situation in Ukraine, in which it “[e]xpresse[d] grave concern that the Russian Federation ha[d] not heeded the calls of the Board to immediately cease all actions against and at nuclear facilities in Ukraine” and “request[ed] that the Russian Federation do so immediately”. In addition, it “[d]eplore[d] and d[id] not recognize, consistent with resolution A/RES/ES-11/4 adopted by the UN General Assembly on 12 October 2022, the Russian Federation’s attempts to take ownership of Ukraine’s Zaporizhzhya Nuclear Power Plant [(ZNPP)] and its attempted illegal annexation of the Ukrainian territory on which the plant is located”.³

4. On 28 September 2023, the General Conference, at its 67th regular session, adopted resolution GC(67)/RES/16⁴ on the nuclear safety, security and safeguards in Ukraine, in which it “[c]all[ed] for the urgent withdrawal of all unauthorized military and other unauthorized personnel from Ukraine’s ZNPP and for the plant to be immediately returned to the full control of the competent Ukrainian authorities consistent with the existing licence issued by the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) to ensure its safe and secure operation and in order for the Agency to conduct safe, efficient, and effective safeguards implementation, in accordance with Ukraine’s comprehensive safeguards agreement and additional protocol”. In addition, it “[f]ully support[ed] the Agency’s continued provision, upon request, of technical support and assistance to Ukraine to help ensure the safe and secure operation of nuclear facilities and activities involving radioactive sources, including the

¹ United Nations General Assembly resolution A/RES/ES-11/4, adopted on 12 October 2022: <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N22/630/66/PDF/N2263066.pdf?OpenElement>, para. 3.

² IAEA Board of Governors resolution GOV/2022/71, adopted on 17 November 2022, para. 1.

³ IAEA Board of Governors resolution GOV/2022/71, adopted on 17 November 2022, para. 2.

⁴ IAEA General Conference resolution GC(67)/RES/16, adopted on 28 September 2023, para. 2.

continued physical presence of IAEA technical experts at the Chernobyl, Rivne, Khmelnytsky, and South Ukraine Nuclear Power Plants” and “[e]ncourage[d] Member States to offer political, financial, and in-kind support to the IAEA comprehensive programme of technical support and assistance to Ukraine, including through the provision of necessary nuclear safety and security equipment as requested by Ukraine”.⁵

5. During the reporting period⁶, from 1 September to 14 November 2023, Agency staff continued to monitor and assess the situation at each nuclear site against the seven indispensable pillars (‘Seven Pillars’) for ensuring nuclear safety and security during an armed conflict that were first outlined by the Director General at the meeting of the Board of Governors held on 2 March 2022 and described in document GOV/2022/52⁷. In addition, the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ) has continued to monitor and report on observance of the five concrete principles for protecting the ZNPP (‘five concrete principles’) established by the Director General at the meeting of the United Nations Security Council (UNSC) on 30 May 2023 and described in document GOV/2023/30⁸.

6. ISAMZ continued to observe the situation at the ZNPP and to gather relevant information needed to assess the nuclear safety and security situation. Based on these efforts, the Agency’s assessment is that the overall situation with respect to nuclear safety and security at the ZNPP continues to be difficult and challenging, with six out of the Seven Pillars compromised either fully or partially.

7. The Agency’s assessment, for most of the reporting period, has been affected by limitations in the information provided to ISAMZ by the ZNPP and delays in the provision of information, as well as a reduction in the access granted to various areas at the site compared to the situation at the time of the establishment of ISAMZ. However, at the end of the reporting period, there has been a positive development in this regard, and the Agency strongly encourages the ZNPP to ensure that timely access and information sharing take place regularly.

8. Issues concerning staffing at the site, the conduct of regular maintenance activities, and special measures taken for securing stable cooling water supply, pose continued significant risks to the overall nuclear safety and security of the ZNPP.

9. During the reporting period, the Agency continued to monitor observance of the five concrete principles at the ZNPP. During walkdowns, there were no indications that the five concrete principles were not being observed. However, ISAMZ has still not been given timely and unrestricted access to all areas of the ZNPP of significance for nuclear safety and security, which limits the Agency’s ability to fully confirm that all five concrete principles are being observed at all times.

10. The Agency remained committed to providing any support it could to help ensure the safe and secure operation of nuclear facilities and activities involving radioactive sources in Ukraine. This includes undertaking impartial assessments of the situation pertaining to nuclear safety, security and safeguards; providing technical expertise and advice, including assistance for ensuring medical support and care for the Ukrainian operating staff, as well as for ensuring radiation safety and nuclear security of radioactive sources; delivering nuclear safety- and security-related equipment; and providing relevant information updates to the public and the international community.

⁵ IAEA General Conference resolution GC(67)/RES/16, adopted on 28 September 2023, paras 3 and 4.

⁶ Following the reporting period of GOV/2023/44.

⁷ Report by the Director General to the Board of Governors, document GOV/2022/52, issued on 9 September 2022, para. 8.

⁸ Report by the Director General to the Board of Governors, document GOV/2023/30, issued on 31 May 2023, para. 23.

11. The Agency maintained its continued presence, with Agency staff at all nuclear sites in Ukraine, and used the information received from each site to inform the public and the international community about the nuclear safety and security situation at all nuclear sites in Ukraine. All rotations of Agency staff at all nuclear sites were conducted as planned and without delays during the reporting period.

12. This report has been produced in response to resolution GOV/2022/17⁹, in which the Board of Governors requested the Director General and the Secretariat to “continue to closely monitor the situation [in Ukraine], with a special focus on the safety and security of Ukraine’s nuclear facilities and report to the Board on these elements, as required”; to resolution GOV/2022/58¹⁰, in which the Board of Governors requested the Director General to “continue to closely monitor the situation and report formally to the Board on these matters as long as required”; and to resolution GOV/2022/71¹¹, in which the Board of Governors requested the Director General to “continue to closely monitor the situation [in Ukraine] and regularly report formally to the Board on these matters as long as required.”

13. This report provides a summary of the situation in Ukraine regarding nuclear safety, security and safeguards from 1 September to 14 November 2023. It also covers progress made by the Agency in providing technical support and assistance in nuclear safety and security to Ukraine. Finally, this report summarizes relevant aspects of the implementation of safeguards in Ukraine under the Agreement Between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons and the Protocol Additional thereto under the current circumstances.

B. Nuclear Safety and Security in Ukraine

B.1. Agency Missions to Ukraine

B.1.1. IAEA Support and Assistance Missions to the Zaporizhzhya, Rivne, South Ukraine and Khmelnytsky Nuclear Power Plants (NPPs), and to the Chornobyl NPP Site

14. The continued presence of Agency staff at the ZNPP (ISAMZ) was established on 1 September 2022 and marked its first anniversary during the reporting period. The IAEA Support and Assistance Missions to the Rivne NPP (RNPP) (ISAMIR), to the South Ukraine NPP (SUNPP) (ISAMISU), to the Khmelnytsky NPP (KhNPP) (ISAMIK) and to the Chornobyl NPP (ChNPP) site (ISAMICH) were deployed between 16 and 23 January 2023. With the establishment of such missions at the 5 nuclear sites in Ukraine and the reinforcement of the ISAMZ team with additional team members, 5 teams of Agency staff, comprising up to 13 staff members in total, have been continuously present in Ukraine without any interruption.

“The presence of the IAEA was essential in helping to stabilize the situation and keeping the world informed about Zaporizhzhya NPP. I am particularly proud of the courageous staff who carry out this important work, as well as those at the other Ukrainian NPPs and the Chornobyl site.”

Director General Rafael Mariano Grossi, 1 September 2023

⁹ IAEA Board of Governors resolution GOV/2022/17, adopted on 3 March 2022, para. 4.

¹⁰ IAEA Board of Governors resolution GOV/2022/58, adopted on 15 September 2022, para. 7.

¹¹ IAEA Board of Governors resolution GOV/2022/71, adopted on 17 November 2022, para. 8.

15. The purpose of the continued presence of Agency staff at all nuclear sites in Ukraine is to help decrease the risk of a nuclear accident. During the reporting period, Agency staff in Ukraine continued with regular activities at each site, which include the conduct of meetings with plant management, field observations of key plant areas, and discussions with technical counterparts to broaden the understanding of the nuclear safety and security situation at the sites.

16. As of 14 November 2023, a total of 75 missions comprising 168 Agency staff members were deployed as part of the continued presence at all 5 nuclear sites in Ukraine, totalling 4652 person-days in Ukraine. The Agency staff at all nuclear sites in Ukraine continued to experience air-raid alarms, some of which required them to take shelter, frequently.

17. Rotations of Agency staff at the RNPP, the SUNPP, the KhNPP and the ChNPP site as well as at the ZNPP that took place during the reporting period were conducted as planned. The new arrangements reported in document GOV/2023/44¹² helped to support safe and secure rotations at the ZNPP with full logistical independence and without delays. The full cooperation of Ukrainian and Russian security officials is indispensable to ensure safe, secure and timely rotations of Agency staff.



*ISAMIR team during a walkdown at the RNPP site with the staff of the RNPP on 15 September 2023.
(Photo: Energoatom)*

18. The Agency continued its rigorous preparations for the deployment of missions to Ukraine. As part of these preparations, more than 120 Agency staff travelling to Ukraine underwent the mandatory training in the Safe and Secure Approaches in Field Environments for Surge Deployment of the United Nations Department of Safety and Security.

19. Maintaining the continued presence of Agency staff at all five nuclear sites in Ukraine continues to be a major undertaking for the Agency and to have a significant impact on the Agency's resources.

¹² Report by the Director General to the Board of Governors, document GOV/2023/44, issued 5 September 2023, para. 14.

The Agency has strengthened its organization and mobilized additional resources, in particular human resources, but there are still remaining needs to sustain the continued presence at all five nuclear sites and to deploy other expert missions to Ukraine, as reported in document GOV/2023/44¹³.

20. The main findings and observations from the IAEA Support and Assistance Missions are reflected in Section B.2.

B.1.2. Medical and Coordination Assistance Mission

21. An Agency team comprising staff of the Vienna International Centre (VIC) Medical Service, the Department of Nuclear Safety and Security, and the Department of Safeguards conducted a medical and coordination assistance mission to Ukraine from 6 to 10 November 2023. The purpose of this mission was to assess capabilities for providing medical support and care, including health screening and health surveillance and mental health support for operating personnel at the ChNPP site; to conduct meetings with national authorities on coordinating the provision of technical support and assistance to Ukraine; and to conduct meetings with other international organizations operating in Ukraine to ensure efficient coordination in the delivery of medical assistance.

22. During the mission, Agency staff met with the senior management and staff of the ChNPP site and the State Agency of Ukraine on Exclusion Zone Management, the staff of the ChNPP medical service and psychologists who provide mental health support, as well as the management and the staff of the Slavutych hospital. Moreover, Agency staff met with the management and representatives of the SNRIU, the Ministry of Health, the National Nuclear Energy Generating Company “Energoatom” (Energoatom) and other national authorities, as well as representatives of the European Bank for Reconstruction and Development and the World Health Organization regional office.



