



IAEA

Atoms for Peace and Development

Board of Governors

GOV/2023/30

Date: 31 May 2023

Original: English

For official use only

Item 8 of the provisional agenda
(GOV/2023/21)

Nuclear Safety, Security and Safeguards in Ukraine

Report by the Director General

Summary

- The Board of Governors, in its resolutions GOV/2022/17, GOV/2022/58 and GOV/2022/71, requested the Director General to continue to closely monitor the situation regarding nuclear safety, security and safeguards in Ukraine and regularly report formally to the Board on these matters. This report provides a summary of the situation in Ukraine regarding nuclear safety, security and safeguards. It covers the period from 21 February to 30 May 2023 and is based on information made available to the Agency, and verified by the Agency, during this period. This report covers the progress made by the Agency in responding to Ukraine's requests to provide technical support and assistance in re-establishing, as appropriate, a sound nuclear safety and security regime at its nuclear facilities and in activities involving radioactive sources.
- This report also summarizes relevant aspects of the implementation of safeguards in Ukraine under the Agreement Between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons and the Protocol Additional thereto under the current circumstances.

Recommended Action

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

Nuclear Safety, Security and Safeguards in Ukraine

Report by the Director General

A. Introduction

1. At the Board of Governors meeting in March 2023, the Director General provided the Board of Governors with a detailed report entitled *Nuclear Safety, Security and Safeguards in Ukraine* (document GOV/2023/10), covering the period from 10 November 2022 to 20 February 2023.

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

3. On 17 November 2022, the Board of Governors adopted resolution GOV/2022/71², on the safety, security and safeguards implications of the situation in Ukraine, 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”.³

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

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

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

4. On 23 February 2023, the Agency issued a report⁴ entitled *Nuclear Safety, Security and Safeguards in Ukraine: February 2022–February 2023*, which provided an overview of events that had taken place since the start of the armed conflict in Ukraine, as well as of the Agency’s response and activities. It also provided an overview of the nuclear safety, security and safeguards situation in Ukraine as known one year after the start of the armed conflict, as reported to the public and the Board of Governors during the year.

Agency report entitled Nuclear Safety, Security and Safeguards in Ukraine: February 2022–February 2023, issued on 23 February 2023.



5. During the reporting period⁵, from 21 February to 30 May 2023, the Agency observed increased military presence and military activities in the vicinity of the Zaporizhzhya Nuclear Power Plant (ZNPP). The increase in military activity was also noted elsewhere in Ukraine, with cruise missiles and aerial vehicles observed flying in close vicinity of some of the country’s operating nuclear power plants (NPPs). The energy infrastructure in Ukraine continued suffering damage from shelling and air attacks, with repairs being challenged by the ongoing military activities. On two occasions, the ZNPP lost all off-site power, on 9 March and on 22 May 2023. For over 12 weeks during the reporting period, the ZNPP was dependent on a single off-site power line to provide electricity for its necessary safe and secure operation, which posed a major risk to overall nuclear safety and security.

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; 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.

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 (every three weeks at the Chernobyl site and every four weeks at other nuclear sites); however, for the first time, significant challenges were faced in February 2023 affecting the timely rotation of Agency staff. The most difficult circumstances were faced at the ZNPP where the rotation was delayed by four weeks.

8. This report has been produced in response to resolution GOV/2022/17⁶, 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/2022/58⁷, in which the Board of Governors requested the Director General to “continue to closely monitor the situation and report

⁴ Available at: <https://www.iaea.org/sites/default/files/23/02/nuclear-safety-security-and-safeguards-in-ukraine-feb-2023.pdf>.

⁵ Following the reporting period of GOV/2023/10.

⁶ IAEA Board of Governors resolution GOV/2022/17, adopted on 3 March 2022, para. 4.

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

formally to the Board on these matters as long as required”; and to resolution GOV/2022/71⁸, 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 21 February to 30 May 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.

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 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, five teams of Agency staff, comprising 11 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 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/2022/52⁹. Agency staff in Ukraine report directly to Headquarters.



Agency flag marking the continued presence of Agency staff at the KhNPP in Ukraine.

12. As of 30 May 2023, 37 missions comprising 81 Agency staff members were deployed as part of the continued presence at all five nuclear sites in Ukraine, totalling 2366 person-days in Ukraine. Maintaining the continued presence

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

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

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.

13. Most rotations that took place during the reporting period were conducted as planned. However, some challenges were also faced. The sixth rotation of ISAMZ in February 2023 had to be postponed for almost a month, significantly extending the time spent by Agency staff at the site, with the next team awaiting permission to travel to the site, while efforts were ongoing to ensure the safe passage of both teams across the line of military contact in the Zaporizhzhya region. Three teams (ISAMISU, ISAMIK and ISAMIR) had their rotations postponed at the end of February 2023, when the United Nations Department of Safety and Security (UNDSS) issued 'halt travel' restrictions for the whole territory of Ukraine in order to ensure safe passage. Each rotation takes usually between four to eight travel days to and from the sites in total. Moreover, the Agency staff at all nuclear sites in Ukraine have frequently experienced air-raid alarms, some of which require them to take shelter.

14. Various logistical and travel arrangements (e.g. via Agency official cars, flights and railways) are used to enable the continued presence of Agency staff in Ukraine, while fully complying with the UNDSS recommendations for ensuring safe and secure travel in Ukraine. Agency staff are housed either at accommodation facilities belonging to the NPPs or directly at the sites. Agency staff are briefed prior to deployment to prepare them for the work to be carried out at each site under the conditions imposed by the armed conflict in Ukraine and to brief them on the safety and security situation.

15. In close cooperation with UNDSS, the Agency ensures that Agency staff on missions to Ukraine are trained on safe and secure actions in the field by attending Safe and Secure Approaches in Field Environments (SSAFE) for Surge Deployment training and are provided with security awareness briefings prior to deployment. The SSAFE training is currently mandatory for the ZNPP site and recommended for all other sites in Ukraine. It will be mandatory for all United Nations system staff in Ukraine as of 1 July 2023.

16. The main findings and observations from the IAEA Support and Assistance Missions are reflected in Section B.3.

B.1.2 Director General's Second Mission to Zaporizhzhya

17. During the reporting period, the Director General crossed the front line to travel to the ZNPP for a second time since the start of the armed conflict. The purpose of the visit, which took place on 29 March 2023, was to witness the damage and changes the ZNPP had sustained since his visit in September 2022, especially those associated with the shelling in November 2022. The Director General's visit was also aimed at ensuring that the regular rotation of Agency staff to and from the ZNPP was maintained and improved, following the very challenging circumstances faced during the delayed rotation in February 2023.

18. During this visit, the Director General, alongside Agency staff including the incoming and outgoing ISAMZ teams, toured the ZNPP site and visited places that had suffered damage from military activities. These included oil storage tanks, condensate storage tanks and dry spent fuel storage. In addition, he met the ZNPP management to discuss issues related to the reduced staffing and precarious power supply.

"The visit was essential for me to make my own assessment of the gravity of the [nuclear safety and security] situation. It is obvious that military activity is increasing in this whole region. There is open talk of offensives and counteroffensives. This area is facing perhaps a more dangerous phase in terms of the ongoing conflict."

Director General Rafael Mariano Grossi, following his second visit to the ZNPP 30 March 2023

19. Crossing the front line to and from the site on 29 March 2023, the Director General observed new indications of increased military activity in the area compared with the situation during his previous visit on 1 September 2022. This highlighted once more the seriousness of the nuclear safety and security situation at the ZNPP and the continuation of concerning developments, which underlines the urgent need for all parties to commit to protect the ZNPP.



Director General Rafael Mariano Grossi touring the ZNPP and its surrounding area during his second visit to the site, on 29 March 2023.

B.2. Protecting the ZNPP

20. During the reporting period, the Director General continued his diplomatic efforts to secure the nuclear safety and security of the ZNPP. This included a number of exchanges, meetings and consultations with high-level officials from both Ukraine and the Russian Federation. The urgency and importance of all parties committing to protect the ZNPP and to prevent a nuclear accident from happening was further highlighted by the continually challenging and dangerous situation at the plant, with an observed increase in the military presence and activities in the area, absence of redundant off-site power supply lines to the site and repeated (on 9 March and 22 May 2023) total loss of off-site power. As a result of these efforts, the initial proposal to establish a zone around the plant evolved to focus more on developing concrete principles to help ensure nuclear safety and security at the ZNPP.



