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# **NUCLEAR SAFETY, SECURITY AND SAFEGUARDS IN UKRAINE**

*Report by the Director General*



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# Nuclear Safety, Security and Safeguards in Ukraine

*Report by the Director General*

## Summary

- This report was submitted to the Board of Governors as document GOV/2023/44 and derestricted on 14 September 2023, and covers the period from 31 May to 31 August 2023. Other reports to the Board of Governors on nuclear safety, security and safeguards in Ukraine covering the period since the 66th regular session of the General Conference are available publicly on the [Agency's website](#).
- The Board of Governors, in its resolutions GOV/2022/17, GOV/2022/58 and GOV/2022/71, requested the Director General to continue to closely monitor the situation regarding nuclear safety, security and safeguards in Ukraine and regularly report formally to the Board on these matters. This report provides a summary of the situation in Ukraine regarding nuclear safety, security and safeguards. It covers the period from 31 May to 31 August 2023 and is based on information made available to the Agency, and verified by the Agency, during this period. This report covers the progress made by the Agency in responding to Ukraine's requests to provide technical support and assistance in re-establishing, as appropriate, a sound nuclear safety and security regime at its nuclear facilities and in activities involving radioactive sources.
- This report also summarizes relevant aspects of the implementation of safeguards in Ukraine under the Agreement between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons and the Protocol Additional thereto under the current circumstances.



# Nuclear Safety, Security and Safeguards in Ukraine

*Report by the Director General*

## A. Introduction

1. At the Board of Governors meeting in June 2023, the Director General provided the Board of Governors with a detailed report entitled *Nuclear Safety, Security and Safeguards in Ukraine* (document GOV/2023/30), covering the period from 21 February to 30 May 2023.

2. On 12 October 2022, the United Nations (UN) General Assembly adopted resolution A/RES/ES-11/4, declaring that, inter alia, the “attempted illegal annexation” of four regions of Ukraine on 4 October 2022 had no validity under international law.<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, which “[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 and its attempted illegal annexation of the Ukrainian territory on which the plant is located”.<sup>3</sup>

4. During the reporting period<sup>4</sup>, from 31 May to 31 August 2023, Agency staff continued to monitor and assess the situation at each nuclear site against the seven indispensable pillars (‘Seven Pillars’) for ensuring nuclear safety and security during an armed conflict that were first outlined by the Director General at the meeting of the Board of Governors held on 2 March 2022 and described in document GOV/2022/52<sup>5</sup>. In addition, the Agency has reinforced the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ) and has been monitoring and reporting, for the first time, on observance of the five concrete principles for protecting the Zaporizhzhya nuclear power plant (ZNPP) established by the Director General at the meeting of the United Nations Security Council on 30 May 2023 and described

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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> Following the reporting period of GOV/2023/30.

<sup>5</sup> Report by the Director General to the Board of Governors, document GOV/2022/52, issued on 9 September 2022, para. 8.

in document GOV/2023/30<sup>6</sup>. It is essential for the ISAMZ team to have unrestricted and timely access to various premises at the ZNPP of relevance for nuclear safety and security to be able to monitor the observance of the five concrete principles and to report accordingly. However, the Agency has not always had such unrestricted and timely access. Regular detonations in the vicinity of the ZNPP, a continued significant military presence and outwards-facing mines between perimeter fences at the site were observed during the reporting period.

5. On 1 July 2023, one backup off-site power line was restored at the ZNPP following a prolonged period of four months during which the ZNPP had been relying on a single off-site power line to provide electricity for its necessary safe and secure operation. However, the situation at the ZNPP continued to be difficult and precarious. One of the two available off-site power lines had disconnected on several occasions during the reporting period although it did not cause a total loss of off-site power to the site. The situation was further exacerbated with the destruction of the Kakhovka dam on 6 June 2023, affecting the availability of water needed for cooling at the ZNPP. As a result, additional measures were required at the site to secure a stable and reliable water supply.

6. The Agency has remained committed to providing any support it can to help ensure the safe and secure operation of nuclear facilities and activities involving radioactive sources in Ukraine. This includes undertaking impartial assessments of the situation pertaining to nuclear safety, security and safeguards; providing technical expertise and advice, including assistance for ensuring medical support and care for the Ukrainian operating staff, as well as for ensuring radiation safety and nuclear security of radioactive sources; delivering nuclear safety- and security-related equipment; providing relevant information updates to the public and the international community; and making efforts to ensure that the ZNPP is protected, with the aim of preventing a nuclear accident. During the reporting period, the Agency initiated support for Ukraine to help manage effectively the consequences affecting the Kherson Oblast resulting from the flooding following the destruction of the Kakhovka dam.

7. The Agency maintained its continued presence, with Agency staff at all nuclear sites in Ukraine, and used the information received from each site to inform the public and the international community about the nuclear safety and security situation at all nuclear sites in Ukraine. Agency staff rotate on a regular basis; however, difficult circumstances owing to bad weather conditions and the demining of access routes continued to be experienced at the ZNPP, leading to delays in staff rotation.

8. This report has been produced in response to resolution GOV/2022/17<sup>7</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>8</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”; and to resolution GOV/2022/71<sup>9</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.”

9. This report provides a summary of the situation in Ukraine regarding nuclear safety, security and safeguards from 31 May to 31 August 2023. It also covers progress made by the Agency in providing technical support and assistance in nuclear safety and security to Ukraine as well as in securing nuclear safety and security protection of the ZNPP.

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<sup>6</sup> Report by the Director General to the Board of Governors, document GOV/2023/30, issued on 31 May 2023, para. 23.

<sup>7</sup> IAEA Board of Governors resolution GOV/2022/17, adopted on 3 March 2022, para. 4.

<sup>8</sup> IAEA Board of Governors resolution GOV/2022/58, adopted on 15 September 2022, para. 7.

<sup>9</sup> IAEA Board of Governors resolution GOV/2022/71, adopted on 17 November 2022, para. 8.



## 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

10. The continued presence of Agency staff at the ZNPP (ISAMZ) was established on 1 September 2022, following the Director General-led IAEA Support and Assistance Mission to the ZNPP that took place in August 2022. The IAEA Support and Assistance Missions to the Rivne NPP (RNPP) (ISAMIR), to the South Ukraine NPP (SUNPP) (ISAMISU), to the Khmelnytsky NPP (KhNPP) (ISAMIK) and to the Chornobyl NPP (ChNPP) site (ISAMICH) were deployed between 16 and 23 January 2023. With the establishment of such missions at the five nuclear sites in Ukraine and the reinforcement of the ISAMZ team with additional team members,<sup>10</sup> five teams of Agency staff, comprising up to 13 staff members in total, have been continuously present in Ukraine.

11. The purpose of the continued presence of Agency staff at all nuclear sites in Ukraine is to help decrease the risk of a nuclear accident. During the reporting period, Agency staff in Ukraine continued with regular activities at each site, which include the conduct of regular meetings with plant management, regular field observations of key plant areas, and regular discussions with technical counterparts to broaden the understanding of the nuclear safety and security situation as well as of the technical requirements in terms of equipment and associated priorities. Agency staff monitor and assess the situation at each nuclear site against the Seven Pillars. In addition, Agency staff at the ZNPP now monitor the observance of the five concrete principles established by the Director General for protecting the ZNPP.<sup>11</sup> Agency staff in Ukraine report directly to Agency Headquarters.



*The ISAMIR team during a walkdown at the RNPP site together with colleagues from the RNPP on 9 June 2023. (Photo: RNPP)*

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<sup>10</sup> See para. 53 below.

<sup>11</sup> See para. 4 above.

12. In July 2023, the ISAMIK team provided training to KhNPP personnel on leading behaviour changes through effective coaching and observations. The purpose of the training was to help improve the employees' safety performance, as well as the safety culture among operating personnel.

13. As of 31 August 2023, a total of 53 missions comprising 116 Agency staff members were deployed as part of the continued presence at all five nuclear sites in Ukraine, totalling 3302 person-days in Ukraine. The Agency staff at all nuclear sites in Ukraine frequently experienced air-raid alarms, some of which required them to take shelter.

14. Rotations of Agency staff at the RNPP, the SUNPP, the KhNPP and the ChNPP site that took place during the reporting period were conducted as planned. However, two rotations at the ZNPP had to be postponed by more than three weeks. Such delays and the inability to implement rotations as planned have an adverse impact on ISAMZ planning as well as on Agency staff deciding to volunteer to take part in ISAMZ. To overcome the challenge of the unpredictability in planning for the ZNPP rotations, the Agency is preparing new arrangements for securing the rotations. As part of these arrangements, armoured vehicles have been procured and additional staff are being recruited to enable sustainable and effective security arrangements to be in place. Moreover, the Agency continued requesting the ZNPP to improve the accommodation and the living and working conditions at the site for Agency staff. These requests resulted in some improvements during the reporting period.



*Handover meeting between ISAMIK teams on 28 July 2023. (Photo: KhNPP)*

15. The Agency continued its rigorous preparations for the deployment of missions to Ukraine, including providing comprehensive briefings for its staff on various topics, such as logistics, reporting procedures, personal security, special equipment, personal dosimetry, mental health support and medical support. Agency staff on missions to Ukraine are undergoing training in the Safe and Secure Approaches in Field Environments for Surge Deployment of the United Nations Department of Safety and Security, which became mandatory for all staff on missions to Ukraine as of 1 July 2023. The training is taken by all Agency staff prior to deployment, despite challenges faced to accommodate all staff who need this training within available slots.



16. Maintaining the continued presence of Agency staff at all five nuclear sites in Ukraine continues to be a major undertaking for the Agency, which is having a significant impact on the Agency's resources. The Agency has therefore been recruiting additional nuclear safety and security experts who are willing and able to take part in missions to Ukraine to enable the sustainability of all rotations. To date, the Agency's remaining needs to sustain the continued presence at all five nuclear sites and to deploy other expert missions to Ukraine are estimated to exceed €18 million.

