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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, GOV/2022/71 and GOV/2024/18, 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 25 May to 30 August 2024 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 June 2024, the Director General provided the Board of Governors with a detailed report entitled *Nuclear Safety, Security and Safeguards in Ukraine* (document GOV/2024/30), covering the period from 24 February to 24 May 2024.

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/2022/71[2], 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/16[4] on nuclear safety, security and safeguards in Ukraine, in which it "fully support[ed] the continued and reinforced physical presence of the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ), given the ongoing risks to nuclear safety, security, and safeguards implementation at the ZNPP" and "[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,

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[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, paras 1 and 2.

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 continued physical presence of IAEA technical experts at the Chornobyl, Rivne, Khmelnytskyy, 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. On 7 March 2024, the Board of Governors adopted resolution GOV/2024/18[6] on the nuclear safety, security and safeguards in Ukraine, in which it "[r]eiterate[d] its grave concern that the Russian Federation ha[d] not heeded the previous calls of the Board of Governors and General Conference contained in their respective resolutions to withdraw its military and other personnel from the ZNPP" and, inter alia, "call[ed] for the urgent withdrawal of all unauthorized personnel from Ukraine's ZNPP".

6. On 28 May 2024, the Director General travelled to Kaliningrad, Russian Federation, where he met with State Atomic Energy Corporation "Rosatom" Director General, Alexey Likhachev, to discuss matters that continue to pose a real challenge for nuclear safety at the ZNPP: the vulnerability of the off-site power lines, the need for reliable water supplies to ensure reactor cooling and other essential functions at the plant, and the situation related to staffing and equipment maintenance. During this meeting, an understanding was reached that all six reactors at the ZNPP should remain in cold shutdown for the time being.

> "***Even with all six reactors in cold shutdown, plant safety and security remain extremely fragile. Any decision to restart the ZNPP's reactors in the future — when it is safe to do so — must be preceded by a very careful and detailed examination of all operational and regulatory aspects relevant for nuclear safety and security to ensure that the plant is not further put in jeopardy***."
>
> Director General Rafael Mariano Grossi, 30 May 2024

Director General Rafael Mariano Grossi meeting the Director General of Rosatom, Alexey Likhachev, on 28 May 2024.

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

[6] IAEA Board of Governors resolution GOV/2024/18, adopted on 7 March 2024, 2022, paras 2 and 3.

7. On 6 June 2024, the Director General held discussions with the Ukrainian Minister of Energy Herman Halushchenko regarding the Agency's ongoing efforts to support nuclear safety and security in Ukraine. During these discussions, the Director General shared with the Ukrainian Minister of Energy the key outcomes of his recent visit to Kaliningrad, in particular the understanding that the ZNPP would not be restarted as long as nuclear safety and security remained in jeopardy due to the conflict.

Director General Rafael Mariano Grossi meeting the Ukrainian Minister of Energy Herman Halushchenko during his official visit to the Agency's Headquarters in Vienna on 6 June 2024.

8. On 11 July 2024, the UN General Assembly adopted resolution A/RES/78/316[7] on the safety and security of nuclear facilities of Ukraine, including the ZNPP, in which it "[w]elcome[d] and encourage[d] the continued efforts of the Director General of the [Agency] to address the risks to nuclear safety and security, as well as to safeguards implementation at the [ZNPP]" and "[c]alle[d] upon all parties to the armed conflict to implement fully the 'seven indispensable pillars for ensuring nuclear safety and security during an armed conflict' and the five concrete principles of the Director General of the [Agency] to help to ensure nuclear safety and security at the [ZNPP]". Furthermore, it "[c]alled upon [UN] Member States to continue to support the efforts of the Director General of the [Agency] to uphold nuclear safety, security and safeguards implementation at all nuclear facilities in Ukraine".

9. During the reporting period[8], from 25 May to 30 August 2024, the Agency maintained the continued presence of its staff at the five nuclear sites in Ukraine without any interruption and 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 and security; providing relevant information updates to the public and the international community; and delivering on the comprehensive programme of technical support and assistance to Ukraine by providing nuclear safety- and security-related equipment and technical expertise and advice, including assistance for ensuring medical support and care for Ukrainian operating staff, for ensuring radiation safety and nuclear security of radioactive sources, and for mitigating the consequences associated with the destruction of the Kakhovka dam.

10. Agency staff present at the five nuclear sites in Ukraine continued to monitor and assess the situation against the seven indispensable pillars for ensuring nuclear safety and security during an armed conflict ('Seven Pillars') that were first outlined by the Director General at the meeting of the Board of

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[7] United Nations General Assembly resolution A/RES/78/316, adopted on 11 July 2024: A/RES/78/316 (undocs.org), paras 6, 9 and 11.

[8] Following the reporting period referred to in GOV/2024/30.

Governors held on 2 March 2022 and described in document GOV/2022/52[9]. In addition, ISAMZ continued to monitor and report on observance of the five concrete principles for protecting the ZNPP ('Five 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/2023/30[10].

11. Although some challenges related to nuclear safety, such as maintenance of structures, systems, and components important to safety and availability of related spare parts, were observed to have been addressed during the reporting period, the Agency still assesses the overall situation with respect to nuclear safety and security at the ZNPP to be precarious, with all Seven Pillars compromised either fully or partially. The ZNPP continued to face challenges related to the number of available off-site power lines as well as their disconnection due to military activities affecting the energy infrastructure; the availability of cooling water; ensuring adequate staffing; ensuring adequate and timely maintenance of all structures, systems, and components important to safety; maintaining reliable supply chains; and ensuring robust on-site and off-site emergency arrangements, each of which presents potential risks to the nuclear safety and security of the plant.

12. ISAMZ reported military activities including explosions, drone attacks, gunfire and a fire at the location of the cooling towers and in the vicinity of the ZNPP and the presence of Russian armed troops and military equipment on site. While ISAMZ did not find any indications that the five concrete principles were not being observed during the reporting period, such activities continue to put the Five Principles and the overall nuclear safety and security of the plant at great risk.

13. ISAMZ reported an improvement in obtaining access to areas and information related to nuclear safety but continued to face some restrictions in obtaining timely and appropriate access to all areas of relevance to nuclear safety and security and in having open discussions with all relevant staff at the ZNPP as appropriate. This limits the Agency's ability to make its assessment and report impartially and objectively on the nuclear safety and security situation at the site, and to fully assess whether all Five Principles are being observed at all times.

14. The Agency continued to request timely and appropriate access to all areas of the ZNPP of significance for nuclear safety and security and to strongly encourage the ZNPP to ensure that open information sharing takes place regularly.

15. Reported attacks on energy infrastructure throughout the country again demonstrated the fragility and vulnerability of the overall energy infrastructure in Ukraine. Although these events did not result in a total loss of off-site power at the ZNPP or at other nuclear sites, they continued to pose a risk to overall nuclear safety and security.

16. On 12 July 2024, a meeting of the Board of Governors was convened at the request of Ukraine, as a Member of the Board of Governors, to address the implications of the situation in Ukraine on technical cooperation with the Agency. On this occasion, the Board of Governors adopted resolution GOV/2024/51[11], in which it "[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 related equipment, training and support as requested by Ukraine".

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

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

[11] IAEA Board of Governors resolution GOV/2024/51, adopted on 12 July 2024, para. 3.

17. This report has been produced in response to resolution GOV/2022/17[12], 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/2022/58[13], 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"; to resolution GOV/2022/71[14], 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"; and to resolution GOV/2024/18[15], in which the Board of Governors requested the Director General to "continue to report comprehensively on the observance of the five concrete principles to help ensure nuclear safety and security at ZNPP as well as the Director General's 'seven indispensable pillars for ensuring nuclear safety and security'; and that he continue to closely monitor the situation and continue to report formally to the Board on these matters for as long as required."

18. This report provides a summary of the situation in Ukraine regarding nuclear safety, security and safeguards from 25 May to 30 August 2024. 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 under the current circumstances 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.

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 Khmelnytskyy Nuclear Power Plants (NPPs), and to the Chornobyl NPP Site

19. During the reporting period, the Agency maintained the continued presence of its staff, comprising up to 13 staff members in total across the 5 nuclear sites in Ukraine, through the uninterrupted deployment of IAEA Support and Assistance Missions to the ZNPP (ISAMZ), the Khmelnytskyy NPP (KhNPP) (ISAMIK), the Rivne NPP (RNPP) (ISAMIR), the South Ukraine NPP (SUNPP) (ISAMISU), and the Chornobyl NPP (ChNPP) site (ISAMICH). 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.

20. The Agency continued its rigorous preparations and logistics for the safe and secure deployment of missions to Ukraine. The rotations of Agency staff at the KhNPP, the RNPP, the SUNPP, and the ChNPP site as well as at the ZNPP during the reporting period were conducted as planned.

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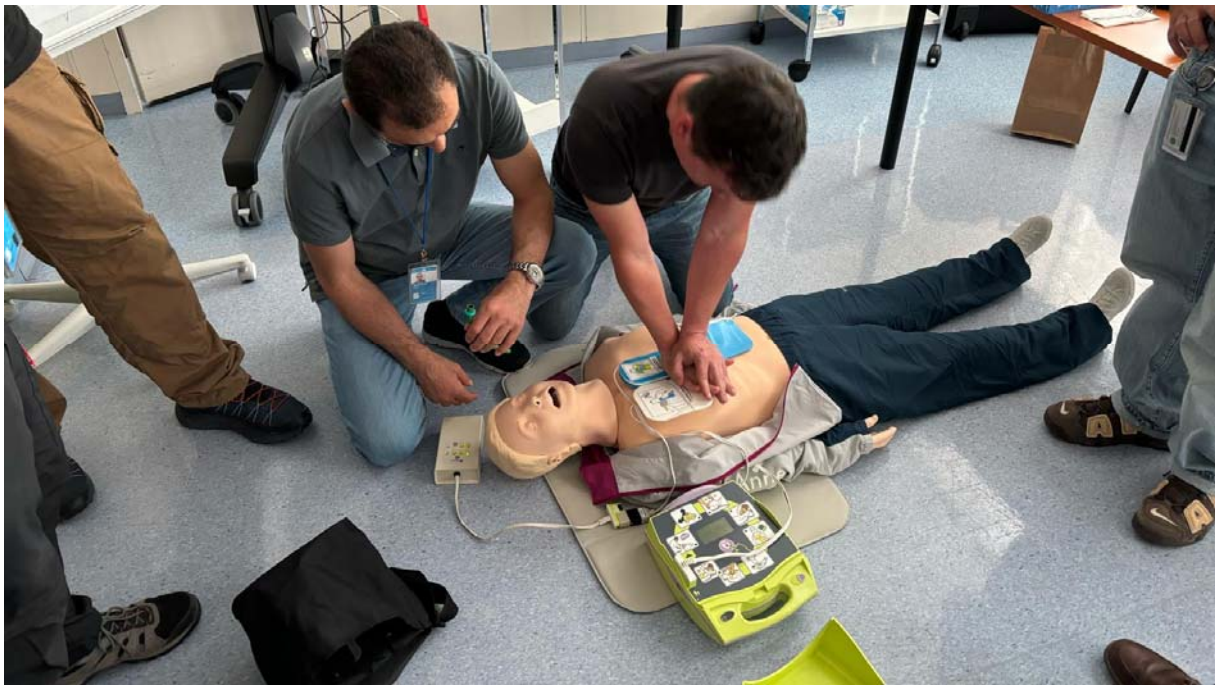
[12] IAEA Board of Governors resolution GOV/2022/17, adopted on 3 March 2022, para. 4.

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

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

[15] IAEA Board of Governors resolution GOV/2024/18, adopted on 7 March 2024, para. 6.



Agency staff taking part in missions to Ukraine receiving cardiopulmonary resuscitation training at the Agency's Headquarters on 29 May 2024.

21. The activities performed by Agency staff at each site include the conduct of technical 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.

ISAMIR visiting the personnel development department at the RNPP on 5 July 2024 to discuss the roles and responsibilities of the department. (Photo: RNPP)

22. As of 30 August 2024, a total of 139 missions comprising 144 Agency staff members had been deployed as part of the continued presence at all 5 nuclear sites in Ukraine, totalling over 277 person-months in Ukraine. Some of the 144 Agency staff members participated in more than one rotation. Agency staff at all nuclear sites in Ukraine continued to experience air raid alarms frequently, some of which required them to take shelter.