Director General Rafael Mariano Grossi meeting Ukrainian President Volodymyr Zelenskyy in Zaporizhzhya, 27 March 2023.

21. The issue of ensuring the nuclear safety and security of the ZNPP was discussed with Ukrainian President Volodymyr Zelenskyy during the Director General's visit to the city of Zaporizhzhya on 27 March 2023. Following this meeting, on 5 April 2023, the Director General travelled to Kaliningrad, Russian Federation, where he held talks with senior Russian officials, including State Atomic Energy Corporation "Rosatom" Director General, Alexey Likhachev.



Director General Rafael Mariano Grossi with Rosatom Director General Alexey Likhachev in Kaliningrad, Russian Federation, on 5 April 2023. (Photo: rosatom.ru)

22. These efforts continued with the Director General undertaking further intensive consultations and discussions with all parties, culminating in the Director General addressing the United Nations Security Council (UNSC) in New York on 30 May 2023. During his address, the Director General gave an update on the Agency's activities concerning nuclear safety, security and safeguards in Ukraine; reminded the UNSC of the Seven Pillars; and set out concrete principles to help ensure nuclear safety and security at the ZNPP in order to prevent a nuclear accident and to ensure the integrity of the ZNPP.

23. These 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.



Director General Rafael Mariano Grossi addressing the United Nations Security Council in New York, 30 May 2023.

24. In his address, the Director General stated that ISAMZ would report to the Director General on the observance of these principles and that he would report publicly on any violations of these principles. He respectfully asked both sides to observe these five principles and for the members of the UNSC to unambiguously support them. The Director General added that the five principles were hereby established, and that the Agency intended to start monitoring these principles through ISAMZ.

25. Following statements from members of the UNSC, the Director General, in his closing remarks, noted that there was general support for the work of the Agency. He took note of nuances in the various statements but concluded that there was consensus for the need to avoid a nuclear accident and the

indispensable work of the Agency to this end. The Director General stated this to have been a step in the right direction; he was encouraged by the support for the Agency's work, for the Seven Pillars and for the five principles that he had established. The Agency will work to consolidate these principles and to be more effective in protecting the ZNPP. He will keep the UNSC informed with regard to implementation and observance of the five principles, and ISAMZ will be reinforced to help ensure a nuclear accident is avoided.

B.3. 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.¹⁰ 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.

27. During the reporting period, the Agency made progress in reviewing challenges in the application of the Agency's safety standards and nuclear security guidance in armed conflicts. A progress update on this review is provided in Annex I.

28. The nuclear safety and security situation in Ukraine continued to be fragile during the reporting period, particularly at the ZNPP, where an increase in military presence and activities in the surrounding area was observed. Attacks on Ukraine's energy infrastructure continued and again affected the reliability and availability of the off-site power lines to all NPPs. The ZNPP suffered another two losses of off-site power, making seven in total since the start of the conflict, while other operating NPPs had to reduce their operating power on several occasions. On 22 May 2023, one reactor unit at the SUNPP was automatically shut down due to grid disturbance or instability. The supply chain and work conditions for operating staff remain difficult and challenging at all nuclear sites owing to the conditions imposed by the armed conflict.

29. An overview of the current nuclear safety and security situation at Ukraine's nuclear facilities and activities involving radioactive sources against the Seven Pillars is presented below. A chronology of events in Ukraine during the period from 21 February to 30 May 2023 is given in Annex II.

30. The situation in Ukraine was also addressed during the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety held from 20 to 31 March 2023 in Vienna. A short summary of the main aspects reported at this Review Meeting in the light of the armed conflict in Ukraine is given in Annex III on the basis of the Summary Report¹¹ issued on 31 March 2023.

B.3.1. Zaporizhzhya NPP

31. The overall situation at the ZNPP with respect to nuclear safety and security continued to be of concern, with all Seven Pillars compromised by the armed conflict and with frequent shelling and landmine explosions occurring in the vicinity of the site. ISAMZ observed that the trend of the Moscow-based Joint Stock Company "Operating Organization of the ZNPP" progressively taking over operational control of the ZNPP, as reported in document GOV/2023/10¹², continued during the

¹⁰ Report by the Director General to the Board of Governors, document GOV/2022/52, issued 9 September 2022, para. 8.

¹¹ Available at: [23-01280e_cns8_9rm2023_08_final.pdf\(iaea.org\)](https://www.iaea.org/publications/23-01280e_cns8_9rm2023_08_final.pdf).

¹² Report by the Director General to the Board of Governors, document GOV/2023/10, issued 22 February 2023, para. 46.

reporting period. ISAMZ reported that the Russian Federation officially announced that the ZNPP is in transition for complete takeover by 1 January 2028.

32. During the reporting period, the ZNPP Units 1 to 4 remained in cold shutdown. Units 5 and 6 remained in hot shutdown for most of the reporting period. The generated steam was used for the chemical treatment of wastewater and boric acid wastewater, for the regeneration of ion exchangers, and for providing for heating at the ZNPP and the nearby city of Enerhodar during the winter. Unit 6 commenced its transition to cold shutdown on 20 April 2023 and entered cold shutdown the next day. Currently, only Unit 5 remains in hot shutdown to provide steam for technological purposes at the site and for grid water heating.

33. All nine diesel-fuelled mobile boilers installed at the ZNPP and over 50 mobile boilers installed in Enerhodar, which provided heat to the city during the winter, were gradually turned off during the reporting period. As of 17 April 2023, all mobile boilers at the ZNPP and in Enerhodar had been turned off. The ISAMZ team was informed that the boilers would receive annual maintenance and would be placed on standby.

Physical integrity

34. While the stability of the six reactor units and the integrity of the spent fuel, fresh fuel and low, medium and high level radioactive waste — located in their respective on-site storage facilities — have so far been confirmed, the ZNPP's physical integrity continues to be severely compromised as a result of the ongoing military activity.



The dry spent fuel storage facility at the ZNPP at the time of Director General Rafael Mariano Grossi's visit on 29 March 2023. Its additional physical protection measures are reported in document GOV/2023/10.

35. On 19 April 2023, the ISAMZ team visited the top floor of Unit 4 turbine hall after it had observed broken windows several days earlier following a loud explosion heard at the site heard on 12 April 2023. The ISAMZ team observed that almost all windows under the roof facing the main turbine building were

broken, including some windows on the opposite wall closest to Unit 3, while no damage was observed to windows on the wall facing the water cooling channels or to windows on the lower floors of the Unit 4 turbine hall.

36. The findings and observations from the visit to Unit 4 appeared inconsistent with the explosion being caused by a landmine. In follow-up discussions with Rosatom, the ISAMZ team was informed that the explosion heard on 12 April 2023, that caused damage to the windows on the top floor of Unit 4, resulted from a drone.

Nuclear safety and security systems and equipment

37. ISAMZ reported that the contingency measure intended to ensure the redundancy of boron water production at the site was still in place, with the reactor vessel of Unit 3 being kept open to serve as a boronated water reservoir, if needed.

38. The water level of the Kakhovka reservoir increased during the reporting period and returned to a normal level. However, on 6 May 2023, the water level was at historically high levels of 17.12 m, which had raised concerns that the high levels could adversely affect the plant. Based on an analysis done as part of stress tests conducted following the Fukushima Daiichi accident in 2011, at water heights above 17.7 m, water from the reservoir would flow directly into the cooling pond of the ZNPP. This could adversely affect the quality of the cooling water but would not affect the nuclear safety of the plant. From 8 to 26 May 2023, the water level of the Kakhovska reservoir was stable, with reported levels between 17.05 m and 17.08 m.

39. The scope of maintenance performed on all ZNPP reactor units since the start of the armed conflict was reported by the ISAMZ team as being reduced owing to the limited number of maintenance staff, absence of external contractors who perform a significant part of the work, and a lack of spare parts needed for the maintenance. ISAMZ reported that the ZNPP had only about a quarter of its regular maintenance staff available and did not have a systematic maintenance and in-service inspection schedule. According to plant management, the maintenance work or any replacement work may be undertaken using the services of a centralized Rosenergoatom company that typically performs such tasks.

40. During the reporting period, the ISAMZ team observed the presence of military vehicles in the turbine halls of Units 1, 2 and 4.

