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*Atoms for Peace and Development*

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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 24 February to 24 May 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 March 2024, the Director General provided the Board of Governors with a detailed report entitled *Nuclear Safety, Security and Safeguards in Ukraine* (document GOV/2024/9), covering the period from 15 November 2023 to 23 February 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.<sup>1</sup> The Agency complies with this resolution.

3. On 17 November 2022, the Board of Governors adopted resolution GOV/2022/71<sup>2</sup>, 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”.<sup>3</sup>

4. On 28 September 2023, the General Conference, at its 67th regular session, adopted resolution GC(67)/RES/16<sup>4</sup> 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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<sup>1</sup> 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.

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

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

<sup>4</sup> 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, Khmelnytsky, and South Ukraine Nuclear Power Plants” and “[e]ncourage[d] Member States to offer political, financial, and in-kind support to the IAEA comprehensive programme of technical support and assistance to Ukraine, including through the provision of necessary nuclear safety and security equipment as requested by Ukraine”.<sup>5</sup>

5. Following the high-level talks with Ukrainian officials reported in document GOV/2024/9<sup>6</sup>, on 6 March 2024 the Director General travelled to the Russian Federation for high-level talks aimed at reducing the ongoing significant risks to nuclear safety and security at the ZNPP. The Director General met with Russian President Vladimir Putin, the Director General of the State Atomic Energy Corporation “Rosatom” Alexey Likhachev, high-level officials from the Federal Environmental, Industrial and Nuclear Supervision Service (Rostekhnadzor), and the Russian Ministry of Foreign Affairs. During these talks, the Director General recalled the essential importance of the strict observance of the five concrete principles for protecting the ZNPP (‘five concrete principles’).



*Director General Rafael Mariano Grossi meeting Russian President Vladimir Putin in the company of the Director General of Rosatom, Alexey Likhachev, on 6 March 2024.  
(Image: Kremlin.ru)*

6. On 7 March 2024, the Board of Governors adopted resolution GOV/2024/18<sup>7</sup>, on 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 military and other unauthorized personnel from Ukraine’s ZNPP”.

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

<sup>6</sup> Report by the Director General to the Board of Governors, document GOV/2024/9, issued on 27 February 2024, para. 11.

<sup>7</sup> IAEA Board of Governors resolution GOV/2024/18, adopted on 7 March 2024, paras 2 and 3.

7. During the reporting period<sup>8</sup>, from 24 February to 24 May 2024, Agency staff continued to monitor and assess the situation at each nuclear site against the seven indispensable pillars (‘Seven Pillars’) for ensuring nuclear safety and security during an armed conflict that were first outlined by the Director General at the meeting of the Board of Governors held on 2 March 2022 and described in document GOV/2022/52<sup>9</sup>. In addition, ISAMZ has continued to monitor and report on observance of the five concrete principles established by the Director General at the meeting of the United Nations Security Council (UNSC) on 30 May 2023 and described in document GOV/2023/30<sup>10</sup>.

8. The Agency 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. During the reporting period, the ZNPP suffered direct attacks for the first time since November 2022. Moreover, frequent disconnection of the limited available off-site power lines were reported due to military activity in areas outside the ZNPP site perimeter. Ensuring adequate staffing, routine inspection and maintenance of safety structures, systems, and components, reliable supply chains and on-site emergency arrangements continues to be challenging and to present risks to the nuclear safety and security of the plant.

9. 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 assessment and report impartially and objectively on the nuclear safety and security situation at the site. Despite its continued requests, ISAMZ continued to face restrictions in obtaining such access and in having open discussions with all relevant staff at the ZNPP.

10. ISAMZ confirmed that a violation of the first concrete principle for protecting the ZNPP — which states that there should be no attack of any kind from or against the plant — had occurred on 7 April 2024 with drone attacks at the plant. ISAMZ observed that the remaining principles continued to be at risk throughout the reporting period. ISAMZ has still not been given timely and appropriate access to all areas of the ZNPP of significance for nuclear safety and security, which continues to limit the Agency’s ability to fully assess whether all five concrete principles are being observed at all times.

11. On 11 April 2024, a meeting of the Board of Governors was convened at the request of two members of the Board of Governors: the Russian Federation and Ukraine. The meeting focused on the implications of the situation at the ZNPP for nuclear safety, security and safeguards following the direct attacks on the ZNPP on 7 April 2024, which significantly increased the risk of a nuclear accident. In his opening remarks, the Director General emphasized the paramount importance of ensuring that such attacks “do not mark the beginning of a new and gravely dangerous front of the war” and “appeal[ed] to military decision makers to abstain from any action violating the IAEA’s [five] concrete principles to prevent a nuclear accident and ensure the integrity of the plant.”

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<sup>8</sup> Following the reporting period referred to in GOV/2024/9.

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

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





*The Chair of the Board of Governors, Holger Martinsen, welcomes delegates and Member State representatives at the opening of the 1716th Board of Governors meeting held at the Agency's Headquarters in Vienna, Austria on 11 April 2024.*

12. On 25 April 2024, the Director General addressed the UNSC to provide an update on the Agency's activities concerning nuclear safety, security and safeguards in Ukraine. This was his seventh address to the UNSC since the start of the armed conflict. In his statement, the Director General focused on the events in the days prior to the UNSC meeting that had resulted in grave violations of the five concrete principles at the ZNPP. He highlighted the events that had occurred since 7 April 2024, when the ZNPP was directly targeted for the first time since November 2022, setting a very dangerous precedent and giving rise to the risk of a nuclear accident. The Director General asked the UNSC for its steadfast support for the Seven Pillars and the five concrete principles and for the Agency's role in monitoring the situation in the service of the international community.



*Director General Rafael Mariano Grossi addresses the UNSC on 15 April 2024.*

13. During the reporting period, the Agency maintained the continued presence of its staff at all 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 technical expertise and advice, including assistance for ensuring medical support and care for the Ukrainian operating staff, as well as for ensuring radiation safety and nuclear security of radioactive sources; delivering nuclear safety- and security-related equipment; and providing relevant information updates to the public and the international community.

14. This report has been produced in response to resolution GOV/2022/17<sup>11</sup>, 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<sup>12</sup>, 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<sup>13</sup>, 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<sup>14</sup>, 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.”

15. This report provides a summary of the situation in Ukraine regarding nuclear safety, security and safeguards from 24 February to 24 May 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 Khmelnytsky Nuclear Power Plants (NPPs), and to the Chornobyl NPP Site**

16. To ensure the continued presence of Agency staff at all five nuclear power plant sites in Ukraine, the Agency continued with the deployment of IAEA Support and Assistance Missions to the ZNPP

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<sup>11</sup> IAEA Board of Governors resolution GOV/2022/17, adopted on 3 March 2022, para. 4.

<sup>12</sup> IAEA Board of Governors resolution GOV/2022/58, adopted on 15 September 2022, para. 7.

<sup>13</sup> IAEA Board of Governors resolution GOV/2022/71, adopted on 17 November 2022, para. 8.

<sup>14</sup> IAEA Board of Governors resolution GOV/2024/18, adopted on 7 March 2024, para. 6.

(ISAMZ), the Khmelnytsky 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.

17. Since the continued presence of Agency staff at the 5 nuclear sites in Ukraine was established, a total of 5 teams of Agency staff comprising up to 13 staff members in total have been continuously present in Ukraine without any interruption. The Agency maintained its rigorous preparations and logistics for the deployment of missions to Ukraine and continued to independently provide the necessary logistics for safe and secure rotations at the ZNPP. 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.

18. Agency staff in Ukraine continued with regular activities at each site, which 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.



*ISAMICH visiting the hot cell in the solid waste processing plant at the ChNPP site on 10 April 2024.  
(Photo: ChNPP)*

19. As of 24 May 2024, a total of 117 missions comprising 137 Agency staff members had been deployed as part of the continued presence at all 5 nuclear sites in Ukraine, totalling over 240 person-months in Ukraine. Some of the 137 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.

20. Maintaining the continued presence of Agency staff at all five nuclear sites in Ukraine continues to be a major undertaking for the Agency, requiring mobilization of significant Agency resources.

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



### B.1.2. Coordination and Medical Assistance Mission

22. An Agency team comprising staff from the Department of Nuclear Safety and Security and the VIC Medical Service (VMS) conducted a coordination and medical assistance mission to Ukraine from 10 to 15 April 2024. The purpose of the mission was twofold: to discuss with the staff and management of the KhNPP, the RNPP and the SUNPP their experience of the continued presence of the Agency staff deployed at each site and possible further improvements to enhance the utilization of the technical support that Agency staff can provide during such missions; and to conduct a follow-up medical assistance mission to Varash, Netishyn and South Ukraine hospitals, as well as to the medical units at the NPPs. The Agency team also met representatives of the SNRIU and the National Nuclear Energy Generating Company “Energoatom”.



*Agency staff during the coordination and medical assistance mission at the RNPP on 10 April 2024.*

*(Photo: RNPP)*

23. During the mission, the current activities of the Agency staff present at the KhNPP, the RNPP and the SUNPP were discussed, as well as possible ways to broaden their nuclear safety- and security-related activities at each site. All parties agreed that the continued presence missions at these sites are well established and are conducted without any major difficulties, and noted further improvements that could be made to the conduct of site activities that would further contribute to a more systematic and comprehensive assessment of the situation at the sites against the Seven Pillars, based on the lessons learned since the continued presence was established. These improvements include the implementation of a systematic approach for Agency staff conducting walkdowns and assessment, as well as harmonization of the scope of their activities across the three NPPs.

24. Moreover, the progress made and the current status of the delivery of assistance within the medical assistance programme for operating personnel at the NPPs was discussed, as well as possible further support that could be given to build capacity among the mental health teams of the NPPs on a sustainable basis, utilizing the resources available at the national level.

25. The main findings and observations from the coordination and medical assistance mission are reflected in Section B.3.3.



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

26. The Agency has continued to monitor and assess the nuclear safety and security situation at Ukraine's nuclear facilities and activities involving radioactive sources against the Seven Pillars. In addition, the Agency continued to monitor and assess observance of the five concrete principles that aim to help ensure the integrity of, and the nuclear safety and security at, the ZNPP. The Agency continued to report regularly on its observations and findings.

27. During the reporting period, the Agency continued preparing the IAEA Technical Document that analyses the issues and challenges faced at nuclear facilities in terms of the practical application of Agency safety standards and nuclear security guidance during armed conflicts, using the knowledge and experience collected in Ukraine since February 2022.

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

### B.2.1. Zaporizhzhya NPP

29. ISAMZ continued its efforts to observe the situation and to gather relevant information needed to assess nuclear safety and security at the ZNPP.

30. Based on these efforts and on the information shared, the Agency's assessment is that the overall situation with respect to nuclear safety and security at the ZNPP continues to be precarious. All Seven Pillars were compromised either fully or partially. Moreover, ISAMZ was not provided with timely and appropriate access to all areas and information related to nuclear safety and security.

***“The world’s attention is rightly focused on the continued danger of Europe’s largest nuclear power plant being hit or losing its off-site power. But there are several other challenging areas that we must continue to monitor closely to help prevent the risk of a nuclear accident, including maintenance, as well as staffing and the availability of spare parts. They all form part of our deep concern regarding nuclear safety and security at the plant.”***

Director General Rafael Mariano Grossi, 22  
March 2024

***“Switching to cold shutdown is a positive step for nuclear safety and security, although one that is currently overshadowed by the great military dangers facing the plant.”***

Director General Rafael  
Mariano Grossi, 11 April 2024

31. At the start of the reporting period, Unit 4 was in hot shutdown and continued to generate heating for the nearby city of Enerhodar, where many plant staff live. The heating season ended on 1 April 2024, when all heating sources were turned off, and Unit 4 was subsequently put into cold shutdown. Unit 4 achieved this state on 13 April 2024 — the first time that all reactor units at the ZNPP had been in cold shutdown since late 2022.<sup>15</sup> Units 1, 2, 3, 5 and 6 remained in cold shutdown throughout the reporting period. This development was a positive step for nuclear safety and security and ensured 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.