Agency staff meeting representatives of the SNRIU and Energoatom on 7 November. (Photo: SNRIU)

¹³ Report by the Director General to the Board of Governors, document GOV/2023/44, issued 5 September 2023, para. 16.

23. Agency staff assessed the capabilities available for provision of medical care and mental health support for the operating staff at the ChNPP site, and discussed possibilities for cooperation and improved coordination in the delivery of technical support and assistance to different organizations in Ukraine according to their priority needs. The Agency team also took the opportunity to explore possible ways to engage with different authorities and utilize different mechanisms for delivering assistance to Ukraine with regard to different components of the assistance programme.

24. The Agency team noted that progress had been made in Ukraine in recent months in various areas impacted by the armed conflict owing to the support provided through the Agency as well as other bilateral or multilateral arrangements and the national authorities. However, the Agency team noted that the needs in various areas of nuclear and radiation safety and nuclear security, as well as of medical assistance, are still considerable and must be addressed based on their urgency. A number of issues were identified for further exploration to shape future cooperation and collaboration to support Ukraine in the most efficient way according to its needs.

25. The findings from this mission and observations are further detailed in Sections B.2.3 and B.3.3.

B.2. Overview of the Situation at Nuclear Facilities in Ukraine

26. The Agency has continued to monitor and assess the nuclear safety and security situation at Ukraine's nuclear facilities and activities involving radioactive sources against the Seven Pillars.¹⁴ The Seven Pillars specifically apply to unprecedented circumstances, in which military activity is near or on the site of a nuclear facility, in particular of an operational NPP, and derive from the Agency's safety standards and nuclear security guidance publications. As such, they do not present additional principles, requirements or recommendations for nuclear safety and security.

27. In addition, the Agency continued to monitor and assess the observance of the five concrete principles that aim to help ensure the integrity of, and the nuclear safety and security at, the ZNPP in order to prevent a nuclear accident.

28. During the reporting period, the Agency continued reviewing challenges in the application of the Agency's safety standards and nuclear security guidance in armed conflicts. The Agency also continued preparing an IAEA Technical Document that will analyse the issues and challenges faced at nuclear facilities in terms of practical application of Agency safety standards and nuclear security guidance during armed conflicts, using the knowledge and experience collected in Ukraine since February 2022, and how these issues and challenges might be addressed by all interested parties, including the Agency.

29. An overview of the current nuclear safety and security situation at Ukraine's nuclear facilities and activities involving radioactive sources against the Seven Pillars as well as an overview of the observations made at the ZNPP against the five concrete principles are presented below. A chronology of events in Ukraine during the reporting period is provided in the Annex.

B.2.1. Zaporizhzhya NPP

30. ISAMZ continued with its efforts to observe the situation and to gather relevant information needed to assess the nuclear safety and security at the ZNPP. Based on these efforts, the Agency's assessment is that the overall situation with respect to nuclear safety and security at the ZNPP continues to be difficult and challenging, with six out of the Seven Pillars compromised either fully or partially.

31. The Agency's assessment, for most of the reporting period, has been affected by limitations in the information provided to ISAMZ by the ZNPP and delays in the provision of information, as well as a

¹⁴ Report by the Director General to the Board of Governors, document GOV/2022/52, issued on 9 September 2022, para. 8.

reduction in the access granted to various areas at the site compared to the situation at the time of the establishment of ISAMZ. However, at the end of the reporting period, ISAMZ was provided with unrestricted access to all main control rooms sequentially and had the opportunity to converse freely with the operating staff present. This is a positive development, and the Agency strongly encourages the ZNPP to ensure that such timely access and information sharing take place regularly.

32. At the beginning of the reporting period, Unit 6 was the only unit in hot shutdown. On 28 September, the ZNPP began transitioning Unit 4 to hot shutdown, a state that was reached on 30 September, when the transfer of Unit 6 to cold shutdown commenced. Unit 6 achieved cold shutdown on 3 October.

33. Ahead of the upcoming winter season, the ZNPP commenced the transfer of Unit 5 to hot shutdown on 13 October after carrying out safety maintenance and testing. Unit 5 reached hot shutdown on 16 October and, together with Unit 4, remained in hot shutdown for the remainder of the reporting period.

34. ISAMZ was informed that a decision regarding how long Unit 5 would remain in hot shutdown was to be made once Enerhodar's heating systems had been stabilized following the start of the heating season on 15 October and that there were no plans to transfer additional units to hot shutdown.

“The IAEA has repeatedly been calling for an alternative steam solution so that all six reactors can be put in cold shutdown, as instructed by Ukraine’s regulator. I hope that the plant will implement this change as soon as possible.”

Director General Rafael Mariano Grossi, 29 September 2023

35. In light of these events and the limited supplies of cooling water at the site as a consequence of the destruction of the Kakhovka dam, the Agency continued to strongly encourage the ZNPP to find an alternative, external source of steam generation to cover its needs and allow for all the reactors to be maintained in cold shutdown. This would also ensure compliance with a regulatory order issued on 8 June by the SNRIU that limits the operation of all six units of the ZNPP to cold shutdown.

36. ISAMZ was informed that the procurement of an external steam generator that would enable all units to be kept in cold shutdown had been initiated, but its installation was not expected to be completed until the first part of 2024.

37. ISAMZ was also informed that the nine mobile diesel boilers with varying capacity of between 1 megawatt and 6.5 megawatts — installed at the ZNPP and used for district heating during the previous cold season — were put into service again during this reporting period. The number of mobile diesel boilers in operation during the reporting period varied between zero and nine, depending on the ambient temperature and the heating needs of the ZNPP and the city of Enerhodar.

Physical integrity

38. During the reporting period, there was no impact on the physical integrity of the six reactor units or of the on-site storage facilities housing spent fuel, fresh fuel, and low, medium and high level radioactive waste despite the ongoing military activity, including frequent explosions, identified by ISAMZ, that reportedly took place at some distance from the plant, and reported drone attacks in the nearby city of Enerhodar.

Nuclear safety and security systems and equipment

39. By 23 September, an additional 7 wells had been drilled near the sprinkler ponds of the ZNPP, bringing the total number of wells intended to supply cooling water to the site to 11. The flow rates of each well were reported to be between 20 m³/h and 24 m³/h, supplying altogether approximately 250 m³

of water per hour, which the site had estimated to be sufficient to maintain the required water level at all 12 sprinkler cooling ponds for cooling the 6 shutdown reactor units.



Drilling of additional wells at the ZNPP site. (Photo: Rosatom)

40. On 27 September, ISAMZ observed that the water level in three of the sprinkler ponds had dropped since the previous visit a few days earlier. ISAMZ was subsequently informed that the drop in the water levels had occurred because the pump from the drainage system to the sprinkler ponds had stopped, while the blowdown pump of the essential service water system was operating and had not been switched off immediately, resulting in the water reduction in the sprinkler ponds. The ISAMZ team continued to visit the sprinkler ponds during the remainder of the reporting period and confirmed that, following the replenishment of the water in the three sprinkler ponds, the water levels in all sprinkler ponds remained within operational limits.

41. The ISAMZ team visited the cooling pond and the waterworks facilities at the ZNPP during the reporting period and — based on its observations — confirmed that the integrity of the isolation gate was intact. The depth of the water in the cooling pond decreased steadily by approximately 1 cm per day until around mid-October, owing to a combination of evaporation and use of the water by the ZNPP. Thereafter, the rate of the decrease in the depth of the water in the ZNPP cooling pond slowed to approximately 1 cm every few days. At the end of the reporting period, the depth of the water in the ZNPP cooling pond was 15.67 m, which was estimated to be sufficient to provide cooling to the six shutdown reactors for many months, even in the absence of the groundwater wells.

42. Following the water leak detection in one of the Unit 4 steam generators and prior to Unit 4's transfer to hot shutdown, the ZNPP identified that the cause of the water leak was a hairline crack in the weld of the steam generator primary header vent pipe, performed welding on the pipe, tested the pressure of the steam generator on the primary and secondary sides, and performed maintenance on the unit's safety trains, including cleaning of the heat exchangers of the safety systems. Maintenance was also performed on the main transformer of Unit 4. Some of these maintenance activities were conducted also prior to this reporting period but were either inadequate or incomplete and warranted additional maintenance being carried out during the reporting period.

43. Prior to transferring Unit 5 to hot shutdown, maintenance was also completed on the unit's safety system trains 2 and 3. Following the transfer of Unit 6 to cold shutdown on 3 October, the ZNPP completed maintenance of the unit's safety system trains 2 and 3, completed maintenance of the unit's transformer, completed maintenance of two minor leaks identified in steam generators 1 and 3 and commenced maintenance of the unit's safety system train 1.

44. Despite the fact that maintenance was performed on the safety systems of Units 4, 5 and 6 during the reporting period, there is no comprehensive systematic maintenance programme at present and the overall level of maintenance being performed at the ZNPP is significantly lower compared to the normal level prior to the start of the armed conflict. During a meeting with the Maintenance Planning Department at the ZNPP in September, ISAMZ was informed that the only scheduled maintenance activities were those related to the safety systems and maintenance plans derived from issues identified during routine checks. Reduced maintenance of safety systems might result in a higher failure rate of other systems and components in operation irrespective of the shutdown state and, thus, might affect the safe operation of the plant.

45. On 13 October, the ZNPP informed ISAMZ that the site was preparing to close the reactor vessel of Unit 3. The reactor head stud tensioning was completed on 31 October, with three instrument penetrations being left open for hydraulic testing. This vessel had been kept open to serve as a borated water reservoir, as reported in document GOV/2023/30. The Agency supported this development as the Agency assessed that it contributed to improved safety at the site. On 3 November, the ZNPP informed ISAMZ that Unit 3 would be kept in cold shutdown following the completion of pressure tests on the primary and secondary cooling circuits.

46. ISAMZ regularly visited the turbine halls during the reporting period and periodically observed the presence of vehicles belonging to Russian Federation troops. Furthermore, ISAMZ was, on some occasions, denied access to parts of the turbine halls, leaving it unable to observe whether there was any equipment present or activities being conducted that could have a potential impact on structures, systems and components essential for nuclear safety and security.

Operating staff

47. The overall staffing numbers at the ZNPP have reduced significantly since the start of the conflict, when the total number of staff was approximately 11 500. During the reporting period, the total number of staff each day, as reported to ISAMZ, increased from around 1800 to approximately 2280, the highest level of staff reported since January 2023.

48. However, the reduced number of experienced Ukrainian staff at the ZNPP has affected the staffing across the plant, most importantly the main control rooms. On 15 September, ISAMZ was informed that, following the delivery of training and 'licensing' of new operators (reported in document GOV/2023/30¹⁵), the number of main control room operators amounted to 120, with approximately 30% of the operators holding valid licences under the Ukrainian requirements and the remaining 70% being newly recruited staff from operating NPPs in the Russian Federation with licences under the Russian requirements issued by the Federal Environmental, Industrial and Nuclear Supervision Service (Rostekhnadzor) or in the process of acquiring such license.¹⁶ ISAMZ was informed that each shift was covered by no less than two 'licenced' main control room operators.

¹⁵ Report by the Director General to the Board of Governors, document GOV/2023/30, issued on 31 May 2023, para. 43.

¹⁶ See para. 2 above.