Operating staff

41. The staffing situation at the ZNPP remains complex and challenging. The current plant management has informed ISAMZ that the total number of staff with Rosatom contracts is now slightly above 3000, with another 1000 in the process of approval. Roughly 1000 staff with National Nuclear Energy Generating Company “Energoatom” contracts still work at the plant, under the direction of plant management appointed by the Russian Federation, and a significant number of Energoatom employees who remain in Enerhodar are now on call and occasionally called upon to work.

42. The ISAMZ learned that a voluntary evacuation of residents from the nearby town of Enerhodar — where most plant personnel live — had begun in early May 2023, creating further uncertainty about the staffing situation. The Director General has repeatedly expressed deep concern about the extremely difficult situation for the ZNPP staff and their families, which could also affect nuclear safety and security.

43. The ISAMZ team was informed that, in response to staff shortages, operators from Russian NPPs had been receiving simulator and on-the-job training at the ZNPP, to be accompanied by a theoretical

and practical examination, in order to become licensed operators under Russian arrangements for the ZNPP. Once trained and licensed, they may be asked to work at the ZNPP in case of staff shortages.¹³

44. The ISAMZ team reported that, by the end of April 2023, the number of staff at the ZNPP on a daily basis had been reduced by approximately 25% compared to January 2023. However, new staff are being recruited for multiple positions at the ZNPP, including 200 staff for maintenance.

Off-site power supply

45. At the beginning of the reporting period, the 750 kV Dniprovskaya line and the 330 kV Ferosplavna backup line were the only off-site power lines available for the ZNPP. On 25 February 2023, the Ferosplavna backup line was disconnected and reconnected twice on the same day and subsequently suffered damage on 1 March 2023. For over 12 weeks during the reporting period, the ZNPP relied on a single off-site power supply line, the 750 kV Dniprovskaya line, for reactor cooling and other essential nuclear safety and security functions, with the maintenance and repair of the 330 kV Ferosplavna backup line continuously postponed owing to military activities in the area.

46. On 9 March and 22 May 2023, the Dniprovskaya line was disconnected, causing the ZNPP to lose all off-site power. With these developments, the ZNPP had lost off-site power seven times since the start of the armed conflict. The emergency diesel generators (EDGs) started immediately and provided essential power to the ZNPP until the Dniprovskaya line was reconnected within the same day on both occasions.

47. In March 2023, the Russian Federation reported that Rosatom had been assisting in the removal of damaged equipment from the 330 kV open switchyard at the Zaporizhzhya thermal power plant (ZTPP) with the aim of restoring three 330 kV lines to the grid system in territory currently controlled by the Russian Federation. Rosatom had agreed to provide the ISAMZ team with access to the ZTPP open switchyard; however, the visit was postponed on several occasions. During the reporting period, the ISAMZ team had still not been able to visit the ZTPP.

Logistical supply chain

48. On 12 April 2023, the ISAMZ team reported that the ZNPP was missing a significant number and type of spare parts, including those needed for essential components such as cooling pumps in Units 5 and 6. As a result, a list of approximately 800 high priority/category 1 spare parts and consumables (including cables, lamps and chemical reagents) had been prepared and submitted to Rosatom by the ZNPP.

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. Four off-site radiation monitoring stations were not connected to the system during the reporting period. The four off-site stations are located in the area affected by the armed conflict, and it has not yet been possible to reconnect them. The ISAMZ team reported on 25 April and 17 May 2023 that one of the four disconnected off-site monitoring stations was found by the ZNPP maintenance crew completely damaged while another station was found intact but with the power supply completely damaged. Both of these stations are located on the left bank of Dnipro river. Radiation levels on site and off site remain normal.

50. On 18 May 2023, the SNRIU reported that it no longer received off-site radiation monitoring data from the vicinity of the ZNPP site. The most recent data received by the Agency on the International Radiation Monitoring Information System (IRMIS) from these off-site radiation monitoring stations

¹³ See para. 2 above.

were from 04:00 UTC on 17 May 2023. The Agency is addressing this issue with the plant management and relevant officials.



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 status and reliability of on-site and off-site emergency arrangements for the ZNPP remained a significant concern during the reporting period. The on-site emergency centre remained occupied by the military authority, and the temporary centre still does not fulfil all the necessary requirements to provide the expected emergency response functions. The off-site emergency centre, located in the city of Zaporizhzhya, is currently not available to the ZNPP owing to the armed conflict. A temporary off-site centre was established in Enerhodar, but its status had not been verified by ISAMZ.

52. The most recent emergency exercise at the ZNPP was conducted in November 2021. The exercise schedule for 2022 was not followed as a result of the armed conflict, and the next exercise is now planned for November 2023.

53. The ISAMZ team was informed that the temporary on-site ZNPP emergency plans for accidents and other emergency situations were updated on 30 March 2023, in line with regulations of the Russian Federation¹⁴ and taking into account the situation resulting from the armed conflict. The full on-site emergency plan for protecting personnel in the event of accidents at the ZNPP is under development.

54. As reported earlier, owing to damage to the ZNPP's fire station, its personnel and equipment had been relocated to the fire station in Enerhodar, which means more time is needed for the plant's fire brigade to reach the ZNPP in case of fire. In March 2023, the ISAMZ team visited the fire station in Enerhodar where it learned that the fire station had been under the authority of the Ministry of the Russian Federation for Civil Defence, Emergencies and Elimination of Consequences of Natural Disasters since 13 February 2023 and that approximately one-third of the staff of the fire brigade had left since the beginning of the armed conflict.

¹⁴ See para. 2 above.

Communications

55. ISAMZ confirmed that there had been no official communication between the ZNPP and the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) since November 2022. The ISAMZ teams report challenges with connecting to mobile telephone networks and constant interruptions to internet connections.

B.3.2. South Ukraine, Khmelnytsky and Rivne NPPs

56. 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.



Handover meeting for incoming and outgoing ISAMIK teams with the KhNPP plant personnel on 14 April 2023.

57. Attacks on Ukraine's energy infrastructure continued during the reporting period. On several occasions, these impacts required power reduction in operating units.

Physical integrity

58. 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. However, cruise missiles and aerial vehicles were observed flying in close vicinity of some of these operating NPPs, threatening the nuclear safety and security of these facilities. The ISAMISU, ISAMIK and ISAMIR teams reported that all three NPPs continue to protect their critical components and vital structures through additional physical protection measures.

Nuclear safety and security systems and equipment

59. 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 conduct regular scheduled

testing of the systems, some of which are witnessed also by the Agency staff present on site. No failures of these systems or challenges to their operation were reported.

Operating staff

60. 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, some of which require sheltering. The Agency teams reported that, during the periods of elevated risk of missile attacks, the plants had been ordering non-essential staff to stay at home.

61. The unpredictability in staff availability causes additional challenge to plant management in terms of planning work activities such as planned maintenance. The Agency teams confirmed that this had no negative impact on the maintenance of the safety and security systems.

62. All mandatory training of operating staff continued according to the annual schedule at all three NPPs. Some of the NPPs introduced additional scenarios at the full scope simulator to strengthen the capability of operating staff to respond to events associated with grid availability.

Off-site power supply

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

64. During the reporting period, all three NPPs were ordered by the grid dispatcher to decrease their power, as a preventative measure, on three occasions during the attacks on Ukraine's energy infrastructure. In addition, on 9 March 2023, the SUNPP lost two of its off-site power lines. The lines were restored on the same day. On 22 May 2023, one reactor unit at SUNPP was automatically shut down due to grid disturbance or instability. These events did not cause any safety or security issues but demonstrated the vulnerability of the nuclear safety and security situation in Ukraine.