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<sup>15</sup> Report by the Director General to the Board of Governors, document GOV/2022/66, issued on 10 November 2022, para. 46.

32. The four diesel steam generators that were commissioned in January 2024 and first commenced operation in February 2024<sup>16</sup> were operated periodically to provide the steam required by the ZNPP to process liquid radioactive waste.

33. The mobile diesel boilers were not operated for most of the reporting period, with all of the heat generated by the ZNPP provided by Unit 4 until it was transitioned to cold shutdown. Thereafter, up to two mobile diesel boilers were used periodically for the ZNPP's own needs.

### ***Physical integrity***

34. Throughout the reporting period, ISAMZ performed regular walkdowns and visits to relevant areas to assess the physical integrity of the six reactor units, safety systems, and the on-site facilities housing spent fuel, fresh fuel and radioactive waste. Despite the ongoing military activity — including frequent explosions, some in close vicinity of the plant, and reported aerial vehicles near the plant — there were no events that significantly affected the physical integrity of the facilities. However, on two occasions ISAMZ reported minor damage to areas important for nuclear safety and security at the ZNPP.

35. On 13 March 2024, ISAMZ was informed by the ZNPP of an alleged drone attack on 12 March 2024, in an area roughly 500 metres outside the site perimeter. No casualties or impact on any structures important to nuclear safety or security were reported. ISAMZ accessed the location on 13 March 2024 and observed a shallow cavity in the ground located just outside the concrete wall surrounding the off-site diesel fuel storage area. Other than some partially burnt foil/plastic material observed in the area, ISAMZ did not observe any remnants of a drone. Based on the available evidence and visual observations, ISAMZ was unable to confirm whether the event was the result of an attack by a drone or another type of projectile.

36. On 7 April 2024, ISAMZ performed ad hoc observations at three locations within the ZNPP site perimeter, related to multiple reported drone attacks on that day.<sup>17</sup> ISAMZ observed some damage to the top of the reactor containment dome of Unit 6 and surrounding structures and assessed that the damage caused did not affect any critical nuclear safety- or security-related structures, systems, and components that might adversely impact the continued safe and secure operation of the plant. This was the first time the ZNPP had come under direct attack since the last reported attacks took place in November 2022.



*Small crater observed in the ground outside the wall surrounding the diesel fuel storage tanks during the ISAMZ walkdown on 13 March (left); an ISAMZ team member observing drone remnants at the containment dome of Unit 6 following the drone strike on 7 April 2024 (right). (Photo: ZNPP)*

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<sup>16</sup> Report by the Director General to the Board of Governors, document GOV/2024/9, issued on 27 February 2024, para. 33.

<sup>17</sup> See paras 83 to 90 below.

37. While these drone attacks did not result in significant damage to the physical integrity of the ZNPP and did not lead to a nuclear incident or accident, they compromised the first of the Seven Pillars, demonstrating that the facilities at the ZNPP remain at risk as the armed conflict continues.

38. The ZNPP informed ISAMZ of other instances of alleged drone activity, including at the oxygen and nitrogen production facility and the ZNPP port on 5 April 2024, as well as on the top of the ZNPP training centre on 7, 9 and 18 April 2024. Although ISAMZ heard explosions that correlated with the times of these events, it was not provided with access to the sites to verify this information and observe and assess any related impact.

***“No one can conceivably benefit or get any military or political advantage from attacks against nuclear facilities. Attacking a nuclear power plant is an absolute ‘no-go’. I firmly appeal to military decision makers to abstain from any action violating the basic principles that protect nuclear facilities.”***

Director General Rafael Mariano Grossi, 7 April 2024

### ***Nuclear safety and security systems and equipment***

39. During the reported period, ISAMZ routinely visited the following:

- The reactor halls of all six units, at times coinciding with the ZNPP conducting the monthly changeover between the spent fuel pool cooling pumps in operation. During these visits, ISAMZ was able to observe the spent fuel pool, steam generators, main coolant pumps, accumulators, pressurizer, pressurizer relief tank, pressurizer safety valves, passive autocatalytic recombiners, emergency core cooling system (ECCS) high pressure safety injection pumps, and the ECCS sumps intakes for the in-containment boron storage tank.
- The safety systems rooms of each unit. During the visits, ISAMZ observed the low and high pressure safety injection pumps, high pressure piston pumps, containment spray pumps, spent fuel pool cooling pumps and heat exchangers, and the ECCS heat exchangers.
- The main steam safety valves, steam dump valves, steam and feedwater isolation valves, and the emergency feedwater system pumps and tanks at Unit 1 and 6. During the visits, ISAMZ also observed the piping installations for the direct injection of water outside the reactor building to the emergency feedwater system.

ISAMZ did not report any major issues of the plant systems affecting the overall nuclear safety or security of the plant based on the observations made during these visits.

40. However, ISAMZ noted:

- A small water leak from the essential water service system and water on the floor of one of the safety systems rooms in Unit 2. The ZNPP informed ISAMZ that the small water leak from the essential service water system had been ongoing for approximately three weeks and would be fixed when the safety train underwent maintenance, and that the water on the floor was due to drainage of the safety train II heat exchanger, which was being cleaned. ISAMZ was able to observe and confirm the reported maintenance and drainage of the heat exchanger.
- A small amount of fresh oil under one of the safety systems pumps in Unit 5. It was subsequently confirmed that the oil levels in the pump were within the technical specifications for the pump, despite the leakage.

- Traces of boric acid in some of the safety systems rooms in Unit 6. ISAMZ assessed this as minor and the situation as stable. ISAMZ was informed that follow-up actions to be taken by the ZNPP to repair the leak in the boron tank in Unit 6, following the “special order” issued in January 2024 and reported in document GOV/2024/9, had been scheduled as part of the planned maintenance of Unit 6, and that the leak was being monitored and remained within the technical specifications.

41. ISAMZ frequently observed the testing of emergency diesel generators (EDGs) and the respective safety systems trains during the reporting period, from a variety of locations including the respective main control room, the supplementary control room, the safety systems instrumentation and control room and at the local EDG control room from where the EDGs had been tested. ISAMZ did not observe any issues during the tests, noting that they were performed according to schedule and approved programmes with all acceptance criteria provided to the team by the ZNPP being met.<sup>18</sup>

42. Throughout the reporting period, ISAMZ continued to hold discussions with the ZNPP in order to develop a better understanding of the maintenance plans for 2024, considering their important role in preventing any degradation of the structures, systems, and components important for nuclear safety. Based on these discussions, ISAMZ learned of the maintenance activities planned for 2024 for Units 1 2 and 6 as well as for some of the systems and components important for the safety of all six units.

43. Scheduled maintenance of Unit 1 commenced on 1 March 2024 and is planned to be completed by mid-2024. The planned activities include maintenance on all three safety trains, the EDGs, and the units’ transformers and their electrical connections. However, the ZNPP reported that maintenance on equipment and components important for safety had been postponed until 20 May 2024 due to the disconnection of the 330 kV Ferosplavna back-up power line, the maintenance activities on the unit’s electrical equipment, and the ongoing military activity in the area.

44. Scheduled maintenance of one of the back-up power transformers for the site and of the main transformer of Unit 2 have commenced on 18 May and 20 May 2024, respectively.

45. ISAMZ will continue to independently monitor and observe maintenance activities based on the maintenance plans for 2024 and to report on them accordingly.

46. Throughout the reporting period, 11 groundwater wells continued to provide approximately 250 cubic metres of cooling water per hour to the 12 essential service water sprinkler ponds. ISAMZ conducted regular walkdowns of the sprinkler ponds throughout the reporting period and confirmed that the height of the water during the walkdowns was sufficient to provide cooling to all six units in the shutdown state.

47. ISAMZ was informed that water is pumped into the ZNPP cooling pond from two separate sources: excess water from the wells and water pumped from the discharge channel of the Zaporizhzhya thermal power plant (ZTPP). The maximum volume of water pumped into the ZNPP cooling pond during the reporting period was approximately 10 000 cubic metres per day, depending on the consumption of essential service water system from the sprinkler ponds and the number of hours per day that the ZNPP pumped water from the ZTPP discharge channel into the cooling pond.

48. The height of the water in the ZTPP discharge channel remained relatively stable throughout the reporting period, fluctuating between 16.47 metres and 16.72 metres. While the ZTPP inlet channel remained disconnected from the former Kakhovka reservoir, it continued to receive some water through

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<sup>18</sup> See para. 2 above.



the ingress of groundwater as well as from precipitation. Water from the ZTPP inlet channel was periodically pumped into the ZTPP discharge channel during the reporting period.

49. The height of the ZNPP cooling pond at the beginning of the reporting period was 15.58 metres and 15.29 metres at the end of the reporting period, representing an overall decrease of over 1 metre from the height of 16.67 metres on 6 June 2023, when the Kakhovka dam was destroyed. Assuming that the height of the cooling pond will decrease at a rate of approximately one centimetre per day, as observed during the summer of 2023, ISAMZ expects that the height of water in the cooling pond is likely to drop to below 14.5 metres by September 2024. The ZNPP reported that the service water pumps and fire pumps will remain operable until the height of the cooling pond drops below 12 metres.

50. ISAMZ visited the cooling pond and waterworks facilities on 26 February, 1 April and 3 May 2024 and was able to discuss and observe the waterworks operations. During these visits, ISAMZ was able to confirm the integrity of the ZTPP discharge channel isolation gate and did not observe any leaks. However, ISAMZ has not been permitted to visit the ZNPP cooling pond isolation gate since November 2023 despite requesting to do so, and was therefore unable to confirm the status of the reinforcement and the overall integrity of the gate throughout the reporting period.

51. ISAMZ will continue to closely monitor and observe the situation at the site to ensure the availability of a sufficient supply of cooling water for the plant's needs at all times, and to report on it accordingly.

52. During the reporting period, ISAMZ observed the presence of anti-personnel mines in the buffer zone between the facility's internal and external fences, which is in the restricted area inaccessible to operating plant personnel. The Agency is not aware of any assessment performed by the ZNPP consistent with Agency safety standards and nuclear security guidance of the potential implications of the presence of these mines for nuclear safety and security systems and equipment at the site.

53. ISAMZ conducted walkdowns of the turbine halls of the six reactor units throughout the reporting period. While ISAMZ did not observe any issue related to nuclear safety and security, on each occasion ISAMZ was prevented from visiting the western part of the turbine halls. This restricted access made it impossible for ISAMZ to fully assess whether there were any issues or materials present in the turbine halls that could potentially affect the nuclear safety and security of the plant.

### ***Operating staff***

54. ISAMZ continued to monitor the situation regarding staffing at the ZNPP throughout the reporting period by conducting walkdowns of all main control rooms and other operational areas, observing the performance of staff during field operations, and holding discussions with the ZNPP personnel, including those of the training centre. On 7 May 2024, the ZNPP informed ISAMZ that the plant employed approximately 5000 personnel and that a further 800 positions remained unfilled. ISAMZ visited the main control rooms of all units consecutively, and was able to observe the number of positions with the requisite composition and the reactor safety parameters. However, ISAMZ was not permitted to engage in discussion with the main control room staff on these occasions, making it difficult for ISAMZ to assess whether they had relevant experience and were sufficiently and suitably qualified for their duties. Notwithstanding, ISAMZ reported that it observed a slight increase in the number of staff at the ZNPP compared to previous reporting periods, and that the new personnel demonstrated their ability to work independently in the field.