23. Maintaining the continued presence of Agency staff at the 5 nuclear sites in Ukraine continues to be a major undertaking for the Agency, requiring mobilization of significant Agency resources. While the Agency secured most of the funding needed to maintain the uninterrupted presence of Agency staff at the 5 nuclear sites in Ukraine until the beginning of 2025, additional funding needs have been assessed to be approximately €9.5 million, assuming that the same level of operations is to be extended until the end of 2025.

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

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

25. The Agency 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. In addition, the Agency continued to monitor and assess observance of the Five Principles aimed at ensuring the integrity and the nuclear safety and security of the ZNPP. The Agency continued to report regularly on its observations and findings.

The seven indispensable pillars for ensuring nuclear safety and security during an armed conflict, outlined for the first time by the Director General at the meeting of the Board of Governors held on 2 March 2022.

The five concrete principles for protecting the ZNPP, established by the Director General during his address to the UNSC on 30 May 2023.

26. 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 Principles, are presented below. A chronology of events in Ukraine during the reporting period is provided in the Annex.

B.2.1. Zaporizhzhya NPP

27. The Agency's assessment is that the overall situation with respect to nuclear safety and security at the ZNPP continues to be precarious, with all Seven Pillars compromised either fully or partially during the reporting period. Despite some improvements in information sharing from the ZNPP, ISAMZ continued to face limitations in the provision of timely and appropriate access to all areas and information related to nuclear safety and security that might have implications for the Agency's assessment of the overall situation.

28. Throughout the reporting period, all units remained in cold shutdown, in compliance with the regulatory order issued on 8 June 2023 by the SNRIU that limits the operation of all six units of the ZNPP to cold shutdown. Following the high-level talks held during the reporting period[16], the Agency's understanding is that no reactor is to be restarted as long as the nuclear safety and security situation at the ZNPP remains in jeopardy due to the conflict.

> "***The ZNPP is continuing to face serious nuclear safety and security risks. We can't afford to let our guard down for a single minute. In view of these challenging and unprecedented circumstances — with Europe's largest nuclear power plant located in a war zone — there is an understanding that its six reactors should remain in cold shutdown for the time being***."
>
> Director General Rafael Mariano Grossi, 30 May 2024

29. During the reporting period, up to two mobile diesel boilers at the site were operated to provide heating for the ZNPP's needs until mid-June 2024. The four diesel steam generators (DSGs) were operated for up to 12 days at a time on two occasions, in June and August 2024, to provide the steam required by the ZNPP to process liquid radioactive waste.

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[16] See paras 6 and 7 above.

30. The ZNPP reported to ISAMZ that several events had occurred on 19 June, 3 July, 5 July and 10 July 2024 outside the ZNPP site perimeter, some of which reportedly caused injury to a number of workers and affected parts of the energy infrastructure. These alleged attacks on the Luch and Raduga electrical substations located in and around the city of Enerhodar, where the ZNPP staff and their families temporarily reside, left the city without power and in some cases affected the supply of tap water to the ZNPP. ISAMZ visited the sites of both substations and observed the damage to them and the debris of what appeared to be a drone. At the Raduga substation, ISAMZ observed an unexploded device on the ground near the damaged transformer.

> "***It is extremely concerning that these drone attacks are continuing, despite the very clear dangers they present to the people of Enerhodar as well as to safety at the ZNPP. They must stop, immediately.***"
>
> Director General Rafael Mariano Grossi, 3 July 2024

ISAMZ observes the damage at the Raduga electrical substation on 20 June 2024.

Physical integrity

31. During the reporting period, ISAMZ did not observe any impact to the physical integrity of the six reactor units or to the on-site storage facilities housing spent fuel, fresh fuel and radioactive waste. However, ISAMZ continued to report military activity in the vicinity of the plant, such as frequent explosions and gunfire that could potentially affect the nuclear safety and security of the site. Some military activities triggered air raid alarms at the site, which postponed or interrupted ISAMZ's planned walkdowns.

32. Moreover, on 11 August 2024, ISAMZ observed thick dark smoke coming from the north-western area of the plant, which the ZNPP reported was the result of an alleged drone attack on one of the plant's cooling towers. ISAMZ visited the location on 12 and 13 August 2024 and viewed associated photos and video footage with the aim of assessing whether there had been any impact on the nuclear safety of the plant or a potential violation of the Five Principles. ISAMZ observed extensive damage to the internal components at the water nozzle distribution level and noted that the main fire seemed unlikely to have occurred at the base of the cooling tower.

33. The cooling towers are not currently required as part of the cooling mechanism for the reactors, which are all in cold shutdown. No radioactive material is present in the area of the cooling towers, which is located approximately 1.5 kilometres from the reactor units at the ZNPP. No signs of elevated radiation levels were measured by ISAMZ. While the Agency assesses that this event does not directly impact the safety of the six units in shutdown, any kind of fire on the site or in its vicinity poses the risk of fire spreading to facilities essential for nuclear safety or security.

ISAMZ observing the damage at the cooling tower on 12 August 2024. (Photo: ZNPP)

34. On 17 August 2024, ISAMZ was informed by the ZNPP that an explosive carried by a drone had detonated just outside of the plant's protected area, in an area adjacent to the essential cooling water sprinkler ponds and about 100 metres from the 750 kV Dniprovska power line. ISAMZ immediately visited the area and reported that the damage seemed to have been caused by a drone equipped with an explosive payload. There were no casualties and no impact on the nuclear safety and security of the plant. However, the road between the two main gates of the ZNPP was impacted.

Nuclear safety and security systems and equipment

35. During the reporting period, ISAMZ was able to routinely visit the reactor halls and other key locations within the reactor containment area, the safety systems rooms, the main control rooms (MCRs) and parts of the turbine halls of all six units. ISAMZ also visited the radioactive waste storage facilities, the dry spent fuel storage facility, and the storage facilities for fresh fuel at the site. Moreover, ISAMZ visited the cooling pond, the discharge channel isolation gate, the essential service water sprinkler ponds including the drilled wells, the metrology department, facilities storing radioactive sources at the site, and the emergency diesel generators (EDGs). ISAMZ did not report any new major issues affecting the overall nuclear safety and security of the plant based on the observations made during these visits.

36. However, ISAMZ noted:

- The presence of oil on the floor of the reactor hall of Unit 4, coming from the polar crane, during a visit on 27 May 2024.
- Traces of boron deposits and oil stains in some of the safety system rooms of Unit 4 visited on 27 May and 28 June 2024.
- Oil and fuel leakages at five of 12 EDGs visited on 9 July 2024, as well as a defect at the connection point to one of the high pressure connection hoses.

- The metrology laboratory's accreditation being based on a national standard of the Russian Federation.[17]

37. ISAMZ continued to be prevented from visiting the western part of the turbine halls throughout the reporting period, and ISAMZ therefore continued to be unable to independently confirm whether there were any issues or materials present in these parts of the turbine halls that could potentially affect the nuclear safety or security of the plant.

38. ISAMZ continued to gather information and independently monitor and observe maintenance activities based on the maintenance plans for 2024. ISAMZ reported the following:

- Scheduled maintenance activities in Unit 1 continued throughout the reporting period, including full-scale maintenance on the heat exchangers, intermediate maintenance on valves, and routine maintenance on pumps. Maintenance on safety train I of Unit 1 was completed and it returned to service on 28 June 2024. Maintenance of safety train II commenced on 15 July 2024 and was completed on 2 August 2024.
- Scheduled maintenance activities in Unit 2 are planned to commence in September 2024 and to include full-scope maintenance of all three safety trains.
- Cleaning and purification of the essential service water sprinkler pond of safety train I of Unit 5 commenced on 20 August 2024 for approximately ten days, during which time the corresponding EDG was unavailable.
- Scheduled maintenance activities in Unit 6 commenced on 8 July 2024 and include maintenance on the polar crane; the refuelling machine; the safety system equipment such as pumps, valves and their motors; the ventilation system; and the main circulation pump snubbers. Maintenance of safety train III of Unit 6, which included cleaning the heat exchangers and servicing the electrical and instrumentation and control components, was conducted from 8 July to 16 August 2024. On 19 August 2024, maintenance activities commenced on safety train I of Unit 6.
- The necessary spare parts have reportedly been available for the planned maintenance activities in Units 1, 2 and 6.
- Maintenance work was being conducted by ZNPP staff together with contractors from the Russian Joint Stock Company "Atomenergoremont".[18]

39. Throughout the reporting period, ISAMZ routinely observed that the 11 groundwater wells continued to provide approximately 250 cubic metres of cooling water per hour to the 12 essential service water sprinkler ponds, which serve as the ultimate heat sink for the cooling of the reactors and safety systems in the shutdown state. However, on 11 August 2024, ISAMZ observed that one of the wells was not in operation, however it was reported to have returned to operation on 12 August 2024 following repairs. On 17 August 2024, ISAMZ observed that the same well was again out of operation. The ZNPP informed ISAMZ that the well had returned to operation on 21 August 2024 following further repairs.

40. ISAMZ routinely visited the essential service water sprinkler ponds and observed that they remained filled with water at heights sufficient to provide cooling to all six units in the shutdown state, except when a cooling pond was being cleaned.

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[17] See para. 2 above.

[18] See para. 2 above.

41. While the Zaporizhzhya thermal power plant (ZTPP) inlet channel remained disconnected from the former Kakhovka reservoir, it continued to receive some water through the ingress of groundwater as well as from precipitation, which was periodically pumped into the ZTPP discharge channel during the reporting period. Additionally, ISAMZ observed that the ZNPP had installed a submersible pump near the isolation gate of the discharge channel of the ZTPP which pumped the remaining water from the Kakhovka reservoir into the ZTPP discharge channel at a reported rate of 100 cubic metres per hour during the day. During the reporting period, the height of the water in the ZTPP discharge channel fluctuated between 16.28 metres and 16.57 metres.

42. Water from the ZTPP discharge channel and unused water from the 11 groundwater wells continued to be pumped into the ZNPP cooling pond throughout the reporting period, reportedly at a maximum flow rate of 270 cubic metres per hour.

43. ISAMZ continued to monitor the heights of the available water resources by receiving daily measurements reported by the ZNPP. In addition, ISAMZ independently measured the height of the water in the ZNPP cooling pond. On 10 July 2024, the height of the water in the ZNPP cooling pond dropped to below 15 metres, which is below the nominal operating limit defined for the circulation pumps of the reactor units. However, ISAMZ and the ZNPP continued to monitor the operability of these pumps below 15 metres. Once the pumps are no longer operable, any further use of the water from the ZNPP cooling pond will only be possible by using additional service and mobile pumps and provided that the height of the water remains greater than approximately 12 metres. If there is a further reduction in the height of the cooling pond water similar to that observed since the destruction of the Kakhovka dam, the Agency assesses that this water source will remain available for at least one more year.

44. On several occasions during the reporting period, ISAMZ discussed with the ZNPP the inventory of radioactive sources at the ZNPP and their intended use and storage. Subsequently, on 22 and 24 July 2024, ISAMZ conducted an independent survey of the inventory of radioactive sources primarily used for non-destructive testing and calibration at the ZNPP, and observed their status. ISAMZ did not identify any discrepancies compared to the inventory of radioactive sources provided. During these activities, ISAMZ learned about three new iridium-192 industrial radiography sources received at the site in January 2024 and that the current authorizations for use of radioactive sources issued under Ukrainian regulations continue to be valid but that the ZNPP plans to obtain new authorization issued by Rostechnadzor[19].

45. During the reporting period, ISAMZ frequently observed the testing of the EDGs and the respective safety system trains from locations such as the MCRs, the emergency control room, and the local EDG rooms. ISAMZ did not observe any nuclear safety issues during the tests.

46. During the reporting period, ISAMZ continued to observe the presence of anti-personnel mines in the buffer zone between the facility's internal and external fences in a restricted area inaccessible to operating plant personnel. The ZNPP and the Russian Federation report that these mines are part of the physical protection system. However, the Agency remains unaware of any assessment performed by the ZNPP consistent with the Agency's safety standards and nuclear security guidance to assess the potential implications of the presence of these mines for nuclear safety and security systems and equipment at the site.

Operating staff

47. During the reporting period, the average total number of staff at the ZNPP was just over 2000 on working days, and over 450 on weekends and designated holidays. The ZNPP informed ISAMZ that the

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[19] See para. 2 above.

recruitment of new staff was ongoing and that the organizational structure was being reviewed to determine staffing needs.