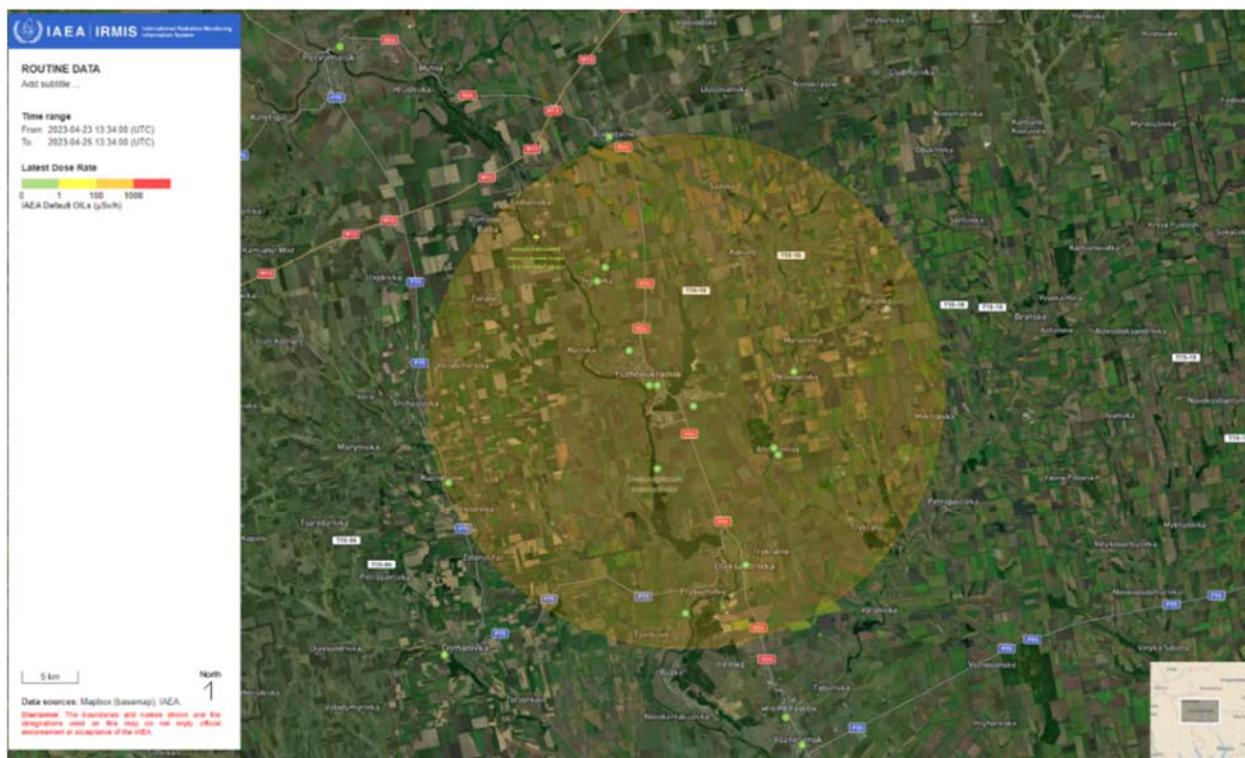
Logistical supply chain

65. 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.

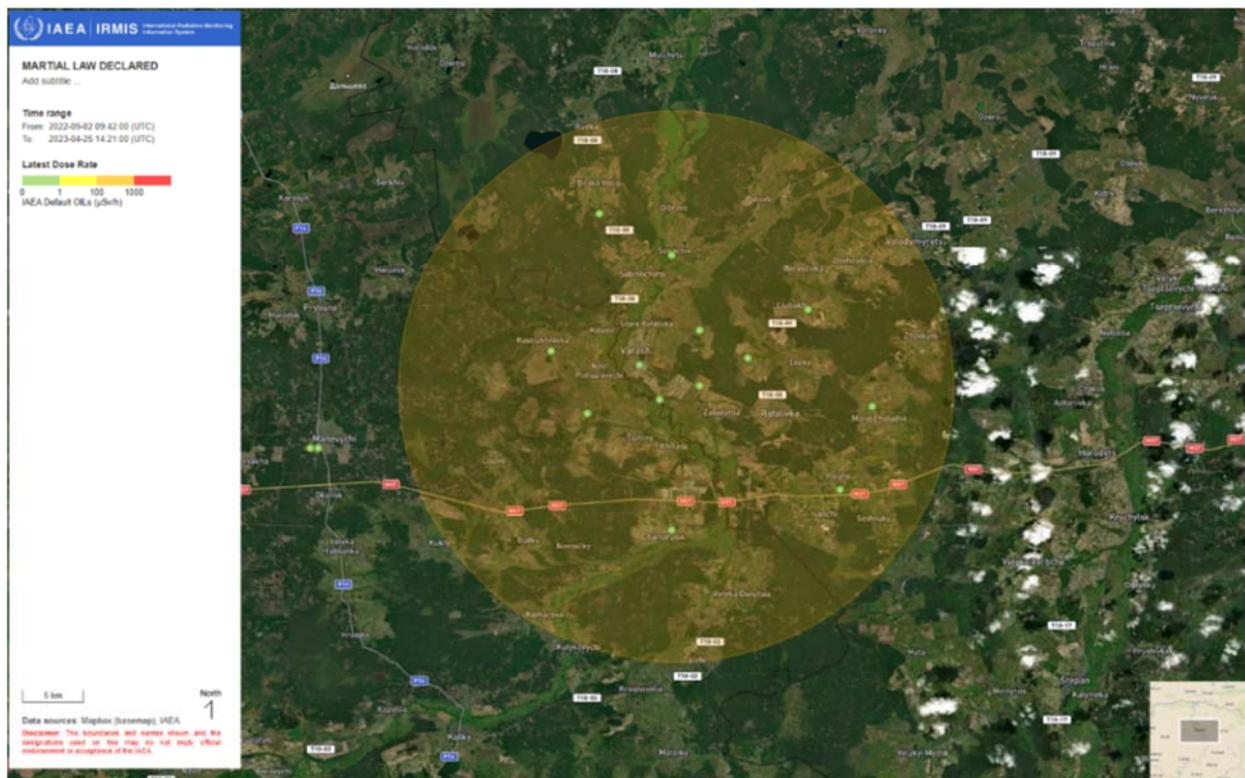
66. Transportation channels (both roads and railways) to and from the NPPs remain unimpeded. Owing to the security situation in the country, the transport of spent fuel from all three NPPs to the centralized spent fuel storage facility at the Chornobyl site had been halted at the start of the armed conflict. In May 2023, Agency teams at the sites reported that the transportation of spent nuclear fuel from the operating NPPs to the centralized spent fuel storage in Chornobyl resumed with at least the first transport of spent fuel from one of these NPPs having been completed.

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

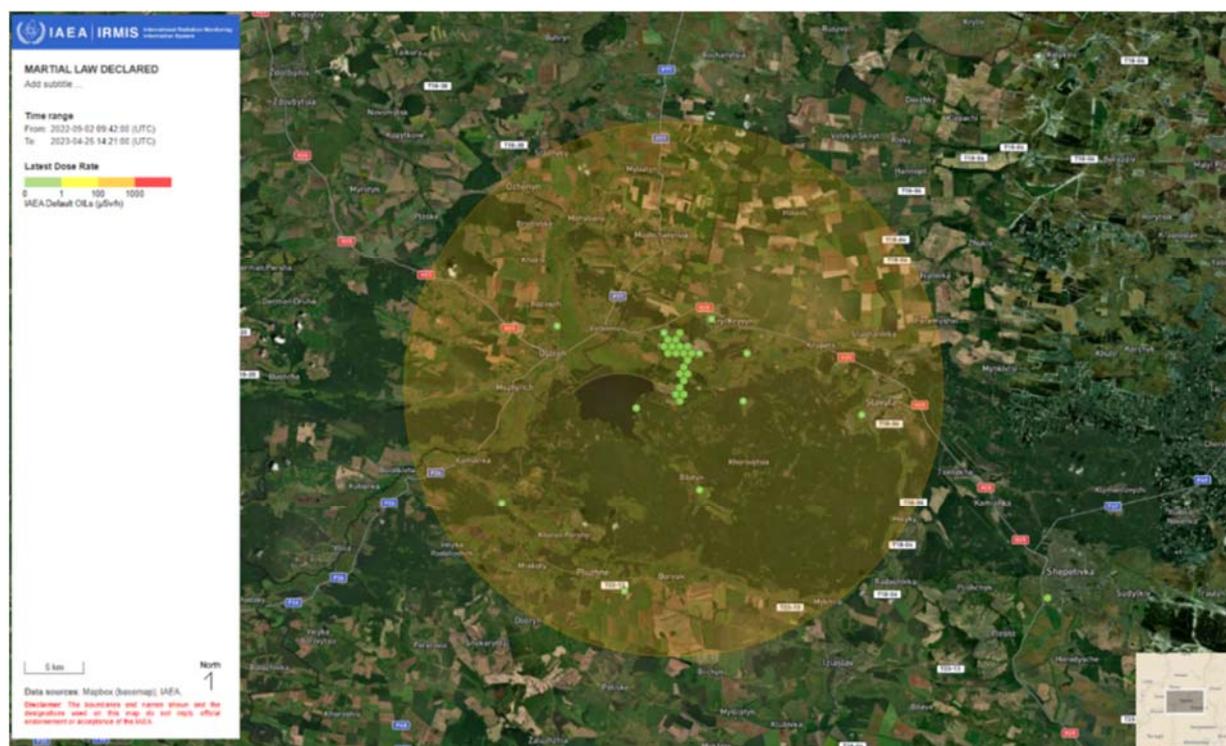
67. All on-site and off-site radiation monitoring stations at the three NPPs worked as per design. The plants continue to perform personal radiation monitoring according to the established procedures.