***“We are continuing to monitor the staffing situation closely, as it is of vital importance for nuclear safety and security. For this purpose, our experts would also require an opportunity to discuss with the operators of the main control rooms, and other qualified staff.”***

Director General Rafael  
Mariano Grossi, 9 May 2024

55. In addition to the main control rooms, ISAMZ visited many areas during the reporting period, including the reactor containment, the safety systems rooms, the turbine halls, the electrical rooms, cable rooms, the 750 kV open switchyard, the EDGs, the radioactive waste storage facilities and the radiation monitoring laboratory. ISAMZ noted that staff members well prepared to provide relevant information were available in each area.

56. During the reporting period, ISAMZ engaged to better understand the staffing requirements for the main control room operators. ISAMZ was informed by the ZNPP that the plant applies regulations issued by the Russian Federation<sup>19</sup> in this regard, as follows:

- For units in cold shutdown, a minimum composition of three authorized personnel is required, consisting of the unit shift supervisor, the senior reactor operator and the senior turbine operator, or the turbine shift supervisor in the absence of the senior turbine operator; and
- For units in hot shutdown or at power, the full composition of five authorized personnel is required, consisting of the unit shift supervisor, the senior unit operator, the senior reactor operator, the senior turbine operator, and the turbine shift supervisor.

57. ISAMZ was further informed by the ZNPP that the main control room staff are now receiving authorizations for all main control rooms, a deviation from the previous approach whereby authorizations were issued either for Units 1–4 or for Units 5–6 and included a requirement to undertake additional training for authorizations to be extended to cover the operation of all six reactor units. ISAMZ observed the main control room operators undertaking simulator training on different units (i.e. personnel from Units 5–6 working in the simulator for Units 3–4).

58. ISAMZ were subsequently informed that the training programme focuses on the current state of the reactor units and encompasses the difficulties that the ZNPP is encountering due to the loss of external power lines and heat sink. Although training in power operation is part of the programme, it is not currently the priority. The training programme is followed by examinations validated by the head of the ZNPP training centre. All relevant documentation for successful candidates is reviewed by Rostechнадзор, which sets a final exam that candidates must pass to obtain authorization.<sup>20</sup>

59. On 27 February 2024, ISAMZ was informed that, as of 20 February 2024, 143 applications for main control room operators had been received and 91 authorizations had been issued. The remaining applicants continue to operate under their Ukrainian licences, which the Russian Federation deems valid until January 2025. The ZNPP informed ISAMZ that there is a sufficient number of authorized staff for the plant in its current state, with all units in shutdown.

60. For the Agency to be able to 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 are needed.

61. Staff at the ZNPP reportedly continue to experience severe psychological stress of various kinds, as reported in document GOV/2024/9. In this context, on 7 March 2024, ISAMZ met with a ZNPP psychologist to discuss the evaluation programme in place. ISAMZ was informed that all ZNPP staff undertake an annual medical and psychological evaluation programme, in accordance with labour

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<sup>19</sup> See para. 2 above.

<sup>20</sup> See para. 2 above.

protection laws in the Russian Federation.<sup>21</sup> Personnel in authorized positions, such as main control room operations, are required to undergo more extensive psychological evaluations.

### ***Off-site power supply***

62. The status of the off-site power supply to the ZNPP remained vulnerable throughout the reporting period. At the start of the reporting period, only one of four 750 kV lines — the Dniprovskaya line — was providing off-site power to the ZNPP. The last of six 330 kV back-up power lines — the Ferosplavna 1 line — that had been disconnected on 20 February 2024, as reported in GOV/2024/9, remained disconnected for 23 days, until 14 March 2024. Shortly afterwards, on 22 March 2024, the 750 kV Dniprovskaya line was disconnected from the ZNPP open switchyard for a period of approximately five hours following military activities affecting the Ukrainian electricity grid. The ZNPP continued to receive off-site power from the 330 kV Ferosplavna 1 back-up power line and thus, no EDGs had to start.

63. On 4 April 2024, the 330 kV Ferosplavna 1 back-up power line was disconnected through actuation of the electrical protection, at a distance of 27 kilometres from the ZTPP 330 kV open switchyard, and was reconnected on 6 April 2024.

64. On 23 May 2024, the 750 kV Dniprovskaya line was disconnected for over three hours due to a short circuit that occurred approximately 6.5 kilometres from the ZNPP 750 kV open switchyard, on the left bank of the Dnipro river. Following reconnection, the ZNPP remained connected to the 750 kV Dniprovskaya line and the 330 kV Ferosplavna 1 back-up line for the remainder of the reporting period.

65. The ZNPP conducted maintenance activities on the main transformer, house load transformers and unit power outlet of Unit 1 between 17 March and 26 April 2024. During this period, Unit 1 was provided with power through the 6 kV back-up power buses. These buses were powered from neighbouring units and not solely from a back-up transformer. This configuration minimized the risk of a start of all three EDGs on Unit 1 in case of a loss of the only remaining power line.

66. ISAMZ conducted walkdowns of the 750 kV open switchyard on 2 April and 2 May 2024, where it observed the connection points of all four 750 kV power lines. ISAMZ observed that the Kakhovka and South Donbass nodes had been dismantled and the current transformers removed, with the components of the South Donbass line used for spare parts for equipment within the 750 kV open switchyard. Following its last visit on 19 December 2022, ISAMZ was still not granted permission to visit the 330 kV open switchyard at the ZTPP.

67. There was no total loss of off-site power during the reporting period. However, the disconnection of the only available off-site power lines on several occasions during the reporting period demonstrates that the status of off-site power continues to be one of the major risks to nuclear safety and security at the ZNPP.

### ***Logistical supply chain***

68. During the reporting period, the supply chain to the ZNPP continued to be provided by the Russian Federation.<sup>22</sup> ISAMZ continued to engage proactively to assess the status and availability of spare parts and the effectiveness of the supply chain. This included visits to the central, electrical and mechanical warehouses and discussions with the ZNPP staff and management. Based on these activities, ISAMZ reported the following observations:

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<sup>21</sup> See para. 2 above.

<sup>22</sup> See para. 2 above.

- A range of electrical spare parts including small and medium sized transformers, electrical control cabinets, gas breakers, bus bar components, cables, and larger electrical and mechanical equipment were all stored properly and in good condition at the central warehouse facility. However, ISAMZ noted that much of the electrical equipment originated from Western suppliers and had been delivered prior to the start of the armed conflict;
- The availability of safety shoes and boots, safety glasses, thermal equipment and potassium iodide tablets. ISAMZ was informed that about 90% of the protective equipment and supplies originated from Rosatom;
- A number of shelves in the mechanical warehouse continue to be empty. The ZNPP staff informed ISAMZ that the warehouse requests equipment from the off-site central warehouse as necessary;
- Equipment and supplies needed for the ongoing maintenance activities of Unit 1 and Unit 2 were procured and available;
- The stocks of spare parts at the electrical warehouse included electrical motors, bearings and other equipment for safety systems, as well as breakers, fuses, switches, relays, valve casings, pipes, gaskets, metal seals, and electrical motors and pistons for the EDGs;
- Although the ZNPP has a schedule for the replacement of the safety class electrical cables, not all of the required cables had been received.

69. ISAMZ followed up with the ZNPP on the identification of suppliers for the purpose of ensuring compatibility, in particular for spare parts and equipment previously supplied by Ukrainian or other companies. The ZNPP did not elaborate on this aspect but informed ISAMZ that the site had the necessary spare parts and equipment available for the plant in its current state, with six units in shutdown. The ZNPP informed further ISAMZ that the transition to a new software system that would enable the ZNPP to publish tenders for the procurement of spare parts and equipment from potential suppliers in the Russian Federation was almost complete.

70. Based on these observations, supply chain logistics seem to have been made available for the needs of the ZNPP but remain fragile. In the absence of detailed and clear information on the supply chain for the ZNPP, ISAMZ could not confirm whether the ZNPP has all the necessary spare parts.

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

71. There were no changes to the status of the on-site and off-site radiation monitoring systems during the reporting period. All on-site radiation monitoring stations were operational, and only three off-site monitoring stations remained disconnected, as reported in document GOV/2024/9.

72. On 9 April 2024, ISAMZ visited the off-site radiation monitoring laboratory located outside of the ZNPP perimeter, within the nearby industrial area and close to the city of Enerhodar. ISAMZ observed the off-site monitoring station, meteorological measurement equipment, and the local control panels for the off-site monitoring stations where all off-site monitoring data was available and stored. During the visit, ISAMZ was informed that the laboratory had special newly adopted procedures to perform analyses and provide support in case of a nuclear accident at the ZNPP. ISAMZ was further informed that arrangements were in place to ensure that, in case of a nuclear accident, the ZNPP mobile monitoring teams and the chemical, biological, radiological and nuclear (CBRN) military units would cooperate as necessary, using equipment such as CBRN surveillance vehicles in addition to the laboratory's surveillance vehicles, and that the teams had received training.



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

74. The ZNPP continued with regular monitoring of the radiation exposure of its staff and noted that exposures had dropped significantly since the start of the armed conflict, due to the shutdown state of all six reactors and the absence of major maintenance activities. ISAMZ was informed that the plant radiation protection programme had been reviewed and adapted to bring it into alignment with the regulatory framework of the Russian Federation.<sup>23</sup>



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

75. During the reporting period, ISAMZ proactively engaged to closely observe the emergency arrangements in place at the ZNPP. The ZNPP informed ISAMZ that until the new emergency plan is completed in September 2024, the existing emergency arrangements are followed based on the temporary emergency plan adopted in March 2023 and reported upon in document GOV/2023/30.

76. The on-site emergency centre remained unavailable throughout the reporting period, with the ZNPP continuing to maintain a temporary emergency centre located in the area beneath the main control room of Unit 2. ISAMZ visited the temporary emergency centre on 6 March 2024 and was informed that all necessary operational procedures were stored in the centre, digitally and in hard copy. During the visit, ISAMZ was informed that the temporary emergency centre did not yet fulfil all the necessary requirements for an emergency response facility — especially those related to the ventilation system, which is not designed to go into closed circulation and filtering mode — nor did it have the capability for oxygen injection, which had been a feature of the permanent on-site emergency centre.

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<sup>23</sup> See para. 2 above.

77. The original off-site emergency centre is located in Zaporizhzhya city on the other side of the front line, making it unavailable to the plant throughout the reporting period. ISAMZ was informed that in case of an emergency situation requiring the temporary emergency centre to be evacuated, a temporary off-site emergency centre located in the city of Enerhodar would be utilized. Furthermore, ISAMZ was informed that the ZNPP seeks to acquire a mobile emergency response centre and has drawn up plans to establish a permanent off-site emergency centre in the city of Enerhodar that would fulfil all the requirements.

78. The ZNPP conducted an emergency drill on 15 May 2024. The drill focused on the measures taken at the ZNPP to respond to simulated damage to a pipe connected to one of the sprinkler ponds that provides water to cool the reactor of Unit 1 and its safety systems. Site personnel were required to use a mobile pumping station to pump water into the affected sprinkler pond while the pipe was being repaired, and to ensure that the safety systems and diesel generators remained operational. ISAMZ observed that the drill was well organized and that personnel responded effectively. The ZNPP informed ISAMZ of its plans to conduct a major emergency exercise later in 2024.

79. Effective emergency arrangements are essential to ensure that the public, property and the environment are protected in case of an emergency, particularly in the circumstances imposed by the armed conflict. However, based on current observations, the existing emergency arrangements appear 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. ISAMZ will continue to monitor and assess the situation and report on it accordingly.