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

### **B.1.2 Director General's Third Mission to Zaporizhzhya**

18. On 15 June 2023, the Director General visited the ZNPP for the third time since the start of the armed conflict. The purpose of the visit was to observe and assess the impact of the destruction of the Kakhovka dam on the nuclear safety of the ZNPP. The Director General's visit was also aimed at reinforcing the ISAMZ team and ensuring that the rotation of Agency staff at the ZNPP, which had been delayed, took place.

19. During his visit to the ZNPP, the Director General observed the systems that are essential for plant cooling, including essential service water cooling sprinklers, the main cooling pond and the thermal power plant discharge channel. He also held discussions with ZNPP management on measures the plant plans to implement in the aftermath of the destruction of the Kakhovka dam to prevent complete loss of cooling of the six reactors and spent fuel ponds. The Director General underlined the importance of maintaining the integrity of the existing cooling water sources and storage to ensure that the ZNPP has enough water for cooling the reactors, and expressed the Agency's readiness to assist and advise the ZNPP on implementing a longer-term solution, in the interest of the nuclear safety of the ZNPP.



*Director General Rafael Mariano Grossi at the ZNPP sprinkler ponds during his third visit to the ZNPP, on 15 June 2023. (Photo: IAEA)*

20. Prior to the ZNPP visit, the Director General met with Ukrainian President Volodymyr Zelenskyy in Kyiv on 13 June 2023. The Director General presented a proposal for a new technical assistance programme to help Ukraine cope with the devastation from flooding in the Kherson Oblast through the application of nuclear science and technology in areas ranging from potable water, human health, soil and water management to integrity assessment of critical infrastructure. President Zelenskyy welcomed and supported this proposal.



*Ukrainian President Volodymyr Zelenskyy meeting Director General Rafael Mariano Grossi and other senior officials of the Agency on 13 June 2023. (Photo: president.gov.ua)*

### **B.1.3 Medical Assistance Mission**

21. Agency staff comprising staff of the Vienna International Centre (VIC) Medical Service and the Department of Safeguards conducted a medical assistance mission to Ukraine from 3 to 16 June 2023. The purpose of this mission was to assess capabilities for providing medical support and care, including health screening and health surveillance for operating personnel at the RNPP, the SUNPP and the KhNPP, as well as to support and observe the health screening programme for the operating personnel of the RNPP. The mission complemented the Agency missions that took place in February and March 2023, which had aimed to assess the medical services and capabilities of the RNPP, the SUNPP, the KhNPP and the ChNPP site, and of the local medical hospitals in towns hosting the NPPs, to provide medical services and support for Agency staff present at these sites.

22. During the mission, Agency staff met with the senior management of the plants, the staff of the facility's medical services and those providing mental health support, as well as the management of the hospitals located in towns hosting the NPPs and of the National Research Centre for Radiation Medicine in Kyiv. Moreover, Agency staff took part in cardiovascular screening for RNPP operating personnel.



*A Senior Medical Officer from the VIC Medical Service performing cardiovascular screening for RNPP operating personnel on 9 June 2023. (Photo: IAEA)*

23. During the mission, Agency staff witnessed first-hand the impact the armed conflict and the difficult work conditions have had on the health (both physical and mental) of operating personnel at the NPPs. Agency staff observed the limitations and challenges faced by medical services at the NPPs and the local hospitals, including psychologists, in providing continued medical support and care for operating personnel. The mission helped identify needs with regard to common critical equipment and supplies, as well as other types of assistance to support health screening and surveillance of operating personnel of the NPPs that can be provided within the scope of the new medical assistance programme announced in April 2023.<sup>12</sup>

24. The findings from this mission and areas of assistance are further detailed in Section B.3.3.

### **B.1.4 IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources**

25. At the request of the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) dated 28 April 2023, the Agency conducted an initial fact-finding mission as part of an IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources (ISAMRAD). The purpose of this mission, which took place from 23 July to 1 August 2023, was to assess the situation regarding radiation safety and nuclear security of radioactive sources in Ukraine; to identify the types of assistance that can be provided, and the needs for safe and secure handling of radioactive sources; and to discuss the next steps in the delivery of ISAMRAD.

26. During the mission, Agency staff visited the Radon Association in Kyiv and Kharkiv, the Izotop facility in Kyiv, the National Cancer Institute in Kyiv, and the National Scientific Centre Institute of Metrology in Kharkiv, and assessed the nuclear safety and security situation at these facilities.

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<sup>12</sup> Report by the Director General to the Board of Governors, document GOV/2023/30, issued on 31 May 2023, para. 74.





*The ISAMRAD team observing disused sealed radioactive source transport flasks at the Radon Association facility in Kharkiv on 28 July 2023. (Photo: IAEA)*

27. The mission specifically focused on aspects that are relevant for establishing a national strategy for regaining control over radioactive sources of interest and radioactive material out of regulatory control, and which can be of relevance for the future Agency assistance programme under ISAMRAD.

28. The findings from this mission and areas of assistance are further detailed in Section B.3.2.

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

29. 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.<sup>13</sup> The Seven Pillars specifically apply to these unprecedented circumstances, in which military forces are near or on the site of a nuclear facility, in particular of an operational NPP, and derive from the Agency's safety standards and nuclear security guidance publications. As such, they do not present additional principles, requirements or recommendations for nuclear safety and security.

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

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<sup>13</sup> Report by the Director General to the Board of Governors, document GOV/2022/52, issued on 9 September 2022, para. 8.



31. The nuclear safety and security situation in Ukraine continued to be challenging during the reporting period, particularly at the ZNPP. While the ISAMZ had been reinforced in response to the need to also observe compliance with the five concrete principles aimed at helping ensure nuclear safety and security at the ZNPP, the destruction of the Kakhovka dam brought new challenges and necessitated exploring ways to provide alternative water supplies for the required cooling at the ZNPP.

*“Now more than ever, the IAEA’s reinforced presence at the Zaporizhzhya nuclear power plant is of vital importance to help prevent the danger of a nuclear accident and its potential consequences for the people and the environment at a time of increased military activity in the region. The possible loss of the plant’s main source of cooling water further complicates an already extremely difficult and challenging nuclear safety and security situation.”*

Director General Rafael Mariano Grossi, 7 June 2023

32. An overview of the current nuclear safety and security situation at Ukraine’s nuclear facilities and activities involving radioactive sources against the Seven Pillars is presented below. A chronology of events in Ukraine during the reporting period is provided in the Annex.

### **B.2.1. Zaporizhzhya NPP**

33. The overall situation at the ZNPP with respect to nuclear safety and security continued to be difficult and challenging, with all Seven Pillars compromised fully or partially by the armed conflict.

34. During the reporting period, ZNPP Units 1 to 3 remained in cold shutdown. Unit 5 remained in hot shutdown for most of the reporting period; however, ZNPP management decided to transition Unit 4 into hot shutdown, so that Unit 5 could be placed into cold shutdown to enable maintenance tasks to be conducted. The transition was completed on 28 July 2023. Unit 4 remained in hot shutdown only up to 12 August, when ZNPP transferred it again to cold shutdown following the detection of a water leak at one of its four steam generators located in the containment. Unit 6 remained in cold shutdown for most of the reporting period; however, it was switched to hot shutdown on 13 August 2023 to continue the generation of process steam needed at the site. The decision of ZNPP management regarding these transitions was contrary to the decision made by SNRIU on 8 June 2023 to limit the license for Unit 5 to cold shutdown as for all other units.<sup>14</sup>

35. In June 2023, ISAMZ reported that the ZNPP was considering the possibility of installing an independent steam boiler that would also allow Unit 5 to be put into cold shutdown while still meeting the need for steam supply for the treatment of raw water, wastewater and borated water, for the generation of cooled water, and for grid water heating. Owing to developments during the reporting period, the Agency strongly encouraged the ZNPP to install an external source of process steam, which, from a nuclear safety perspective, would provide the safest longer-term solution for the steam needs at the site.

### ***Physical integrity***

36. During the reporting period, there was no impact on the physical integrity of the six reactor units or on the on-site storage facilities housing spent fuel, fresh fuel, and low, medium and high level radioactive waste. However, ongoing military activity, including frequent detonations and landmine explosions in the vicinity of the site, was regularly reported by the ISAMZ teams, as was the damage observed by the Director General to the switchyard of the Zaporizhzhya thermal power plant (ZTPP) reportedly from drone strikes.

<sup>14</sup> See para. 2 above.

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

37. The destruction of the Kakhovka dam on 6 June 2023 led to a large reduction in the water level of the Kakhovka reservoir, which supplied cooling water to the ZNPP. Consequently, the depth of the water in the reservoir was no longer sufficient to supply water to the inlet channel of the ZTPP, from which the water was pumped to the ZTPP discharge channel — which then supplied the cooling water for the ZNPP.

38. In the days following the destruction of the Kakhovka dam, water was pumped from the ZTPP inlet channel to keep the ZNPP cooling pond and the ZTPP discharge channel full. Eventually, the pumps at the ZTPP were no longer able to pump water from the inlet channel due to the significant reduction in the level of the Kakhovka reservoir. Submersible pumps were periodically used to pump the residual water, together with rainwater and groundwater collected in the ZTPP inlet channel, into the ZTPP discharge channel.

39. The depths of the ZNPP cooling pond and the ZTPP discharge channel remained relatively stable, reducing at a rate of approximately one centimetre per day through a combination of utilization and natural evaporation of the water reserves. Currently, the abundant supplies of water will remain sufficient for many months, provided that the integrity of the ZNPP cooling pond and ZTPP discharge channel are preserved. The ZNPP has initiated efforts to ensure redundant sources of cooling water, including efforts to build additional groundwater wells at the site.