*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.

68. The established emergency arrangements for these NPP sites remain operational and are regularly maintained, and training on the arrangements is regularly provided. Additional provisions have been reported to have been implemented to further improve the effectiveness of the emergency arrangements during the armed conflict. The Agency staff present at the three NPPs have been informed that the emergency arrangements are adequate for the current situation. Periodic emergency exercises are conducted to include scenarios related to the armed conflict, and its possible impact on the safety and security of the NPPs.

Communications

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

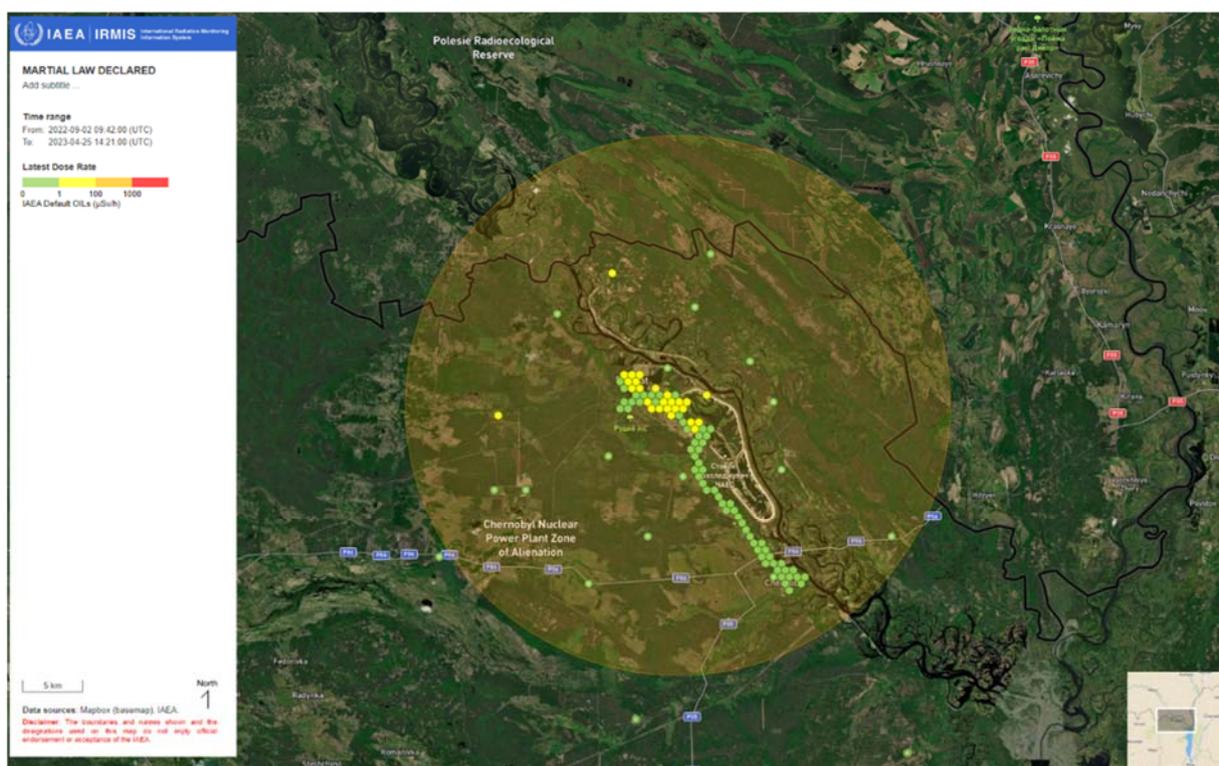
B.3.3 Chernobyl NPP Site and Other Facilities

70. 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 and GOV/2023/10 with regard to the assessment of the nuclear safety and security situation against the Seven Pillars. Both spent fuel storage facilities, ISF-1 and ISF-2, at the ChNPP site remain in operation. However, the transport of spent fuel from ISF-1 to ISF-2 has been temporarily suspended due to security reasons. Operations in the waste treatment facility have also been suspended.

71. During the reporting period, ISAMICH reported the following:

- Additional measures were implemented to protect the main switchyard at the ChNPP site against possible military attacks and further work in this regard is in progress;
- Internal inspections of the ChNPP structures, systems and components performed by the operating staff and regulatory inspectors resumed in 2023 and have found all to be fully operational, in accordance with established operational limits and conditions;

- The stressful conditions for the operating staff continued to be exacerbated by the challenging living conditions, together with complicated site access;
- The power supply to the ChNPP switchyard had been reduced on 9 March 2023 due to attacks on Ukraine’s energy infrastructure and normal power levels were restored on 10 March 2023;
- The supply chain continued to be challenged; however, the ChNPP has inventory of critical spare parts and consumables, and efforts have been undertaken to identify new suppliers for those components and materials where the original suppliers are no longer available;
- The off-site radiation monitoring system was functional, but the field monitoring performed by the staff in the Exclusion Zone was still difficult, as the area had not been fully demined following the Russian military withdrawal; The last reported explosion of a landmine in the Exclusion Zone was reported on 19 April 2023 during work done in the area by one of the contractors, who sustained injuries and underwent medical treatment;
- The ChNPP emergency preparedness and response documentation was reviewed, and some modifications to account for evacuation of site personnel in case of military activities were implemented as a result of the lessons learned during the occupation; and
- All communication means remained available during the reporting period, and the site was under regular regulatory control.



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.



The ISAMICH team visiting the new safe confinement at the ChNPP site on 7 April 2023.

72. No events that have an impact on nuclear and/or radiation safety and nuclear security have been reported for other facilities in Ukraine.

B.4. IAEA Technical Support and Assistance for Nuclear Safety and Security

73. The Agency continued to make progress in the delivery of technical support and assistance to Ukraine, in line with the agreed comprehensive technical plan for nuclear safety and security assistance to Ukraine's nuclear facilities and activities involving radioactive sources as explained in document GOV/2022/52. This plan focuses on remote assistance through external support, the delivery of nuclear safety- and security-related equipment, in-person technical support and assistance through on-site expert missions, and the deployment of rapid assistance should an emergency occur.

74. In a call with Ukrainian President Volodymyr Zelenskyy on 26 April 2023, and in light of the harsh conditions under which the Ukrainian operating staff at all nuclear sites are performing their duties, the Director General expressed readiness for the Agency to deploy a new programme of medical assistance for operating personnel at the Ukrainian NPPs, which was welcomed by President Zelenskyy. The Agency has developed the concept for the new programme, aimed at ensuring that plants operating personnel are fit for duty and have access to the necessary medical support and care to maintain their physical and mental health despite the stressful conditions imposed by the armed conflict. The concept for this new programme was sent to President Zelenskyy on 8 May 2023. In this context, from 3 to 16 June 2023, the Agency plans to implement a medical assistance mission in Ukraine to assess capabilities for providing health screening and surveillance for operating personnel at the operating NPPs in Ukraine and to support and observe health screening programme for RNPP personnel.



Director General Rafael Mariano Grossi in a call with Ukrainian President Volodymyr Zelenskyy on 26 April 2023.

75. 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, that about 20 organizations with various responsibilities in nuclear and radiation safety and nuclear security are receiving assistance from the Agency, and that available resources are limited. This coordination is complemented by the findings and work done by the Agency staff at the KhNPP, the SUNPP, the RNPP and the ChNPP site, who work together with their technical counterparts to identify urgent needs and priorities.

76. 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, including the funding required to enable the continued presence of Agency staff at the five nuclear sites in Ukraine.

B.4.1 In-person Assistance

77. The Agency maintained the continued presence of Agency staff at all five nuclear sites in Ukraine through the rotation of Agency staff. The delivery of this assistance continues to require significant resources. Ensuring that these resources are secured necessitates strong collaboration with Member States and international organizations.