### ***Communications***

80. 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.

81. ISAMZ reported that Internet connections remained functional, even during reported power outages in the nearby city of Enerhodar.

### ***Five concrete principles for protecting the ZNPP***

82. During the reporting period, the Agency continued to monitor observance of the five concrete principles at the ZNPP. For this purpose, ISAMZ conducted regular walkdowns at the ZNPP site and had access to most of the areas requested, though sometimes only after waiting for some time for the access permission to be granted. However, ISAMZ was not permitted to access several areas — such as the western part of the turbine halls of all six units, the ZNPP cooling pond isolation gate, the radioactive waste processing building and the ZTPP 330 kV open switchyard — throughout the entire reporting period. The access restrictions imposed on ISAMZ by the ZNPP continue to limit the Agency's ability to fully assess whether all five concrete principles are being observed at all times.

83. During the reporting period, ISAMZ reported that a clear violation of the first of the five concrete principles had occurred on 7 April 2024 for the first time since their establishment on 30 May 2023 and the direct attacks on the site in November 2022. Moreover, ISAMZ continued to report the presence of armed troops and military equipment at the site and reported an increase in military activities —

including rifle and machine gun fire and explosions at the site and in its vicinity — throughout the reporting period, putting other principles at risk.



*The five concrete principles for protecting the ZNPP established by the Director General Rafael Mariano Grossi in his address to the UNSC on 30 May 2023.*

***“What once seemed unimaginable — military activity near a nuclear power plant — has become a daily reality. The situation is not improving and as long as this tragic war continues, the plant remains in danger. For this reason, I again call for maximum restraint and full observance of the five concrete principles established at the United Nations Security Council in May last year.”***

Director General Rafael Mariano Grossi, 15 March 2024

84. On 7 April 2024, ISAMZ was informed by the ZNPP that two drones had detonated: one detonation was reported to have occurred on site, near a canteen building located close to the second laboratory building, and a second was reported to have occurred off site in the port, north-west of the protected area. ISAMZ noted that the reported events correlated with explosions the team had heard throughout the day around noon local time, followed closely by rifle fire. ISAMZ requested and was granted permission from the ZNPP to visit the on-site location to observe the scene, allowing ISAMZ access to it within a few hours of hearing the explosions.

85. On arrival at the location where the on-site detonation had reportedly occurred, ISAMZ observed what appeared to be a damaged military logistics vehicle with military markings that, despite being largely intact, showed superficial markings to the chassis and glass spalling to the windshield, and a large pool of oil that had leaked from the engine. ISAMZ also observed pools of blood near the door on the driver’s side, as well as blood smears indicating that at least one casualty was likely to have been dragged from the scene to inside the nearby building. ISAMZ observed remnants of a small drone at the location.





*ISAMZ visiting the on-site location where the first drone detonation reportedly took place on 7 April 2024, observing the damaged military logistics vehicle (left) and the remnants of the drone (right).  
(Photo: ZNPP)*

86. Based on its observations at the scene, ISAMZ assessed that the drone, carrying a small explosive, was likely to have targeted the vehicle and caused the observed damage.

87. While at the scene, ISAMZ was informed of a drone strike on the rooftop of the Unit 6 reactor building, which correlated to the explosion the team had heard in the afternoon of the same day, just before their visit to the aforementioned scene had been granted. ISAMZ was granted permission and was escorted immediately to visit the rooftop of the Unit 6 reactor building.

88. Approximately 2 minutes after arriving at the rooftop, ISAMZ heard rifle fire from a lower elevation (most likely the roof of the Unit 6 turbine hall), approximately 20–30 metres away from the team. ISAMZ was quickly taken inside the Unit 6 reactor building to shelter. Shortly after taking shelter, ISAMZ heard a nearby explosive detonation at a distance of less than 250 metres.

89. Once it was deemed safe to do so, ISAMZ was permitted to return to the rooftop of the Unit 6 reactor building and climbed to the top of the reactor containment dome, where it observed that the impacted site was an array of long range closed-circuit television (CCTV) cameras and several other unknown devices located on the apex of the containment dome. ISAMZ observed the remains (at least four battery capsules, one partially intact rotor and some electronic wiring) of what appeared to be a small four-rotor drone that had detonated next to the power/communications relay box underneath two CCTV cameras. The detonation appeared to have resulted in major damage to the power/communications relay box, rendering it no longer operational.

90. ISAMZ did not observe any structural damage to the reactor containment. However, the reactor containment provides the ultimate barrier against the release of fission products into the environment in case of a nuclear accident; should the containment be damaged, any amount of radioactive material released from the reactor or its spent fuel pool — no matter how small or large — would enter directly into the environment. Therefore, every effort should be made to protect the integrity of the containment at all times, in line with the five concrete principles.





*ISAMZ on the rooftop of the Unit 6 reactor building when the rifle shooting commenced (left) and a close-up of the battery capsule remains (right). (Photo: ZNPP)*

91. During the visit to the rooftop of the Unit 6 reactor building, ISAMZ was informed that the shooting and subsequent explosion heard while on the rooftop was related to an incoming drone that had circled the roof and been shot down, landing at ground level on the eastern side of the Unit 6 reactor building next to the primary make-up water storage tank. ISAMZ was immediately escorted to this location, where the team observed two connected craters that appeared to have been freshly created in the ground next to the concrete slab supporting the primary make-up water storage tank. ISAMZ observed remnants of a drone but did not observe any significant damage to any infrastructure or any indications of casualties in the area. The nearby tanks appeared to have some historic shrapnel damage to the thermal insulation protective metal sheet cover, but ISAMZ could not determine whether some of the damage had occurred more recently.



*ISAMZ visiting the location of the two connected craters next to the primary make-up water storage tank at the eastern side of the Unit 6 reactor building (left), and observing a piece of foil and part of a rotor blade that appeared to be remnants of the drone (right). (Photo: ZNPP)*



*Locations of the three locations within the ZNPP perimeter visited by ISAMZ following reported drone strikes.*

92. The ZNPP informed ISAMZ of other incidences of alleged drone activity near the ZNPP during the reporting period, including at the oxygen and nitrogen production facility and the ZNPP port on 5 April 2024, and on top of the ZNPP training centre on 7, 9 and 18 April 2024. Although ISAMZ heard explosions correlating with the times of these reported events, it was not granted access to the relevant locations to perform an independent assessment and verify this information.

***“Our presence at the Zaporizhzhya Nuclear Power Plant is needed more than ever. As I also informed the Security Council, we are getting dangerously close to a nuclear accident. This month’s drone attacks were the first clear violation of the five concrete principles for the protection of the site that I established at the Security Council almost one year ago.”***

Director General Rafael Mariano Grossi, 18 April 2024

93. Although ISAMZ accessed the rooftop of the Unit 6 reactor building, the team has not yet been granted access to the rooftops of Units 1 and 5.

94. There was no indication that any heavy weapons were launched from within the ZNPP perimeter during the reporting period and ISAMZ did not observe any heavy weapons in areas to which the team had access. However, ISAMZ frequently reported the presence of armed troops (which the Russian Federation claims are members of the Russian National Guard and some CBRN specialists), armoured personnel carriers, military logistics-type vehicles and weapon-mounted armoured vehicles, none of which are considered heavy weapons under the five concrete principles.

95. ISAMZ reported hearing artillery fire and rockets launched from the close vicinity of the ZNPP site perimeter. ISAMZ needs timely access to all areas of relevance for nuclear safety and security to be

able to confirm the absence of heavy weapons, at all times, that could be used in an attack to or from the plant.

96. During the reporting period, the ZNPP did not suffer a total loss of off-site power. However, the 750 kV Dniprovskaya line and the 330 kV Ferosplavna 1 back-up line were disconnected on several occasions as a result of military activity outside the ZNPP site perimeter, demonstrating that the third concrete principle continues to be at risk.

97. The ZNPP stated that key infrastructure at the site was being 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 ISAMZ or the Agency to fully confirm that all structures, systems and components essential for the safe and secure operation of the ZNPP are protected against acts of sabotage, due to limitations on information and access to various areas of the site.

### **B.2.2. Khmelnytsky, Rivne and South Ukraine NPPs**

98. ISAMIK, ISAMIR and ISAMISU continued observing the nuclear safety and security situation at the KhNPP, the RNPP and the SUNPP sites, respectively, with respect to the Seven Pillars.

99. The KhNPP, the RNPP and the SUNPP continued to be the only operating NPPs in Ukraine that produced 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 unplanned maintenance.

100. At the KhNPP, Unit 2 had to be shut down from 13 March 2024 for unplanned maintenance on the turbine shaft. On 2 April 2024, ISAMIK reported Unit 2 to have returned to nominal power. On 8 April 2024, KhNPP had to reduce the power production of Unit 2 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.

101. At the RNPP, Units 1 and 4 commenced planned outages on 5 April and 8 March 2024, respectively, while Unit 2 at the SUNPP commenced a planned outage on 14 April 2024. Each of these outages includes maintenance activities and refuelling of the reactor units.

102. In April 2024, the spent fuel from Unit 4 at the RNPP was transferred to the Central Spent Fuel Storage Facility in the exclusion zone around the ChNPP.

103. Throughout the reporting period, frequent air-raid alarms were reported by the Agency staff present at these NPPs.

#### ***Physical integrity***

104. 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***

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



### ***Operating staff***

106. All three NPPs reported that they had a sufficient number of qualified operating staff to ensure safe and secure plant operation. Agency teams at the KhNPP, the RNPP and the SUNPP 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.

107. ISAMIK was informed that the operational personnel at the KhNPP undergo psychological evaluations every two years and that there have been no major changes in the results of these evaluations since the armed conflict started. The KhNPP also informed ISAMIK that approximately 2% of staff surveyed in 2022 have indicated that they are experiencing significant stress, with the results showing no significant changes during subsequent evaluations and that staff had been provided with information to access outside sources of support. Additionally, approximately 200 staff members had requested and completed a training course on mental health awareness and coping mechanisms. The training was developed by the psychologists at the KhNPP in support of the staff of the NPPs. Physical examinations of operational personnel are conducted annually.

### ***Off-site power supply***

108. 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.

109. Early in the morning of 22 March 2024, as a result of military activities affecting Ukraine's power infrastructure, the SUNPP was disconnected from two of its eight off-site power lines for a few hours. During that time, power production was reduced. One of the disconnected lines — the 750 kV Dniprovska line — supplies power also to the ZNPP.

110. Between mid-March and mid-April 2024, one of the two 750 kV off-site power lines connected to the RNPP was disconnected for planned maintenance. Subsequently, the disconnection of one of the lines between 6 and 8 May 2024 was reported to ISAMIR.

111. On 8 May 2024, the RNPP informed ISAMIR that fluctuations in the power supply of the 330 kV back-up power lines connected to the plant had occurred on two occasions as a result of military attacks on non-nuclear power plants elsewhere in Ukraine, but that the fluctuations remained within the allowable limits and therefore no disconnections had occurred.

### ***Logistical supply chain***

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

113. The major supply chain issues encountered at the beginning of the armed conflict have been resolved by diversifying suppliers, setting up national manufacturers and finding alternative transportation methods.