49. During the reporting period, ISAMZ conducted walkdowns of the main control rooms of Units 1 to 6 and met with additional ZNPP staff at the site. Through these activities, ISAMZ aimed to understand and clarify the status of staffing, especially in the main control rooms.

50. ISAMZ observations from these activities include:

- On several occasions, both newly recruited main control room operators and some other staff at the ZNPP appeared unfamiliar with essential technical information and procedures;
- Some staff are required to perform multiple functions at the ZNPP, even those of critical importance for nuclear safety; and
- Staff reportedly were continuing to be under strong psychological stress of various kinds, including whether to sign contracts with the JSC “Operating Organization of the ZNPP” or not to do so.

51. For most of the reporting period, ISAMZ was requested that any questions related to staffing or the training of staff, especially the main control room operators, should only be addressed to the management of the Joint Stock Company (JSC) “Operating Organization of the ZNPP”. However, at the end of the reporting period, ISAMZ requested and received timely approval to perform a walkdown of all main control rooms one after the other. The walkdown was conducted on 14 November and provided ISAMZ with the opportunity to, inter alia, observe and assess the staffing situation at all main control rooms at the same time and converse with the operating staff present. ISAMZ will continue to request such visits with the aim of being able to independently assess the status of staffing in the main control rooms.

52. ISAMZ was informed that the number of maintenance staff had increased to 804 due to the recruitment of approximately 250 new staff who are undergoing training. This number of maintenance staff represents approximately only 40% of the number of maintenance staff at the ZNPP prior to the armed conflict, a situation that is not sustainable, with the potential to impact the operation of safety systems.

53. Throughout the reporting period, ISAMZ was also informed about three separate occasions when there were drone strikes in or near the city of Enerhodar, where most of the ZNPP staff live, albeit without casualties but with some damage to buildings. In particular, on 7 September, three drone attacks were reportedly carried out on Enerhodar. Furthermore, on 2 November, there were reports of drone attacks in the city of Enerhodar. Such military activity adds to the stress and challenging circumstances that the ZNPP staff face regularly, also potentially compromising the five concrete principles.

54. These findings and observations indicate the seriousness of the staffing situation at the ZNPP as well as the challenge of replacing the loss of experienced and knowledgeable operating staff. This situation is not sustainable and may have implications for nuclear safety and security.

Off-site power supply

55. The supply of off-site power to the ZNPP did not change during the reporting period. One of four 750 kV power lines — the Dniprovska line — and one of six 330 kV power lines — the Ferosplavna 1 line — continued to provide off-site power to the ZNPP. There were no disconnections of these lines from the respective open switchyards and no cases of total loss of off-site power during the reporting period. However, eight out of ten off-site power supply lines remained unavailable during the reporting period, and the risk of loss of the remaining two off-site power lines continued to be high owing to the armed conflict.

56. The ISAMZ team continued to request permission to visit the 330 kV open switchyard of the Zaporizhzhya thermal power plant, but such permission was not granted during the reporting period. ISAMZ last visited the switchyard on 19 December 2022.

Logistical supply chain

57. During the reporting period, the supply chain to the ZNPP continued to be provided by the Russian Federation. ISAMZ was informed that the ZNPP had completed the adaptation of its procurement process to align it with the procurement process and requirements of the Russian Federation. The management of the JSC “Operating Organization of the ZNPP” informed ISAMZ that the products usually purchased from Ukraine were being replaced by similar products from the Russian Federation, which covered approximately 90% of the ZNPP’s needs.¹⁷ However, the supply chain logistics remained fragile with no guarantee of timely deliveries in the future. The Agency recognizes that such products are important for the continued safe and secure operation of the plant but notes that the use of such products are not authorized by the Ukraine authorities.

On-site and off-site radiation monitoring system and emergency preparedness and response

58. There were no changes to the status of the on-site and off-site radiation monitoring systems during the reporting period. All on-site radiation monitoring stations were operational, and only three off-site monitoring stations remained disconnected, as reported in document GOV/2023/44.

59. The online transmission of data from the radiation monitoring system around the ZNPP to the SNRIU was not re-established during the reporting period. Data from the off-site radiation monitoring stations continued to be manually provided several times a week to the ISAMZ team and were, together with the results from the monitoring conducted by the ISAMZ team, uploaded to and displayed on the Agency’s International Radiation Monitoring Information System.



Radiation monitoring data from the monitoring stations and measurements taken by the ISAMZ team in the 20 km radius around the ZNPP. Radiation levels are normal.

¹⁷ See para. 2 above.

60. ISAMZ participated in discussions with the management of the JSC “Operating Organization of the ZNPP” and the head of the emergency centre at the ZNPP on 19 September regarding emergency arrangements in place at the ZNPP. ISAMZ learned that the ZNPP had contracted an external expert to prepare a new on-site emergency plan intended to supersede the temporary emergency plan adopted in March 2023 and reported upon in document GOV/2023/30. The new plan is expected to be completed and approved by September 2024.

61. ISAMZ was informed that no emergency evacuation drill had been conducted since March 2022 partly due to circumstances imposed by the armed conflict and partly due to concerns that such a drill could cause unnecessary stress to the staff. ISAMZ was also informed that an emergency exercise will take place later in November 2023.

62. The large number of new staff at the ZNPP, especially those in the main control rooms, combined with the lack of emergency exercises and drills, raises concerns regarding the site’s ability to be able to effectively respond to emergency situations.

Communications

63. Official communication between the ZNPP and the SNRIU has not been restored. The ZNPP remains in contact with the Ukrainian electricity grid on matters related to off-site power supply. The ISAMZ team reported continued challenges with connecting to mobile telephone networks and constant interruptions to internet connections at the site.

Five concrete principles for protecting the ZNPP

64. During the reporting period, the Agency continued to monitor observance of the five concrete principles at the ZNPP. For this purpose, ISAMZ conducted regular walkdowns at the ZNPP site and had access to most areas requested, though often only after having to provide a significant period of advance notice.

65. During those walkdowns, there were no indications that the five concrete principles were not being observed.

66. However, ISAMZ has still not been given timely and unrestricted access to all areas of the ZNPP of significance for nuclear safety and security, which limits the Agency’s ability to provide a clear confirmation that all these concrete principles are being observed at all times.

- 1 There should be no attack of any kind from or against the plant, in particular targeting the reactors, spent fuel storage, other critical infrastructure, or personnel
- 2 The plant should not be used as storage or a base for heavy weapons (i.e. multiple rocket launchers, artillery systems and munitions, and tanks) or military personnel that could be used for an attack from the plant
- 3 Off-site power to the plant should not be put at risk. To that effect, all efforts should be made to ensure that off-site power remains available and secure at all times
- 4 All structures, systems and components essential to the safe and secure operation of the ZNPP should be protected from attacks or acts of sabotage
- 5 No action should be taken that undermines these principles



The five concrete principles for protecting the nuclear safety and security at the ZNPP established by the Director General Rafael Mariano Grossi at the UNSC meeting on 30 May 2023.

67. Since 5 September, ISAMZ has requested to perform walkdowns of all six turbine halls, one after the other, to be able to fully assess, at one time, whether there may be any items present that may be in violation of any of the five concrete principles. While ISAMZ was granted access to one turbine hall at a time throughout the reporting period, such unrestricted access to all turbine halls together was not granted. Furthermore, ISAMZ was only granted partial access to selected turbine halls, again limiting the Agency's ability to make a clear assessment that the five concrete principles were being observed at all times.

68. On 11 October, ISAMZ was granted access to visit the rooftop of Unit 2, but the rooftops of the remaining units, especially Units 1, 5 and 6, remained inaccessible during the reporting period.

69. Having to make continued advance requests for access to relevant areas of the ZNPP and being unable to access some critical areas for very long periods of time pose challenges for the ISAMZ team and the Agency to make observations and to report unequivocally on the observance of the five concrete principles. The Agency continued to request timely and unrestricted access to all areas at the ZNPP important for nuclear safety and security.

70. During the reporting period, ISAMZ did not observe attacks from or against the plant, in particular targeting the reactors, spent fuel storage, other critical infrastructure or personnel, although it did report regular detonations and gunfire in proximity to the ZNPP site.

71. On 11 October, ISAMZ visited both levels of the reactor building rooftop of Unit 2, where the team could clearly view the entire rooftop of the Unit 2 turbine hall as well as parts of the rooftops of the reactor buildings and turbine halls of Units 1 and 3. During the reporting period, ISAMZ was able to conduct walkdowns at various areas of the ZNPP, including different turbine halls.

72. ISAMZ did not observe any heavy weapons (i.e. multiple rocket launchers, artillery systems and munitions, and tanks) during walkdowns at any areas to which the teams had access. However, for the Agency to fully confirm the absence of heavy weapons at the ZNPP, prompt access is needed.

73. ISAMZ continued to report the presence of troops on the site. The Russian Federation states that these troops are from the Russian National Guard (Rosgvardia), as well as some chemical, biological, radiological and nuclear (CBRN) defence specialists.

74. During the reporting period, no instances of disconnection of off-site power lines were reported and no total loss of off-site power took place. However, the ongoing military activities in the region continued to pose a threat to the reliability of the off-site power as seen from the reported drone strikes in or near the city of Enerhodar and detonations regularly reported in proximity to the ZNPP.

75. ISAMZ observed that the anti-personnel mines on the inside perimeter fences of the ZNPP had been removed during the reporting period.

76. The ZNPP stated that key infrastructure at the site was being protected by the troops of the Russian National Guard and that additional physical protection measures had been put place as reported in documents GOV/2022/66 and GOV/2023/10. However, it is not possible for ISAMZ or the Agency to fully confirm that all structures, systems and components essential for the safe and secure operation of the ZNPP are protected against acts of sabotage due to limitations and restricted access to information and various areas at the site.

“Whatever happens in a conflict zone wherever it may be, everybody would stand to lose from a nuclear accident, and I urge that all necessary precautions must be taken to avoid it happening.”

Director General Rafael
Mariano Grossi, 8 September
2023

77. While there were no indications that the five concrete principles were not being observed, the Agency continues to request timely and unrestricted access for ISAMZ to all areas of the ZNPP of significance for nuclear safety and security, to ensure that all five concrete principles are being observed at all times.

B.2.2. South Ukraine, Khmelnytsky and Rivne NPPs

78. The SUNPP, the KhNPP and the RNPP continued to be the only operating NPPs in Ukraine that produced electricity for the Ukrainian network during the reporting period. All reactors at these sites are in operation except for periods of scheduled outages for maintenance and refuelling.

79. There were no reported instances of the operating NPPs having to reduce power production as a result of the armed conflict during the reporting period. Frequent air-raid alarms were reported by the Agency staff present at these NPPs.

Physical integrity

80. No physical damage was caused to the SUNPP or the RNPP as a result of military activities during the reporting period. The activities at both NPPs, as well as at the KhNPP, to protect their critical structures, systems, and components and vital structures through additional mitigatory measures were reported to have continued.