78. As noted in documents GOV/2023/10 and GOV/2022/66, the Agency acknowledges the potential impact of the armed conflict on the safety and security of radioactive sources. As part of previous nuclear safety and security missions to Ukraine, various facilities that use, store, transport and manage radioactive sources were visited and the nuclear safety and security situation at these facilities assessed,

namely facilities in the Chernobyl Exclusion Zone, the RADON facilities in Kharkiv and Kyiv, as well as the Izotop facility in Kyiv.

79. During the reporting period, the Agency held discussions with the SNRIU on the status of radioactive sources within those Ukrainian facilities and to reaffirm the Agency's willingness to provide, upon request, technical support and assistance for the safe and secure management of radioactive sources. Following later discussions, in March 2023 the Agency prepared an initial Assistance Action Plan (AAP) for an IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources in Ukraine, which was presented to the SNRIU on 2 May 2023. This AAP outlines the initial steps for assistance in the area of safety and security of radioactive sources and proposes an initial fact-finding mission to support potential future assistance.

B.4.2 Delivery of Equipment

Requests for assistance

80. During the reporting period, no additional requests for nuclear safety and security equipment were received under the statutory functions of the Agency or under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. The total number of requests for assistance published on the Agency's Unified System for Information Exchange in Incidents and Emergencies, and transmitted by the Agency to 31 of the 39 Assistance Convention States Parties that are registered in the Response and Assistance Network (RANET), remained unchanged compared to those reported in document GOV/2022/66. Those requests were made on 22 and 29 April, 8 July, 9 August and 3 October 2022.

81. The Agency continued working to address the additional needs for technical support and assistance based on the requests under the statutory functions of the Agency or under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency; those identified from the expert missions conducted in 2022; and additional requests, such as those received on 15 November 2022 concerning the enterprises in the Chernobyl Exclusion Zone, the Radon Association and the Kharkov Institute of Physics and Technology, and on 28 November 2022 concerning the energy sector in Ukraine that were reported in detail in document GOV/2023/10. This work encompasses further prioritization of the urgent needs and the development of detailed technical and functional requirements for the nuclear safety- and security-related equipment to facilitate efficient procurement and delivery. With regard to the request for support to the energy sector received on 28 November 2022, the work on the technical and functional requirements for the various items requested was completed in April 2023 in close cooperation with the Ministry of Energy of Ukraine, and an estimate was made for the expected costs exceeding €20 million.

Offers of assistance

82. In response to Ukraine's requests, 12 Member States¹⁵ that were registered under RANET had offered assistance in the form of equipment by 30 May 2023.

83. One additional Member State — Greece — made an offer of an in-kind contribution on 23 February 2023. The offer pertains to portable personal gamma dosimeters, as well as the services of its national ionizing radiation calibration laboratory. The Agency engaged with Ukrainian counterparts and identified recipients of the equipment in Ukraine and is engaging with Greece to agree on the arrangements for delivery of the equipment.

¹⁵ Australia, Canada, France, Germany, Hungary, Israel, Japan, Romania, Spain, Sweden, Switzerland and the United States of America.

84. By 30 May 2023, 17 Member States¹⁶ and an international organization¹⁷ 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, five Member States expressed interest in providing extrabudgetary cash contributions, with a particular focus on supporting the continued presence of Agency staff at nuclear sites in Ukraine throughout 2023.

85. One of these Member States — France — expressed its interest in supporting the provision of spare parts and rubber products for diesel generators at the SUNPP and provided an extrabudgetary cash contribution to the Agency to this end on 1 March 2023. The Agency entered into a partnership agreement with France and Energoatom to enable the provision of this assistance, exceeding €2 million, on 5 May 2023.



IAEA Deputy Director General and Head of the Department of Nuclear Safety and Security Lydie Evrard with Delphine Hournau-Pouëzat, Resident Representative of the Permanent Mission of the French Republic to the Agency, and Yevhenii Tsymbaliuk, Resident Representative of the Permanent Mission of Ukraine to the Agency at the signing ceremony of the agreement between the Agency, the Ministry for Europe and Foreign Affairs of France and Energoatom for the provision of spare parts for EDGs at the SUNPP on 5 May 2023.

86. Despite the generous contributions made by these donors, the needs of Ukraine remain significant. The Agency is continuing its efforts in coordinating and collaborating with donors to secure further funding and assistance, which is of paramount importance for the Agency to be able to continue providing the required technical support and assistance to Ukraine, and to continue delivering programmatic activities in accordance with its mandate.

¹⁶ Australia, 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.

¹⁷ European Commission.

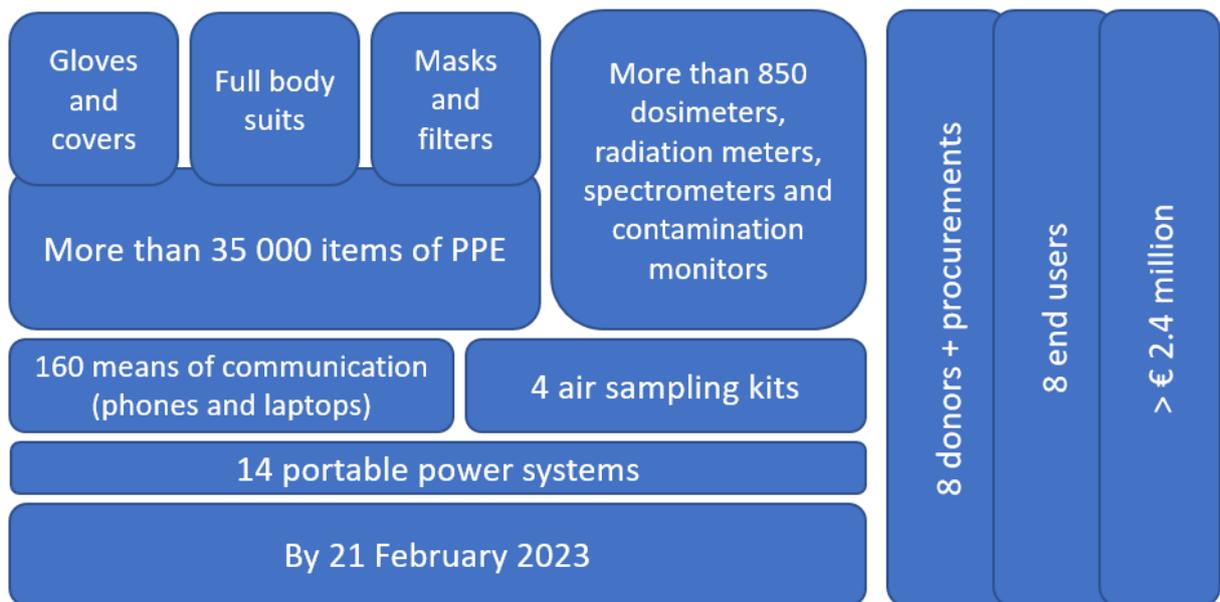
Provision of assistance

87. 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 elaborate needed requirements and of allocated funding.

88. Following the completion of delivery of offered equipment from Member States, five assistance reports were prepared during the reporting period. They describe the assistance provided under the respective AAPs and, once finalized, are intended to conclude the process of providing that assistance.

89. During the reporting period, three Member States¹⁸ fully or partially prepared the equipment and associated documentation for shipment to Ukraine through the Agency. In addition, two Member States that made offers under RANET are preparing the remaining equipment for shipment. The Agency is liaising closely with these Member States to facilitate the timely delivery of this equipment.

90. The cost of the unmet needs for the procurement of nuclear safety- and security-related equipment and for its delivery to Ukraine is estimated to exceed €60 million, excluding the costs associated with the needs for the energy sector in Ukraine mentioned in paragraph 77. The Agency is working closely with the SNRIU to ensure that there is improved coordination at the national level to identify the next urgent needs and to assign priorities to which the next round of assistance will be tailored.



Overview of deliveries of equipment delivered to Ukraine by 21 February 2023.

¹⁸ Canada, Israel and Switzerland.



Over 145 000 pairs of personal protective overalls donated by Switzerland delivered to the Ministry of Health of Ukraine, 6 March 2023 (left, photo: SNRIU) and respiratory masks donated to SUNPP by Canada, 3 March 2023 (right, photo: SUNPP).

Delivery of equipment

91. During the reporting period, seven deliveries of equipment took place, from 27 February to 1 March, from 2 to 3 March, on 6 March, on 22 March, from 6 to 11 April, on 1, 24 and 26 May 2023, bringing the total number of deliveries of equipment to Ukraine to 17. Following these deliveries, the value of the equipment delivered to Ukraine approaching €5 million, with 71% of shipments associated with donated equipment and 29% of shipments associated with procured equipment.