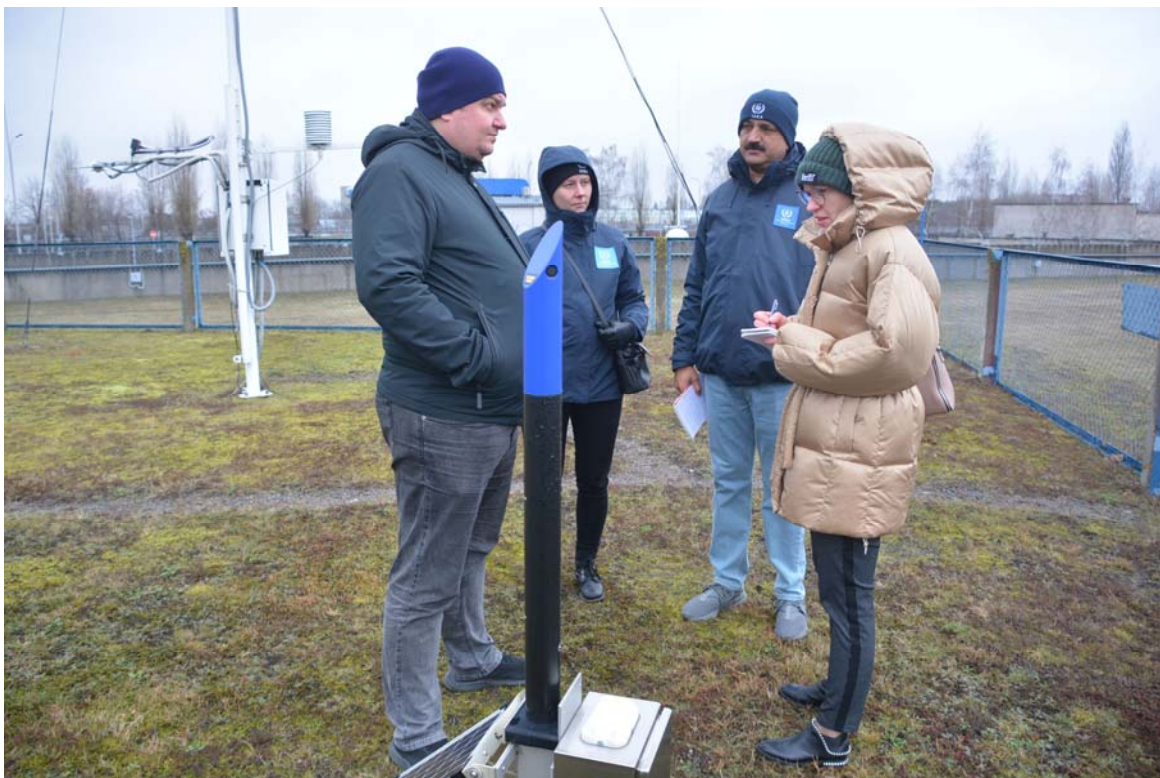
### ***On-site and off-site radiation monitoring system and emergency preparedness and response***

114. On 5 March 2024, the ISAMIK team visited the State fire and rescue centre where the team was shown training programmes, drills and exercises. ISAMIK was informed that most of the firefighting back-up vehicles are more than ten years old, which does not comply with the applicable fire protection regulation.



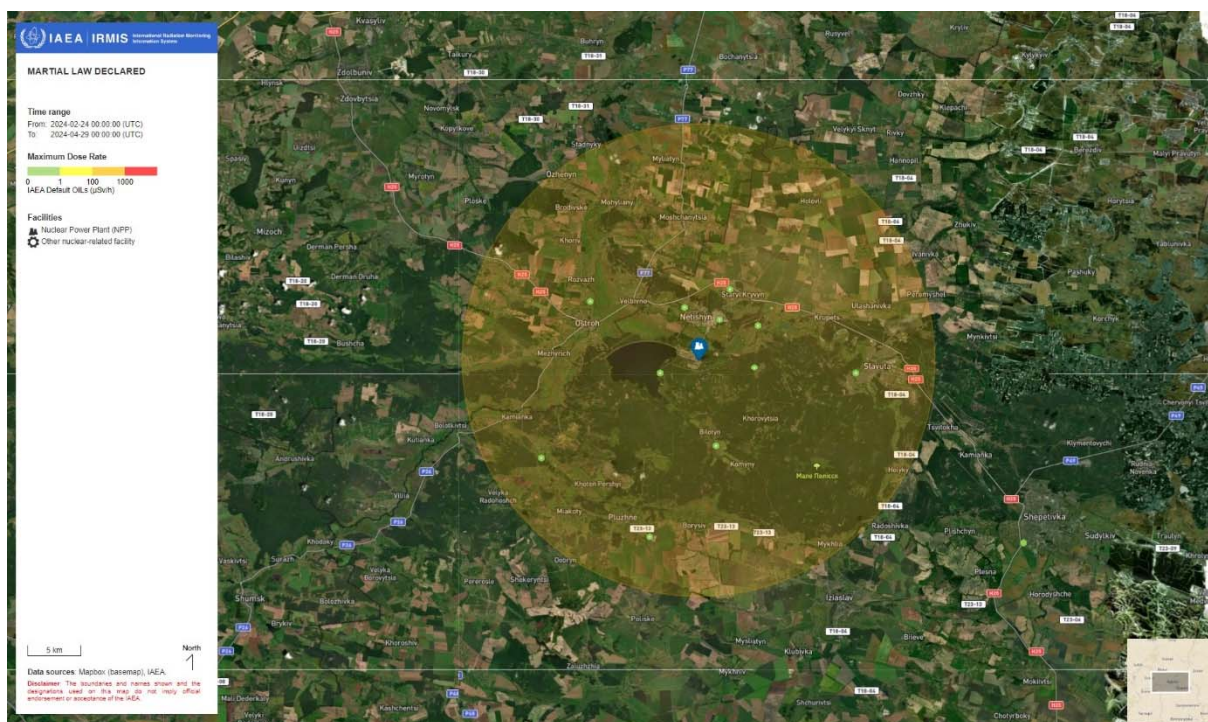
*ISAMIK visiting the State fire and rescue centre on 5 March 2024. (Photo: KhNPP)*

115. During the reporting period, ISAMIK, ISAMIR and ISAMISU visited the plants' external emergency response centres and environment monitoring laboratories and discussed their current respective capacities and capabilities, and did not report any issue related to nuclear safety and security.

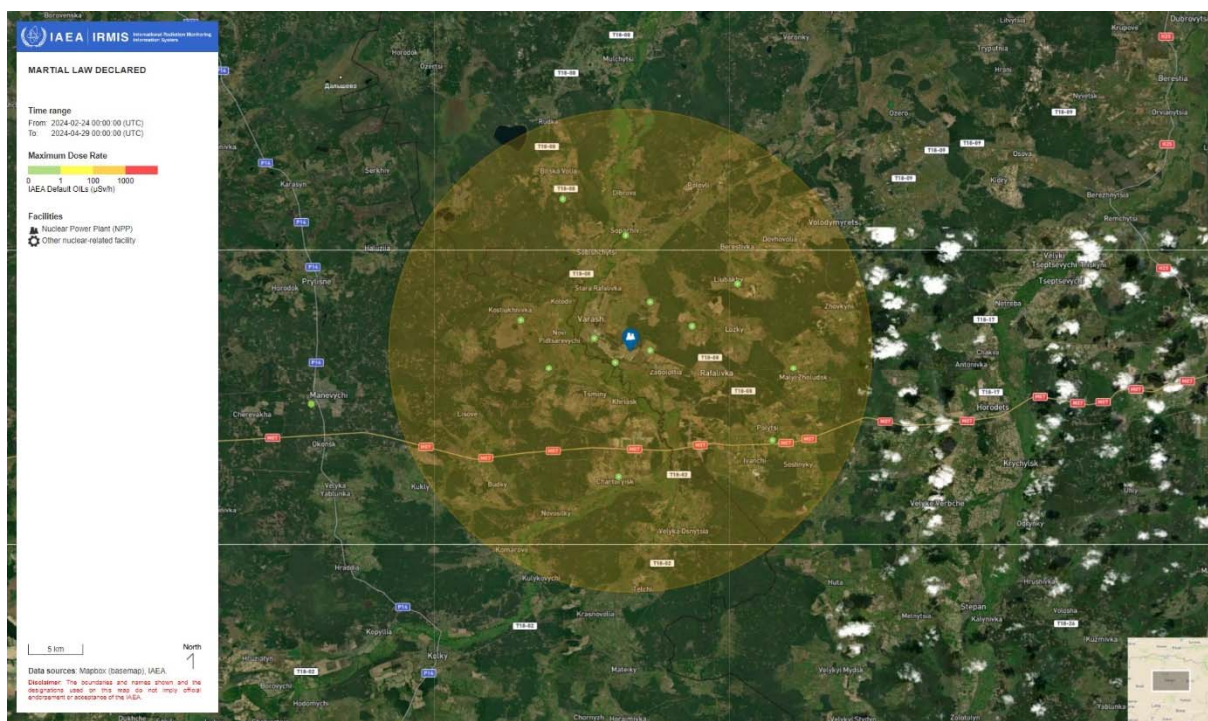


*ISAMIR during the walkdown to the environmental monitoring laboratory at the site on 6 March 2024. (Photo: RNPP)*



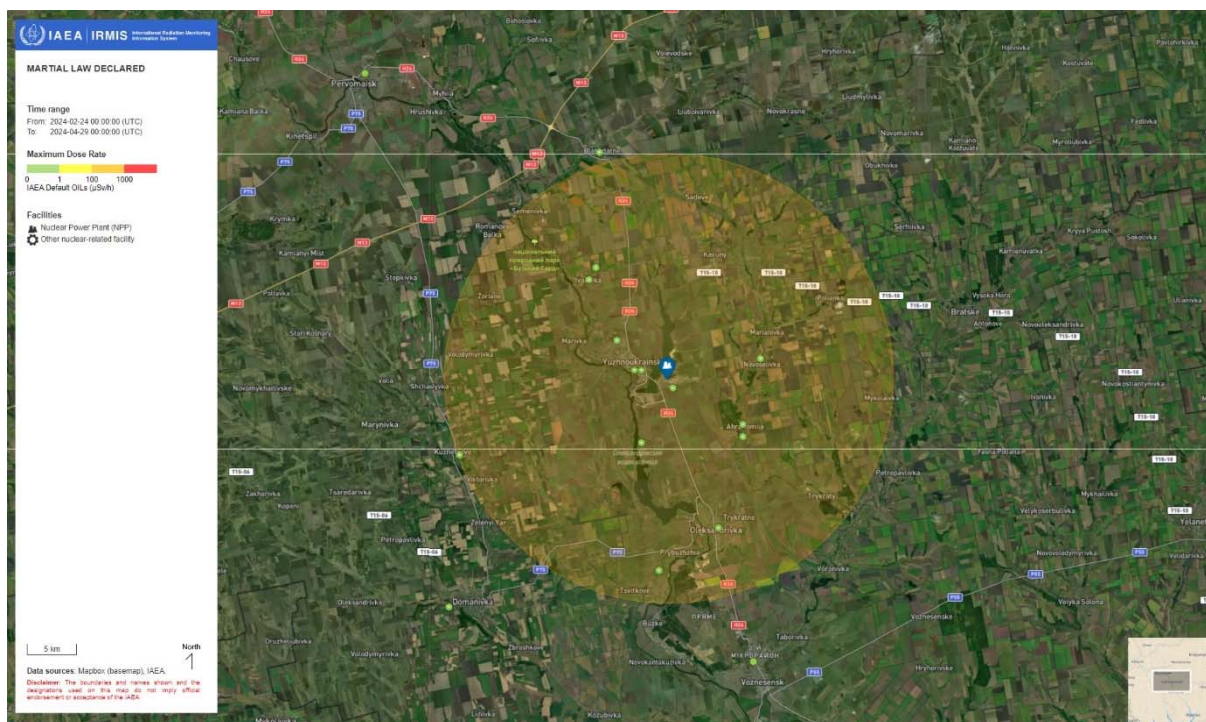


*Radiation monitoring data from the monitoring stations in the 20 km radius around the KhNPP.  
Radiation levels are normal.*



*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***

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

117. Ukrainian inspectors from the SNRIU continued to be present at all three NPPs.

### **B.2.3. Chornobyl NPP Site and Other Facilities**

118. 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 or GOV/2024/9 with regard to the assessment of the nuclear safety and security situation against the Seven Pillars.