48. ISAMZ visited all six MCRs on several occasions during the reporting period. ISAMZ observed that each unit consisted of three authorized personnel per MCR on average, in line with the number reported in document GOV/2024/30[20]. On 1 August 2024, the ZNPP informed ISAMZ that all MCR operators had received an authorization from the Federal Environmental, Industrial and Nuclear Supervision Service (Rostechnadzor)[21] after successful completion of their training. ISAMZ was informed that MCR operators received an initial authorization with a validity of five years.

49. On some occasions, ISAMZ was able to converse with MCR operators regarding their authorizations and experience, but on most occasions ISAMZ faced restrictions imposed by the ZNPP and was unable to openly interact and exchange information with the operators.

50. Based on the observations of ISAMZ, in particular during visits[22] to various key facilities and locations at the site, the staffing situation at the ZNPP appeared to have gradually improved. However, for the Agency to be able to fully assess the staffing situation at the ZNPP, including in relation to qualifications and training, and reach a conclusion regarding its potential implications for nuclear safety and security, timely and precise information as well as open discussions with all relevant staff continue to be needed.

Off-site power supply

51. The status of the off-site power supply to the ZNPP remained vulnerable throughout the reporting period. The ZNPP off-site power supply continued to rely on only two off-site power lines — the 750 kV Dniprovska line and the 330 kV Ferosplavna 1 back-up line. On 22 August 2024, the 330 kV Ferosplavna 1 back-up line was disconnected at 16:00 local time, which the ZNPP reported was due to a short circuit in the line, at a distance of 17 kilometres from the ZTPP 330kV open switchyard. The Ukrainian grid dispatchers reported to the ZNPP that they were working to locate and repair the short circuit, which was reconnected at 15:30 local time on 23 August 2024.

52. ISAMZ continued to monitor the maintenance activities on electrical components located on site and in the 750 kV open switchyard, which provide off-site power to all six units. ISAMZ reported the following developments during the reporting period:

- Maintenance of the main transformer of Unit 2, together with the house load transformers and respective equipment in the 750 kV open switchyard, was completed.
- On 8 July 2024, the main transformer of Unit 3, together with the house load transformers and respective equipment in the 750 kV open switchyard, were put into maintenance. The main transformer was put back into operation on 15 August 2024.
- ISAMZ learned that the air breakers in the 750 kV open switchyard were being exchanged for gas breakers. Additionally, ISAMZ was informed that repairs on two of the three cells of the Kakhovka node had been completed and that spare parts were available to complete the work, but that there were no plans to do so until the military situation had stabilized.

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[20] Report by the Director General to the Board of Governors, document GOV/2024/30, issued on 27 May 2024, para. 56.

[21] See para. 2 above.

[22] See para. 30 above.

– Maintenance was completed on one pair of back-up power transformers, and one of the breakers of the autotransformer was put into maintenance on 3 August 2024. These transformers enable back-up power to be supplied from the 330 kV open switchyard to the ZNPP.

53. During the maintenance activities, the ZNPP made a temporary modification to the electrical power configuration so as to ensure uninterrupted power supply to all units while minimizing the risk of a start of the EDGs in case of a loss of the connection between the ZTPP 330 kV open switchyard and the back-up transformers.

54. Wildfires near the 750 kV open switchyard were reported on 28 May and 3 July 2024, raising concerns about a potential adverse impact on the ZNPP off-site power supply. ISAMZ visited the site of the reported wildfires on 31 July 2024 and observed burnt vegetation. No impact on the off-site power supply was reported to have occurred.

55. On 3 August, ISAMZ observed fire and smoke coming from an area to the north-east of the ZNPP, near the ZTPP inlet channel. The ZNPP reported that the fire had occurred underneath the overhead cables of the 750 kV Dniprovska line and the 330 kV Ferosplavna 1 back-up line. There was no disconnection of either line.

56. ISAMZ continued to request access to the ZTPP 330 kV open switchyard and to observe the status of the only remaining functional back-up power line node as well as restoration work on damaged components, which had been observed when ISAMZ last visited the switchyard on 19 December 2022.

57. While no total loss of all the off-site power lines occurred during the reporting period, the fact that only two of ten off-site power lines remained available, combined with the proximity of the site to the frontline and the military activity in the area, continued to underscore that the off-site power supply poses a major risk to the nuclear safety and security of the ZNPP.

> "***I remain very concerned about the vulnerability of the electricity network across Ukraine. Over two years ago, when this tragic conflict first started, I outlined the seven indispensable pillars of nuclear safety and security. Pillar 4 states that there must be a secure off-site power supply from the grid for all nuclear sites. It is essential that the electricity network across all of Ukraine remains stable to help maintain nuclear safety at all nuclear power plants***."
>
> Director General Rafael Mariano Grossi, 19 July 2024

Logistical supply chain

58. During the reporting period, the supply chain to the ZNPP continued to be provided by the Russian Federation.[23] ISAMZ continued to access relevant locations at the ZNPP to assess the status and availability of spare parts, including visits to the central, mechanical and electrical warehouses, and to other departments such as the non-destructive testing and metrology departments, and to hold discussions with the ZNPP staff. Based on these activities, ISAMZ reported the following:

– Spare parts for the ongoing maintenance activities were reportedly supplied through Rosatom and Atomenergoremont.[24]

– Maintenance activities at each unit reportedly commenced only when at least 85% of the spare parts were made available on site, with the remaining 15% of spare parts planned to be delivered during the course of the maintenance.

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[23] See para. 2 above.

[24] See para. 2 above.

- The spare parts are reportedly stored in off-site warehouses due to the risk posed by the armed conflict, and all spare parts are planned to be returned and stored in the ZNPP on-site warehouses when the situation becomes more stable.
- Spare thermal mechanical equipment, including electrical motors reportedly procured recently through the Russian Federation, were observed by ISAMZ at the site.
- Procurement training had been delivered to the ZNPP staff, and suppliers from the Russian Federation had been identified to address various plant needs, including for radioactive sources required for equipment intended for non-destructive testing at the site, chemical reagents and consumables.

59. During visits to the diesel fuel storage facility on 8 and 31 July 2024, ISAMZ was informed that the current stock of diesel fuel was 1300 cubic metres, in addition to the fuel stored in the individual tanks of the EDGs. The ZNPP informed ISAMZ that usage during the summer season was approximately 7–10 tonnes per week. Furthermore, ISAMZ was informed that the inventory was lower due to planned maintenance on the tanks. ISAMZ was informed that, in case of a loss of off-site power resulting in the need to operate the EDGs, the site could receive diesel fuel in approximately 24–48 hours.

60. ISAMZ was also informed that, due to the lower usage rate, the most recent delivery of diesel fuel had occurred in the second quarter of 2024 and that the next planned shipment was scheduled for November 2024, by which time the usage of diesel fuel will be higher due to the operation of the mobile diesel boilers. While the Agency noted that ISAMZ had previously observed the delivery of diesel fuel to the ZNPP, indicating that the supply chain was in place, the amount observed was the smallest volume of diesel fuel noted so far at the diesel fuel farm.

61. While these observations continued to indicate that the supply chain appeared to be in place to meet the needs of the ZNPP, ISAMZ was still unable to independently confirm that all necessary and compatible spare parts were available or could be supplied to the ZNPP when and as needed.

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

62. During the reporting period, all on-site radiation monitoring stations were operational, as reported in document GOV/2024/9. However, as a result of alleged shelling and fire on 24 June 2024, one additional off-site radiation monitoring station located approximately 16 kilometres to the south-west of the ZNPP was destroyed, bringing the total number of off-site radiation monitoring stations no longer reporting monitoring data to 4.

63. Following the damage to the Raduga electrical substation on 21 June 2024, resulting in a loss of power to parts of Enerhodar and the industrial zone, some of the off-site radiation monitoring stations in these areas were temporarily inoperable after their back-up batteries became depleted.

"***The loss of one radiation monitoring station does not have a direct impact on safety at the ZNPP, but it forms part of a continuous erosion of a range of safety measures during the war that remains a deep source of concern***."

Director General Rafael Mariano Grossi, 27 June 2024

The damaged off-site radiation monitoring station located approximately 16 km to the south-west of the ZNPP. (Photo: ZNPP)

64. The loss or inoperability of off-site radiation monitoring stations does not pose a direct risk to the public or the environment, or to the nuclear safety and security of the plant. However, it will reduce the amount of data available in the event of a release of radioactive material into the environment and will have an adverse impact on the ability to perform robust assessment of the situation and ensure sound decision-making regarding the need for public protective actions.

65. The online transmission of data from the radiation monitoring systems around the ZNPP to the SNRIU continued to be interrupted and was not restored during the reporting period. Data from the on-site and off-site radiation monitoring stations continued to be provided to ISAMZ manually several times a week and were uploaded to and displayed on the Agency's International Radiation Monitoring Information System (IRMIS) together with the results of the radiation monitoring conducted by ISAMZ. All radiation levels reported to and collected by ISAMZ were normal throughout the reporting period.

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

66. During the reporting period, ISAMZ continued to closely monitor and assess the emergency arrangements in place at the ZNPP. ISAMZ conducted visits to the temporary on-site emergency centre on several occasions and engaged in discussions with the ZNPP staff. As a result, ISAMZ reported the following:

- The drafting of the new emergency plan had been completed; the plan was going through the review and approval process and was expected to come into force from 30 September 2024.
- The on-site emergency centre remained unavailable throughout the reporting period, with the ZNPP continuing to use the temporary emergency centre located in the area beneath the MCR of Unit 2, even though its design does not comply with all of the typical characteristics of an emergency response facility.
- The ZNPP had reportedly concluded the evaluation of the exercise conducted on 15 May 2024 and reported in document GOV/2024/30, had identified lessons to be learned, and had developed an action plan to address the necessary improvements.
- The ZNPP plans to conduct a full-scale on-site emergency exercise in September 2024. However, the participation of the local population and off-site authorities from the areas surrounding the plant had not been determined. A further exercise is planned for November 2024, with the participation of a technical support organization from the Russian Federation.[25]
- The off-site emergency centre, which is located on the other side of the frontline in Zaporizhzhya city, remained unavailable to the plant and the use of another location was reportedly still under consideration.

67. Effective emergency arrangements are essential to ensure the protection of the public, property and the environment in case of an emergency, particularly in the circumstances imposed by the armed conflict. The conduct of emergency drills and exercises and the practice of addressing lessons learned are important components of maintaining effective emergency arrangements. However, based on current observations, the existing emergency arrangements continue to have major shortcomings in terms of ensuring an effective response in the event of an emergency warranting the implementation of public protective actions off site.

Communications

68. Official communication between the ZNPP and the SNRIU has not been restored. The ZNPP remains in contact with the Ukrainian electricity grid operator on matters related to the off-site power supply.

69. ISAMZ reported that internet connections remained functional, even during reported power outages in the nearby city of Enerhodar. However, ISAMZ reported that it had experienced challenges in connecting to local mobile telephone networks and periods when communications utilizing satellite phones and global positioning systems could not be established.

Five concrete principles for protecting the ZNPP

70. During the reporting period, the Agency continued to monitor observance of the Five Principles at the ZNPP. ISAMZ conducted regular walkdowns within the ZNPP site and other areas such as the ZNPP cooling pond and 750 kV open switchyard, and noted improvements in obtaining access to areas and information related to nuclear safety. However, for the duration of the reporting period ISAMZ was

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[25] See para. 2 above.

prevented from accessing all areas relevant for nuclear safety and security, such as the western side of the turbine halls, the ZNPP cooling pond isolation gate and the ZTPP 330 kV open switchyard. The access restrictions imposed on ISAMZ by the ZNPP continue to limit the Agency's ability to fully assess whether all Five Principles are being observed at all times.

71. Based on its observations and with these limitations, ISAMZ did not find any indications that the Five Principles were not being observed during the reporting period.

72. However, ISAMZ observed that some principles were put at great risk during the reporting period. Namely, although ISAMZ did not report any attacks from or against the plant targeting the reactors, spent fuel storage, or other critical infrastructure or personnel, it continued to report that it regularly heard explosions and gunfire in proximity to the ZNPP site or at the location of the cooling towers and that military activities close to the ZNPP site intensified in August 2024.

73. Moreover, ISAMZ observed the damage to the cooling tower resulting from an alleged drone attack on 11 August 2024. Based on its observations, ISAMZ could not reach a definitive conclusion regarding a violation of the Five Principles. To enable it to do so, ISAMZ requested access to the inside of the impacted cooling tower as well as to the second of the two cooling towers at the plant in order to see inside the structure and identify materials and specifications similar to those that may have been present in first cooling tower prior to the fire. However, during the reporting period, ISAMZ was not given access to the inside of the two cooling towers. On this occasion, the Director General reiterated that any military action against the plant constitutes a clear violation of the Five Principles for protecting the ZNPP.