Breakdown of total deliveries to Ukraine by donations and procurements.

92. The deliveries comprised equipment donated by Canada, Israel and Switzerland under the RANET mechanism and procured by the Agency under extrabudgetary contributions provided by Australia, the United Kingdom and the United States of America. As a result of these deliveries, entities such as the SNRIU, Energoatom, the SUNPP, VostokGOK, the Radon Association, the State Scientific and Technical Center for Nuclear and Radiation Safety, the State Register of Ionizing Radiation Sources and Individual Radiation Doses, the Ministry of Health and the Ukrainian Hydrometeorological Centre received equipment including satellite communication system, personal protective equipment (PPE), potassium iodide (KI) pills, dosimeters, spectrometers, IT equipment, vehicles and portable power systems. In addition, the Agency has been delivering medical equipment and supplies for critical care intended for the medical facilities at each nuclear site where Agency staff are present.



The ISAMICH team delivering a defibrillator to the medical staff at the ChNPP site on 31 March 2023.



Overview of deliveries of equipment delivered to Ukraine between 22 February and 30 May 2023.



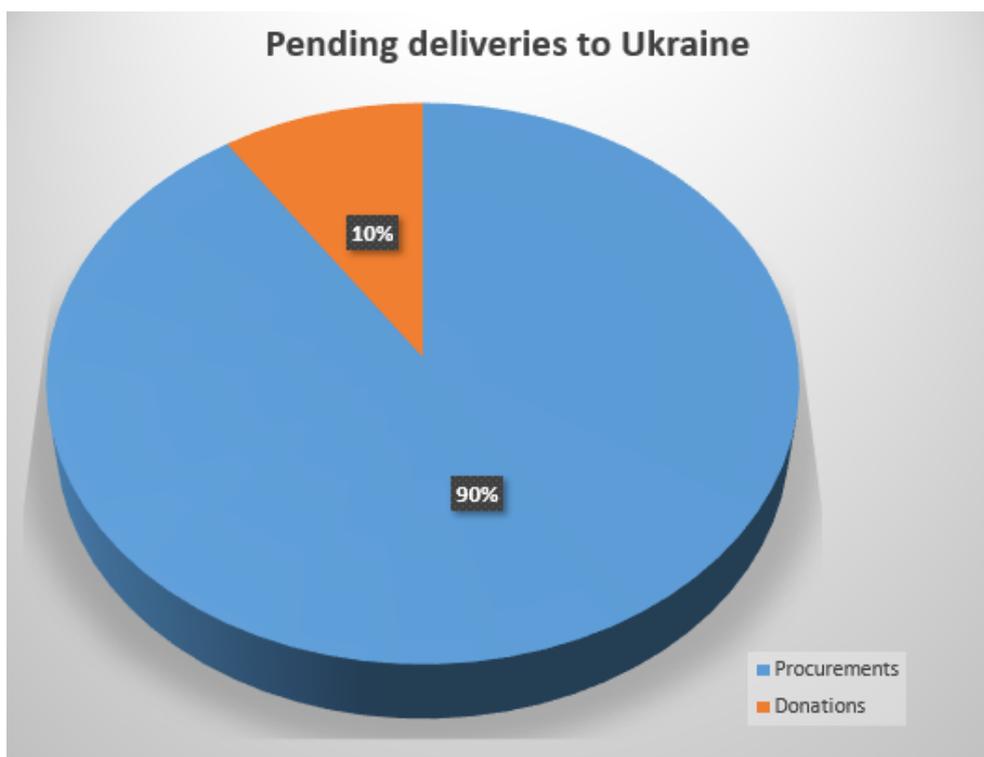
Personal protective equipment donated by Israel at the Agency's Headquarters, from where it was delivered to Energoatom and the Radon Association in April 2023.



One of the five vehicles delivered to the SNRIU and the State Scientific and Technical Center for Nuclear and Radiation Safety on 22 March 2023. (Photo: SNRIU)

93. The Agency is finalizing arrangements for the delivery of the equipment donated by two Member States¹⁹, which is expected to take place in the coming months. The deliveries will comprise PPE, dosimeters, spectrometers, decontamination showers, IT and communication equipment, and related items.

94. In addition to these planned deliveries, more nuclear safety- and security-related equipment is expected to be transported to Ukraine in the coming months, either from remaining in-kind contributions from two Member States or procured by the Agency with a total amount exceeding €2 million. Additional nuclear safety and security equipment is in various stages of procurement.



Breakdown of the next deliveries to Ukraine by donations and procurements.

B.4.3 Remote Assistance

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

B.4.4 Deploying Rapid Assistance

96. 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.

¹⁹ Canada and Japan.

C. Implementation of Safeguards in Ukraine

C.1 Background

97. 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.

98. 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 Chernobyl site, which hosts three shutdown reactors, the reactor damaged in the 1986 nuclear accident, and two spent fuel processing and storage facilities.

99. 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 Chernobyl 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

100. 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.

101. 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. The transmission of all data from all of the nuclear facilities and LOFs was possible 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 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.

102. With the establishment of a continued presence of Agency staff at the RNPP, the KhNPP and the SUNPP, as well as at the ChNPP site, safeguards activities have been integrated with the various IAEA Support and Assistance Missions to the extent possible. Designated safeguards inspectors for Ukraine typically comprise part of the missions of technical experts continuously present in Ukraine. For efficiency, Agency inspectors are scheduled to be present whenever safeguards activities are planned — e.g. 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 also planned, as needed, for activities that cannot be covered in the course of the IAEA Support and Assistance Missions, including the installation or servicing of equipment and the conduct of complementary access. The Department of Safeguards has provided additional logistical support to IAEA Support and Assistance Missions in the form of PPE, communications equipment, emergency (travel) equipment, vehicles and administrative support.

103. 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, over the reporting period, two unannounced inspections were performed at NPPs.

D. Summary

104. The armed conflict has continued to threaten nuclear safety and security in Ukraine. An increase in military activity in the country, as well as in the military activity and presence at the ZNPP, was observed during the reporting period, resulting in even greater concerns regarding its potential impact on the safe and secure operation of nuclear facilities and activities involving radioactive sources.

105. The situation at the ZNPP continues to be particularly difficult and challenging, with the Seven Pillars being compromised at all times. During the reporting period, the plant suffered 2 losses of off-site power, while it had been relying for over 12 weeks on a single off-site power line for the required electricity. The progressive takeover of the operational control of the plant by the Russian Federation continued to be observed during the reporting period.

106. After intensive consultations and discussions with all parties, the Director General addressed the UNSC in New York on 30 May 2023. In his address, the Director General gave an update on the Agency's activities concerning nuclear safety, security and safeguards in Ukraine; reminded the UNSC of the Seven Pillars; and set out five concrete principles to help ensure nuclear safety and security at the ZNPP in order to prevent a nuclear accident and to ensure the integrity of the ZNPP. As a result, these five concrete principles were established and the Agency will monitor these principles through ISAMZ.

107. 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 impacts on them caused by the attacks on Ukraine's energy infrastructure.

108. The Agency has further intensified and deepened its technical work in Ukraine through the continued presence of Agency staff at all nuclear sites in Ukraine. Agency staff present at each nuclear site have been monitoring and assessing the nuclear safety and security situation against the Seven Pillars and have been sharing impartial and fact-based information with the Agency's Headquarters. This information is shared transparently with the public and the international community through, for example, the Director General's regular updates posted on the Agency's website.

109. So far, 37 missions comprising 81 Agency staff members were deployed as part of the continued presence at all five nuclear sites in Ukraine, totalling 2366 person-days in Ukraine. 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.

110. The Agency has continued providing technical support and assistance to Ukraine in nuclear safety and security. During the reporting period, seven deliveries of donated and procured nuclear safety- and security-related equipment to different organizations in Ukraine were organized, with many more expected in the coming months.

111. In addition, the Agency prepared a new programme for medical assistance to Ukrainian operating personnel at NPPs to ensure their health and well-being while carrying out their duties relevant to nuclear safety and security. This programme is intended to enable the Ukrainian NPPs to have arrangements in

place for, and its operating personnel have access to, necessary services for ensuring their physical and mental health and for periodic assessment of their fitness for duty. It also aims to ensure that the responsible medical facilities have the required capability to provide those services and critical medical support and care.