### ***Physical integrity***

119. 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***

120. 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***

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

122. ISAMICH was informed that the provision of regular training to ChNPP staff was challenging, as training infrastructure is mainly located in Slavutych, making it impractical to conduct training activities.

### ***Off-site power supply***

123. The ChNPP site had an off-site power supply through one 750 kV line and three 330 kV and five 110 kV back-up power lines. EDGs were available but were not utilized during the reporting period, other than for routine testing. Maintenance was performed on one of the five 110 kV lines during the reporting period, however the line remained operational at all times.

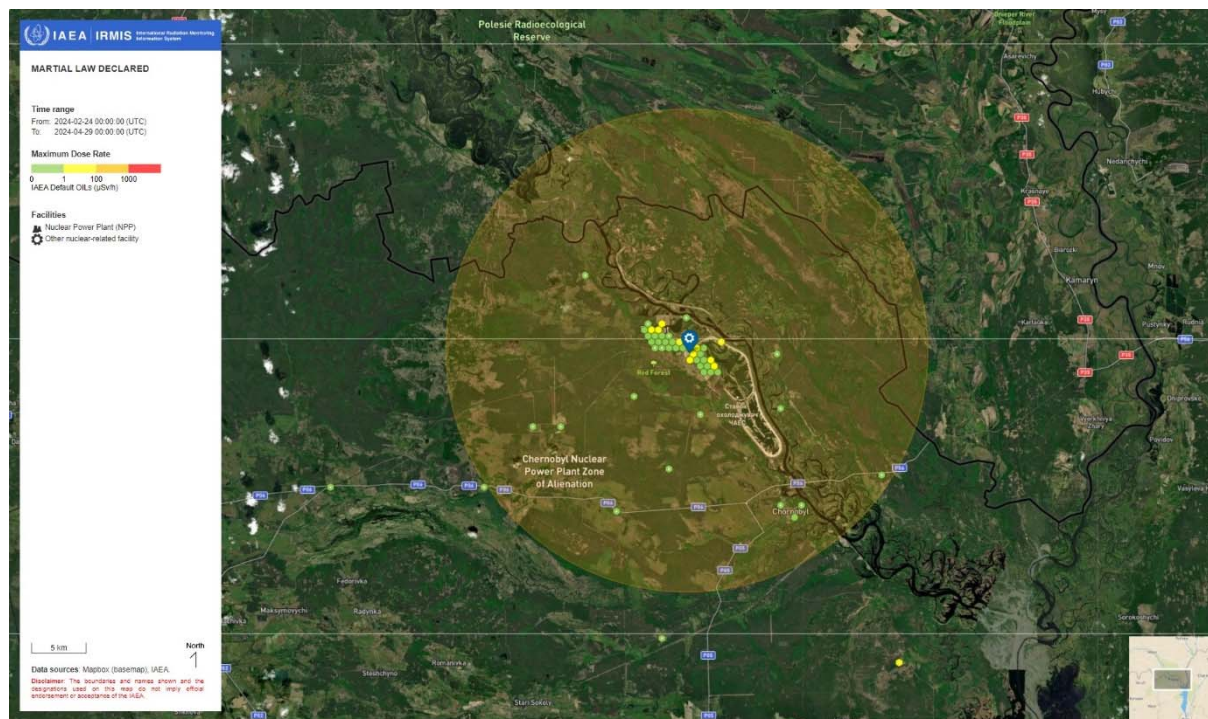
### ***Logistical supply chain***

124. 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.

125. ISAMICH was informed by the ChNPP management that public funding had been very limited, preventing the site from stocking up on spare parts. Therefore, some specific and costly spare parts for the New Safe Confinement depend on the provision of external support, for example through the European Bank for Reconstruction and Development.

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

126. During the reporting period, ISAMICH reported several emergency drills and trainings taking place at the site, involving several departments at a time and including the fire department in some cases.



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

### ***Communications***

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

### ***Other Facilities***

128. For one week at the end of March and again at the beginning of April 2024, the subcritical Neutron Source installation, located in the north-eastern city of Kharkiv, lost its external power supply. The facility relied on its emergency power supply system during these periods. It has been in a deep subcritical state since the beginning of the conflict. The events did not give rise to any radiological consequences.

129. 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**

130. 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 medium and long term environmental, social and economic impact of the flooding in the Kherson Oblast. It would also encompass remote assistance and the deployment of rapid assistance should the need arise.

131. 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.

132. 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.

133. By 24 May 2024, 26 Member States<sup>24</sup> and 1 international organization<sup>25</sup> had offered extrabudgetary cash contributions to support Agency efforts in providing technical support and assistance to Ukraine in nuclear safety, security and safeguards, including for sustaining the continued presence of Agency staff at the five nuclear sites in Ukraine.

134. 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 Equipment**

#### ***Requests for assistance***

135. On 22 May 2024, the Agency received from Ukraine a new request for assistance in the form of nuclear safety equipment, under the statutory functions of the Agency and through the operational arrangements<sup>26</sup> under the Convention on Assistance in the Case of a Nuclear Accident or Radiological

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<sup>24</sup> 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 and the United States of America (USA).

<sup>25</sup> The European Commission representing the European Union.

<sup>26</sup> 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/emergency-preparedness-response/international-operational-arrangements>.



Emergency. This is the tenth request for assistance in the form of equipment since the start of the armed conflict. The request relates to equipment needs of the KhNPP, the RNPP and the SUNPP, including priority needs such as spare parts for the EDGs.

136. During the reporting period, the Agency continued working to address these requests from Ukraine as well as the needs identified during the expert missions conducted in 2022 and 2023, based on their urgency and taking into account the funding available.

### *Offers of assistance*

137. By 24 May 2024, 13 Member States<sup>27</sup> had offered assistance in the form of in-kind contributions of equipment for supporting Ukraine. No new offers of in-kind contributions of equipment were received during the reporting period.

### *Delivery of equipment*

138. The Agency continued to deliver equipment to end users in Ukraine. During the reporting period, the Agency organized a total of 10 equipment deliveries to Ukraine, bringing the total number of such deliveries to 47.

139. The deliveries comprised equipment procured by the Agency under extrabudgetary contributions provided by Australia, the European Union, Japan and the United Kingdom (UK) as well as an in-kind contribution from the United States of America. As a result of these deliveries, entities such as the Eastern Mining and Processing Enterprise “VostGOK”, the State Emergency Service of Ukraine, the State Enterprise “USIE Izotop”, the ChNPP, the SUNPP and the RNPP received equipment such as radiation/contamination monitoring devices, spectrometers, physical protection systems and equipment, personal protective equipment, communication systems and devices, power supply equipment, testing/inspection equipment and similar items.



*Portable radio devices and hand-held metal detectors received by the ChNPP on 6 and 11 March 2024, procured using extrabudgetary funding from the European Union. (Photo: ChNPP)*

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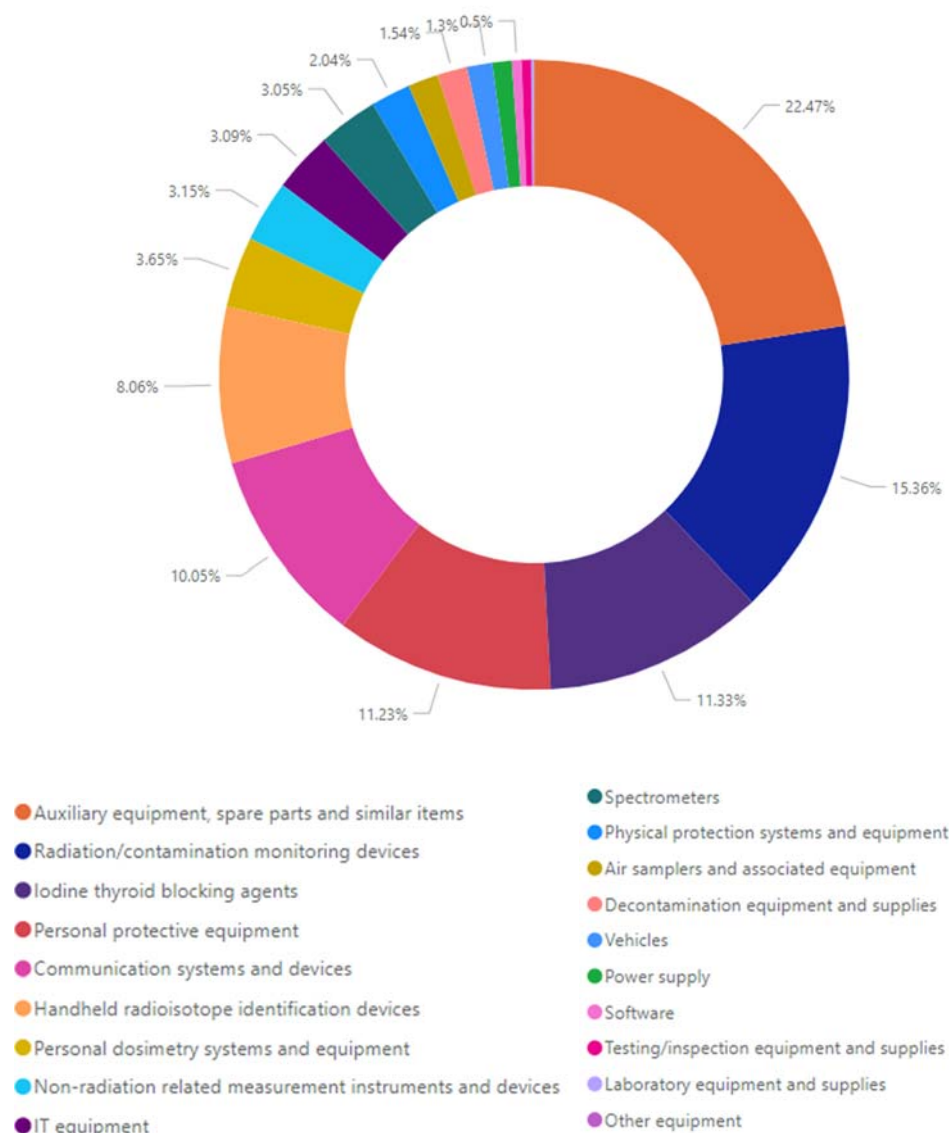
<sup>27</sup> Australia, Canada, France, Germany, Greece, Hungary, Israel, Japan, Romania, Spain, Sweden, Switzerland and the USA.