40. During the period following the destruction of the Kakhovka dam, the six reactors at the ZNPP continued to be cooled using the essential cooling system, with replenishment of water via underground water pumped from the site's drainage system. On 19 August, the ISAMZ team was informed that a new groundwater well had been commissioned at a location adjacent to the plant's sprinkler ponds providing about 20 m<sup>3</sup> of water per hour to the site's drainage system. During the reporting period, four new wells (out of 10 to 12 wells envisaged) had been built near the sprinkler ponds.

41. The ISAMZ team conducted walkdowns of the isolation gates of the ZNPP cooling pond and the ZTPP discharge channel and observed work performed to prevent leakage through the gates and to provide reinforcement.



*The ISAMZ team observing the water level at the Kakhovka reservoir from the ZTPP discharge channel isolation gate on 9 June 2023. (Photo: Rosatom)*

42. During the reporting period, ZNPP staff performed limited-scope periodic maintenance on some safety systems across different units. Furthermore, the ZNPP continued the regular testing of the safety systems, and no malfunctions of safety systems were reported by the ISAMZ team. However, the conduct of full-scope maintenance is still subject to the delivery of the necessary spare parts and supplies and on availability of maintenance staff to carry out the work. ISAMZ is continuing to monitor these issues.

### ***Operating staff***

43. The staffing situation at the ZNPP remains complex and challenging. The number of staff reported to the ISAMZ team remained relatively stable during the reporting period. However, the reported staffing level is at approximately 75% of that reported in January 2023.

44. On 26 August 2023, the ISAMZ team was informed that the current number of maintenance staff at the ZNPP was at only 36% of the pre-armed conflict level, raising concerns about the ability of the site to properly maintain the systems, structures and components important for nuclear safety and security. Furthermore, the ISAMZ team was informed that new maintenance staff had been recruited, but that time was required for the new staff to complete the necessary training and gain valuable operational knowledge and experience to work at the ZNPP. The ISAMZ team was also informed that additional maintenance contractors from Rosenergoatom could attend to the ZNPP on short notice to assist in the performance of maintenance tasks if needed.<sup>15</sup>

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

45. On 1 July 2023, following four months of reliance on a single off-site power line (the 750 kV Dniprovsk line), the Ferosplavna off-site backup power line was reconnected to the ZNPP. During the reporting period, the 750 kV Dniprovsk line was disconnected on four occasions (on 4 and 22 July and 10 August 2023), but the ZNPP did not suffer a total loss of off-site power owing to the availability of the reconnected backup power line.

46. During the reporting period, in preparation for the transition to the hot and cold shutdown states of Units 4 and 5, major maintenance was completed on the 750 kV–330 kV autotransformer, and the autotransformer was put back into operation. Consequently, the reliability of electrical power supply to the ZNPP improved.

47. The ISAMZ team continued to request access to the ZTPP 330 kV–150 kV open switchyard during the reporting period. The Russian Federation’s State Atomic Energy Corporation “Rosatom” had previously agreed to provide the ISAMZ team with access thereto; however, the visit was postponed on several occasions. A short visit was conducted by the Director General during his visit to the ZNPP on 15 July 2023. The most recent visit by an ISAMZ team to the open switchyard was on 19 December 2022.

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

48. During the reporting period, the ISAMZ team was not able to verify whether the delivery of any of the requested components on the list of approximately 800 high priority/category 1 spare parts and consumables<sup>16</sup> had taken place. Nevertheless, the ISAMZ team was informed that the ZNPP management had decided to avoid storing a large number of expensive components at the site, stating that this was to prevent them from being destroyed as a result of shelling, and that, instead, it had made

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<sup>15</sup> See para. 2 above.

<sup>16</sup> Report by the Director General to the Board of Governors, document GOV/2023/30, issued on 31 May 2023, para. 48.

arrangements for their supply, should the need arise, from Russian NPPs with delivery times of less than 24 hours.<sup>17</sup>

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

49. All on-site radiation monitoring stations were operational during the reporting period. One of the four off-site radiation monitoring stations that were reported in document GOV/2023/30 to have not been connected was restored and put back into operation on 28 July 2023.

50. The online transmission of data from the radiation monitoring system around the ZNPP to the SNRIU was not re-established during the reporting period. As an interim measure, data from the off-site radiation monitoring stations are manually provided several times a week to the ISAMZ team and are, together with the results from the monitoring conducted by the ISAMZ team, uploaded to and displayed on the Agency's International Radiation Monitoring Information System.



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

51. The ISAMZ team visited the temporary on-site emergency centre on 19 June 2023 and observed that the ZNPP continued to keep its emergency arrangements, in line with the temporary on-site emergency plans updated in March 2023, to provide for the protection of ZNPP personnel in the event of shelling at the site. The ISAMZ team was informed that the development of a new on-site emergency plan was ongoing, with the aim of aligning it with corresponding regulations of the Russian Federation.<sup>18</sup>

### ***Communications***

52. Official communication between the ZNPP and the SNRIU has not been restored. The ISAMZ team reported continued challenges with connecting to mobile telephone networks and constant interruptions to internet connections at the site.

<sup>17</sup> See para. 2 above.

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



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

53. During the reporting period, the Agency reinforced its presence at the ZNPP to monitor observance of the five concrete principles established by the Director General at the meeting of the United Nations Security Council on 30 May 2023 and described in document GOV/2023/30.<sup>19</sup>

54. The five concrete principles are:

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

***“With military tension and activities increasing in the region where this major nuclear power plant is located, our experts must be able to verify the facts on the ground. Their independent and objective reporting would help clarify the current situation at the site, which is crucial at a time like this with unconfirmed allegations and counter allegations.”***

Director General Rafael Mariano  
Grossi, 5 July 2023

55. In order to monitor observance of the five concrete principles, the ISAMZ team conducted regular walkdowns of areas at the ZNPP of significance for nuclear safety and security. While, in general, the ISAMZ team was able to conduct independent verifications at the site, some areas of the plant, such as reactor building rooftops or turbine halls, remained inaccessible for the ISAMZ team for long periods. The ISAMZ team was not granted access to the rooftops of Units 1, 2, 5 or 6 during the reporting period. The ZNPP requested the ISAMZ team to provide advance notice of one week for all requests for access to relevant premises at the plant. Such an arrangement does not allow for prompt observation and assessment in the case of urgent needs arising from claims or in reaction to unexpected events such as the destruction of the Kakhovka dam.

56. During the reporting period, the ISAMZ team did not observe attacks from or against the plant, in particular targeting the reactors, spent fuel storage, other critical infrastructure or personnel, although it did report regular detonations and gunfire in close proximity to the ZNPP site. At least on four occasions, the main off-site power line was disconnected, but these events could not be unambiguously attributed to a particular military activity, and the availability of the backup off-site power line helped ensure that the ZNPP did not suffer another total loss of off-site power.

57. The ISAMZ team reported a continued military presence at the site, albeit without significant changes to the number of military personnel present. Moreover, on 23 July 2023, the ISAMZ team observed directional anti-personnel mines located in a buffer zone between the site’s internal and external perimeter barriers under the control of the military. In this particular case, the ISAMZ team reported that these mines were situated in a restricted area that operating personnel could not freely access and were deployed facing away from the site. The ISAMZ team’s assessment, based on its own observations and the plant’s clarifications, was that any detonation of these mines, at the observed

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<sup>19</sup> Report by the Director General to the Board of Governors, document GOV/2023/30, issued on 31 May 2023, para. 23.

location and placement, would not critically affect the site's nuclear safety and security systems. However, the presence of explosives on the site represents a safety hazard and is inconsistent with Agency safety standards. No other mines or heavy weapons were observed by the ISAMZ team within the perimeter of the site during the reporting period, including on the rooftops of the Unit 3 and Unit 4 reactor buildings, to which the ISAMZ team was granted access on 3 August 2023.

58. Given the tense situation amid considerable speculation of imminent military action in the region, the Director General has repeatedly called for both sides to observe the five concrete principles to help prevent a nuclear accident.

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

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

60. Attacks on Ukraine's energy infrastructure continued during the reporting period. However, there were no reported instances of the operating NPPs having to reduce power production. Frequent air-raid alarms were reported at these NPPs, some of which were accompanied by recommendations to take shelter.

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

61. No physical damage was caused to the facilities at the SUNPP, the KhNPP or the RNPP as a result of military activities during the reporting period. The work at all three NPPs to protect their critical components and vital structures through additional mitigatory physical protection measures was reported to have continued.

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

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

#### ***Operating staff***

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

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

64. All three operating NPPs benefit from robust design, which provides for several independent connections with the outside grid, as well as the availability of emergency diesel generators (EDGs), mobile diesel generators and additional sources of power such as nearby hydroelectric power plants.

65. The ISAMIR team reported that one external power line had been disconnected on 11 July 2023 and reconnected two days later. There were no other instances reported of off-site power having been affected.