112. 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.

113. The Agency has continued to undertake a vital verification role to reach independent conclusions that nuclear material under safeguards remains in peaceful use 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 I: Agency Safety Standards and Nuclear Security Guidance: Challenges in their Application in Armed Conflicts

1. The analysis of the challenges in the application of Agency safety standards and nuclear security guidance in armed conflicts continued during the reporting period, with the launch of the second phase of the analysis. In this phase, the scope of analysis has been broadened to cover all facilities and activities, and the review of the publications extended to Safety Requirements *Predisposal Management of Radioactive Waste* (IAEA Safety Standards Series No. GSR Part 5), *Decommissioning of Facilities* (IAEA Safety Standards Series No. GSR Part 6), *Safety of Research Reactors* (IAEA Safety Standards Series No. SSR-3), *Safety of Nuclear Fuel Cycle Facilities* (IAEA Safety Standards Series No. SSR-4) and *Disposal of Radioactive Waste* (IAEA Safety Standards Series No. SSR-5); the Safety Guide *Storage of Spent Nuclear Fuel* (IAEA Safety Standards Series No. SSG-15 (Rev. 1)); and the Nuclear Security Series publications *Nuclear Security Recommendations on Radioactive Material and Associated Facilities* (IAEA Nuclear Security Series No. 14) and *Nuclear Security Recommendations on Nuclear and Other Radioactive Material out of Regulatory Control* (IAEA Nuclear Security Series No. 15).

2. Further to this analysis, the Agency initiated the preparation of an IAEA Technical Document an aim of which is to analyse the issues and challenges faced at nuclear facilities in terms of practical application of the IAEA 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 IAEA.

Annex II: Chronology of Events Since 21 February 2023

Events at the Zaporizhzhya Nuclear Power Plant

- On 21 February, the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ) noted that the alternative on-site emergency centre offered limited means and equipment that were inadequate for long-term emergency management.
- By 22 February, the water level of the Kakhovka reservoir was reported to have dropped to 14.1 m.
- On 25 February, the Ferosplavna 330 kV backup power line was disconnected and reconnected twice.
- On 1 March, the 330 kV Ferosplavna line was disconnected after sustaining damage far from the plant. The connection had not been restored and the Zaporizhzhya nuclear power plant (ZNPP) continued to rely upon only one external power line (the 750 kV Dniprovskaya line) by the end of the reporting period.
- On 4 March, ISAMZ learned that additional fortifications would be installed within the site's perimeter in the following month.
- On 9 March, the only available external power line, 750 kV Dniprovskaya line, was disconnected. The ZNPP lost all off-site power and all 20 emergency diesel generators started. Eight generators operated for about 11 hours until the Dniprovskaya power line was restored.
- On 9 March, ISAMZ reported an increased military presence on site.
- On 10 March, the ISAMZ team was not allowed to visit the turbine halls of Units 1, 2 and 4.
- On 13 March, the ISAMZ team was denied access to the nearby thermal power plant switchyard, which serves as backup electrical power connection between the ZNPP and the Ukrainian grid. Approval for the visit was obtained only later in April.
- On 25 March, two mobile boilers were placed in standby mode given the increased ambient temperature.
- On 26 March, two more boilers were placed in standby mode.
- On 3 April, the water level of the Kakhovka reservoir was reported to be 14.7 m.
- On 7 April, additional physical protection barriers were installed at the ZNPP's main gate.
- On 8 April, a mine detonation was heard close to the plant's perimeter, in the area of the sprinkler cooling ponds.
- On 17 April, all mobile diesel boilers on site ceased operating given the warmer ambient temperatures.
- On 18 April, ISAMZ observed broken windows in the Unit 4 turbine building. Initially, this damage was reported as having been caused by a mine explosion.
- On 20 April, Unit 6 began transitioning to cold shutdown mode, as the steam it produced was no longer needed for heat. Unit 5 remained in hot shutdown to supply a minimum amount of steam for the plant's self needs.
- On 21 April, Unit 6 reached cold shutdown status.

- On 21 April, ISAMZ reported the water level in the Kakhovka reservoir to be 16.2 m.
- On 24 April, Rosatom personnel informed ISAMZ that the explosion that had broken the windows in the Unit 4 turbine hall was caused by a drone.
- On 25 April, ZNPP personnel found one of the off-site radiation monitoring stations, which had previously lost connection with the plant, to have been severely damaged by military activities.
- On 25 April, the ZNPP released 30 000 tropical fish into the cooling pond and channels. These fish consume organic matter accumulated in the cooling system, thereby preventing clogging and obstructions in the water intake pipes. The fish that had been present before the start of the conflict had died owing to the low winter temperatures.
- On 6 May, the water level of the Kakhovka reservoir was reported to be 17.12 m.
- On 15 May, the water level in the Kakhovka reservoir was reported to be 17.05 m.
- On 17 May, ISAMZ learned that one of the four disconnected off-site radiation monitoring stations, located on the left bank of the Dnipro, was found to be intact, but the power supply to the station had been completely damaged. The station was dismantled and transferred to the ZNPP to prevent it from being damaged due to military activities.
- On 17 May, the Agency received the last data from the ZNPP off-site radiation monitoring stations on IRMIS.
- On 18 May, the SNRIU reported that it no longer received off-site radiation monitoring data from the vicinity of the ZNPP site.
- On 22 May, the ZNPP lost all off-site power for seventh time since the start of the armed conflict, and its emergency diesel generators started. The Dniprovska power line was restored later the same day.
- On 26 May, the water level in the Kakhovka reservoir was reported to be 17.08 m.

Events at the Chernobyl Nuclear Power Plant Site

- On 9 March, owing to missile attacks and disruption to the Ukrainian national grid, the power received from one of the 750 kV external lines dropped significantly.
- On 5 and 6 April, one of the bridges used by the workers to get to the plant flooded, significantly increasing the time needed to transfer staff to and from the site, which was already quite substantial.
- On 14 April, a river on the route used by the workers to commute to the plant flooded, increasing the journey time even further.
- On 19 April, a landmine exploded while one of the contractors was performing work with an excavator in an abandoned village in the Exclusion Zone.
- On 23 April, some non-critical repair activities had to be postponed. It was not possible to safely transport the construction equipment to the site owing to the damage to and flooding of the access bridges.
- On 12 May, ISAMICH reported that one of the bridges used by plant staff to get to the site was no longer flooded and could be used again. This allowed plant staff to reach their destination in a more secure and efficient manner.

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

- On 28 February, personnel working at the Rivne nuclear power plant's (RNPP's) switchyard were withdrawn from their posts due to increased risk of missile attacks. This had no effect on operation.
- On 1 March, all three units at the South Ukraine nuclear power plant (SUNPP) were forced to reduce their power output preventively, at the request of the national grid dispatcher.
- On 9 March, as a result of attacks and damage to the Ukrainian electrical grid, both units at the Khmelnytsky nuclear power plant (KhNPP), all four units at the RNPP and all three units at the SUNPP were forced to reduce their power.
- On 9 March, one cruise missile flew close to the SUNPP. In addition, as a result of the shelling on that day, two external high voltage lines were disconnected, with a number of backup lines available. The connection was restored by the following day.
- On 23 March, aerial vehicles flew close to the KhNPP.
- On 22 May, ISAMISU reported that an emergency shutdown had occurred at one of the three reactor units of the SUNPP due to grid disturbance or instability.

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.

Annex III: Main Aspects Reported During the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety in Light of the Armed Conflict in Ukraine

1. The Joint Eighth and Ninth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety was held from 20 to 31 March 2023 in Vienna. One Contracting Party informed that it could only partially fulfil its commitments and responsibilities under the Convention with respect to ensuring nuclear safety in its installations due to the ongoing armed conflict in the country.
2. At this Review Meeting, some Contracting Parties described that they had undertaken additional actions in relation to emergency preparedness considering the impact of a possible radiological release in light of the situation in Ukraine due to the armed conflict. Some Contracting Parties have recognized the challenge of protecting nuclear installations and associated safety related infrastructure from armed attacks against a nuclear installation devoted to peaceful purposes.
3. In addition, some Contracting Parties are reviewing and/or updating emergency preparedness and response arrangements particularly on transboundary impacts to address the consequences of a potential nuclear accident at nuclear installations in light of the situation in Ukraine due to the armed conflict. Some Contracting Parties are actively monitoring the situation and providing information to the public and media.