“This incident again underlines the extremely precarious nuclear safety situation in Ukraine, which will continue as long as this tragic war goes on. The fact that numerous windows at the site were destroyed shows just how close it was. Next time, we may not be so fortunate.”#

#

Director General Rafael
Mariano Grossi,
25 October 2023

81. On 25 October, the KhNPP was shaken by powerful explosions taking place near the plant. ISAMIK was subsequently informed that two drones had been shot down — one approximately 5 kilometres and another approximately 20 kilometres from the site. There was no direct impact from the drones on the site, and the blasts did not affect the KhNPP’s operations or its connection to the national electricity grid. However, the shockwaves damaged the windows of several buildings at the site, including the passageway to the reactor buildings, an integrated auxiliary building, a special equipment building, the training centre, as well as other facilities, underlining the extremely precarious situation.

82. ISAMIK assessed the damage at the KhNPP and observed 26 broken windows but reported no impact on nuclear safety and security at the site.

Nuclear safety and security systems and equipment

83. All nuclear safety and security systems at the SUNPP, the KhNPP and the RNPP continued to operate as designed and to be fully functional. The plants’ operating staff conducted regular operational testing and preventative maintenance of the systems, some of which were witnessed by the Agency staff present on site. No failures of these systems or challenges to their operation were reported.

84. Maintenance was performed at the reactor units during planned outages and refuelling. The planned outage of Unit 1 of the SUNPP was completed ahead of schedule, and the unit was reconnected to the grid on 7 September. The RNPP also completed its planned outage of Unit 2 on 11 October, ahead of schedule, which included the successful loading of a new type of fuel. Unit 2 of the KhNPP continued to be in a planned outage since August 2023, and the outage was expected to be completed in November 2023.



Agency staff from the ISAMISU team visiting the control room at Unit 3 of the SUNPP together with the plant shift supervisor on 16 October 2023. (Photo: D. Kozhevnikov, SUNPP)

Operating staff

85. All three NPPs reported having sufficient qualified operating staff to ensure the safe and secure plant operation. The Agency teams at the SUNPP, the KhNPP and the RNPP did not report any change in the staffing levels during the reporting period. However, the operating staff at the three NPPs continue to be exposed to increased stress due to the armed conflict, including frequent air-raid alarms.

Off-site power supply

86. All three operating NPPs benefit from robust design, which provides for several independent connections with the outside grid, including additional sources of power such as nearby hydroelectric power plants.

87. No reductions in the operating power of the SUNPP, the KhNPP or the RNPP were reported as a result of military activities, such as attacks on the energy infrastructure of Ukraine, during the reporting period.

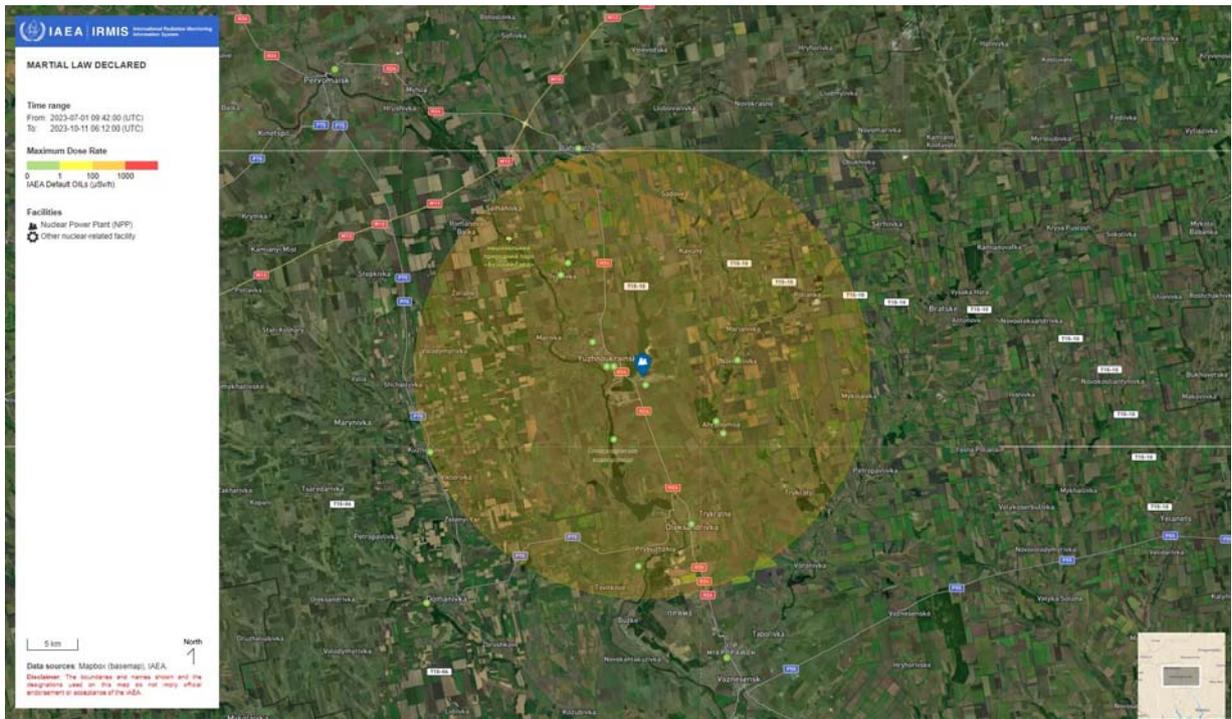
Logistical supply chain

88. No new challenges to logistical supply chains for the SUNPP, the KhNPP or the RNPP were reported during the reporting period.

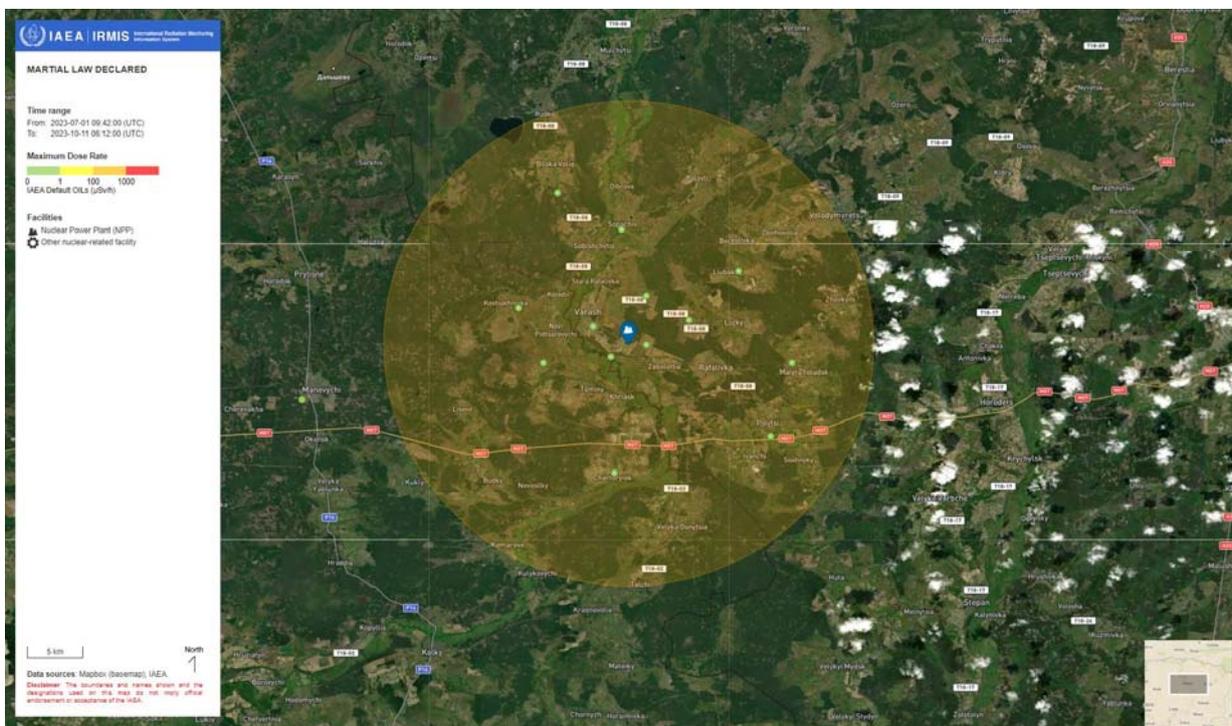
On-site and off-site radiation monitoring system and emergency preparedness and response

89. All on-site and off-site radiation monitoring stations at the SUNPP, the KhNPP and the RNPP continued to work as designed. Owing to the events of 24 October near the KhNPP site (see paragraph 75 above), a power outage in the nearby area of Slavuta forced two of the plant's 11 off-site radiation monitoring stations to temporarily rely on back-up power supplies before external electricity was

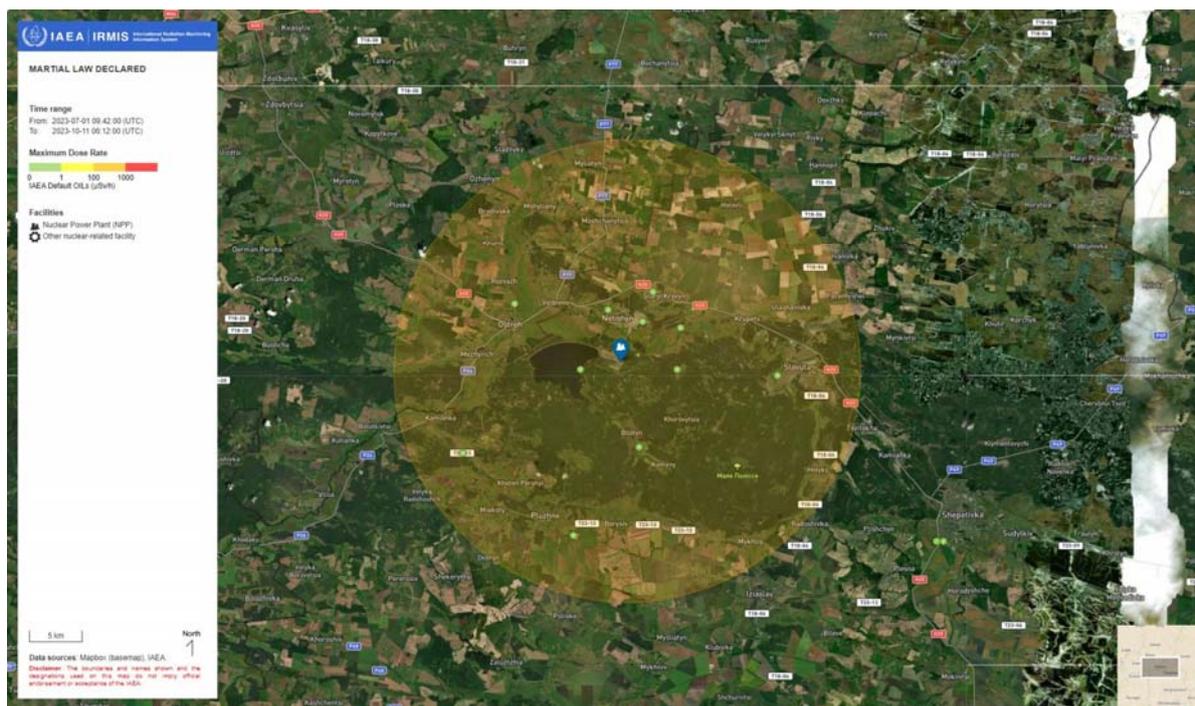
restored later that day. All three plants continue to perform personal radiation monitoring according to established procedures.