66. No reductions in the operating power of the reactor units at the SUNPP, the KhNPP or the RNPP were reported.

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

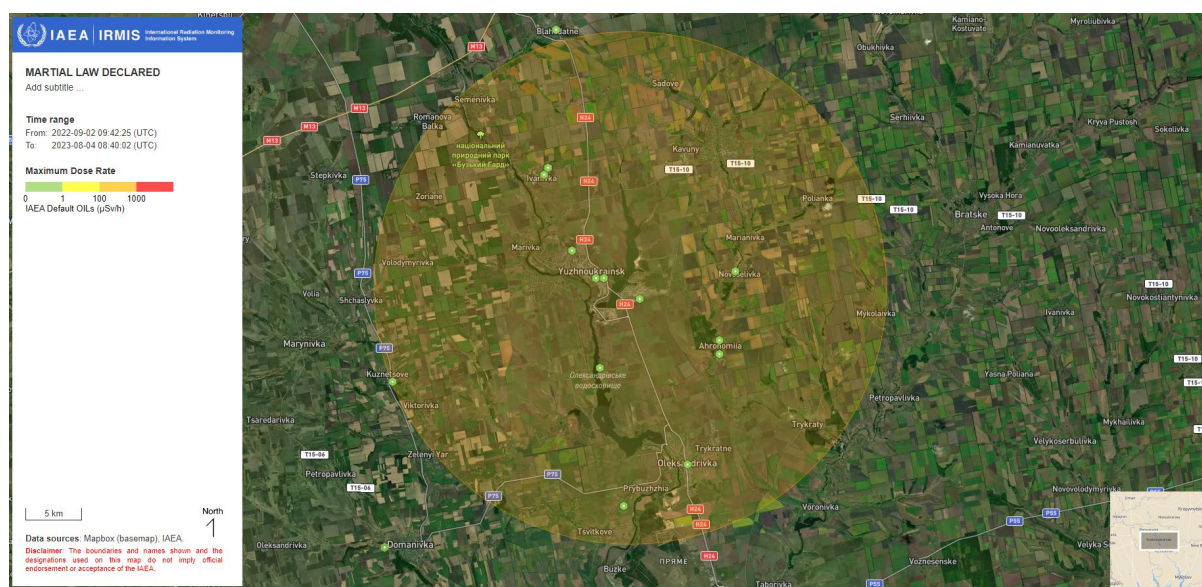
67. Although all three NPPs face challenges with regard to the logistical supply chain, they have been able to perform all needed maintenance activities on safety and safety-related systems without delay. An inventory of all items at each of the three NPPs has been established and is maintained through a centralized database so that the NPPs are aware of what is available and can support each other with spare parts, as needed.

68. The IAEA Support and Assistance Mission teams reported that the NPPs had made considerable efforts to find alternative suppliers of spare parts previously ordered from the Russian Federation. In addition, the RNPP plans to receive the first batch of Westinghouse-produced WVER-440 fuel to be loaded into Unit 2 during a planned outage that commenced in early August 2023.

69. The transportation channels (both roads and railways) to and from the NPPs remain unimpeded.

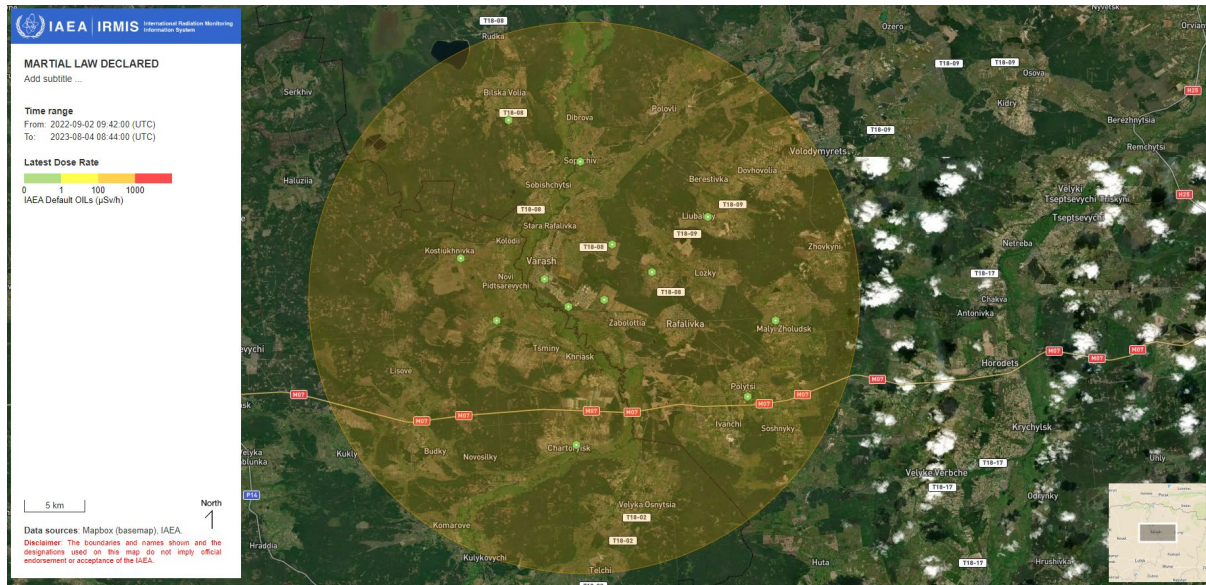
### ***On-site and off-site radiation monitoring system and emergency preparedness and response***

70. All on-site and off-site radiation monitoring stations at the three NPPs worked as per design. The plants continue to perform personal radiation monitoring according to the established procedures.

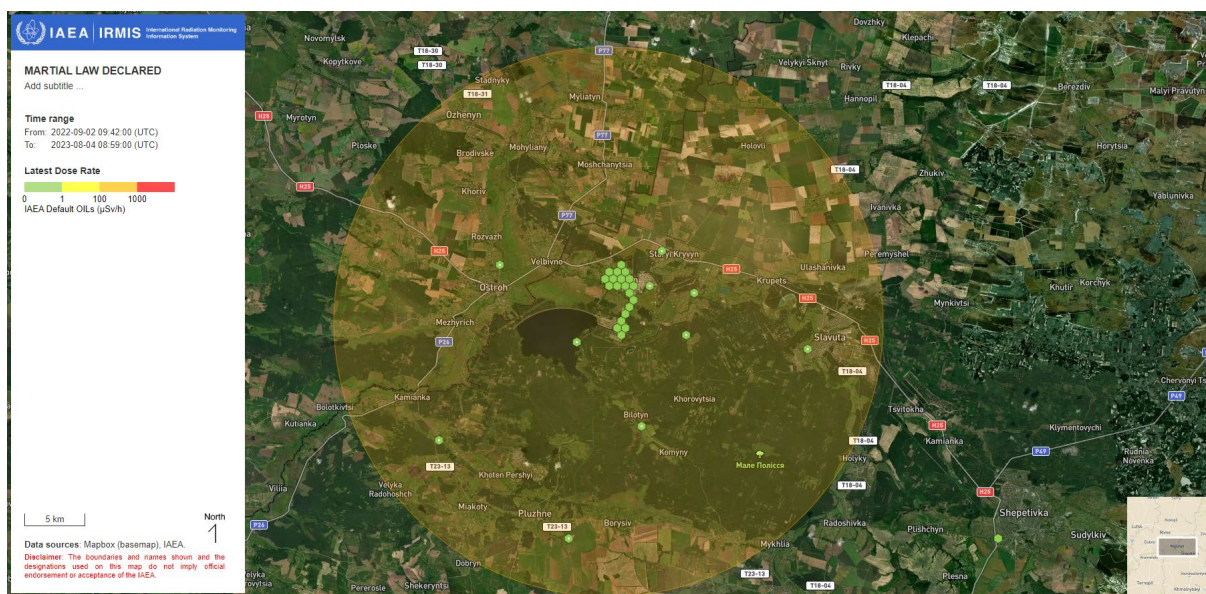


*Radiation monitoring data from the monitoring stations in the 20 km radius around the SUNPP.  
Radiation levels are normal.*





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



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

71. A national emergency response exercise was conducted on 29 and 30 June 2023, involving the participation of KhNPP, RNPP and SUNPP staff responding to a scenario involving a simulated nuclear emergency at the ZNPP.

### **Communications**

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

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

73. The nuclear safety and security situation at the ChNPP site did not show any significant deviation from the situation reported in GOV/2022/52, GOV/2022/66, GOV/2023/10 or GOV/2023/30 with



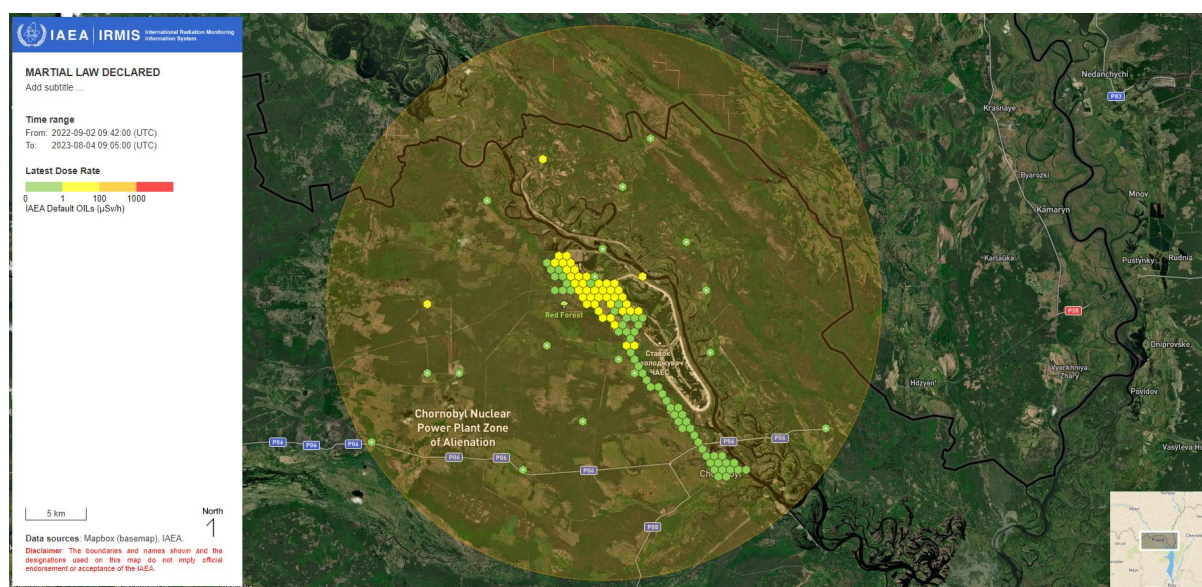
regard to the assessment of the nuclear safety and security situation against the Seven Pillars. Operations in the waste treatment facility continued to be suspended.