74. On 17 August 2024, ISAMZ was informed by the ZNPP that an explosive carried by a drone detonated just outside of the plant's protected area. The impact site was close to the essential cooling water sprinkler ponds and about 100 metres from the Dniprovska power line, the only remaining 750 kV line providing a power supply to the ZNPP. ISAMZ immediately visited the area and reported that the damage seemed to have been caused by a drone equipped with an explosive payload. There were no casualties and no impact on any NPP equipment. However, there was impact to the road between the two main gates of the ZNPP. On this occasion, the Director General called for strict observance of the Five Principles established for the protection of the plant.

> "***Yet again we see an escalation of the nuclear safety and security dangers facing the ZNPP. I remain extremely concerned and reiterate my call for maximum restraint from all sides and for strict observance of the five concrete principles established for the protection of the plant***."
>
> Director General Rafael Mariano Grossi, 17 August 2024

75. The ZNPP informed ISAMZ of alleged military attacks at off-site locations and of drones near the site perimeter being supressed using small arms fire or drone attacks causing fires, including at the nearby 750kV open switchyard and the ZNPP cooling pond. No damage or casualties were reported. ISAMZ could not verify this information, although the alleged attacks coincided with the sound of small arms fire and smoke heard and observed by ISAMZ in the vicinity of the site. On 31 July 2024, ISAMZ visited the 750 kV open switchyard and observed burnt vegetation, but was unable to confirm the cause.

76. ISAMZ reported that military activity in the area - including very close to the plant - has been intense during the week of 12 August 2024. The team has heard frequent explosions, repetitive heavy machine gun and rifle fire and artillery at various distances from the plant.

77. ISAMZ did not observe the presence of any heavy weapons (i.e. multiple rocket launchers, artillery systems, and munitions and tanks) in the areas of the ZNPP that it visited. For the Agency to fully

confirm the absence of heavy weapons at the ZNPP, timely and appropriate access to all areas, including the western parts of the turbine halls, is required.

78. ISAMZ continued to report the presence of armed troops (which the Russian Federation claims are members of the Russian National Guard and some chemical, biological, radiological and nuclear (CBRN) specialists) and military equipment such as armoured personnel carriers, military logistics-type vehicles, and weapon-mounted armoured vehicles. ISAMZ reported that armed troops prevented its access to the western parts of the turbine halls.

79. During the reporting period, the 330 kV Ferosplavna 1 back-up power line was disconnected for approximately 24 hours due a short circuit that occurred 17 kilometres from the ZTPP 330 kV open switchyard. Reportedly, the disconnection was due to shelling in the area around Nikopol. The 750 kV Dniprovska line, the main source of external power to the ZNPP, was not disconnected during the reporting period.

80. Fires that occurred in proximity to the 750 kV open switchyard and in the land below the last remaining off-site power lines, which were reportedly caused by drone attacks, put the off-site power at additional risk. Furthermore, ISAMZ continued to be denied permission to access the ZTPP 330 kV open switchyard in order to observe that the off-site power supplied through that switchyard was not being put at risk.

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

B.2.2. Khmelnytskyy, Rivne and South Ukraine NPPs

82. The KhNPP, the RNPP and the SUNPP continued to be the only operating NPPs in Ukraine producing electricity for the Ukrainian network during the reporting period. All reactors (nine in total) at these sites remained in operation during the reporting period, except during scheduled outages for maintenance and refuelling and during the automatic shutdown of one reactor unit at the RNPP and one reactor at the SUNPP, which occurred on 26 August 2024 due to electrical grid fluctuations caused by military activities affecting energy infrastructure. For the same reason, on 26 August 2024, the RNPP and the SUNPP also suffered a reduction in operating power in the remaining reactor units.

83. On 22 June 2024, the KhNPP had to reduce the power production of Unit 1 and postpone a planned outage based on a direction issued by the Ukrainian electricity grid dispatcher. This action was taken to provide a baseload electricity supply to the grid and to compensate for the decreased electricity production from other non-nuclear electricity generation plants as a result of the armed conflict. These events had no impact on nuclear safety and security. On 26 July 2024, the refuelling outage of Unit 1 began.

84. At the RNPP, the refuelling outages of Units 1 and 4 were completed on 27 and on 29 May 2024, respectively. This was followed by the outage of Unit 3 between 1 June 2024 and 16 July 2024. Following the 45-day refuelling and maintenance outage, Unit 3 was reconnected to the grid on 16 July 2024, initially operating at lower power due to electrical grid limitations. Unit 2 commenced a planned outage for refuelling and maintenance on 27 August 2024.

85. During the reporting period, Units 3 and 1 of the SUNPP were shut down for refuelling and maintenance on 1 June and on 15 June 2024, respectively. Following the successful completion of the

planned refuelling outages, Units 2, 1 and 3 were restarted on 7 June, 25 July and 23 August 2024, respectively.

86. Throughout the reporting period, frequent air raid alarms were reported by the Agency staff present at these NPPs, some of which required them to take shelter.

87. At all three NPPs, staff of the National Nuclear Energy Generating Company "Energoatom" who previously worked at the ZNPP are gradually being integrated into the plants' activities by supporting the construction of new units or the work of various departments, and some staff are undergoing training to operate certain units.

Physical integrity

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

Nuclear safety and security systems and equipment

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

ISAMIK performing a walkdown with counterparts at the KhNPP. (Photo: KhNPP)

Operating staff

90. All three NPPs reported that they had a sufficient number of qualified operating staff to ensure safe and secure plant operation. ISAMIK, ISAMISU and ISAMIR did not report any change in staffing levels during the reporting period. However, the operating staff at these NPPs continued to be exposed to increased stress due to the armed conflict, including as a result of frequent air raid alarms.

"***The sporadic loss of basic living essentials such as electricity and drinking water is affecting the staff and families at all nuclear power plants and facilities throughout Ukraine, potentially impacting on their ability to perform their important nuclear safety and security work***."

Director General Rafael Mariano Grossi, 11 July 2024

Off-site power supply

91. All three operating NPPs benefit from a robust design that provides for several independent connections with the outside grid, including additional sources of power such as nearby hydroelectric power plants. In June 2024, the installation of an additional 6 kV diesel generator was observed at the KhNPP, providing an additional safety line to the electrical supply.

92. However, the off-site power lines at all NPPs continued to be affected by the military activities across Ukraine, as follows:

- At the KhNPP, between 8 and 9 June 2024 one of the two 750 kV off-site power lines was taken out of operation at the request of the grid operator.
- At the RNPP, between 27 and 28 May 2024 one of the two 750 kV off-site power lines was taken out of operation at the request of the grid operator. Additionally, between 16 July and 4 August 2024, power at the 330 kV switchyard was limited due to grid limitations.
- On 26 August 2024, the KhNPP and the RNPP reported that some off-site power lines were disconnected as a result of military activities affecting the energy infrastructure.
- At the RNPP, Units 1, 3 and 4 were disconnected from the grid on 26 August 2024 due to military activities resulting in grid instability. Unit 3 was reconnected to the grid, albeit at reduced power, later the same day.
- At the SUNPP, on 26 August 2024, the operating power of all three units was reduced due to electrical grid limitations as a result of military activities impacting the electrical infrastructure. At 17:10 local time on 26 August 2024, Unit 3 was automatically shut down by the activation of safety protections triggered due to fluctuations in the electricity grid. Unit 3 was restarted on 27 August 2024, approximately 12 hours after it was shut down, and returned to operation at low power.

93. At the SUNPP, on 15 July 2024 Unit 2 was temporarily shut down following the actuation of electrical protections due to a transformer problem in the 330 kV open switchyard located outside the NPP site. As a result of a short circuit, there was damage to the ceramic insulator, causing an oil leak that caught fire due to an electric arc. After the electrical connection was restored, the reactor was restarted and began supplying electricity to the grid after about 17 hours, reaching full power just over 24 hours after the shutdown.

ISAMISU visiting the Pivdennyy Buh river on 17 July 2024.

Logistical supply chain

94. No new challenges to the logistical supply chains for the KhNPP, the RNPP and the SUNPP were identified during the reporting period.

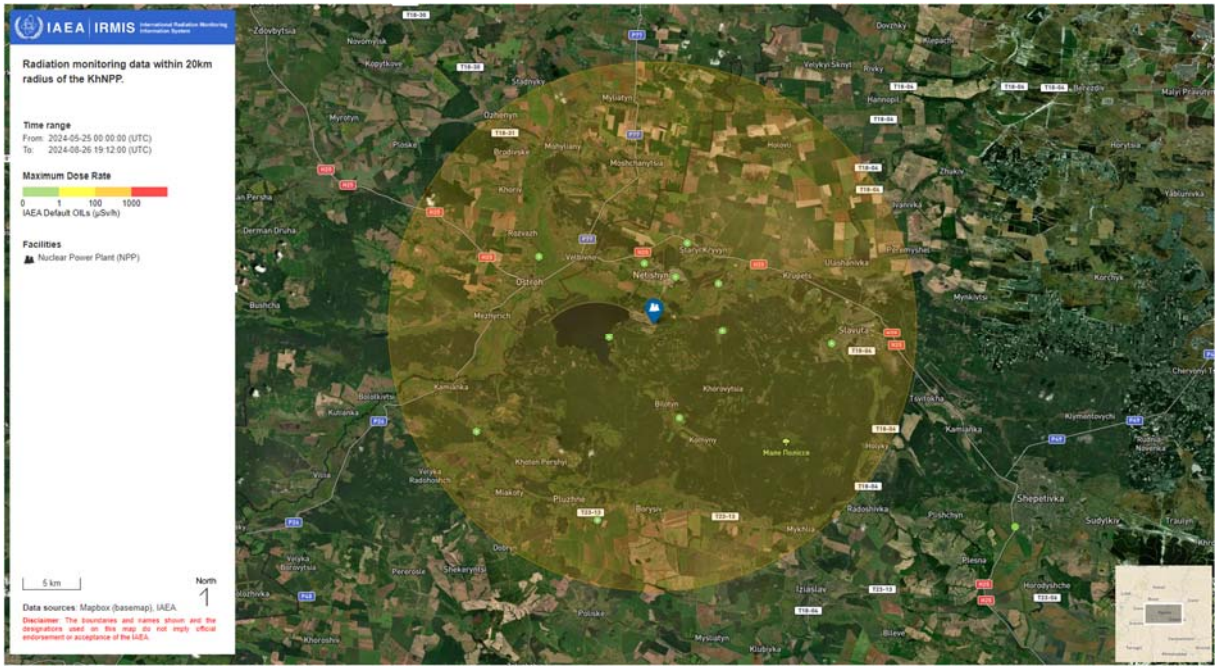
On-site and off-site radiation monitoring systems and emergency preparedness and response

95. On 12 and 13 June 2024, a large-scale emergency exercise took place at the SUNPP involving other entities such as Energoatom and the SNRIU and with support from the RNPP and the KhNPP. ISAMISU observed the exercise and the information and data exchange between the on-site emergency response centre, the off-site entities, and the on-site and off-site monitoring systems. ISAMISU noted the successful completion of the exercise and the beneficial cooperation between the operating NPPs in Ukraine.