*Radiation monitoring data from the monitoring stations in the 20 km radius around the SUNPP.
Radiation levels are normal.*



*Radiation monitoring data from the monitoring stations in the 20 km radius around the RNPP.
Radiation levels are normal.*



*Radiation monitoring data from the monitoring stations in the 20 km radius around the KhNPP.
Radiation levels are normal.*

90. ISAMIK observed a plant-wide emergency exercise on 11 October. The ISAMIK team reported that the exercise was well planned and implemented and that the response and communications arrangements appeared to be effective. Following the exercise, the KhNPP convened all parties involved, including off-site responders and the military, to discuss and document lessons learned and to identify corrective actions to be implemented. The areas for improvement identified cover matters such as on-site and off-site communication, fire protection and decontamination. The KhNPP has already developed an action plan for implementation of the improvements.



*The ISAMIK team at the KhNPP during the emergency exercise conducted on 11 October 2023.
(Photo: Energoatom)*

Communications

91. All communication means remained available during the reporting period. Ukrainian inspectors from the SNRIU continue to be present at all three NPPs.

B.2.3. Chornobyl NPP Site and Other Facilities

92. The nuclear safety and security situation at the ChNPP site did not show any significant deviation from the situation previously reported in GOV/2022/52, GOV/2022/66, GOV/2023/10, GOV/2023/30, or GOV/2023/44 with regard to the assessment of the nuclear safety and security situation against the Seven Pillars.

93. Operations in the liquid waste treatment facility that had begun in August 2023 continued during the reporting period, while operations at the solid waste treatment facility continued to be suspended. Both spent fuel storage facilities, ISF-1 and ISF-2, at the ChNPP site remained in operation.

Physical integrity

94. ISAMICH reported that there was no physical damage caused to the facilities at the ChNPP site during the reporting period. The physical integrity of all ChNPP facilities remained intact. The plant continued with installation of additional protections against external impacts.

Nuclear safety and security systems and equipment

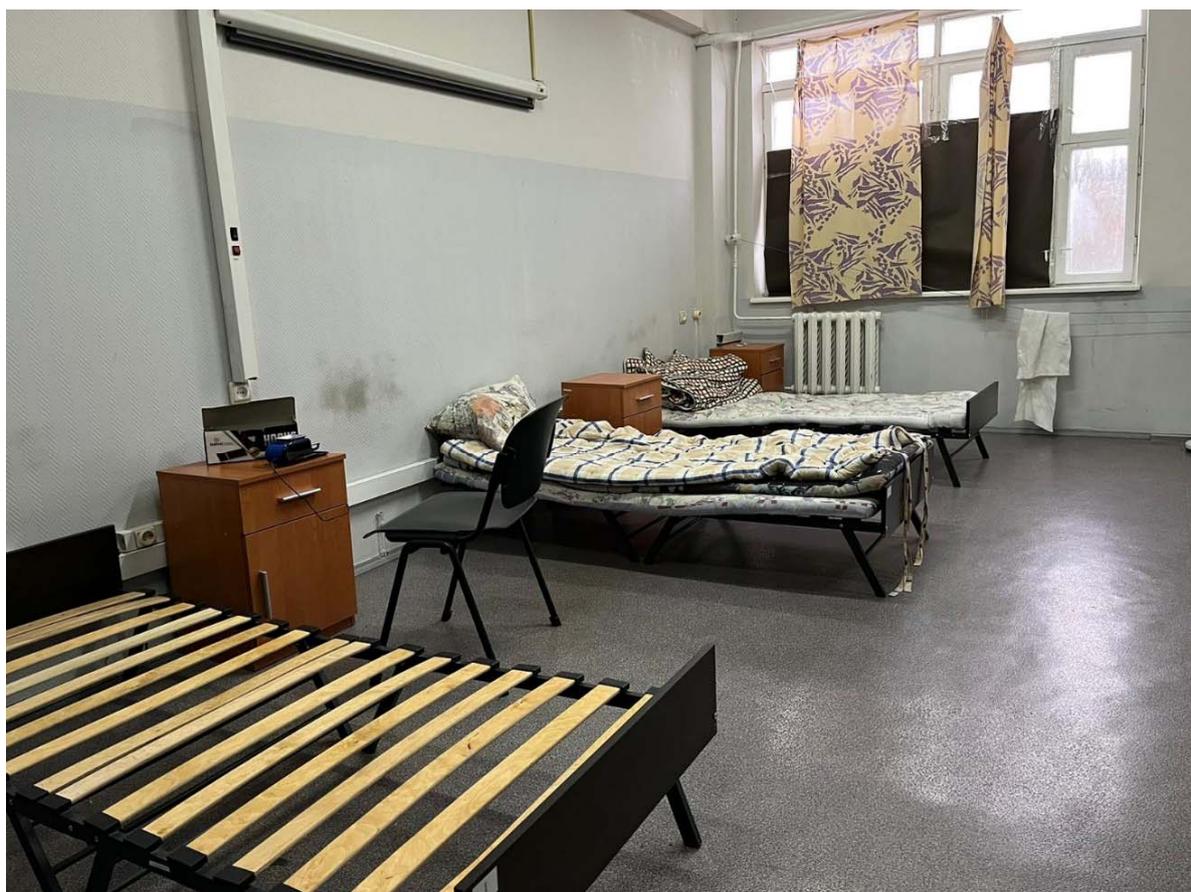
95. ISAMICH confirmed that there had been no failures or deficiencies in the nuclear safety and security structures, systems, and/or components and no challenges to their operation were encountered.

Operating staff

96. ISAMICH observed continued difficult and stressful working and living conditions for the operating staff. On 8 November, Agency staff visited the dormitories where operating staff live. These dormitories are in former administrative buildings and offices that were adapted in the efforts made to provide more suitable living conditions for the operating staff.

97. Agency staff observed that, while safety rules were being applied, there were temporary beds, limited furniture, insufficient or no ventilation and humidity, and rooms often accommodated six operating staff or more. There was also an absence of sufficient essential electrical appliances, unreliable internet connection and extremely limited, improvised facilities for socializing and exercising. Such conditions add to the serious impact on the physical and mental health of the operating staff following the occupation.

98. Despite these circumstances, the operating staff continue to be able to fulfil their safety and security duties. However, the situation is not sustainable, and the restoration of infrastructure to enable the operating staff to travel to and from Slavutych daily appeared to be complex and will reportedly not be possible to be resolved within a reasonable length of time.



Temporary living conditions of the operating staff at the ChNPP visited by Agency staff on 8 November. (Photo: IAEA)

Off-site power supply

99. The ChNPP site has available off-site power supply through one 750 kV line, and three 330 kV and five 110 kV backup power lines. Emergency diesel generators (EDGs) were available but were not utilized during the reporting period. Some of the 330 kV and 110 kV lines were taken out of service for maintenance and were put back in service afterwards.

Logistical supply chain

100. Challenges in the supply chain and transportation to and from the site remain as the infrastructure in the region has been impacted by the conflict. This includes challenges to the transportation of spent nuclear fuel, as the site hosts two spent fuel storage facilities.

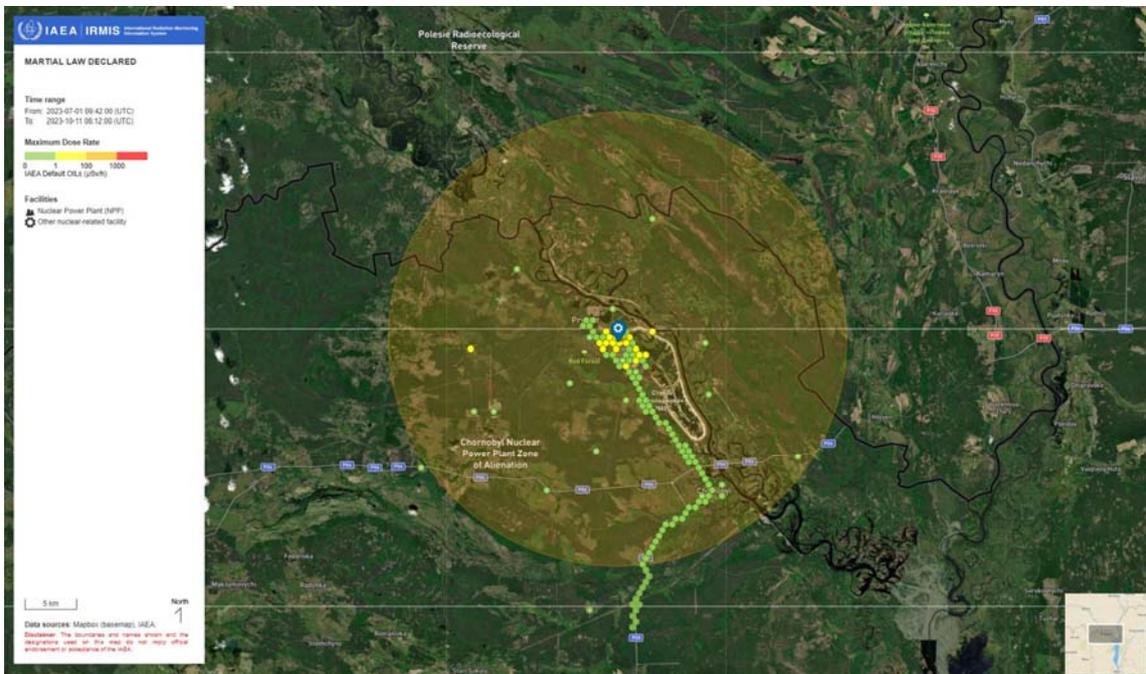
On-site and off-site radiation monitoring system and emergency preparedness and response

101. The ChNPP maintained availability of all necessary communication means with required stakeholders without interruptions.

102. The on-site and off-site radiation monitoring systems remained functional, and the recorded radiation levels were normal. ISAMICH conducted regular independent measurements of radiation levels on the site and in the vicinity and confirmed normal levels.



ISAMICH team visiting the main control room of Unit 3 of the ChNPP on 5 October. (Photo: IAEA)



Radiation monitoring data from the monitoring stations and measurements taken by the ISAMICH team in the 20 km radius around the ChNPP. Radiation levels are normal.

103. No other events having an impact on nuclear and/or radiation safety and nuclear security were reported for other facilities in Ukraine.

B.3. IAEA Technical Support and Assistance for Nuclear Safety and Security

104. The Agency continued to make progress in the delivery of its comprehensive programme of technical support and assistance to Ukraine. The programme consists of the delivery of nuclear safety- and security-related equipment; in-person technical support and assistance through on-site expert missions and the continued presence of Agency staff at the five nuclear sites in Ukraine (further information on the latter is provided in Section B.2.); a medical assistance programme for operating staff at NPPs (reported in document GOV/2023/30); and assistance in managing the medium- and long-term environmental, social and economic impact of the flooding in the Kherson Oblast (reported in document GOV/2023/44). It also encompasses remote assistance and the deployment of rapid assistance should the need arise.