74. Both spent fuel storage facilities, ISF-1 and ISF-2, at the ChNPP site remained in operation. At the beginning of July 2023, the ChNPP received approvals from the competent authorities to transport spent fuel from ISF-1 to ISF-2. As part of the preparatory work for the transport of the spent fuel, all relevant inspections were conducted by the SNRIU.

75. During the reporting period, two forest fires that could not be easily extinguished owing to the unpassable state of the bridge over the Prypyat river occurred near the ChNPP site. However, the fires did not pose a threat to the nuclear safety and security of the ChNPP site.

76. The ISAMICH team reported:

- No physical damage caused to the facilities at the ChNPP site;
- No failures of the nuclear safety and security systems and no challenges to their operation;
- Continued difficult and stressful working and living conditions for the operating staff, with an impact on their health;
- Availability of off-site power supply through one 750 kV line, and three 330 kV and five 110 kV backup power lines;
- Challenges in the supply chain, in efforts to identify potential suppliers and in the restoration of the metallic bridge at the Uzh river for use by heavy vehicles;
- Availability of all communication means; and
- Functional off-site radiation monitoring system, with normal radiation levels.



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

77. In an effort to improve the working and living conditions of staff and to reduce stress, during the reporting period, ChNPP management was able to:

- Introduce new work shifts for its staff, changing from 14 days on site and 10 days' break to 13 days on site and 11 days' break; the new work shifts were approved and were implemented as of 26 August 2023; and

- Exempt its staff deemed essential for the safe and secure operation of the site from military service for a further six months.

78. The ISAMICH team reported that, prior to the conflict, a fire brigade integrated with the local fire department had been located at the ChNPP. However, the ChNPP is currently unable to maintain the contract for an on-site fire unit due to a lack of funds. As a mitigatory action, the ChNPP has trained its staff to perform fire-fighting activities on site.



*The ISAMICH team visiting the reactor hall of Unit 3 of the ChNPP  
on 20 July 2023. (Photo: ChNPP)*

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

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

80. The Agency continued to make progress in the delivery of its comprehensive programme of technical support and assistance to Ukraine, in line with the agreed technical plan for nuclear safety and security assistance to Ukraine's nuclear facilities and activities involving radioactive sources as described in document GOV/2022/52. This comprehensive programme not only focuses on the delivery

of nuclear safety- and security-related equipment and in-person technical support and assistance through on-site expert missions and the continued presence of Agency staff at the five nuclear sites in Ukraine (further information on the latter is provided in Section B.2), but also encompasses remote assistance and deployment of rapid assistance should the need arise.

81. The comprehensive assistance programme was expanded to cover the new medical assistance programme for operating staff at NPPs in Ukraine in April 2023, as reported in GOV/2023/30. In June 2023, following the damage of the Kakhovka dam and associated flooding of the Kherson Oblast, a new programme of assistance was announced by the Director General during his third visit to Zaporizhzhya. The IAEA Support and Assistance Mission to the Kherson Oblast (ISAMKO) aims at managing the medium- and long-term environmental, social and economic impact of the flooding in the Kherson Oblast that will negatively affect the whole of Ukraine.

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

83. 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 related necessary funding to enable delivery of the assistance needed.

84. By 31 August 2023, 18 Member States<sup>20</sup> and an international organization<sup>21</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. In addition, three additional Member States expressed interest in providing extrabudgetary cash contributions for technical support and assistance to Ukraine.

85. An overview of the different components of the comprehensive programme for assistance to Ukraine is presented below.

### **B.3.1 Delivery of Equipment**

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

86. During the reporting period, no additional requests for nuclear safety and security equipment were received under the statutory functions of the Agency, including through the operational arrangements<sup>22</sup> under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention). The total number of requests for assistance published on the Agency's Unified System for Information Exchange in Incidents and Emergencies, and, upon Ukraine's request, transmitted by the Agency to 31 of the 39 Assistance Convention States Parties that are registered in the Response and Assistance Network (RANET), remained unchanged compared to those reported in

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<sup>20</sup> Australia, Austria, Canada, China, Czech Republic, France, Germany, Ireland, Italy, Japan, New Zealand, Norway, the Republic of Korea, Spain, Sweden, Switzerland, the United Kingdom and the United States of America.

<sup>21</sup> European Commission.

<sup>22</sup> The operational arrangements include the RANET and the *Operations Manual for Incident and Emergency Communication* (EPR-IEComm 2019) available at: [International operational arrangements](#).



document GOV/2022/66. Those requests were made on 22 and 29 April, 8 July, 9 August and 3 October 2022.

87. The Agency continued working to address the needs for technical support and assistance to Ukraine. These needs derive from requests under the statutory functions of the Agency, including through the operational arrangements<sup>23</sup> under the Assistance Convention mentioned above; from those identified during the expert missions conducted in 2022 and 2023; and from additional requests, such as those received on 15 November 2022 concerning the enterprises in the Chornobyl Exclusion Zone, the Radon Association and the Kharkov Institute of Physics and Technology, and on 28 November 2022 concerning the energy sector in Ukraine, which were reported upon in detail in document GOV/2023/10.

88. Considering that the needs are great, priorities were assigned in June 2023 towards urgently needed nuclear safety and security equipment, in close collaboration with Ukrainian authorities. The costs for priority nuclear safety and security equipment were estimated to exceed €16 million. In addition, funding is still not available for meeting the overall needs for the energy sector requested on 28 November 2022, which are estimated to exceed €18 million.

### ***Offers of assistance***

89. In response to Ukraine's requests, 12 Member States<sup>24</sup> registered under RANET and one additional Member State — Greece — had offered assistance in the form of equipment by 31 August 2023. No new offers of in-kind contributions to assist Ukraine were made during the reporting period.

90. During the reporting period, two Member States — Canada and Greece — prepared equipment to be delivered to Ukraine through the Agency. One additional Member State that had made offers under RANET — Japan — continued to work on its offer of assistance to Ukraine. The Agency is liaising closely with these Member States to facilitate the timely delivery of equipment.

### ***Delivery of equipment***

91. The Agency continued to deliver the equipment donated by Member States to end-users in Ukraine. In addition, the number of items procured or in the process of procurement by the Agency to assist Ukraine increased during the reporting period as a result of the work done to establish requirements and of funding having been allocated.

92. During the reporting period, five deliveries of equipment took place, bringing the total number of deliveries of equipment to Ukraine to 22, with 67% of the shipments associated with donated equipment and 33% of shipments associated with procured equipment.

93. The deliveries comprised equipment procured by the Agency under extrabudgetary contributions provided by Australia, Germany, the Republic of Korea and the United States of America, as well as the European Union. As a result of these deliveries, entities such as the ChNPP site, the State Emergency Service of Ukraine (SESU), the SNRIU, the KhNPP, the SUNPP, the RNPP and VostokGOK received equipment including a satellite communication system, decontamination units, medical equipment and supplies, IT equipment, power supply systems, infrared sensors and portable radiation detectors.

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<sup>23</sup> The operational arrangements include the RANET and the *Operations Manual for Incident and Emergency Communication* (EPR-IEComm 2019) available at: [International operational arrangements](#).

<sup>24</sup> Australia, Canada, France, Germany, Hungary, Israel, Japan, Romania, Spain, Sweden, Switzerland and the United States of America.





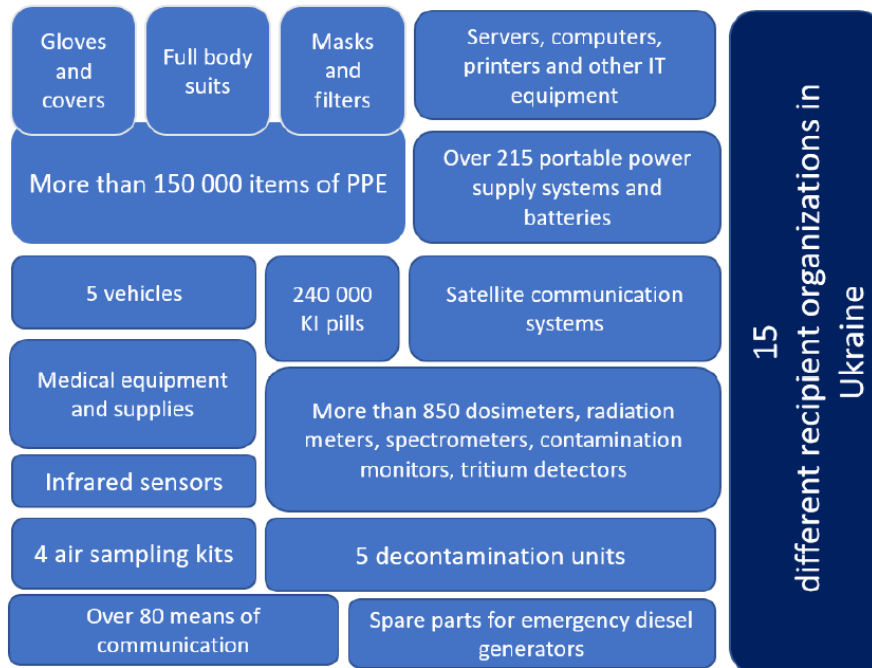
*Decontamination unit delivered to SESU on 29 June 2023. Five decontamination units were part of this delivery. The units were procured by the Agency using an extrabudgetary contribution from the European Union. (Photo: “PROFF” Limited Liability Company)*