*Industrial portable X-ray machine delivered to RNPP on 25 March 2024. The equipment was procured using extrabudgetary funding from the UK. (Photo: RNPP)*

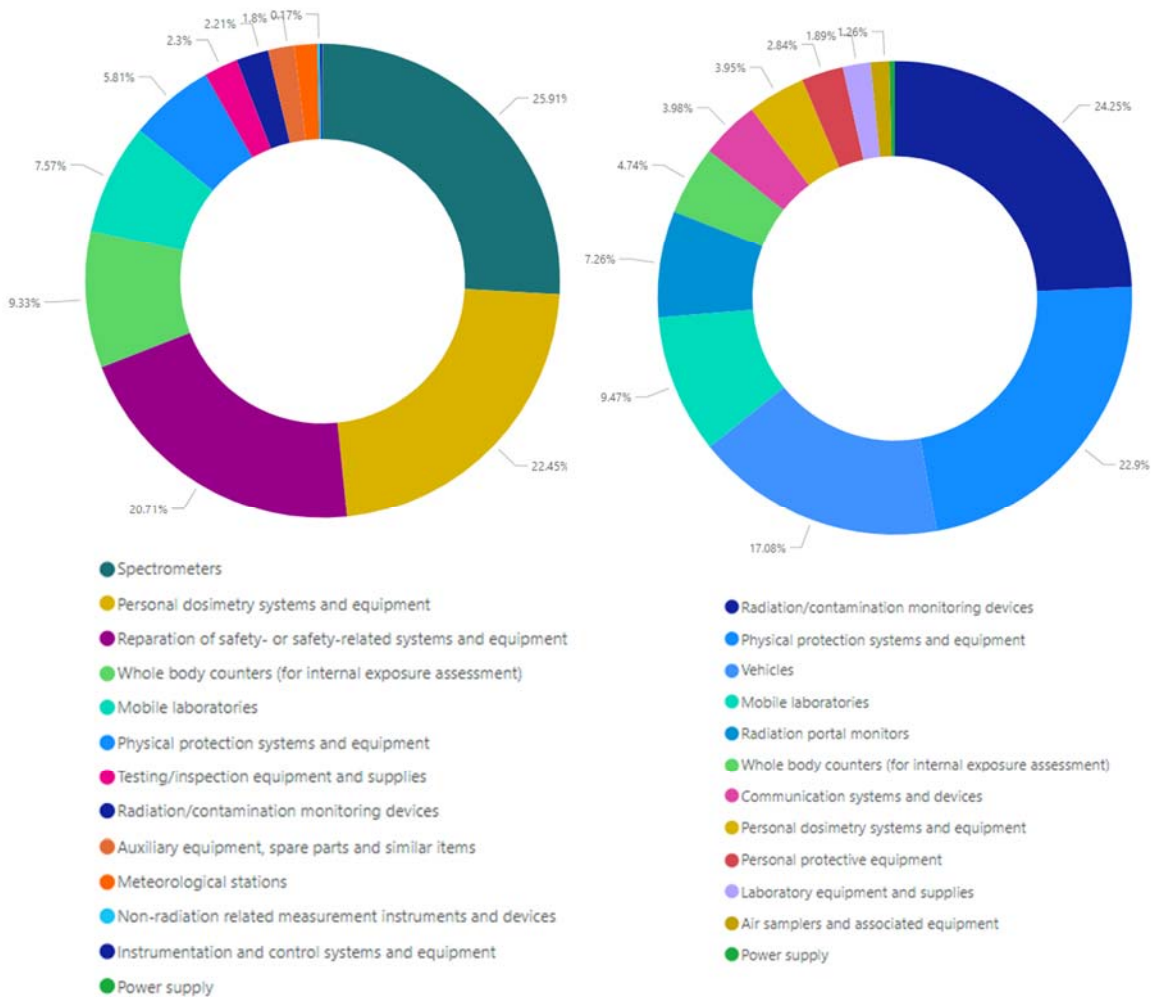
140. Following these deliveries, the value of the nuclear safety- and security-related equipment delivered to Ukraine since the start of the armed conflict approached €9.4 million.



*Overview of monetary value of items as a percentage of the total monetary value of the nuclear safety- and security-related equipment worth €9.4 million delivered to 18 different organizations in Ukraine since the start of the armed conflict.*

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

142. More nuclear safety- and security-related equipment procured by the Agency is expected to be transported to ten different organizations in Ukraine in the coming months. The total cost of these deliveries, including those for the energy sector, exceeds €4.5 million. Additional nuclear safety- and security-related equipment is in various stages of procurement which exceeds €10.3 million.



*Overview of 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) (left) and in the process of procurement (right) for delivery to Ukraine.*

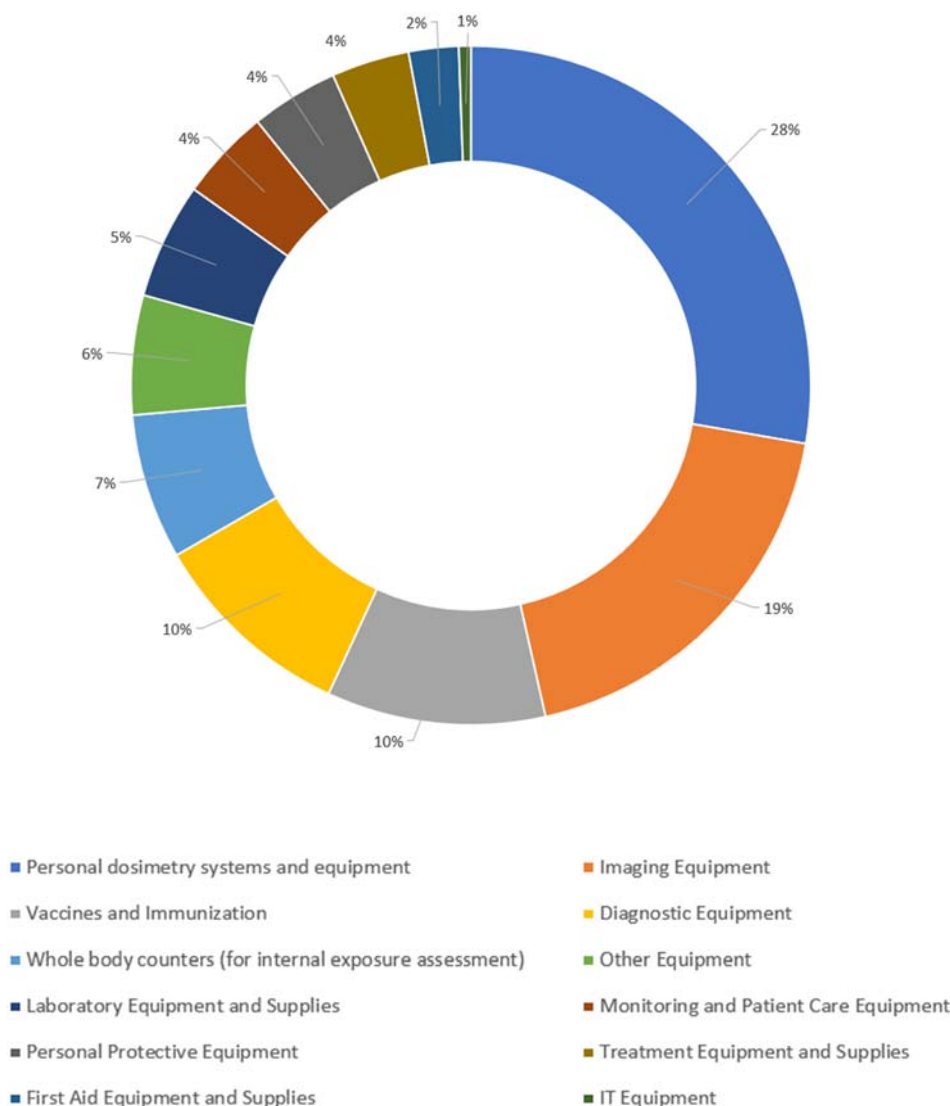
### B.3.2. ISAMRAD

143. 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.

144. Agency staff work with the SNRIU to identify dates to initiate activities under the agreed Assistance Action Plan. 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

145. 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, the KhNPP, the RNPP and the SUNPP. Delivery of these items is expected in the coming months.



*Overview of monetary value of items as a percentage of the total monetary value of medical equipment and supplies, including radiation protection and monitoring equipment, under procurement for all nine beneficiaries of the medical assistance programme, in the amount of approximately €1.3 million.*

146. Furthermore, the Agency has initiated an assessment to prioritize medical equipment and supplies for the next round of procurement. It is expected that the value of the second round of procurement will exceed €2 million.

147. During the medical assistance mission conducted from 10 to 15 April 2024 in Ukraine<sup>28</sup>, VMS staff discussed with the staff and management of the programme’s beneficiaries — the medical units at the KhNPP, the RNPP and the SUNPP as well as the Varash, Netyshin and South Ukraine hospitals — the

<sup>28</sup> See B.1.2 above.

ongoing implementation of the programme. Beneficiaries of the programme expressed their appreciation for the Agency's continuing support, emphasizing its significance and the importance of collaboration with the Agency as the only international organization with a tailored programme for assisting the operating staff of the NPPs in Ukraine. VMS staff engaged in detailed discussions and coordination with the beneficiaries in relation to the medical equipment and supplies to be procured with available funding as a priority.

148. The staff of all beneficiaries reported an increased level of fatigue. Significant challenges were reported in integrating returning military personnel back into their jobs at NPPs. Staff of VMS discussed the specialized support and resources this integration requires in a sustainable and consistent manner at national level and possible ways the Agency can assist through this programme.

#### **B.3.4. ISAMKO**

149. Remote discussions and consultations with relevant counterparts in Ukraine continued during the reporting period with the aim of identifying the assistance needed for recovery of the Kherson Oblast, to be delivered under the IAEA Support and Assistance Mission to the Kherson Oblast (ISAMKO). During the reporting period, Ukraine established a dedicated focal point for the ISAMKO programme. Coordination meetings are planned with relevant Ukrainian counterparts to agree on the priorities and beneficiaries of the programme and next steps in its implementation, taking account of the relevant assistance provided under different components of the overall assistance programme.

#### **B.3.5. Remote Assistance**

150. 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. The training is planned to be delivered through remote webinars and on-site training that utilizes the benefit of the continued presence of Agency staff at the sites.

#### **B.3.6. Deploying Rapid Assistance**

151. 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**

152. 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.

153. 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 NPP sites and at the ChNPP site.



154. 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.

155. 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**

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

157. 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 at these sites 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 transfers verifications — and otherwise provide technical support to the ongoing safety and security missions. Separate safeguards missions in the field 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.

158. During the reporting period, the Agency performed complementary access at two locations and successfully conducted physical inventory verifications at a number of locations. The Agency also verified spent fuel that was transferred from the Rivne NPP to the centralized storage facility at Chornobyl. In addition, the Agency verified spent fuel transferred from the spent fuel storage facility at Chornobyl to dry storage at Chonobyl. The Agency also verified inter-unit transfers of spent fuel at one NPP. 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 verification of nuclear material inventories. 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

159. The situation at the ZNPP continues to be precarious, with all Seven Pillars being compromised fully or partially. During the reporting period the plant suffered direct attacks, threatening its physical integrity and the overall nuclear safety and security of the site. Moreover, the plant continued to face challenges related to staffing, continued and regular inspection and maintenance of critical safety systems, equipment and components, a reliable logistic supply chain and effective on-site emergency arrangements. All these aspects impact the nuclear safety and security situation at the plant.

160. 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 assessment and report impartially and objectively on the nuclear safety and security situation at the site.

161. During the reporting period, the Agency reported that a clear violation of the first of the five concrete principles for protecting the ZNPP had occurred on 7 April 2024, the first violation observed since the direct attacks in November 2022 and the establishment of the five concrete principles on 30 May 2023. In addition, ISAMZ reported the presence of armed troops and military equipment at the site and reported an increase in military activities, including rifle and machine gun fire and explosions, at the site and in its vicinity throughout the reporting period, putting all of the other concrete principles at risk. The access restrictions imposed on ISAMZ by the ZNPP continue to limit the Agency's ability to fully assess whether all five concrete principles are being observed at all times.

162. 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, causing some planned maintenance activities to be postponed, or requiring power production to be reduced.