105. The Agency and its Ukrainian counterparts have continued to cooperate closely in order to understand better and address the priority needs of Ukraine as efficiently as possible, as the situation evolves. This effort needs to continue with strong coordination and cooperation at the national level, taking into account that the needs are great and that available resources are limited. There are over 25 organizations with various responsibilities in nuclear and radiation safety and nuclear security, as well as with responsibilities in providing medical support and care for operating staff at the NPPs, in ensuring food and water safety, and in other relevant areas that are receiving or in need of assistance from the Agency.

106. The Agency has also continued to work closely with a number of Member States and international organizations to ensure coordination in the provision of technical support and assistance to Ukraine and to secure the funding necessary to enable the delivery of the assistance needed.

107. By 14 November 2023, 23 Member States¹⁸ and an international organization¹⁹ had offered extrabudgetary cash contributions to support Agency efforts in providing technical support and assistance to Ukraine in nuclear safety, security and safeguards, including for sustaining the continued presence of Agency staff at the five nuclear sites in Ukraine. A number of Member States expressed additional interest in providing extrabudgetary cash contributions for technical support and assistance to Ukraine.

108. An overview of the different components of the comprehensive programme for assistance to Ukraine is presented below. The Agency's remaining needs to provide technical support and assistance across the different components of the comprehensive programme reported in document GOV/2023/44²⁰ have still not been met.

B.3.1. Delivery of Equipment

Requests for assistance

109. During the reporting period, no additional requests for nuclear safety and security equipment were received under the statutory functions of the Agency, including through the operational arrangements²¹

¹⁸ Australia, Austria, Belgium, Canada, China, the Czech Republic, Finland, France, Germany, Ireland, Italy, Japan, the Republic of Korea, the Netherlands, New Zealand, Norway, Poland, Slovakia, Spain, Sweden, Switzerland, the United Kingdom and the United States of America.

¹⁹ The European Commission representing the European Union.

²⁰ Report by the Director General to the Board of Governors, document GOV/2023/44, issued 5 September 2023, paras 88, 109 and 112.

²¹ The operational arrangements include RANET and the *Operations Manual for Incident and Emergency Communication* (EPR-IEComm 2019) available at: <https://www.iaea.org/topics/emergency-preparedness-response/international-operational-arrangements>

under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention). The total number of requests for assistance published on the Agency's Unified System for Information Exchange in Incidents and Emergencies, and, upon Ukraine's request, transmitted by the Agency to 31 of the 39 Assistance Convention States Parties that are registered in the Response and Assistance Network (RANET), remained unchanged compared to those reported in document GOV/2022/66. Those requests were made on 22 and 29 April, 8 July, 9 August and 3 October 2022.

110. The Agency continued working to address the needs for technical support and assistance to Ukraine. These needs derive from requests under the statutory functions of the Agency, including through the operational arrangements²² under the Assistance Convention; from those requests identified during the expert missions conducted in 2022 and 2023; and from additional requests, such as those received on 15 November 2022 concerning the enterprises in the Chornobyl Exclusion Zone, the Radon Association and the Kharkov Institute of Physics and Technology, and on 28 November 2022 concerning the energy sector in Ukraine, which were reported upon in detail in document GOV/2023/10.

Offers of assistance

111. In response to Ukraine's requests, 12 Member States²³ registered under RANET and 1 additional Member State — Greece — had offered assistance in the form of equipment by 31 August 2023. No new offers of in-kind contributions to assist Ukraine were made during the reporting period.

Delivery of equipment

112. The Agency continued to deliver equipment to end users in Ukraine. During the reporting period, 10 deliveries of equipment took place, bringing the total number of deliveries of equipment to Ukraine to 32, with 25% of the shipments associated with donated equipment and 75% of the shipments associated with procured equipment.

113. The deliveries comprised equipment procured by the Agency under extrabudgetary contributions provided by Austria, Canada, Japan, the Republic of Korea, Norway, the United Kingdom and the European Union and equipment donated by Canada and Greece. As a result of these deliveries, entities such as the ChNPP site, the "Izotop" Ukrainian State production enterprise, the KhNPP, SNRIU, the SUNPP, the RNPP, the Institute for Safety Problems of NPPs, the State Register of Ionizing Radiation Sources and Individual Radiation Doses and the Ministry of Health received equipment including satellite communication systems, medical equipment, information technology (IT), laboratory equipment and supplies, portable dissolved hydrogen analysers, mobile helium leak detectors, sodium and gas



Mobile helium leak detector delivered to the SUNPP on 7 October 2023. The equipment was procured using an extrabudgetary contribution from the European Union. (Photo: SUNPP)

²² The operational arrangements include RANET and the *Operations Manual for Incident and Emergency Communication* (EPR-IEComm 2019) available at: <https://www.iaea.org/topics/emergency-preparedness-response/international-operational-arrangements>

²³ Australia, Canada, France, Germany, Hungary, Israel, Japan, Romania, Spain, Sweden, Switzerland and the United States of America.

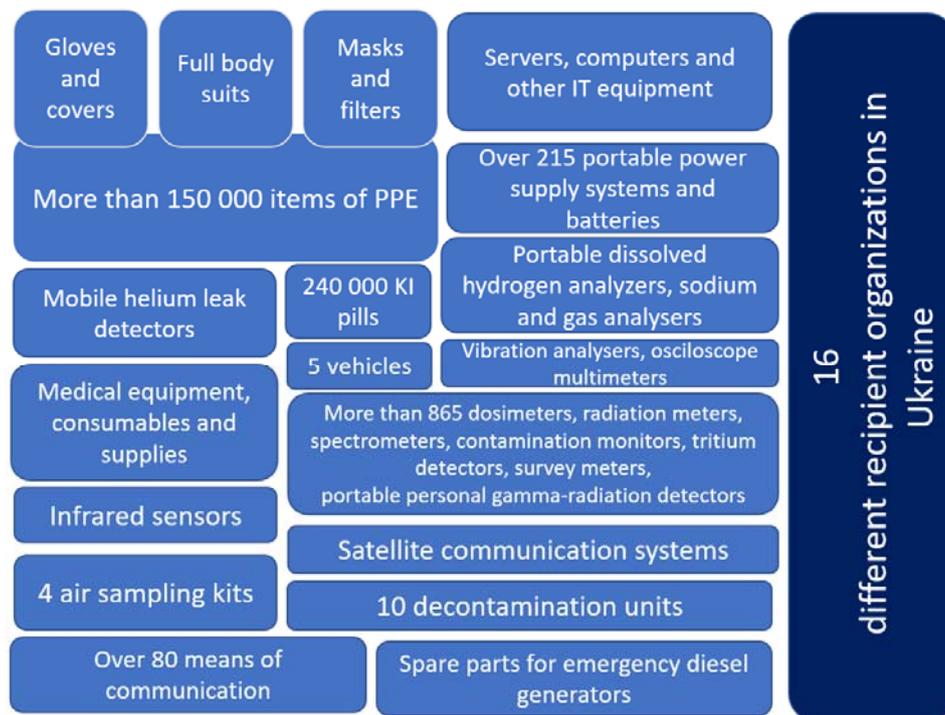
analysers, portable gamma-radiation detectors, vibration analysers, portable neutron survey meters, personal protective equipment and similar items.

114. In addition, the second delivery of spare parts and rubber products for EDGs was received by the SUNPP, as confirmed on 29 September 2023. This delivery is the second under the Agency’s partnership agreement with France and Energoatom, which was signed on 5 May 2023 and reported upon in document GOV/2023/30.



Medical equipment delivered to the ChNPP site in September 2023. The equipment was procured using an extrabudgetary contribution from the European Union. (Photo: ChNPP)

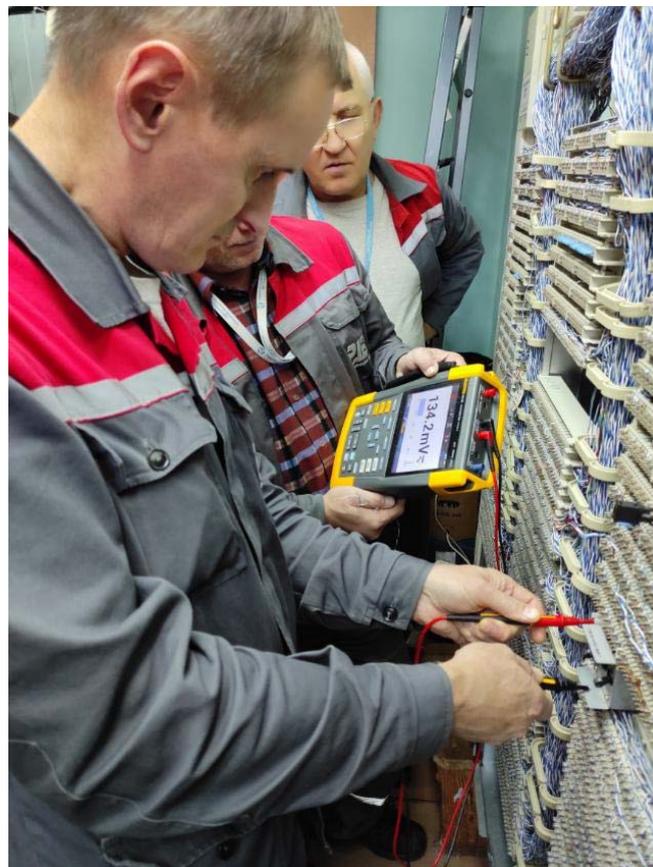
115. Following these deliveries, the value of the nuclear safety and security equipment delivered to Ukraine exceeded €7.1 million.



Overview of the nuclear safety- and security-related equipment worth €7.1 million that has been delivered to Ukraine since the start of the armed conflict.



Donated equipment received by the RNPP on 11 October 2023. The donation comprised a dissolved oxygen analyser and sodium and gas analysers procured using an extrabudgetary contribution from Japan. (Photo: RNPP)



An oscilloscope multimeter in use at the RNPP. The equipment was delivered on 11 October 2023 and procured using an extrabudgetary contribution from Canada. (Photo: RNPP)

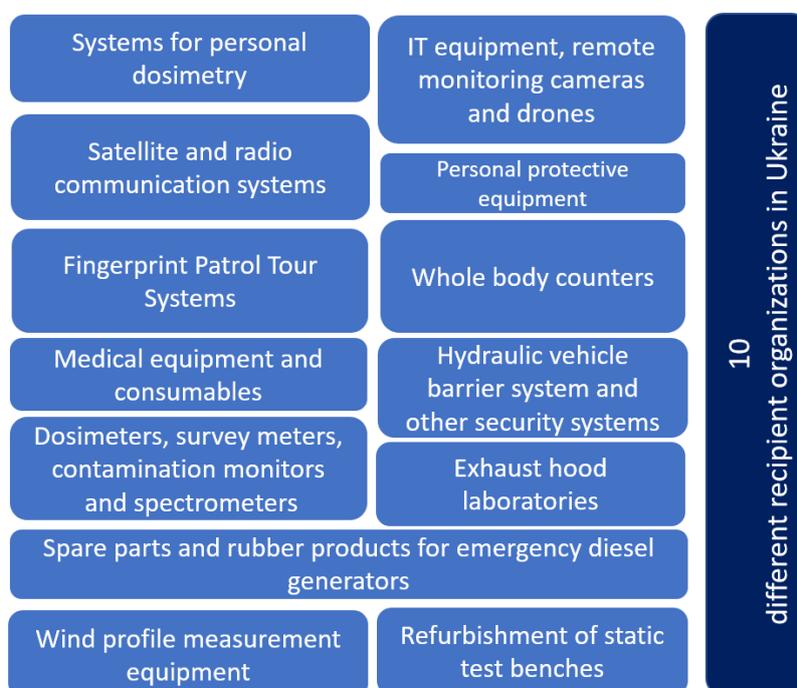


Starlink terminals delivered to the KhNPP on 5 October 2023. The system was activated and in use as of 24 October 2023. An extrabudgetary contribution from the European Union was used to deliver this assistance. (Photo: KhNPP)

116. During the reporting period, the Agency worked to finalize the arrangements for the delivery of equipment donated by three Member States.²⁴ The delivery of the equipment from two Member States — Canada and Greece — was completed. The Agency continued liaising closely with Japan to facilitate the delivery of its equipment, as well as with Canada to prepare for an additional delivery of equipment.