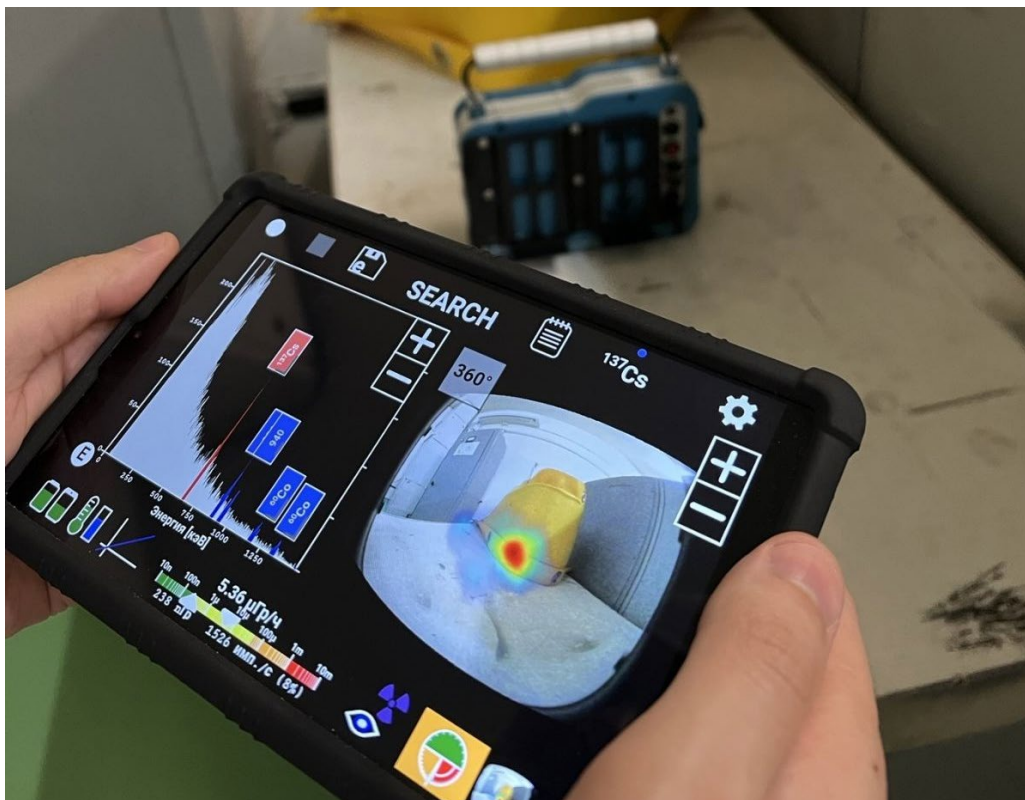
*Medical equipment and supplies delivered to the SUNPP on 1 July 2023 using extrabudgetary contributions from the Republic of Korea. (Photo: SUNPP)*

94. In addition, the first delivery of spare parts and rubber products for EDGs was received by the SUNPP on 13 June 2023. This delivery is the first under the Agency’s partnership agreement with France and the National Nuclear Energy Generating Company “Energoatom” signed on 5 May 2023 and reported upon in GOV/2023/30.

95. Following these deliveries, the value of the nuclear safety and security equipment delivered to Ukraine approached €5.7 million.



*Overview of the nuclear safety- and security-related equipment worth €5.7 million that has been delivered to Ukraine since the start of the armed conflict.*

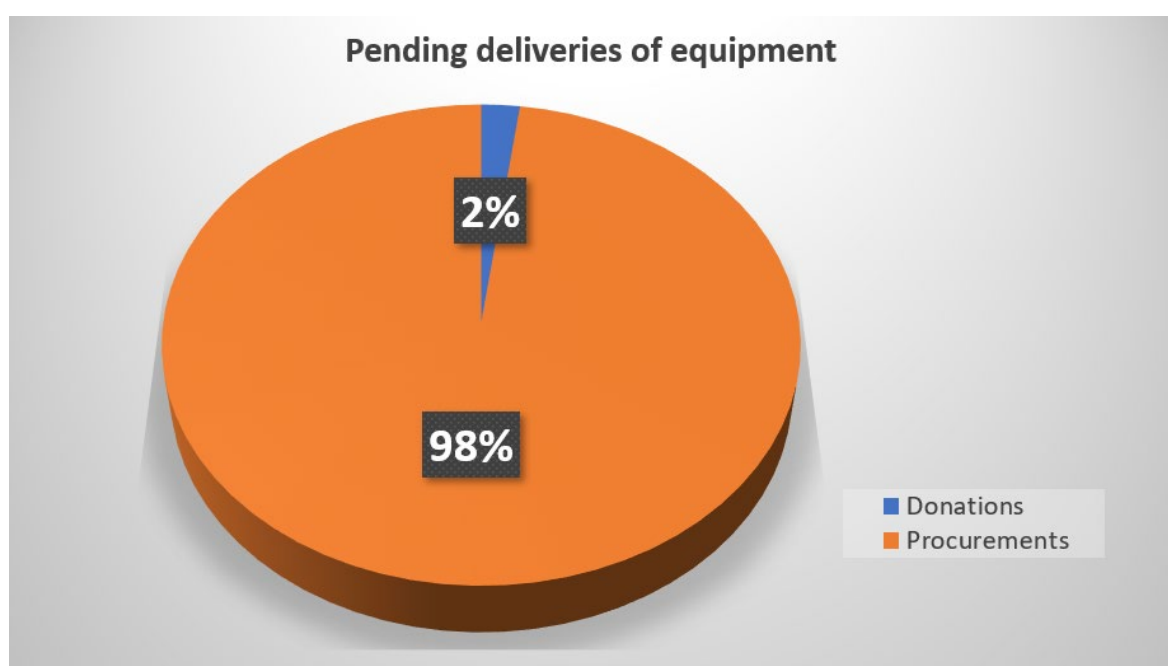


*Gamma ray imaging spectrometer in use at the SUNPP. This piece of equipment was procured by the Agency using an extrabudgetary contribution from the United Kingdom and delivered to the SUNPP on 26 May 2023. (Photo: SUNPP)*

96. Following the delivery of equipment from five Member States, five assistance reports were completed and shared with Ukraine and the assisting Member States during the reporting period. These reports concluded the process providing the assistance for nuclear safety and security equipment as envisaged in the respective Assistance Action Plans.

97. The Agency is finalizing arrangements for the delivery of equipment donated by two Member States<sup>25</sup>, which is expected to take place in the coming months. The deliveries will comprise personal protective equipment (PPE), dosimeters, spectrometers, decontamination showers, IT and communication equipment, and related items.

98. In addition to these planned deliveries, more nuclear safety- and security-related equipment is expected to be transported to ten different organizations in Ukraine in the coming months. The total cost of these deliveries exceeds €2.3 million. Of this equipment, 2% is related to donations from Member States and 98 % has been procured by the Agency using extrabudgetary contributions.



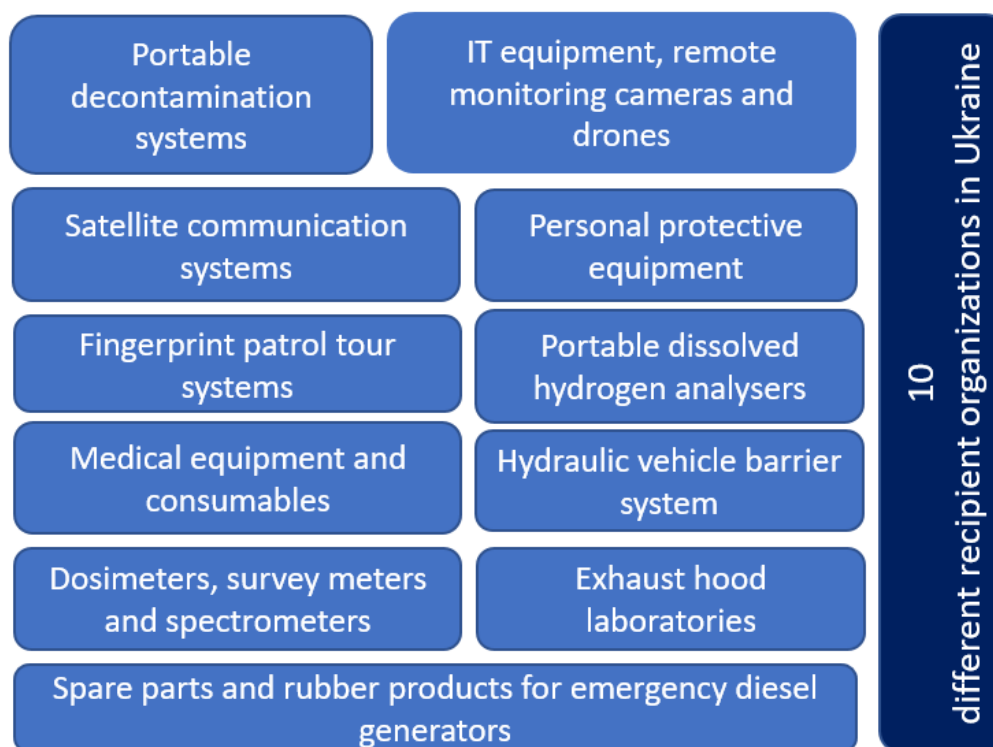
*Overview of pending deliveries to Ukraine of procured and donated equipment.*

99. The remaining spare parts and rubber products for EDGs for the SUNPP under the Agency's partnership with France and Energoatom are also expected to be delivered in the near future, while additional nuclear safety- and security-related equipment is in various stages of procurement.

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<sup>25</sup> Canada and Japan.





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

### B.3.2 ISAMRAD

100. The Agency acknowledged the potential impact of the armed conflict on the safety and security of radioactive sources in documents GOV/2022/66, GOV/2023/10 and GOV/2023/30 and engaged in discussions with the SNRIU on the potential technical support and assistance to be provided for the safe and secure management of radioactive sources. A fact-finding mission that took place from 23 July to 1 August 2023 (described in Section B.1.4) was the first significant accomplishment to enable the delivery of such assistance.