163. The Kharkov Institute of Physics and Technology (KIPT) lost its external power due to shelling on two occasions during the reporting period. While these events did not give rise to any radiological consequences, they do highlight the risks that the armed conflict poses to activities and to facilities other than NPPs.

164. The Agency continued providing technical support and assistance to Ukraine related to nuclear safety and security. During the reporting period, 10 deliveries of donated and procured nuclear safety- and security-related equipment to different organizations in Ukraine were organized, bringing the total number of deliveries to 47. In total, €9.4 million worth of equipment has now been delivered to Ukraine since the start of the armed conflict.

165. 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 five nuclear sites in Ukraine continues to be a major undertaking for the Agency, requiring significant resources. As of 24 May 2024, a total of 117 missions comprising 137 Agency staff members had been deployed as part of the continued presence at all five nuclear sites in Ukraine, totalling over 240 person-months in Ukraine.

166. In addition, the Agency advanced the procurement of the first round of priority equipment within the medical assistance programme and continued its actions to identify priority assistance to support the recovery of the Kherson Oblast.

167. 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.

168. 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.

169. 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 24 February to 24 May 2024**

### **Events at the Zaporizhzhya Nuclear Power Plant**

- On 24 February, ISAMZ was informed by the ZNPP that all scheduled preventative maintenance activities on safety-related equipment, except for routine testing of the safety systems, were suspended until reconnection of the 330 kV Ferosplavna 1 back-up line.
- On 26 February, ISAMZ was informed by the ZNPP that a drone attack had allegedly occurred in Enerhodar the previous evening, targeting a roof where telecommunications equipment was located. The team went to Enerhodar to see the building where the attack had purportedly taken place, and no signs of damage were visible at the time of the visit.
- On 26 February, ISAMZ visited the isolation gate of the discharge channel of the ZTPP but was not given access to visit the isolation gate of the large ZNPP cooling pond. ISAMZ faced the same situation on 1 April and 3 May.
- On 27 February, ISAMZ was informed by Rostekhnadzor that a total of 143 applications for authorizations of operating personnel had been received, 91 of which had resulted in authorizations being issued. The ZNPP reported that it had a sufficient number of staff for the plant's six reactors in their current state of shutdown.
- On 28 February, ISAMZ heard an explosion some distance from the plant, followed by what appeared to be small arms fire close to or on the site. The ZNPP informed the team that Russian troops had taken measures to "protect the plant" against drones in the area, but that the ZNPP had not itself been attacked and that there had been no damage or casualties. No further details were given regarding this incident. The team was not allowed to visit the area as the ZNPP explained that it was outside the plant's control.
- On 1 March, ISAMZ heard an explosion some distance from the ZNPP. On 2 March, the team was informed by the ZNPP that there had been shelling in parkland a few hundred metres away from the city hall of Enerhodar. On arrival at the location that same day, ISAMZ was informed that debris from the munitions allegedly used had already been removed. While the team observed some damaged trees and marks on the ground, it was not possible to determine whether shelling had occurred.
- On 1 March, ISAMZ was informed by the ZNPP that it had commenced maintenance activities on Unit 1, except for those planned to be performed on safety systems and electrical equipment, which had been postponed pending the reconnection of the 330 kV Ferosplavna 1 line disconnected since 20 February 2024.

- On 4 March, ISAMZ visited the ZNPP's electrical and mechanical warehouses to assess the availability of spare parts essential for maintenance. The ZNPP informed the team that the site had spare parts for upcoming maintenance and for the reactors in their existing shutdown states, adding that the spare parts had been provided by the Russian Federation.
- On 4 March, ISAMZ performed a walkdown of the Unit 3 turbine hall and was unable to access the western part of the hall.
- On 6 March, ISAMZ visited the ZNPP temporary emergency response centre and was informed that the emergency arrangements at the ZNPP will continue under a temporary emergency plan until the new plan is completed (expected this year). The team was also informed that a major exercise was being planned for late 2024.
- On 6 March, ISAMZ performed a walkdown of the turbine hall of Unit 5 and was unable to access the western part of the hall or the equipment on the ground floor. ISAMZ faced a similar situation during the walkdowns conducted on 15 March and 19 April.
- On 8 March, ISAMZ was informed that the ZNPP's diesel steam generators had resumed operations to treat liquid waste (having previously been operated in early February 2024).
- On 13 March, ISAMZ was informed by the ZNPP of a drone attack on 12 March in an area roughly 500 metres outside the perimeter of the plant. No casualties were reported. The team accessed the location and observed a shallow cavity in the ground, just outside the concrete wall that surrounds the off-site diesel fuel storage area. The team also observed some partially burnt foil/plastic material in the area. The impact had not caused damage to any structures and had had no impact on nuclear safety and security.
- On 14 March, the ZNPP reconnected to the 330 kV Ferosplavna 1 back-up power line (the line had been lost on 20 February due to an incident on the other side of the Dnipro River).
- On 14 March, ISAMZ conducted a sequential walkdown of all six main control rooms, addressing the matters of staffing and nuclear safety. The same activity, involving unrestricted sequential walkdowns of all six main control rooms, was repeated on 9 April.
- On 17 March, ISAMZ was informed that the 4 diesel steam generators had been shut down following the processing of around 1200 cubic metres of liquid waste and borated water.
- On 20 March, ISAMZ was informed by the ZNPP that planned maintenance of some of Unit 1's safety systems had been postponed due to the "general situation in the plant's surroundings", without further elaboration.
- On 20 March, ISAMZ was informed that extended maintenance periods were being planned for Units 1, 2 and 6 of the ZNPP during 2024.
- On 22 March, ZNPP lost connection to the 750 kV Dniprovska power line, due to a short circuit that occurred approximately 95 kilometres from the ZNPP 750 kV open switchyard. The cause of the disconnection was unclear and, as no physical damage to the line was identified, it was reconnected approximately five hours later.
- On 25 March, ISAMZ performed a walkdown the turbine hall of Unit 4 and was not able to access the western part of the hall. ISAMZ faced a similar situation during the walkdown conducted on 24 April.
- On 29 March, ISAMZ observed what appeared to be some crystallized boric acid in one of the intakes of the sumps for the Emergency Core Cooling System in Unit 1.

- On 1 April, following a meeting between Enerhodar and the ZNPP, the decision was made to end the heating season for 2023–2024 and to shut down local heat generation, prompting the ZNPP to reconsider Unit 4's status of hot shutdown.
- On 1 April, ISAMZ performed a walkdown of the turbine hall of Unit 6 and was unable to access the western part of the hall.
- On 1 April, ISAMZ reported that, at that time, water was being pumped to the cooling pond, at a rate of approximately 400 cubic metres per hour, from two sources: the ZTPP discharge channel and excess water from the wells feeding the sprinkler ponds (i.e. approximately 10 000 cubic metres of water was being pumped to the cooling pond per day).
- On 4 April, the ZNPP lost the connection to the 330 kV Ferosplavna 1 back-up power line. The cause was not immediately clear, but the outage followed reports of military activity in the region.
- On 5 April, ISAMZ requested and was denied access to the 330 kV ZTPP switchyard.
- On 5 April, ISAMZ was informed by the ZNPP that there had been a drone strike near the site's oxygen and nitrogen production facility and another near the port. ISAMZ was denied access to the sites and the Agency could therefore not verify these alleged attacks.
- On 6 April, the ZNPP regained its connection to the 330 kV Ferosplavna 1 back-up line.
- At 13:50 local time on 7 April, ISAMZ was informed by the ZNPP that two drones had detonated. The first detonation reportedly occurred on site, near a canteen building located close to the second laboratory building (LBK-2), while the second reportedly occurred off site in the port, north-west of the protected area. ISAMZ noted that the reported events correlated with explosions heard at 11:17, 11:39, and 12:06 local time, the latter having been followed closely by about 30 rounds of rifle fire. ISAMZ requested approval from the ZNPP to access to the on-site location.
- At 15:08 local time on 7 April, ISAMZ heard approximately 80 rounds of rifle fire followed by an explosion at 15:10 local time.
- At 15:30 on 7 April, ISAMZ was informed by the ZNPP that the team could visit the on-site location outside the canteen. At approximately 15:55 local time, ISAMZ arrived at the scene. The team subsequently visited the rooftop of the Unit 6 reactor building (the site of the explosion at 15:10 local time the same day), and the ground level outside of the Unit 6 reactor building following a drone attack that had occurred while ISAMZ was on the rooftop of Unit 6.
- On 7, 9 and 18 April, ISAMZ was informed of alleged drone attacks at the ZNPP site or in the vicinity of the site perimeter; however, ISAMZ did not receive approval to visit the scene and therefore, the Agency could not verify that these attacks had occurred.
- On 8 April, ISAMZ performed a walkdown of the turbine hall of Unit 2 and was unable to access the western part of the hall. ISAMZ faced a similar situation during the walkdown conducted on 3 May.
- On 10 April, ISAMZ conducted a walkdown of the ZNPP's radioactive waste storage facility and was denied access to some parts of the facility.
- On 13 April, Unit 4 was transitioned to cold shutdown, with all units put into that state for the first time since late 2022.



- On 22 April, ISAMZ visited the ZNPP training centre and noted for the first time that the building was being repaired following damage sustained in 2022, when the plant was hit several times.
- From 9 to 10 May, an air-raid alarm remained in place at the ZNPP for approximately 25 hours, during which time the movement of personnel outside of buildings was restricted. ISAMZ did not report hearing any military activities at the site or in its vicinity.
- On 15 May, ISAMZ observed the emergency drill conducted at the ZNPP.
- On 18 May, one of the two back-up power transformers at the ZNPP was put into planned maintenance.
- On 20 May, the main transformer of Unit 2 was put into planned maintenance.
- On 20 May, planned maintenance activities resumed at Unit 1, having previously been postponed on 20 March.
- On 22 May, an alleged drone attack occurred on a transport workshop in the nearby industrial area around 4 kilometres from the ZNPP; reportedly, the alleged attack resulted in some damage but no casualties.
- On 23 May, the 750 kV Dniprovskia line was disconnected for over three hours due to a short circuit that occurred 6.5 kilometres away from the ZNPP 750kV open switchyard.

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

- On 14 March, ISAMIK was informed that the plant manually shut down Unit 2 on 13 March to investigate an issue with the turbine. The KhNPP determined that the turbine shaft had been displaced relative to its normal position due to a problem with some of the diaphragms. These were subsequently replaced and Unit 2 returned to operation on 30 March. Nuclear safety and security was not affected.
- On 22 March, ISAMISU reported that it temporarily lost connection to one 750 kV and one 330 kV power line. SUNPP continued to have access to other power lines and remained in operation, albeit it at a reduced power output, until the 750 kV line was reconnected.
- On 30 March, maintenance on the turbine hall of Unit 2 at the KhNPP was completed and the reactor began supplying power to the grid.
- On 26 April and between 6 and 8 May, the RNPP was disconnected from one of the 750 kV lines connected to the site.
- On two occasions on 8 May, the RNPP observed fluctuations in the electricity from the back-up power lines. The RNPP informed ISAMIR that the fluctuations had occurred as a result of military attacks on non-nuclear power plants elsewhere in Ukraine.

#### **Events at the Chernobyl Nuclear Power Plant Site**

- No events took place during the reporting period that affected nuclear safety and security at the ChNPP site.

#### **Events at Other Facilities**

- On 22 March, the SNRIU reported to the Agency that KIPT had lost its external power due to shelling. The facility relied on its EDGs. All on-site radiation levels remained normal. KIPT recovered its off-site power one week later, on 29 March.

- On 4 April, the SNRIU reported to the Agency that KIPT had again lost its external power due to shelling, for approximately seven hours. The facility relied on EDGs during this time, and all on-site radiation levels remained normal.