117. In addition to these planned deliveries, more nuclear safety- and security-related equipment procured by the Agency is expected to be transported to ten different organizations in Ukraine in the coming months. The total cost of these deliveries exceeds €2.4 million.

118. The delivery of the last remaining spare parts and rubber products for EDGs for the SUNPP under the Agency’s partnership with France and Energoatom is also expected by the end of 2023, while additional nuclear safety- and security-related equipment is in various stages of procurement.



Overview of the nuclear safety- and security-related equipment pending delivery to Ukraine.

²⁴ Canada, Greece and Japan.

B.3.2. IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources

119. Following the fact-finding mission that took place from 23 July to 1 August that was reported upon in document GOV/2023/44, the Agency developed a proposal in the form of an Assistance Action Plan for the first phase of delivering assistance in light of the findings and observations from the mission. During this phase, to be carried out under the IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources (ISAMRAD), the Agency envisages the provision of advice, training and equipment in the area of the safety and security of radioactive sources in Ukraine, with a focus on high activity radioactive sources (Category 1 to 3 radioactive sources, as defined in the Agency's Code of Conduct on the Safety and Security of Radioactive Sources).

120. This proposal is pending discussion and agreement with the SNRIU before its implementation.

B.3.3. Medical Assistance for Operating Staff at NPPs

121. During the reporting period, the Agency engaged intensively in identifying and putting in place suitable mechanisms to deliver identified needs and to allocate funding according to this programme of assistance. As part of this work, during the new Medical and Coordination Assistance Mission that took place from 6 to 10 November in Ukraine, Agency staff visited the Slavutych hospital, which provides medical care and support for operating staff at the ChNPP site, and the Slavutych Social and Psychological Centre, which provides mental health support for the operating staff of the ChNPP site. The Agency staff observed the dedication and professionalism of the staff of both facilities and noted progress in the refurbishment of their facilities in recent months. The staff appeared knowledgeable and resourceful and able to provide medical care and mental health support for the ChNPP site staff, but further support should continue to be provided as part of this programme to make them fully equipped to do so.



Agency staff meeting the management of the Slavutych Hospital, which provides medical support and care for the operating staff at the ChNPP site on 6 November. (Photo: IAEA)

122. The Agency initiated work to prepare and deliver capacity-building activities to psychologists supporting the operating staff at the NPPs. Information was collected and remote meetings were held with the mental health support teams at the KhNPP, the SUNPP, the RNPP and the ChNPP site. At these meetings, the current mental health support areas of interest and the challenges faced by these teams and operating staff were discussed. The priority areas through which they could be supported with training were identified as crisis intervention and emergency psychology.

123. Based on the findings from these activities, the VIC Medical Service, in cooperation with mental health experts, developed a preliminary programme for enhancing the capabilities of the NPP mental health teams, with a primary focus on capacity-building activities, including practical workshops, and on other resources needed for local psychologists who provide emotional and psychological support to the operating staff at the Ukrainian plants. The programme envisages an implementation plan involving immediate, mid- and long-term activities.

124. The series of workshops for psychologists supporting operating staff at each NPP was initiated on 2 November with the delivery of the first workshop for the psychologists at the KhNPP. It will be complemented by additional workshops to be conducted throughout November 2023 up to February 2024, targeting all operating NPPs and the ChNPP site. These workshops are tailored to the most pressing and major needs of the staff at each NPP and address the topics of trauma, post-traumatic stress disorder and living with the armed conflict.

B.3.4. IAEA Support and Assistance Mission to the Kherson Oblast

125. Remote discussions and consultations with relevant counterparts in Ukraine to agree on the implementation of in-field expert mission(s) in relation to the assistance for the Kherson Oblast continued during the reporting period under the IAEA Support and Assistance Mission to the Kherson Oblast (ISAMKO). Such missions are envisaged to address the overall approach to supporting Ukraine in different technical areas of assistance within this programme, such as civil structure integrity assessment, potable water safety, human health, and food and agriculture, as well as to discuss the current situation, challenges and needs in each technical area of assistance.

B.3.5. Remote Assistance

126. No remote assistance in nuclear safety and security was requested or provided during the reporting period. However, as part of the activities that the Agency implemented to better understand where the NPPs need training within the medical assistance programme, leadership and management for safety and security, including safety and security culture, were identified as being of great importance for each site. The Agency initiated work to outline a programme to provide remote support to each site in these areas, as well as to support each site's staff in participating in various training events organized elsewhere.

B.3.6. Deploying Rapid Assistance

127. No nuclear or radiological emergency involving nuclear facilities or activities involving radioactive sources was declared during the reporting period, and no deployment of rapid assistance was requested.

C. Implementation of Safeguards in Ukraine

C.1. Background

128. Ukraine acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) as a non-nuclear-weapon State in December 1994. Ukraine subsequently brought into force a comprehensive safeguards agreement (CSA) with the Agency in connection with the NPT in January 1998 and an additional protocol (AP) thereto in January 2006.

129. The Agency implements safeguards at 35 nuclear facilities and more than a dozen locations outside facilities (LOFs) in Ukraine. The safeguards implementation effort is concentrated at 4 NPP sites, which host 15 operational power reactors, and at the ChNPP site, which hosts 3 shutdown reactors, the reactor damaged in the 1986 nuclear accident, and 2 spent fuel processing and storage facilities.

130. On 25 February 2022, Ukraine submitted to the Agency a special report under Article 68 of its CSA informing the Agency that “as a result of the temporarily occupied territory of Chernobyl region, Ukraine has lost control over nuclear material” subject to safeguards on the ChNPP site. Ukraine submitted two additional special reports to the Agency, dated 4 March and 5 July 2022, regarding Ukraine’s loss of control over nuclear material at all facilities on the Zaporizhzhya site and at three LOFs in south-eastern parts of Ukraine, respectively.

131. Despite the very challenging circumstances, the Agency has continued to implement safeguards in Ukraine in accordance with the CSA and the AP, and in line with established annual implementation plans for Ukraine, to verify the declared nuclear material at declared facilities and LOFs and/or design information at such facilities.

C.2. Recent Developments

132. Since the Director General’s previous report, the Agency has continued to rely on remotely transmitted data from its cameras, seals and unattended monitors to maintain continuity of knowledge over declared inventories of nuclear material. All data collected by these systems were transmitted successfully to Agency Headquarters during the reporting period. The Agency has maintained its continuous acquisition and analyses of open source information, and its analyses of satellite imagery covering nuclear installations in Ukraine. This has proved to be essential for the Agency in the preparation of its in-field verification activities, in particular at the Zaporizhzhya site. The Agency has been acquiring and analysing satellite imagery and continuously monitoring all available open source information to track developments and to assess the operational status of the plant, including the detection of possible damage caused by shelling at the site.

133. With the establishment of a continuous presence of Agency staff at the RNPP, the KhNPP and the SUNPP, as well as at the ChNPP site, safeguards activities have been integrated with the various IAEA Support and Assistance Missions to the extent possible. Designated safeguards inspectors typically comprise part of the technical experts continuously present in Ukraine. For efficiency reasons, Agency inspectors are scheduled so as to be present whenever safeguards activities are planned — for example, to conduct physical inventory verifications or spent fuel transfer verifications — and otherwise provide technical support to the ongoing safety and security missions. Independent safeguards missions are planned, as needed, for activities that cannot be covered in the course of IAEA Support and Assistance Missions, including the installation or servicing of safeguards equipment and the conduct of complementary access.

134. During the reporting period, the Agency performed complementary access at two locations and successfully conducted physical inventory verifications at a number of locations. In particular, physical inventory verifications were performed for all facilities on the Zaporizhzhya site, including the six reactor units, the fresh fuel store and the dry cask store. The participation of Agency inspectors as part of the various IAEA Support and Assistance Missions has also enabled the resumption of the implementation of unannounced inspections at many facilities and, during the reporting period, three such unannounced inspections were performed at various sites. Finally, Agency technical experts have travelled to NPPs and to the ChNPP site to install, service and maintain the Agency safeguards systems that monitor the loading, conditioning and transfer of spent fuel from NPPs to dry storage at Chornobyl.

D. Summary

135. The situation at the ZNPP continues to be difficult and precarious, with six out of the Seven Pillars being compromised fully or partially. Issues concerning the availability of sufficient and qualified staff essential for safe operation, the absence of regular maintenance activities and special measures for providing cooling water persist and threaten the nuclear safety and security at the site.

136. There were no indications of non-observance of the five concrete principles at the ZNPP. However, the lack of timely and unrestricted access limits the Agency from being able to fully confirm that all five concrete principles are being observed at all times.

137. The Agency's assessment, for most of the reporting period, has been affected by limitations in the information provided to ISAMZ by the ZNPP and delays in the provision of information, as well as a reduction in the access granted to various areas at the site compared to the situation at the time of the establishment of ISAMZ. However, at the end of the reporting period, there has been a positive development in this regard and the Agency strongly encourages the ZNPP to ensure that timely access and information sharing take place regularly.

138. During the reporting period, the KhNPP, the SUNPP and the RNPP continued to be the only operating NPPs in Ukraine, and to operate safely and securely despite the challenging circumstances imposed by the armed conflict. The KhNPP experienced explosions in the proximity of the plant resulting in damage to windows, albeit without direct impact on the operation of the KhNPP.

139. While the ChNPP site continues to recover and resume safe and secure operation in the reporting period, the Agency noted the difficult, improvised living conditions for the operating staff of the ChNPP.

140. The Agency continued providing technical support and assistance to Ukraine related to nuclear safety and security. During the reporting period, 10 deliveries of procured and donated nuclear safety- and security-related equipment to different organizations in Ukraine were organized, bringing the total number of deliveries to 32. In partnership with France and Energoatom, the Agency also assisted in the delivery of the second consignment of spare parts and rubber products for EDGs for the SUNPP. In total, over €7.1 million worth of equipment has now been delivered to Ukraine since the start of the armed conflict.

141. Maintaining the continued presence of Agency staff at all five nuclear sites in Ukraine continues to be a major undertaking for the Agency, which has strengthened its organization and mobilized additional human resources accordingly. Rotations taking place during the reporting period were as planned. So far, a total of 75 missions comprising 168 Agency staff members have been deployed as part of the continued presence at all 5 nuclear sites in Ukraine, totalling 4652 person-days in Ukraine.