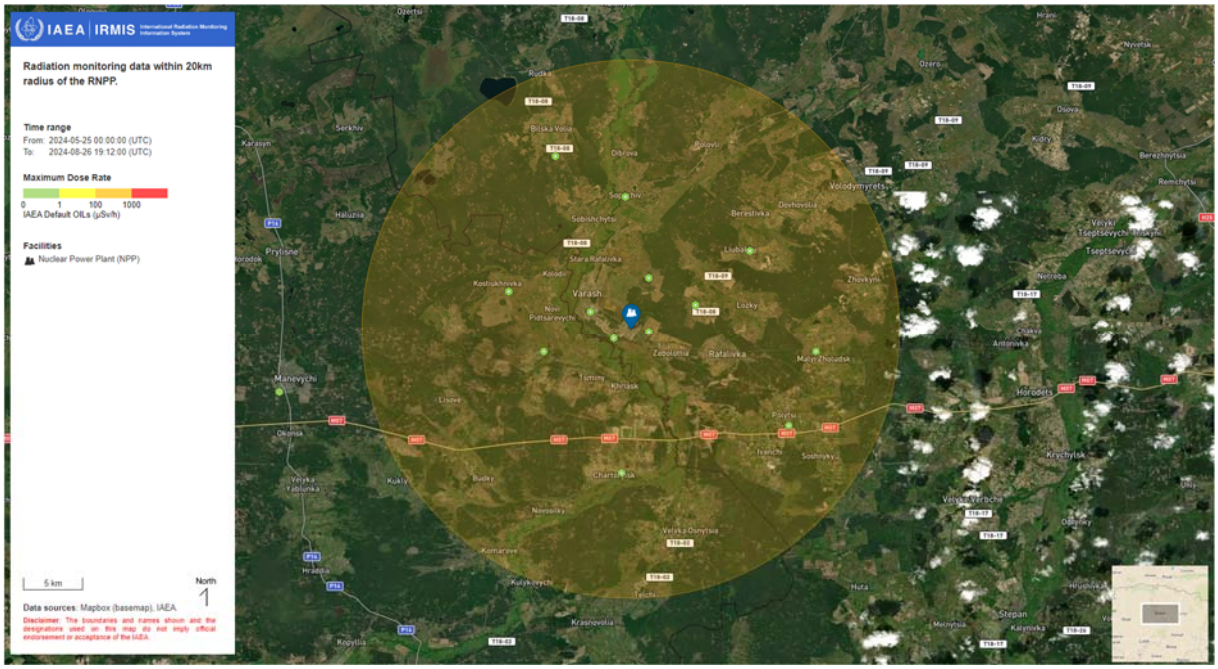
96. During the reporting period, ISAMIK, ISAMIR and ISAMISU visited the plants' on-site and off-site emergency response centres and the environmental monitoring laboratories and discussed their current respective capacities and capabilities. Agency experts did not report any issues affecting the nuclear safety or security of the plants on the basis of these visits.

ISAMIK discussing with KhNPP staff some of the Agency's recent deliveries of equipment to the external radiation monitoring laboratory, 8 August 2024. (Photo: KhNPP)

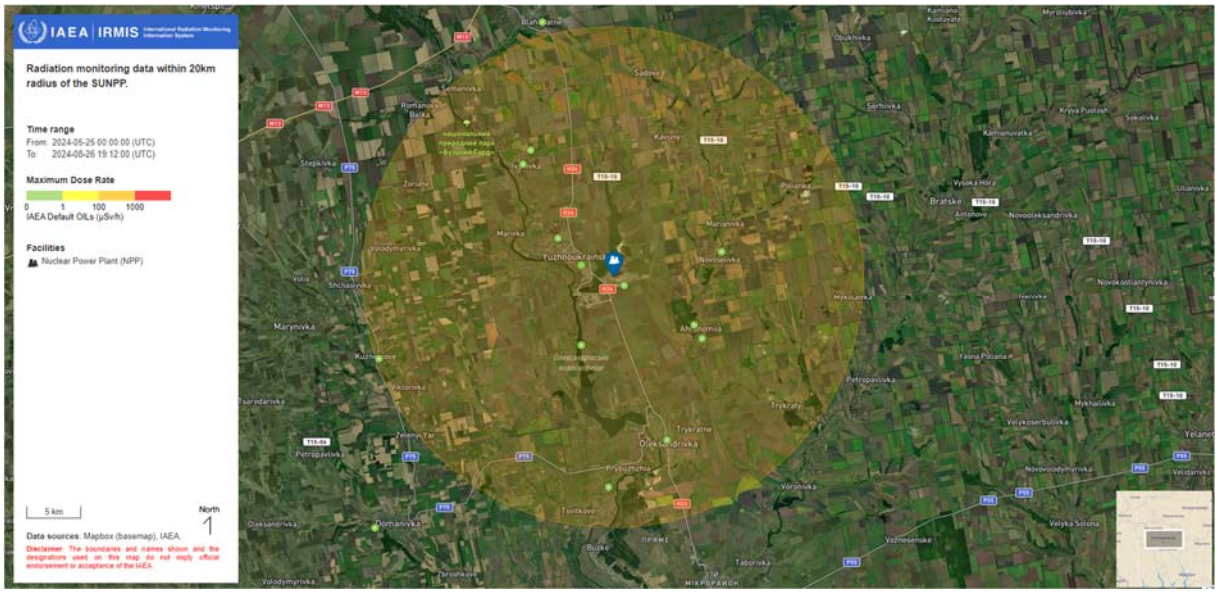
97. All off-site radiation monitoring stations were reported to be operational throughout the reporting period, with the measurements transmitted to and displayed on IRMIS.



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

Communications

98. All means of communication remained available during the reporting period.

99. Agency teams reported that inspectors from the SNRIU continued to be present at all three NPPs.

B.2.3. Chornobyl NPP Site and Other Facilities

100. The nuclear safety and security situation at the ChNPP site did not show any significant deviation from the situation previously reported in documents GOV/2022/52, GOV/2022/66, GOV/2023/10, GOV/2023/30, GOV/2023/44, GOV/2023/59, GOV/2024/9 or GOV/2024/30 with regard to the assessment of the nuclear safety and security situation against the Seven Pillars.

Physical integrity

101. ISAMICH reported that no events occurred during the reporting period that affected the integrity of the facilities on site.

Nuclear safety and security systems and equipment

102. ISAMICH reported that there were no situations in which nuclear safety and security systems were not functional. However, ISAMICH was informed by the ChNPP that some of the nuclear safety and security systems require maintenance and funding to replace older equipment with more modern versions.

Operating staff

103. As highlighted in more detail in documents GOV/2023/59, GOV/2024/9 and GOV/2024/30, ISAMICH confirmed that living conditions for staff remained a challenge, although the situation still allowed for the safe and secure operation of the site.

Off-site power supply

104. The supply of off-site power to the ChNPP site was through one 750 kV line, three 330 kV and five 110 kV back-up power lines for the majority of the reporting period. On 26 August 2024, after military activities disrupted the electricity grid across Ukraine, the single 750 kV off-site power line and one 330 kV off-site power lines were unavailable. The ChNPP continued to receive off-site power through other back-up 330 kV and 110kV power lines. As a result of the disruptions to the off-site power supply on 26 August 2024 including the sudden unavailability of some off-site power lines, two EDGs automatically started and operated for a few seconds.

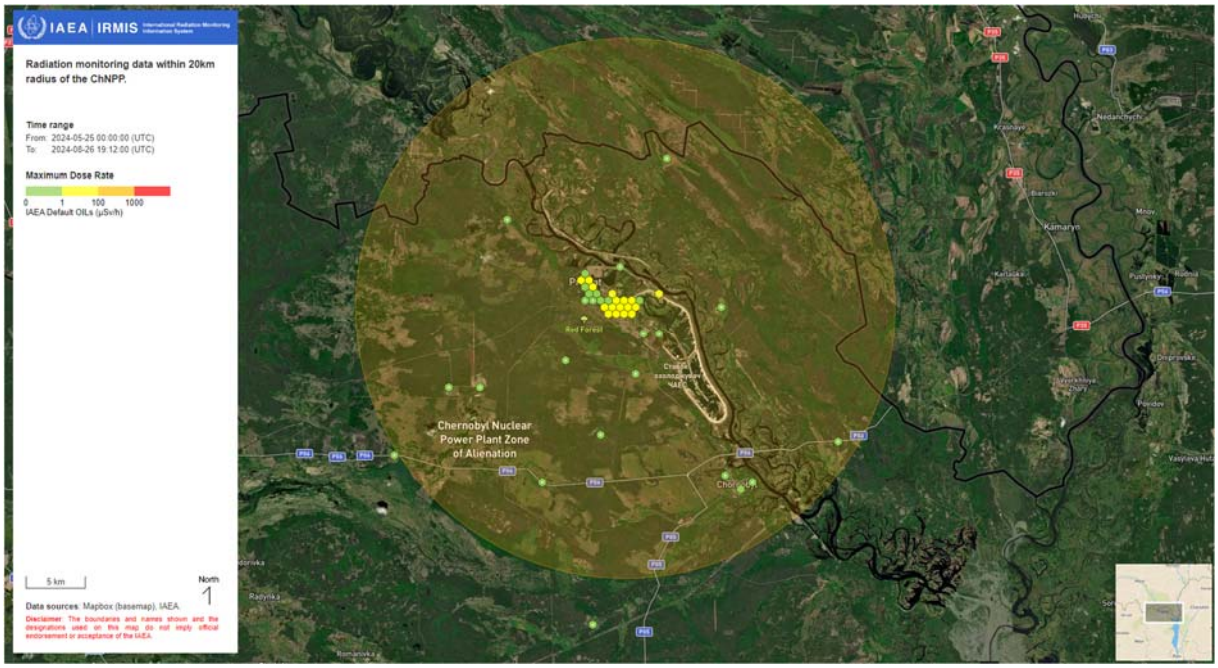
105. On 24 July 2024, after frequent issues arose affecting one of the 3 available 330 kV off-site power lines, the ChNPP took the decision to manually switch off the line during the daytime and switch it back on at night every day. The ChNPP stated that an intermittent electrical fault some distance from the site had been recurring for the past 12 months.

Logistical supply chain

106. Challenges in the supply chain and in transportation to and from the site remain, as the infrastructure in the region has been impacted by the armed conflict.

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

107. During the reporting period, ISAMICH visited the fire and rescue unit of the Chornobyl NPP site and the radiation safety laboratory and reported that they were fully operational. Off-site and on-site radiation monitoring systems were also reported to be fully operational. Radiation levels and dose rates are continuously monitored and are reported to be normal.



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

Communications

108. The ChNPP maintained the availability of all necessary means of communication with stakeholders without interruption.

Other Facilities

109. On 8 July 2024, the 'Okhmatdyt' National Specialized Children's Hospital in Kyiv was reportedly the target of a missile attack. The hospital uses ionizing radiation generators and there were no radioactive sources present at the facility during the reported attack. Reportedly, the event did not give rise to any radiological consequences affecting staff, patients, the public or the environment.

110. No other events were reported to have taken place during the reporting period affecting other facilities or activities in Ukraine.

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

111. The Agency continued to make progress in the delivery of its comprehensive programme of assistance to Ukraine. In addition to the in-person technical support and assistance provided through on-site expert missions — including the continued presence of Agency staff at the five nuclear sites in Ukraine, further information on which is provided in Section B.1. — the programme consists of the delivery of nuclear safety- and security-related equipment; a medical assistance programme for operating staff at the NPPs; and assistance in managing the environmental, social and economic impact of the flooding following the destruction of the Kakhovka dam. It also encompasses remote assistance and the deployment of rapid assistance should the need arise.

112. The Agency and its Ukrainian counterparts have continued to cooperate closely in order to better understand 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 the available resources limited.

113. 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.

114. By 30 August 2024, 26 Member States[26] and 1 international organization[27] 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 5 nuclear sites in Ukraine.

115. An overview of the latest developments regarding the different components of the comprehensive programme for assistance to Ukraine is presented below.

B.3.1. Delivery of Nuclear Safety- and Security-related Equipment

Requests for assistance in terms of nuclear safety- and security-related equipment

116. On 9 August 2024, the Agency received a new request for nuclear safety- and security-related equipment to be provided under the statutory functions of the Agency, and the operational arrangements[28] under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention). This is the eleventh request for assistance in the form of equipment since the start of the armed conflict. The request relates to physical protection needs at the ChNPP site.

117. During the reporting period, the Agency continued working to assess and prioritize the needs set out in these requests and to address them alongside other needs, based on their urgency and taking into account the funding available. The remaining funding needed for priority nuclear safety- and security-related equipment is estimated to be over €12 million.

Offers of assistance

118. By 30 August 2024, 13 Member States[29] had offered assistance in the form of in-kind contributions of nuclear safety- and security-related equipment for supporting Ukraine. No new offers of in-kind contributions of equipment were received during the reporting period.

Delivery of nuclear safety- and security-related equipment

119. The Agency continued to deliver equipment to various organizations in Ukraine. During the reporting period, the Agency organized a total of 12 deliveries of equipment related to nuclear safety and security, bringing the total number of such deliveries to 59, including deliveries to meet the needs of the energy sector in Ukraine.

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[26] Australia, Austria, Belgium, Canada, China, Czechia, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Republic of Korea, Malta, the Kingdom of the Netherlands, New Zealand, Norway, Poland, Saudi Arabia, Slovakia, Spain, Sweden, Switzerland, the United Kingdom (UK) and the United States of America (USA).

[27] The European Commission representing the European Union.