101. The fact-finding mission specifically focused on aspects related to search and recovery of radioactive sources such as orphan sources, the detection of and response to nuclear or other radioactive material out of regulatory control, and related matters pertaining to safe packaging and safe and secure transport and storage of radioactive sources.

102. Agency staff observed that the SNRIU already possessed a mature strategic plan, currently being implemented, to search for and secure orphan sources on Ukrainian controlled territories, including the recently de-occupied territories. This plan is based on a well-maintained national database of radioactive sources. Agency staff noted the need for technical support and assistance to the SNRIU and other organizations with relevant responsibilities within this strategic plan to ensure that they possess the necessary equipment, knowledge and expertise to embark on various activities for regaining control over radioactive sources and for their safe and secure management.

103. The Agency is currently defining more specifically the areas and scope of assistance that could be provided within ISAMRAD based on the findings and estimated costs associated with the delivery of such assistance.

### B.3.3 Medical Assistance for Operating Staff at NPPs

104. The new medical assistance programme for NPP operating personnel aims to enable Ukrainian NPPs to have arrangements in place for, and that their operating personnel have access to, the necessary physical and mental health services and for periodic assessment of the fitness for duty of personnel. It also aims to ensure that the responsible medical facilities have the required capability to provide those services and critical medical support and care when needed.

105. The medical assistance mission held from 3 to 16 June 2023 (described in Section B.1.3) complemented missions that had taken place in February and March 2023 to assess the medical services and capabilities of four nuclear sites (the three operating NPPs and the ChNPP site) and the local medical hospitals in towns hosting the NPPs for providing medical services and support for Agency staff present at the sites. These missions were led by the staff of the VIC Medical Service. The medical assistance mission was followed by a remote coordination meeting that took place on 3 July 2023 with all relevant Ukrainian authorities.

106. These activities revealed the limitations in the availability of resources at the medical facilities at each site and in the towns hosting the NPPs as well as at the National Research Centre for Radiation Medicine in Kyiv and the challenges they face in providing medical support and care for NPP operating staff. Such medical support and care pertain to both physical and mental health and encompass critical care, health screening and surveillance, immediate medical treatment, dose assessment and mental health support. Agency staff noted that most of the facilities have staff who are knowledgeable and trained to benefit and utilize assistance through this programme and that maintaining stable staffing levels at these facilities should be sought.

107. Agency staff noted that mental health support was available for NPP personnel. However, the staffing levels and expertise were designed for peaceful times, while the armed conflict has brought many new demands and challenges with overriding priorities, particularly among the ChNPP staff — who carry out their duties in difficult living and working conditions while also dealing with the consequences of the occupation.

108. An overview of the areas of assistance, as well as their scope and priority levels, for medical facilities in towns hosting the NPPs and the National Research Centre for Radiation Medicine in Kyiv, which are all beneficiaries of the medical assistance programme, is provided in Table 1.

*Table 1: Overview of the areas and scope of assistance and associated priorities for medical assistance*

AREA OF ASSISTANCE	PRIORITY	SCOPE OF ASSISTANCE
Critical care equipment and supplies	Immediate	Procurement and delivery of defibrillators, ventilators, aspirators, oximeters, patient monitors, electrical cardiographs, cholesterol meters, blood pressure and glucose meters, blood and urine analysers, ultrasound devices, portable X-ray machines, compression bandages, supplies for immobilization of patients, fully equipped ambulance vehicles, personal protective equipment, first aid kits, medicines, etc.

*“We must never forget the brave staff of Ukraine’s nuclear power plants, who are carrying out their vital work tasks in very challenging and stressful circumstances. The medical support we are now delivering is designed to help them during these unimaginably difficult times and, by doing so, also support nuclear safety and security in general.”*

Director General Rafael  
Mariano Grossi, 2 June 2023

AREA OF ASSISTANCE	PRIORITY	SCOPE OF ASSISTANCE
<b>Prevention</b>	Immediate	Procurement and delivery of vaccines, influenza and COVID-19 tests, drug and alcohol tests, etc.
<b>Medical equipment and supplies for health screening and surveillance</b>	Mid-term Long-term	Procurement and delivery of X-ray devices, surgical and diagnostic endoscope systems, digital mammographs, computed tomography (CT) scanners, physiotherapy equipment, ophthalmoscopes; and provision of technical advice and support in developing screening programmes and their implementation, and remote and in-person training.
<b>Radiation monitoring and protection equipment and agents</b>	Immediate Mid-term	Procurement and delivery of equipment such as dosimeters and survey meters, personal protective equipment, potassium iodide (KI) pills, decontamination units; and provision of technical advice and support, and remote and in-person training.
<b>Mental health support</b>	Immediate Mid-term Long term	Provision of advice and support in assessing the situation and in developing programmes for mental health support, and remote and in-person training, etc.  Procurement of equipment and supplies to help improve the living conditions of staff on site (e.g. for the ChNPP site) such as beds and mattresses, IT/communication equipment, equipment for relaxation rooms.
<b>Dose assessment and medical treatment of overexposed or contaminated patients</b>	Mid-term Long-term	Procurement and delivery of equipment and supplies such as thyroid scintigraphy equipment, whole body counters, dosimeters and survey meters, respiratory diagnostic systems, biochemical analysers, decorporation agents and other medicines, and personal protective equipment.

109. The preliminary cost estimate for delivery of this assistance is about €15 million, with €9.5 million for immediate needs.



*Medical supplies being delivered to the RNPP during the medical assistance mission in June 2023.  
(Photo: IAEA)*



### B.3.4 ISAMKO

110. The destruction of the Kakhovka dam on 6 June 2023 resulted in flooding of the communities downriver, with environmental, social and economic impacts that will negatively affect the Kherson Oblast and the whole of Ukraine. The Director General presented the potential areas of assistance of ISAMKO for Ukraine during his meeting with President Zelenskyy during his third visit to Zaporizhzhya. During the meeting, it was agreed that a fact-finding mission would be conducted to help assess the situation on the ground and verify assistance needs.

111. Pending implementation of the fact-finding mission, the Agency engaged in remote discussions and consultations with relevant counterparts in Ukraine and identified more closely the areas of assistance that could be covered by ISAMKO. Such areas include civil structure integrity assessment, potable water safety, human health, and food and agriculture. An overview of the areas of assistance and their scope and associated priority levels is provided in Table 2.

*“Through the use of nuclear techniques, we will determine the effects on potable water, human health, and soil and water management and assess the integrity of critical infrastructure. Ukraine can count on our assistance now and in dealing with the longer-term consequences of this disaster.”*

Director General Rafael  
Mariano Grossi, 9 June 2023

Table 2: Overview of the preliminary areas and scope of assistance and associated priorities for ISAMKO

AREA OF ASSISTANCE	PRIORITY	SCOPE OF ASSISTANCE
<b>Civil structure integrity assessment</b>	Mid-term Long-term	Procurement and delivery of non-destructive testing equipment (such as infrared cameras, profometers and rebound hammer test equipment); as well as the provision of technical advice and support, and remote and in-person training.
<b>Potable water safety</b>	Immediate Mid-term Long-term	Procurement and delivery of isotope hydrology equipment (field and laboratory equipment for hydrological, hydrochemical and isotopic analysis of surface water and groundwater); as well as the provision of technical advice and support, and remote and in-person training.
<b>Human health</b>	Immediate Mid-term Long-term	Procurement and delivery of equipment (such as portable X-ray machines and CT devices), and provision of remote and in-person training.
<b>Food and agriculture</b>	Immediate Mid-term Long-term	Procurement and delivery of equipment for early detection and investigations of post-flood animal and zoonotic disease outbreaks; food monitoring, sampling and analysis; monitoring soil water status, surface soil texture and drainage status in agricultural land; and enhancing crop production. Provision of technical advice and support, and remote and in-person training.

112. The cost estimate for such assistance is expected to be about €9 million, with €2 million for immediate needs. A more precise determination and an estimate of the needs and costs for delivery of assistance under ISAMKO should be available following the implementation of the fact-finding mission that is pending agreement with the Ukrainian authorities.

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

113. No remote assistance in nuclear safety and security was requested or provided during the reporting period.

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

114. 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**

115. 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.

116. 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 four NPP sites, which host 15 operational power reactors, and at the Chornobyl site, which hosts three shutdown reactors, the reactor damaged in the 1986 nuclear accident, and two spent fuel processing and storage facilities.

117. 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 Chornobyl 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.

### **C.2. Recent Developments**

118. 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.

119. 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 Headquarters during the reporting period. The Agency has maintained its continuous analyses of open source information and its acquisition and analyses of satellite imagery covering nuclear installations in Ukraine. This has proved to be essential for the preparation of 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 damage caused by shelling at the site.

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

121. The participation of Agency inspectors as part of the various IAEA Support and Assistance Missions has also enabled the resumption of unannounced inspections at many facilities, and, during the reporting period, one unannounced inspection was performed at an NPP.

## **D. Summary**

122. The armed conflict has continued to threaten nuclear safety and security in Ukraine. The destruction of the Kakhovka dam on 6 June 2023, resulted in a large decrease in the water level in the reservoir that the ZNPP uses for cooling water intake essential for maintaining safe operation, which necessitated exploring and identifying alternative water supplies.

123. Although one backup off-site power line was restored at the ZNPP following a prolonged period of four months during which the ZNPP had been relying on a single off-site power line to provide electricity for its necessary safe and secure operation, the situation at the ZNPP continued to be difficult and precarious, with the Seven Pillars being compromised fully or partially at all times. The main off-site power supply line suffered several disconnections during the reporting period. Although a total loss of off-site power did not occur, such disconnections underlined the continuing precarious nuclear safety and security situation at the plant.