142. In addition, the Agency implemented a Medical and Coordination Assistance Mission to Ukraine during the reporting period. During this mission, the Agency team noted progress made in Ukraine in recent months in various areas impacted by the armed conflict owing to the support provided through the Agency as well as other bilateral or multilateral arrangements and the national authorities. However, the Agency team noted that the needs in various areas of nuclear and radiation safety and nuclear security, as well as of medical assistance, are still considerable and must be addressed based on their urgency and in close cooperation with other assisting parties where possible.

143. The continued commitment of Member States and their close cooperation with the Agency is essential for ensuring nuclear safety and security in Ukraine under all circumstances and for providing assistance efficiently, while ensuring the timely delivery of the Agency's programmatic activities.

144. The Agency has continued to undertake a vital verification role to reach independent conclusions that nuclear material under safeguards remains in peaceful activities and that safeguarded facilities are not used for the undeclared production or processing of nuclear material. The Agency continues to implement safeguards in Ukraine, including in-field verification activities, in accordance with Ukraine's CSA and AP. Based on the evaluation of all safeguards-relevant information available to the Agency to date, the Agency has not found any indication that would give rise to a proliferation concern.

Annex: Chronology of Events from 1 September to 14 November 2023

Events at the Zaporizhzhya Nuclear Power Plant

- On 1 September, the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ) was informed that there were four wells in operation close to the plant's sprinkler ponds.
- On 4 September, a water leak was detected in a recirculation valve of the essential service water system in Unit 5. To repair this valve, the site had to place one safety train each in Unit 5 and Unit 6 offline. After the valve was repaired, the safety train in Unit 6 was returned to standby mode, while that of Unit 5 was kept offline for maintenance work.
- On 4 September, ISAMZ was informed that there were five wells in operation close to the plant's sprinkler ponds.
- On 5 September, ISAMZ requested a walkdown of all six turbine halls, one after the other, to be able to fully assess, at one time, whether there were any items present that may be in contravention of the five concrete principles. This request was not granted during the reporting period.
- On 6 September, ISAMZ was informed that the Zaporizhzhya nuclear power plant (ZNPP) had decided to temporarily reduce the number of personnel on the site to minimum levels owing to concerns of a higher risk of military activities in the area.
- On 7 September, ISAMZ was informed that more drone strikes had taken place in the nearby city of Enerhodar, where many plant staff live with their families. No casualties were reported.
- On 7 September, ISAMZ was informed that there were seven wells in operation close to the plant's sprinkler ponds.
- On 8 September, the ISAMZ team visited the turbine hall of Unit 1, where they observed a total of 15 vehicles, but no heavy weapons.
- On 8 September, the ISAMZ team conducted a walkdown of the main control room of Unit 6 and were informed that most of the operators had been recently recruited from and licensed by the Russian Federation. The operators were unable to provide clear answers to the ISAMZ team's questions about the severe accident management guidelines and the emergency operating procedures. In one instance, a clear answer was not given concerning the validity of an individual licence.
- On 11 September, ISAMZ was informed about further drone attacks in the nearby city of Enerhodar, which had caused minor damage to two buildings. The ZNPP informed ISAMZ that there were no casualties reported at that time.
- On 14 September, ISAMZ was informed that there were eight wells in operation close to the plant's sprinkler ponds.
- On 15 September, ISAMZ was informed that there were nine wells in operation close to the plant's sprinkler ponds.
- On 15 September, ISAMZ was informed that there were approximately 120 main control room operators: approximately 30% of the operators held valid Ukrainian licences and the remaining 70% were newly recruited staff members with licences from the Federal Environmental,

Industrial and Nuclear Supervision Service (Rostekhnadzor) or were in the process of acquiring a licence.

- On 15 September, the ISAMZ team visited the main control room of Unit 5, where it was informed that all the main control room operators in Unit 5 had signed contracts with the Joint Stock Company ‘Operating Organization of ZNPP’ and had already passed the test for or were in the process of testing for and obtaining licences from Rostekhnadzor.
- On 21 September, ISAMZ was informed that the repair of the hairline crack in the weld of the Unit 4 steam generator’s primary header vent pipe was successful.
- On 22 September, ISAMZ was informed that there were ten wells in operation close to the plant’s sprinkler ponds.
- On 23 September, ISAMZ was informed that there were 11 wells in operation close to the plant’s sprinkler ponds supplying around 250 cubic metres of water per hour. The site had estimated that this would be a sufficient number of wells to maintain the required water level for all 12 sprinkler cooling ponds.
- On 25 September, ISAMZ was informed that the ZNPP was preparing to once again transition Unit 4 from cold shutdown to hot shutdown to generate steam for various safety functions at the facility, and that Unit 6 would be transitioned to cold shutdown.
- On 27 September, during a walkdown at the ZNPP site, ISAMZ observed that the level of water in three of the sprinkler ponds had fallen since the previous visit. At the time of that walkdown, the site was replenishing the three sprinkler ponds to return the water levels to normal.
- On 28 September, ISAMZ was informed that the ZNPP had ordered the equipment needed to generate enough steam to meet the site’s requirements. This equipment is expected to be installed at the beginning of 2024, provided that there are no supply chain delays.
- On 29 September, ISAMZ conducted a walkdown of the sprinkler ponds and confirmed that the water levels of all ponds were within the operational limits.
- On 30 September, the ZNPP transitioned Unit 4 from cold shutdown to hot shutdown to generate steam for various safety functions at the facility.
- On 3 October, the ZNPP transitioned Unit 6 from hot shutdown to cold shutdown.
- On 6 October, ISAMZ was informed that the site performed testing on two of Unit 6’s steam generators owing to the presence of boron in the secondary circuit.
- On 8 October, ISAMZ was informed that the tests performed by the ZNPP identified small water leaks in one tube each in steam generators 1 and 3 in Unit 6.
- On 10 October, ISAMZ was informed that the small water leaks in steam generators 1 and 3 in Unit 6 had been repaired and testing was being performed to confirm the successful repairs.
- On 11 October, the ISAMZ team was granted access to the rooftop of Unit 2, where they could view the entire rooftop of Unit 2’s turbine hall as well as parts of the rooftops of the reactor buildings and turbine halls of Units 1 and 3. No mines or explosives were observed.
- On 13 October, the ZNPP informed ISAMZ that it had decided to close the reactor vessel of unit 3 – which had been left open and was being used as a reservoir of borated water in case needed.

- On 13 October, ISAMZ was informed that the ZNPP was transitioning a second reactor, Unit 5, from cold shutdown to hot shutdown in preparation for the upcoming winter season.
- On 16 October, the ZNPP transitioned Unit 5 from cold shutdown to hot shutdown.
- On 18 October, the ISAMZ team was informed that it was permitted to conduct a walkdown of all floors of the turbine halls of Units 3 and 4 on the same day. However, after conducting an unrestricted walkdown of the Unit 3 turbine hall, ISAMZ was only allowed partial access to the turbine hall of Unit 4.
- On 18 October, a senior unit operator informed ISAMZ that he was in charge of Units 1 and 4 simultaneously.
- On 20 October, the special building 1 control room operators informed ISAMZ that they were also required to perform the duties of field operators.
- On 22 October, ISAMZ visited the mobile diesel boilers and observed that the boilers were in good condition, with fire safety labels on all of them.
- On 23 October, ISAMZ was only granted partial access to the turbine hall of reactor Unit 1.
- On 24 October, ISAMZ conducted a walkdown of the ZNPP cooling pond and associated areas, where they observed cleaning of the outlet channel of the cooling towers and the cooling pond's sprinkler system. The team was informed that this work was being performed due to the fact that these systems were normally in operation and that the current shutdown status of all 6 reactors provides the opportunity to perform this work.
- On 24 October, ISAMZ was informed by the ZNPP that there were no plans to restart any reactor units.
- On 25 October, ISAMZ was informed that a fire alarm system had been installed in the locations of the mobile diesel boilers. ISAMZ was also informed of 57 mobile diesel boilers installed in Enerhodar, as well as two larger boilers at the ZTPP and one in its industrial area.
- On 27 October, ISAMZ was only granted partial access to the turbine hall of reactor Unit 2.
- On 31 October, ISAMZ was informed that in preparation for the winter, work has commenced to insulate the ground water wells that have been constructed near the essential service water sprinkler pond area.
- On 31 October, ISAMZ was informed that an emergency exercise was planned to be conducted in November.
- On 2 November, the ZNPP reported that pressure testing of the Unit 3 steam generators is being performed following the closure of the reactor vessel. The ZNPP also reported that the hydraulic test of the primary circuit for Unit 6 had been completed.
- On 2 November, ISAMZ was informed by the ZNPP of drone attacks in Enerhodar.
- On 3 November, the ZNPP informed ISAMZ that Unit 3 would be kept in cold shutdown after the completion of pressure testing of the primary and secondary cooling circuits. ISAMZ were also informed that steam generator tests on Unit 3 had been completed, with no anomalies detected.
- On 3 November, the ISAMZ team performed a walkdown of the perimeter of ZNPP, and did not observe any mines or explosives, including in the locations where mines had previously been observed.

- On 7 November, the ZNPP reported that pressure testing of the Unit 3 steam generators had been completed successfully.
- On 8 November, the ZNPP informed ISAMZ that Rostekhnadzor had established a new position, the ‘Head of ZNPP Nuclear and Radiation Safety Inspections’, as part of the Donskoy Interregional Territorial Department for Nuclear and Radiation Safety Supervision. The purpose of the position is, according to Rostekhnadzor, to establish a more permanent presence of Rostekhnadzor at the ZNPP, to provide regulatory control in accordance with Russian legislation and to administer the provision of licences to employees.
- On 8 November, ISAMZ was informed that an emergency exercise would take place later in November.
- On 14 November, ISAMZ performed a walkdown of all six main control rooms, one after the other.

Events at the Khmelnytsky, South Ukraine and Rivne Nuclear Power Plants

- On 21 September, the IAEA Support and Assistance Mission to the South Ukraine Nuclear Power Plant (ISAMISU) reported that a station blackout had occurred in the nearby town of Varash, caused by the emergency shutdown of the 110 kV power line that supplies electricity to the town from the Rivne nuclear power plant (RNPP). Power was restored within one hour and there was no impact on the safe and secure operation of the RNPP.
- On 11 October, the IAEA Support and Assistance Mission to the Rivne Nuclear Power Plant (ISAMIR) reported that the RNPP had completed the scheduled maintenance of Unit 2, including the successful loading of a new type of fuel into Unit 2’s reactor. After it had been restarted, the reactor was reconnected to the grid.
- On 25 October, the KhNPP was shaken by powerful explosions taking place near the plant. The IAEA experts at the site performed a walkdown to assess the damage and observed 26 broken windows as a result of the explosions near the site.

Events at the Chernobyl Nuclear Power Plant Site

- The situation at the Chernobyl site remained stable despite the ongoing difficult living conditions for the site staff. No new events were reported.

Events at Other Facilities

- The situation at other facilities in Ukraine with nuclear or radioactive material in use remained stable. No new events were reported at these sites.