[28] The operational arrangements include the IAEA Response and Assistance Network (RANET) and the Operations Manual for Incident and Emergency Communication (EPR-IEComm 2019) available at: https://www.iaea.org/topics/emergencypreparedness-response/international-operational-arrangements.

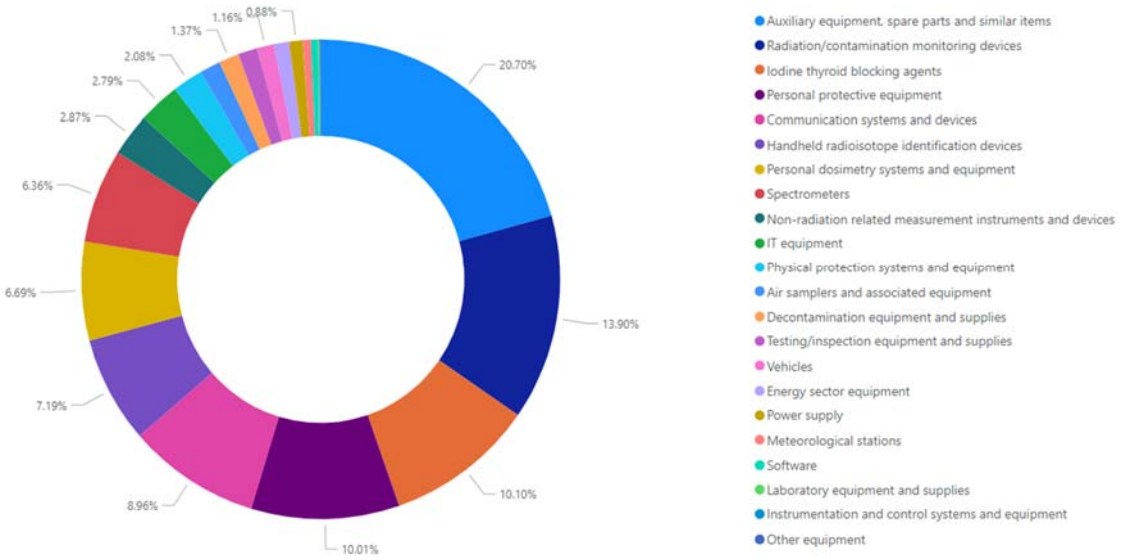
[29] Australia, Canada, France, Germany, Greece, Hungary, Israel, Japan, Romania, Spain, Sweden, Switzerland and the USA.

Instrumentation and control systems and equipment delivered to the RNPP on 26 June 2024, procured using extrabudgetary funding from Japan. (Photo: RNPP)

Uninterruptible power supply unit delivered to the Ukrainian Hydrometeorological Centre of the State Emergency Service of Ukraine on 8 July 2024, procured using extrabudgetary funding from Switzerland. (Photo: Ukrainian Hydrometeorological Centre of the State Emergency Service of Ukraine)

120. These 12 deliveries comprised equipment procured by the Agency under extrabudgetary contributions provided by Canada, Japan, New Zealand, the Republic of Korea, Sweden, Switzerland, the UK and the European Union. As a result of these deliveries, the Joint Stock Company "Chernihiv Oblenergo", the KhNPP, the RNPP, the SUNPP, the "Izotop" Ukrainian State production enterprise, the Public Health Centre of the Ministry of Health of Ukraine (Regional Centers for Disease Control and Prevention) and the Ukrainian Hydrometeorological Centre of the State Emergency Service of Ukraine received equipment such as instrumentation and control systems and equipment; meteorological stations; spectrometers; individual dosimetry system; auxiliary equipment, spare parts and similar items; non-radiation related measurement instruments and devices; physical protection systems and equipment; and information technology (IT) equipment and power supply systems.

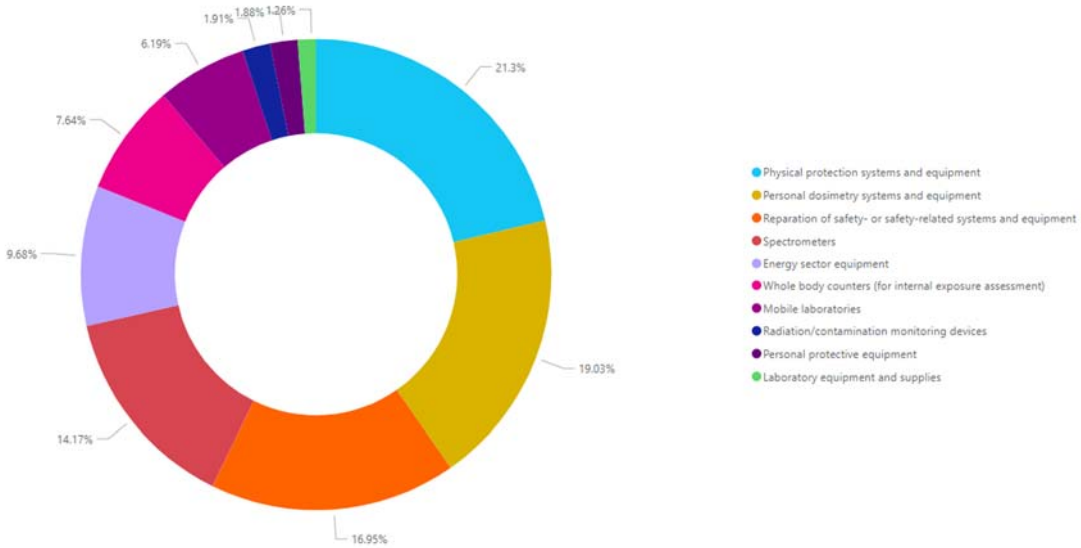
121. Following these deliveries, the value of the nuclear safety- and security-related equipment delivered to Ukraine since the start of the armed conflict amounts to €10.52 million.



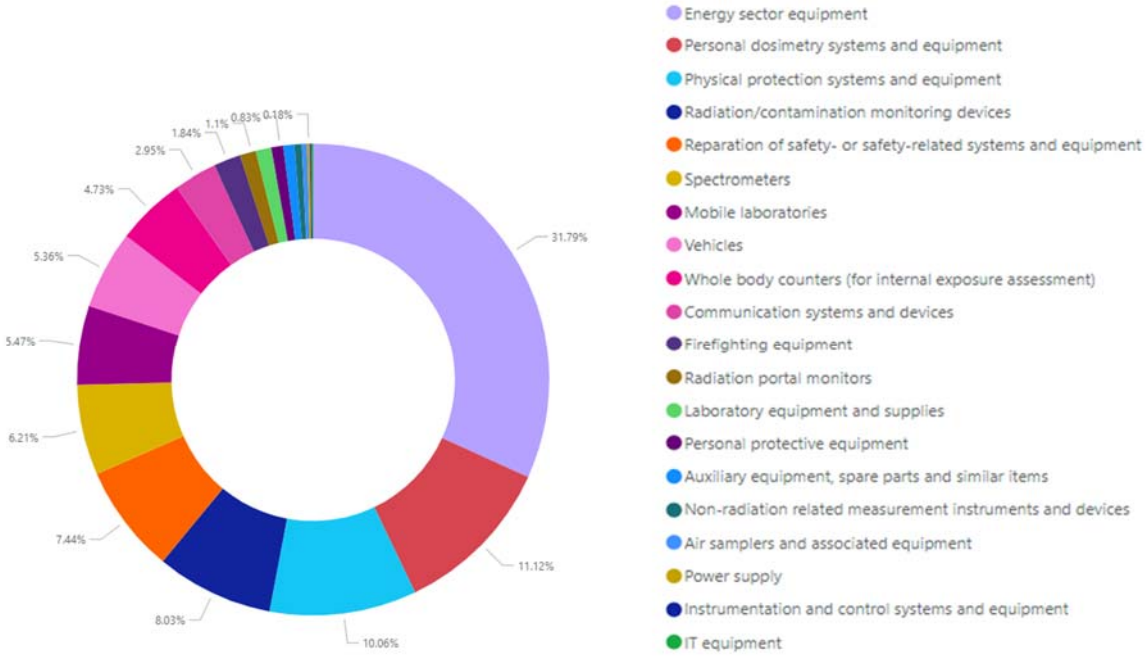
Overview of the monetary value of items as a percentage of the total monetary value of the nuclear safety- and security-related equipment worth €10.52 million delivered to 18 different organizations in Ukraine since the start of the armed conflict.

122. During the reporting period, the Agency continued liaising with Canada to finalize arrangements for the third and final shipment of donated equipment.

123. More nuclear safety- and security-related equipment procured by the Agency is expected to be transported to 17 different organizations in Ukraine in the coming months. The total cost of these expected deliveries exceeds €4.5 million. Additional nuclear safety- and security-related equipment is in various stages of procurement and exceeds €6.5 million, with many more items and pieces of priority equipment in the preparation and funding allocation stage.



Overview of the monetary value of items as a percentage of the total monetary value of the nuclear safety- and security-related equipment procured (in transit or pending readiness) for delivery to Ukraine.



Overview of the monetary value of items as a percentage of the total monetary value of the nuclear safety- and security-related equipment in the process of procurement for delivery to Ukraine.

B.3.2. ISAMRAD

124. During the reporting period, the Agency and Ukraine, through the SNRIU, agreed on a proposal in the form of an Assistance Action Plan for the first phase of delivering assistance within the framework of the IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources (ISAMRAD) in the light of the findings and observations of the fact-finding mission conducted from 23 July to 1 August 2023. During this phase, 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 1–3 radioactive sources, as defined in the Agency's Code of Conduct on the Safety and Security of Radioactive Sources), with a focus on radioactive sources under threat due to ongoing military activities in the areas in which they are used or located.

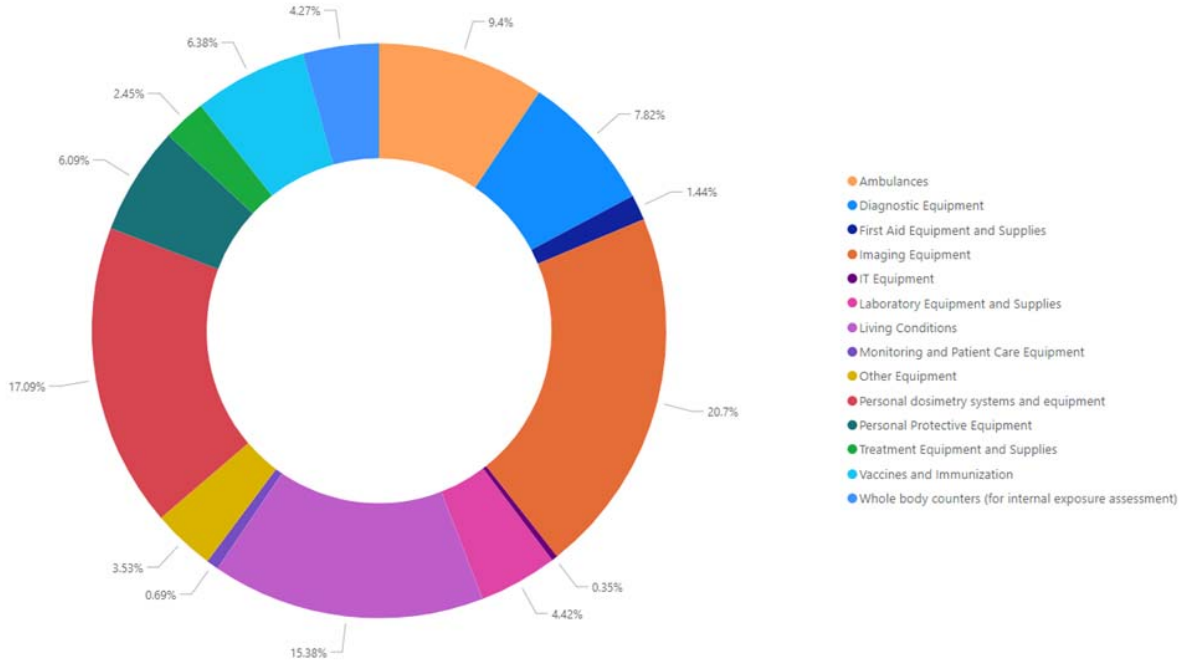
125. On 7 August 2024, the Agency held a remote meeting with Ukrainian authorities to discuss the implementation of the first phase envisaged under the agreed Assistance Action Plan. Based on this discussion, it was agreed to prioritize particular facilities which use high activity radioactive sources and are under increased threat due to ongoing military activities in the areas in which they are located, and the provision of further technical expertise and advice to assist with the safe and secure transport and storage of high activity radioactive sources. Moreover, a new ISAMRAD mission to be implemented in Ukraine to initiate this work has been tentatively agreed.