124. During the reporting period, the Agency reinforced ISAMZ, and monitored and reported, for the first time, on observance of the five concrete principles established by the Director General on 30 May 2023. The ISAMZ team reported regular detonations and gunfire in the vicinity of the ZNPP, continued military presence, and directional anti-personnel mines located in a buffer zone between the site's internal and external perimeter barriers. The Agency observed that the granting of access for the ISAMZ team to some areas at the ZNPP of significance for the nuclear safety and security had been delayed or prevented on several occasions. This prevented the ISAMZ team from promptly assessing the situation against the five concrete principles.

125. The KhNPP, the SUNPP and the RNPP continued to be the only operating NPPs in Ukraine. They continued operating safely and securely during the reporting period despite the challenging circumstances for their operating staff and the frequent air-raid alarms.

126. The Agency continued providing technical support and assistance to Ukraine in nuclear safety and security. During the reporting period, five deliveries of procured nuclear safety- and security-related equipment to different organizations in Ukraine were organized, bringing the total number of deliveries to 22. In partnership with France and Energoatom, the Agency also assisted in the delivery of the first consignment of spare parts and rubber products for EDGs for the SUNPP. With all these deliveries, €5.7 million worth of equipment has been delivered to Ukraine since the start of the armed conflict.



127. Maintaining the continued presence of Agency staff at all five nuclear sites in Ukraine continues to be a major undertaking for the Agency, significantly impacting the human resources available to support the continued presence as well as continued delivery of the Agency's programmatic activities, and requires significant resources. So far, 53 missions comprising 116 Agency staff members have been deployed as part of the continued presence at all five nuclear sites in Ukraine, totalling 3302 person-days in Ukraine.

128. In addition, the Agency implemented three additional missions to Ukraine during the reporting period, including the third visit of the Director General to Zaporizhzhya and the medical assistance mission in June 2023, as well as ISAMRAD in July 2023.

129. Through the recently implemented missions, the Agency observed on the ground the impact the destruction of the Kakhovka dam had had on the ZNPP, assessed capabilities and identified needs to be addressed within the scope of medical assistance programme, and assessed the situation on the ground to be able to develop a programme to support the safe and secure management of radioactive sources that are out of regulatory control in Ukraine.

130. Moreover, flooding in the Kherson Oblast resulting from the destruction of the Kakhovka dam is expected to result in adverse consequences for human and animal health, water and food safety and agriculture, giving rise to further assistance needs for Ukraine. This led to the development of a new programme of assistance (ISAMKO) being announced as part of the overall comprehensive programme of assistance to Ukraine, and preliminary discussions took place during the reporting period to help identify assistance to be provided and to estimate related costs prior to the conduct of a fact-finding mission.

131. The continued commitment of Member States and their close cooperation with the Agency is essential to ensuring nuclear safety and security in Ukraine under all circumstances and to providing assistance efficiently, while ensuring the timely delivery of the Agency's programmatic activities. The needs of Ukraine are great, and the Agency is committed to working closely with all stakeholders capable of helping ensure that these needs are met.

132. 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 31 May to 31 August 2023**

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

- On 3 June, one off-site radiation monitoring station lost its connection with the plant. Its power supply was found to be not operational.
- On 6 June, the Kakhovka dam was severely damaged. The water level in the reservoir that the Zaporizhzhya nuclear power plant (ZNPP) had used for cooling water intake started to decrease at around 5 cm/hour. The ZNPP started pumping water via the nearby thermal power plant to increase its reserves.
- On 6 June, the ZNPP restored operation of one of the previously disconnected off-site radiation monitoring stations.
- On 8 June, the State Nuclear Regulatory Inspectorate of Ukraine limited Unit 5's license to cold shutdown only. The ZNPP maintained the unit in hot shutdown.
- On 8 June, the ZNPP was able to keep operating the pumps in the nearby thermal power plant, even though the water level there had decreased to below 12.7 m. It had been estimated in the past that this was the minimum water level for pumping.
- On 8 June, the nearby thermal power plant switchyard was hit by four drone strikes, as reported by the Russian Federation.
- On 14 June, the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ) inspected the isolation gate connecting the cooling pond with the reservoir. The gate's integrity was confirmed and the ISAMZ team could see how some additional reinforcing barriers had been installed.
- On 23 June, the ZNPP operated the pumps in the nearby thermal power plant for the last time. The water level in the thermal plant's intake channel had become too low.
- On 1 July, the ZNPP successfully deployed and operated submersible pumps in the nearby thermal power plant. From this point onwards, the ZNPP would operate these pumps as needed to replenish water in the thermal plant's discharge channel.
- On 1 July, the 330 kV Ferosplavna line, which had been disconnected since 1 March, was successfully reconnected, providing the ZNPP with a backup power source.
- On 4 July, the 750 kV Dniprovsk line was disconnected. The 330 kV Ferosplavna line was able to provide power to the ZNPP for 11 hours, after which the Dniprovsk line was reconnected.
- On 13 July, the ZNPP started construction of an additional physical barrier to reinforce the isolation gate connecting the cooling pond to the reservoir.
- On 14 July, the ZNPP completed maintenance of the transformer that serves as one of the connections between the nuclear plant's 750 kV switchyard and the thermal plant's 330 kV switchyard, increasing the reliability of the electrical power supply to the ZNPP.
- On 16 July, the ZNPP completed testing and verification of Unit 4's safety systems in order to transfer the unit from cold to hot shutdown.
- On 22 July, the 750 kV Dnirovsk line was disconnected. The 330 kV Ferosplavna line was able to provide power for eight hours, after which the Dnirovsk line was reconnected.

- On 23 July, ISAMZ observed outwards-facing mines between the internal and external perimeter fences.
- On 25 July, the ZNPP transitioned Unit 4 from cold to hot shutdown.
- On 28 July, the ZNPP transitioned Unit 5 from hot to cold shutdown.
- On 28 July, the ZNPP installed a new off-site radiation monitoring station near the thermal power plant to replace a station that was out of order.
- On 2 August, ISAMZ observed that the isolation gate separating the cooling pond from the Kakhovka reservoir had been reinforced with concrete blocks and soil to a thickness of up to 4 metres.
- On 3 August, ISAMZ was given unimpeded access to the rooftops of the Unit 3 and Unit 4 reactor buildings. The team did not observe any mines or explosives.
- On 4 August, ISAMZ visited the dry spent fuel storage facility where they were able to verify the integrity of the fuel casks stored there.
- On 8 August, during a walkdown of the turbine hall of Unit 2, the ISAMZ team observed the presence of a number of military trucks parked in an area reserved for vehicle maintenance.
- On 10 August, the ISAMZ team was informed that the ZNPP would transfer reactor Unit 4 from hot shutdown to cold shutdown following the detection of a water leak at one of its four steam generators located in containment and that Unit 6 would be transferred to hot shutdown to continue steam production on site.
- On 10 August, the 750kV Dniprovska power line disconnected twice. It initially disconnected for approximately twelve hours until 13:37 local time, then again at 16:13 local time, and reconnected at approximately 19:00 local time.
- On 12 August, the ZNPP transitioned Unit 4 from hot shutdown to cold shutdown.
- On 13 August, the ZNPP transitioned Unit 6 from cold shutdown to hot shutdown.
- On 15 August, the ZNPP confirmed that the cause of the leak within the steam generator of Unit 4 was due to a hairline crack in the weld of the steam generator primary header vent pipe.
- On 17 August, the ZNPP performed welding on the pipe within the steam generator of Unit 4 and pressure testing of the steam generator was subsequently conducted successfully.
- On 19 August, ISAMZ was informed that a new groundwater well had been commissioned and was providing about 20 m<sup>3</sup> of water per hour to the cooling water used for the sprinkler ponds. The ZNPP informed ISAMZ that the location of the well, close to the plant's sprinkler ponds, had been selected after consultations with geological specialists and that the ZNPP intended to build an additional 10–12 wells around the perimeter of the sprinkler ponds.
- On 25 and 26 August, ISAMZ was informed that the second well and the third well near the sprinkler ponds were operating.
- On 31 August, ISAMZ was informed that drilling of the fourth well near the sprinkler ponds had been completed.

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

- On 28 June, a reactor trip occurred at Unit 1 of the South Ukraine nuclear power plant (SUNPP).



- On 11 July, one unspecified external power line was disconnected from the Rivne nuclear power plant (RNPP) and reconnected two days later. All other power lines were available.
- On 9 August, the Agency experts at the Khmelnytsky nuclear power plant, the RNPP and the SUNPP reported several nationwide air-raid alarms. The teams reported that the nuclear safety and security situation at the sites was not affected.

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

- On 6 June, a small fire broke out in the Exclusion Zone. The fire did not have any impact on nuclear safety and security.
- On 17 June, another small fire broke out in the Exclusion Zone. There was no impact on nuclear safety and security.
- On 11 July, one external power line was disconnected and reconnected the following day. The site had other power lines available.
- On 13 July, repairs to a bridge that had been damaged in the past were completed. This bridge allows easier access of personnel and equipment to the site.
- On 17 July, an external power line that had been disconnected in the past was reconnected.
- On 9 August, the Agency experts at the Chornobyl nuclear power plant (ChNPP) site reported several nationwide air-raid alarms. The team reported that the nuclear safety and security situation at the site was not affected.
- On 19 August, in northern Ukraine, there were reports of a missile attack on the city of Chernihiv which resulted in several fatalities and many injuries. The city is located around 40 kilometres from Slavutych where most of the ChNPP site's workers live. However, some of them live in Chernihiv itself. The Agency experts did not hear of any injuries to plant personnel and there was no damage at the ChNPP site. However, the IAEA team at the Chornobyl site was informed that staff were very concerned about family and friends living in the affected area.

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

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



# IAEA

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*Atoms for Peace and Development*

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