126. The assistance envisaged will be provided taking into consideration the nuclear safety- and security-related equipment already delivered by the Agency to identified organizations to enhance the safety and security of their radioactive sources, and the equipment in the process of procurement or delivery (see B.3.1).

B.3.3. Medical Assistance for Operating Staff at NPPs

127. During the reporting period, progress was made in procuring the first round of priority medical equipment and supplies reported in document GOV/2024/9, with the aim of helping to enhance the

healthcare services available for operating personnel at the ChNPP site, the KhNPP, the RNPP and the SUNPP.



Overview of the monetary value of items as a percentage of the total monetary value of medical equipment and supplies, including radiation protection and monitoring equipment, in transit or under procurement for all nine beneficiary organizations of the medical assistance programme, in the amount of approximately €2.34 million.

128. On 25 July 2024, the South Ukraine hospital received a digital colour Doppler ultrasound system. On 13 August 2024, the ChNPP site received mattresses aimed at providing better living conditions for the ChNPP staff. Additional medical equipment and supplies are expected to be delivered in the coming months.

South Ukraine hospital receiving the digital colour Doppler ultrasound system on 25 July 2024.

129. Furthermore, the Agency has completed its assessment to prioritize medical equipment and supplies for the next round of procurement. The estimated cost of the next round of procurement is approximately €3.5 million. The Agency has initiated the procurement of a number of priority items planned under this round of procurement, such as equipment and consumables intended for improving the living conditions of the ChNPP staff and fully equipped ambulances for the ChNPP medical unit and Varash hospital. However, for the Agency to be able to address these priority needs within the programme as well as the other immediate needs reported in document GOV/2023/44[30], funding in amount of approximately €6 million needs to be mobilized.

130. During the reporting period, the Agency continued providing mental health support to the staff and managers of Ukrainian NPPs and to the psychologists and mental health teams supporting them. A series of workshops on trauma risk management were conducted in a virtual format from 23 to 29 July 2024, with support provided by the UK. The training focused on equipping the participants — comprising 36 Ukrainian staff including managers, supervisors and psychologists at the operating NPPs and the ChNPP — with the skills to spot signs of distress, provide peer support and manage the psychological impact of traumatic events. The training sessions were highly appreciated by all the participants.

131. The Agency initiated the preparation of the next set of training events, which will leverage the experience of local psychologists with the aim of ensuring that sustainable support is available at the national level. It is envisaged that these training events will be delivered in 2024.

132. On 9 August 2024, the Agency received a new request for assistance within this programme, comprising of tests for the early assessment and proper identification of COVID-19 infections among NPP operating staff. The Agency assessed the provision of such assistance to be a priority in light of the current surge of such infections, with the aim of helping to reduce the spread and the number of infectious cases among the operating staff.

B.3.4. ISAMKO

133. During the reporting period, the Agency conducted a series of coordination meetings with relevant counterparts in Ukraine, as reported in document GOV/2024/30[31]. This led to the identification of potential needs and beneficiaries in various areas of food control and safety, human and animal health, soil and water management and isotope hydrology that could benefit from assistance within the scope of the IAEA Support and Assistance Mission to the Kherson Oblast (ISAMKO).

134. On 11 July and 30 August 2024, the Agency received two official requests for assistance from the Ministry of Energy of Ukraine. The request comprised radiation monitoring and other laboratory equipment; laboratory supplies and consumables used in studying different environmental samples; imaging equipment, medicines and vaccines; and IT equipment and similar items. The intended beneficiary organizations, of which there are 22 in total, are the Ministry of Health of Ukraine, its Regional Centers for Disease Control and Prevention in areas affected by the destruction of the Kakhovka dam and its healthcare institutions in Kherson; the Ukrainian Geological Survey under the Ministry of Energy and its regional laboratories; the State Service of Ukraine on Food Safety and Consumer Protection and its regional laboratories; the Ukrainian Hydrometeorological Institute of the State Emergency Service of Ukraine; and the State Scientific Research Institute of Laboratory Diagnostics and Veterinary and Sanitary Expertise in Kyiv.

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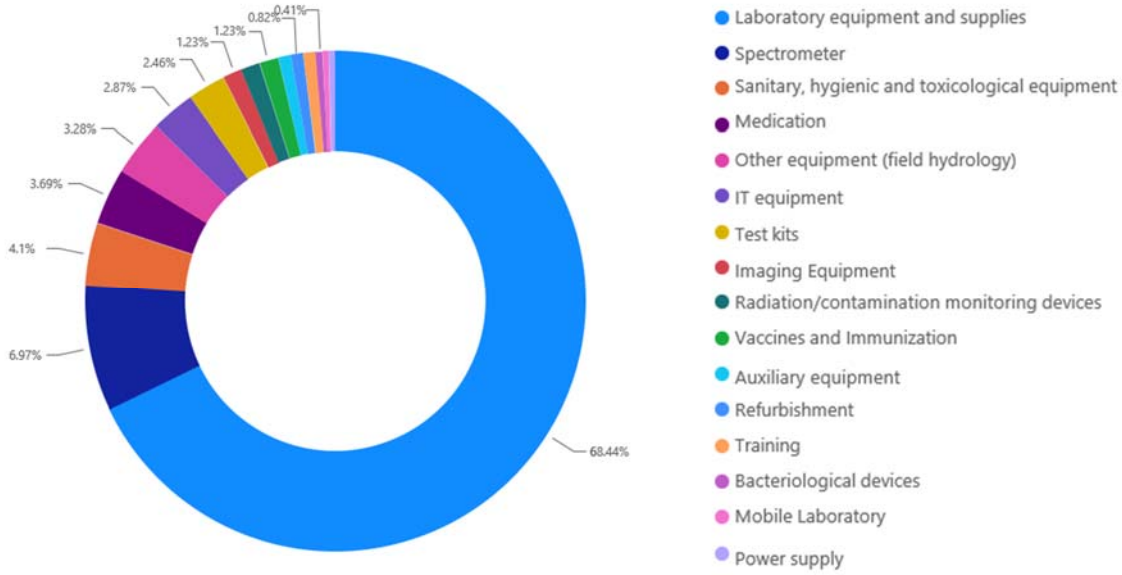
[30] Report by the Director General to the Board of Governors, document GOV/2023/44, issued on 5 September 2023, para. 109.

[31] Report by the Director General to the Board of Governors, document GOV/2024/30, issued on 27 May 2024, para. 149.

135. The Agency assessed and prioritized the requested needs and estimated their cost to be approximately €2.8 million. Procurement was initiated for priority items worth €809 000, amounting to over 60% of the requested needs.



Overview of the monetary value of items as a percentage of the total monetary value of equipment and supplies under procurement for all five beneficiary organizations of ISAMKO, in the amount of approximately €0.8 million.

B.3.5. Remote Assistance

136. No remote assistance in nuclear safety and security was provided during the reporting period. The Agency agreed training activities on the topics of leadership and management for nuclear safety and security, including safety and security culture as well as cybersecurity, to be delivered to all Ukrainian NPPs throughout 2024 and 2025 through remote webinars and on-site training, taking advantage of the continued presence of Agency staff at the sites.

B.3.6. Deploying Rapid Assistance

137. 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

138. 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.

139. 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 shut down reactors, the reactor damaged in the 1986 nuclear accident, and 2 spent fuel processing and storage facilities.

140. 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.

141. 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

142. 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 the Agency's 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.

143. With the establishment of a continuous presence of Agency staff at the KhNPP, the RNPP, the SUNPP and the ZNPP, 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.

144. During the reporting period, the Agency successfully conducted physical inventory verifications at a number of locations. The Agency also verified spent fuel that was transferred from the SUNPP and KNPP to the centralized storage facility at Chornobyl. In addition, the Agency verified the transfer of spent fuel from the spent fuel storage facility at Chornobyl to dry storage at Chornobyl. The Agency also verified inter-unit transfers of spent fuel at two NPPs. Inspections were also carried out at the fresh fuel storage facility at the Zaporizhzhya site. The participation of Agency inspectors as part of the various IAEA Support and Assistance Missions has continued to enable the implementation of interim inventory verifications. Finally, Agency technical experts continued to travel to NPPs and to the ChNPP site to install, service and maintain the Agency safeguards systems that monitor the loading and transfer of spent fuel from NPPs and the spent fuel pond at the Chornobyl site to dry storage at Chornobyl.

D. Summary

145. Although some challenges related to nuclear safety were observed to have been addressed during the reporting period, the situation at the ZNPP continues to be precarious, with all Seven Pillars being compromised fully or partially. The plant kept all units in cold shutdown throughout the reporting period and, following the high-level talks held by the Director General, the Agency's understanding is that no reactor is to be restarted as long as the nuclear safety and security situation at the ZNPP remains in jeopardy due to the conflict.

146. The ZNPP continued to face challenges related to the number of available off-site power lines and their disconnection following military activities affecting the energy infrastructure in Ukraine; the availability of cooling water; ensuring adequate staffing; ensuring adequate and timely preventative maintenance of all structures, systems, and components important to safety; maintaining reliable supply chains; and ensuring robust on-site and off-site emergency arrangements. Each of these challenges presents potential risks to the nuclear safety and security of the plant.

147. ISAMZ did not find any indications that the Five Principles were not being observed; however, it regularly reported explosions, drone attacks, gunfire and fire in the vicinity of the ZNPP and at the location of the cooling towers as well as the presence of military equipment at the site and anti-personnel mines in the buffer zone between the facility's internal and external fences, which continue to put some of the principles at great risk.

148. While the Agency welcomes the improvement in obtaining access and information relevant to nuclear safety during the reporting period, ISAMZ still faced restrictions in obtaining timely and appropriate access to all areas of relevance to nuclear safety and security and in having open discussions with all relevant staff at the ZNPP. This limits the Agency's ability to make its assessment and report impartially and objectively on the nuclear safety and security situation at the site, and to fully assess whether all Five Principles are being observed at all times.

149. The Agency continued to request timely and appropriate access to all areas of the ZNPP of significance for nuclear safety and security and to strongly encourage the ZNPP to ensure that open information sharing take place regularly to enable the Agency to make its independent, impartial and objective assessment of the nuclear safety and security situation at the site.

150. During the reporting period, the KhNPP, the RNPP and the SUNPP continued to operate safely and securely despite the challenging circumstances imposed by the armed conflict. The military activities on the territory of Ukraine resulted in frequent air raid alarms at these sites and affected the energy infrastructure, disrupting to the operating power of reactor units.

151. The Agency continued providing technical support and assistance to Ukraine related to nuclear safety and security. During the reporting period, 12 deliveries of procured nuclear safety- and security-related equipment to various organizations in Ukraine were organized, bringing the total number of deliveries to 59. In total, over €10.5 million worth of equipment has been delivered to 18 organizations in Ukraine since the start of the armed conflict.

152. The Agency maintained a continuous presence at all nuclear sites without interruption, and all rotations were conducted in a timely manner and as planned. Maintaining the continued presence of Agency staff at all 5 nuclear sites in Ukraine continues to be a major undertaking for the Agency, requiring significant resources. As of 30 August 2024, a total of 139 missions comprising 144 Agency staff members had been deployed as part of the continued presence at all 5 nuclear sites in Ukraine, totalling over 277 person-months in Ukraine. Some of the 144 Agency staff members participated in more than one rotation.

153. The Agency arranged two deliveries to Ukraine as part of the medical assistance programme and advanced the procurement of other priority equipment. Furthermore, the Agency organized additional mental health training sessions for NPP staff and managers and their mental health teams to assist them in building skills to manage the impact of the stressful and traumatic experience of the armed conflict.

154. During the reporting period, the Agency received the first official request from Ukraine for assistance to support the recovery of the Kherson Oblast and other areas affected by the flooding following the destruction of the Kakhovka dam. The request relates to equipment and supplies covering various areas within this component of the comprehensive programme for assistance. The Agency assessed these needs and associated priorities and initiated procurement to address them. Finally, a way forward was agreed for implementing the first phase of the ISAMRAD programme.

155. The Director General is grateful to 30 Member States and the European Union for the extrabudgetary contributions provided to the Agency for assisting Ukraine in the area of nuclear safety, security and safeguards, and would welcome any further support. Across various components of the comprehensive programme of assistance, currently unmet funding needs to address identified priorities in various programmes and maintain the same level of operations for the continued presence missions throughout the next year amount to approximately €23 million.

156. The continued commitment of Member States and their close cooperation with the Agency are 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.

157. 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 25 May to 30 August 2024

Events at the Zaporizhzhya Nuclear Power Plant

- On 26 May, ISAMZ was awakened by four explosions near the site; the ZNPP informed the ISAMZ that there had been no damage to the plant.
- On 27 May, ISAMZ observed oil on the floor of the reactor hall of Unit 4, coming from the overhead cranes, and boron deposits on the floors of some of the safety systems rooms. The ZNPP reported that these would be addressed through cleaning and maintenance.
- On 28 May, ISAMZ performed a walkdown of the turbine hall of Unit 5 and was unable to access the western part of the hall.
- On 28 May, ISAMZ observed a wildfire to the south of the 750 kV open switchyard, but it appeared to have been extinguished later in the week and did not cause any damage to electrical systems.
- On 5 June, ISAMZ performed a walkdown of the turbine hall of Unit 6 and was unable to access the western part of the hall.

- On 6 June, ISAMZ visited the site's cooling pond and observed that its height was almost 1.5 metres below the level observed prior to the destruction of the Kakhovka dam. During the visit, ISAMZ was informed that the ZNPP had installed a submersible pump near the isolation gate of the discharge channel of the ZTPP, capable of pumping 100 cubic metres of water per hour from the Kakhovka reservoir into the discharge channel for use at the ZNPP.
- On 10 June, ISAMZ visited an electrical distribution building located in the nearby town of Enerhodar to observe the impact of alleged shelling which, according to the ZNPP, occurred on 8 June.
- On 11 June 2024, ISAMZ reported hearing two explosions close to the site, which the ZNPP explained were caused by the detonation of mines in the area near the cooling pond. The ZNPP did not report any casualties or damage.
- On 12 June, ISAMZ confirmed with the ZNPP that a mine located near the plant's cooling pond area had exploded on 11 June; no physical damage or casualties were reported from the explosion. The cause of the explosion was not shared.
- On 16 and 17 June, ISAMZ heard explosions close to the site; the ZNPP informed ISAMZ that there had been no impact on or near the site itself.
- On 19 June, the Luch substation in the city of Enerhodar was destroyed, and the ZNPP informed ISAMZ that the cause was a drone attack.
- On 19 June, ISAMZ visited the ZNPP training centre, including the full scope simulator, the valve maintenance technical laboratory, and the mock-up of the reactor building. The ZNPP informed ISAMZ that the training for MCR staff is performance-based, and that individual training lasts around 40 hours on average, depending on the position held.
- On 20 June, ISAMZ went to the Luch substation and confirmed that it had been destroyed and was not operational.
- From 10 to 18 June, the ZNPP operated the 4 DSGs to treat 500 cubic metres of liquid waste. The DSGs were next operated between 5 and 16 August to treat 1000 cubic metres of liquid waste.
- On 21 June, ISAMZ visited all six MCRs to observe the situation regarding key operational staff and was informed that some of the staff had been newly appointed to their positions at the ZNPP in recent months.
- On 22 June, ISAMZ visited the site of the Raduga substation in the city of Enerhodar to observe damage to one of its two transformers, which the ZNPP stated had been caused by a drone attack the previous evening. The failure of the Raduga substation affected the electrical supply to some of the area's external environmental radiological monitoring stations, which had stopped working briefly that morning after running out of battery.
- On 25 June, ISAMZ was informed by the ZNPP that an off-site radiation monitoring station located around 16 kilometres south-west of the plant had been destroyed by shelling and gunfire on 24 June. Due to the security situation, ISAMZ was unable to access the location to observe the damage.
- On 25 June, ISAMZ performed a walkdown of the turbine hall of Unit 5 and was denied access to the western part of the hall.

- On 28 June, ISAMZ's walkdown of the plant's cooling pond and associated cooling water facilities was cut short by an air raid alarm.
- On 30 June, ISAMZ heard gunfire as well as two explosions close to the site.
- On 1 July 2024, ISAMZ was informed by the ZNPP that drone activity had increased around the site, reaching an axial distance of approximately 300–500 metres from the site perimeter. On other occasions during the reporting period, ISAMZ observed smoke coming from the vicinity of the ZNPP 750 kV open switchyard and cooling pond, which the ZNPP stated was the result of alleged drone strikes. Despite this, ISAMZ did not observe any drones near the site, and no damage to the ZNPP, the adjacent industrial zone or the ZTPP 330 kV open switchyard was reported.
- On 2 July, the ZNPP informed ISAMZ that the metrology laboratory had transitioned from its ISO17025 management system accreditation to a Russian-recognized standard.
- On 3 July, ISAMZ observed thick smoke and heard explosions coming from the vicinity of the plant's 750 kV switchyard. ISAMZ was informed that drones had hit an adjacent forest, starting fires in windy conditions. Furthermore, it was informed by the ZNPP that three drone strikes near the town of Enerhodar had hit one of the electrical substations (Raduga), reportedly injuring eight workers.
- On 6 July, ISAMZ was informed by the ZNPP of an attack on 5 July that had damaged an electrical transformer in a substation of Enerhodar, resulting in a power outage lasting several hours.
- On 10 and 11 July, ISAMZ observed smoke coming from nearby locations, including from behind the 750 kV open switchyard. ISAMZ was informed that the cause for the smoke had been drone strikes and shelling, but ISAMZ was unable to verify the cause.
- On 11 July, ISAMZ was informed by the ZNPP that shelling near the city of Enerhodar on 10 July had impacted a water pumping station and another electrical substation, leaving residents without tap water and electricity during the day.
- On 11 July, ISAMZ was unable to perform planned walkdowns due to an air raid alarm, even though there were no sounds of military activity during this time.
- On 12 July, ISAMZ was informed by the ZNPP that a military strike had damaged a regional substation, cutting off electricity to Enerhodar and also impacting water supplies. For the second time that week, ISAMZ reported that no tap water was available in some buildings at the site.
- On 12 July, ISAMZ performed a walkdown of the turbine hall of Unit 1 and was denied access to the western part of the hall.
- During the week of 15 July, on two occasions ISAMZ observed smoke in the distance, which the ZNPP stated was due to forest fires.
- On 18 July, ISAMZ discussed the ongoing maintenance of the components of the main transformer of Unit 3, which were being disassembled for servicing. On the same day, ISAMZ observed that isolation tags had been placed on the main transformer's panel in the MCR due to the ongoing planned maintenance on the transformer.
- On 19 July, ISAMZ observed the maintenance of some electrical as well as instrumentation and control equipment within Unit 6. It also performed a walkdown of the turbine hall of Unit 6 and was denied access to the western part of the hall.

- On 23 July, ISAMZ was informed by the ZNPP of the maintenance plan for the remainder of 2024, the use of third-party maintenance organizations, and the supply chain arrangements for the maintenance campaign.
- On 31 July, during a visit to the off-site diesel fuel storage, ISAMZ was informed by the ZNPP that the reduced storage of diesel fuel was due to the upcoming planned maintenance of the storage tanks.
- On 4 August, ISAMZ observed smoke coming from an area to the north of the ZNPP near the ZTPP inlet channel; the plant confirmed that the fire was underneath the overhead cables of the 750 kV Dniprovska line and the 330 kV Ferosplavna 1 back-up power line.
- On 4 August, ISAMZ was informed by the ZNPP that staff at the ZTPP had allegedly been unable to go outside to start the pump that transfers water from the ZTPP inlet channel to the ZTPP discharge channel for some time, due to the risk of shelling.
- On 8 August, ISAMZ was informed by the ZNPP that the new emergency plan is expected to come into force by 30 September 2024 and that two drills are planned before the end of 2024: one in September and one in November/December.
- On 9 August, ISAMZ performed a walkdown of the turbine hall of Unit 2 and was denied access to the western part of the hall.
- On 10 August, ISAMZ was informed by the ZNPP that artillery had allegedly struck a local power and water substation in the nearby city of Enerhodar. The attack caused the failure of two transformers, leading to a city-wide power outage. As a result, water had to be supplied using diesel generators. On 11 August, the team was informed by the ZNPP that power had been restored in the city.
- On 11 August, ISAMZ observed that one of the wells near the ZNPP sprinkler ponds was not in operation. The well was returned to operation on 12 August 2024 following repairs. On 17 August, ISAMZ observed that the same well was again out of operation, and was subsequently informed that it had been returned to operation on 21 August 2024 following repairs.
- On 11 August, ISAMZ observed thick dark smoke coming from the north-western area of the plant, after hearing numerous explosions throughout the evening. The ZNPP informed ISAMZ that an alleged drone attack on one of the plant's cooling towers had taken place that day. ISAMZ visited the site of the alleged attack and viewed relevant photos and video footage. The nuclear safety of the plant was not affected, as the cooling towers are not currently in operation. The ZNPP informed ISAMZ that the impact of the fire on the structural integrity of the cooling tower needs to be assessed and that it may need to be dismantled.
- On 13 August, during a walkdown of the cooling towers and shortly after requesting access to cooling tower 2, ISAMZ was promptly accompanied back to a secure location due to an air raid alarm.
- On 15 August, ISAMZ performed a walkdown of the turbine halls of Units 3 and 4 and was denied access to the western parts of both halls.
- On 17 August, ISAMZ was informed by the ZNPP that an explosive carried by a drone had detonated just outside of the plant's protected area. The impact site was close to the essential cooling water sprinkler ponds and about 100 metres from the Dniprovska power line. The team immediately visited the area and reported that the damage seemed to have been caused by a drone equipped with an explosive payload. There were no casualties and no impact on any

equipment at the plant. However, the road between the two main gates of the ZNPP was impacted.

- On 22 August, the 330 kV Ferosplavna 1 back-up power line was disconnected at approximately 16:00 local time due to a short circuit 17 kilometres away from the ZTPP 330kV open switchyard.
- On 23 August, the 330 kV Ferosplavna 1 back-up power line was reconnected at approximately 15:30 local time. ISAMZ was informed by the ZNPP that the cause of the short circuit or possible damage to the line was unknown.

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

- Between 27 and 28 May 2024, one of the two 750 kV off-site power lines of the RNPP was taken out of operation at the request of the grid operator.
- Between 5 and 18 June 2024, one of the four 330 kV off-site power lines was taken out of operation for planned maintenance.
- On 12 and 13 June, ISAMISU observed a large-scale emergency exercise conducted at the SUNPP, which included participation from the KhNPP and the RNPP.
- On 20 June, ISAMISU team members sheltered in their hotel after hearing small arms fire nearby. ISAMISU was later informed that a drone had been shot down in the vicinity of the hotel, but that it had not targeted the hotel or the plant.
- On 27 June, ISAMISU team members sheltered in their hotel after hearing small arms fire nearby. They were later informed that there had been military action in the region, but that it had not targeted the hotel or the plant.
- On 1 and 4 July, one of the four 330 kV off-site power lines at the RNPP was taken out of operation for a few hours for planned maintenance.
- On 16 July, ISAMISU reported that Unit 2 of the SUNPP was temporarily shut down following the actuation of electrical protections due to a current transformer problem in the 330 kV open switchyard, located outside the NPP site.
- Between 16 July and 4 August 2024, power at the 330 kV switchyard of the SUNPP was limited due to grid limitations.
- On 26 August, ISAMIK and ISAMISU sheltered at their hotels in the morning and could hear explosions in the distance, delaying their arrival at their respective sites.
- On 26 August, Units 1, 3 and 4 of the RNPP were disconnected from the grid due to electrical fluctuations following military activities. Later that day, Unit 3 was reconnected to the grid but operated at reduced power.
- On 26 August, all three units at the SUNPP operated at reduced power in accordance with instructions issued by the national electrical grid operator following military activities across Ukraine. Unit 3 automatically shut down later that day and was returned to operation after approximately 12 hours.

Events at the Chornobyl Nuclear Power Plant Site

- On 25 July, one of the five 110 kV back-up power lines was disconnected for planned maintenance.

- On 26 August, the ChNPP lost connection to its only 750 kV off-site line and to one of the back-up 330 kV lines. The site remained connected to both the 330 kV and 110 kV off-site power lines. However, two EDGs activated and operated for a few seconds due to the instability in the off-site power supply.

Events at Other Facilities

- On 8 July, the 'Okhmatdyt' National Specialized Children's Hospital in Kyiv was reportedly the target of a missile attack.
- No other events were reported affecting other facilities and activities in Ukraine.