IV. Attacks on nuclear installations in Ukraine and the response missions of the International Atomic Energy Agency

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Ukraine has 15 operable nuclear reactors at four nuclear power plants (NPPs). In 2023 all four NPPs, as well as other nuclear installations, were subject to disruptions cause by either direct military attacks or by attacks (e.g. missile strikes) elsewhere in the Ukrainian electricity grid. Zaporizhzhia NPP (ZNPP)—the largest in Europe—continued to be occupied by Russian military forces. In addition, a large artificial body of water used by ZNPP as a source of cooling water—the Kakhovka Reservoir—ceased to exist after an explosion demolished the Kakhovka Dam in June 2023. This event caused significant environmental, social and economic damage to the region, as well as presenting yet another nuclear safety risk to the already severely impaired nuclear power plant. Attacks, disruptions and territory annexation by Russia continued to present extraordinary nuclear safety, security and safeguards challenges for the personnel of the Ukrainian facilities, for the state authorities and for the International Atomic Energy Agency (IAEA).[1]

This section first reviews the attacks on and other challenges faced by Ukrainian nuclear installations in 2023. It then describes the regulatory proposals, response missions and other measures undertaken by the IAEA to respond to the extraordinary risks to nuclear safety and security in Ukraine.

Events at Ukrainian nuclear installations in 2023

Attacks on nuclear installations in Ukraine and other events that endangered the nuclear safety of Ukrainian reactors continued in 2023 (see table 8.1). A large fraction of the reported disruptions was caused by disturbances not at the nuclear power plants themselves, but in the Ukrainian electricity grid, which was frequently attacked by Russian forces. An uninterrupted ability of NPPs to receive electricity from the grid is important for nuclear safety for two reasons.[2] First, unlike other power sources, NPPs require a significant amount of cooling even after shutdown. Immediately after shutdown, the nuclear fuel in a reactor of the size of those installed at Zaporizhzhia NPP continues to produce about 200 megawatts (MW) of energy from residual

[1] For a brief description and list of member states of the IAEA see annex B, section I, in this volume. On the Russia–Ukraine war see also chapter 1, chapter 2, section I, and chapter 10, sections II and III, in this volume.

[2] IAEA, *Electric Grid Reliability and Interface with Nuclear Power Plants*, IAEA Nuclear Energy Series no. NG-T-3.8 (IAEA: Vienna, 2012), pp. 8–9.

Table 8.1. Attacks on nuclear facilities in Ukraine and other significant disturbances, 2023[a]

Facility	Date	Type of attack or disturbance
Chornobyl NPP		
Six reactor units (units 1–3 shut down; unit 4 partially destroyed in the 26 Apr. 1986 nuclear accident; units 5–6 never commissioned) Two spent fuel interim storage facilities (ISF-1 and ISF-2) Multiple radioactive waste-management and disposal facilities at the NPP site and in the wider Chornobyl exclusion zone	9 Mar.	Disturbance in electricity grid causes disruption in power received from the grid
Khmelnytsky NPP		
Two operational reactor units (each 950 MW(e)) Two reactor units under construction	14 Jan. 9 Mar. 25 Oct.	Missile attacks on electricity grid force preventive reduction in power output Disturbance in electricity grid forces preventive reduction in power output Explosions in the vicinity of the NPP cause minor damage at the NPP site and cut off power to off-site radiation-monitoring stations
Rivne NPP		
Four operational reactor units (two of 950 MW(e) each, one of 381 MW(e) and one of 376 MW(e))	14 Jan. 9 Mar.	Missile attacks on electricity grid force preventive reduction in power output Disturbance in electricity grid forces preventive reduction in power output
South Ukraine NPP		
Three operational reactor units (each 950 MW(e))	14 Jan. 1 Mar. 9 Mar. 22 May 2 June	Missile attacks on electricity grid force preventive reduction in power output Disturbance in electricity grid forces preventive reduction in power output Disturbance in electricity grid forces preventive reduction in power output; cruise missile overflight and shelling in the vicinity Disturbance in electricity grid causes emergency shutdown Disturbance in electricity grid causes emergency shutdown
Zaporizhzhia NPP[b]		
Six reactor units (each 950MW(e)), shut down since Sep. 2022	7 Jan. 26 Jan. 9 Mar. 8 Apr. 22 May	A 330 kV back-up power line repaired after damage due to shelling on 29 Dec. 2022 Explosions in the vicinity, no damage to the site Complete loss of external power for 11 hours due to disturbance in electricity grid Explosions outside the NPP perimeter Complete loss of external power for 5 hours due to power line cut

Facility	Date	Type of attack or disturbance
Zaporizhzhia NPP (cont.)		
	6 June	Water levels in the reservoir that provides cooling for the NPP falls following breach of the Kakhovka Dam
	3 July	Main 750 kV external power line to the NPP cut off (restored on 5 July)
	15 Nov.	Unit 6 experiences a 90-minute power outage that necessitates the use of an emergency diesel generator to provide the electricity needed for cooling and other vital functions
	26 Nov.	Rocket and artillery fire in the vicinity; main 750 kV external power line to ZNPP cut off (restored on 28 Nov.)
	29 Nov.	External power cut off (restored on 2 Dec.)
Kyiv Institute for Nuclear Research		
WWR-M research reactor	14 Jan.	Fire on the premises caused by an air attack

NPP = Nuclear Power Plant; kV = kilovolt; MW(e) = megawatt-electric.

[a] For a summary of attacks on Ukrainian nuclear installations in 2022 see Fedchenko, V., 'Nuclear security during armed conflict: lessons from Ukraine', SIPRI Research Policy Paper, Mar. 2023, p. 2.

[b] The International Atomic Energy Agency (IAEA) continues to regard Zaporizhzhia NPP as a Ukrainian plant in line with United Nations General Assembly Resolution ES-11/4, 'Territorial integrity of Ukraine: Defending the principles of the Charter of the United Nations', 12 Oct. 2022.

Sources: IAEA, *Nuclear Safety, Security and Safeguards in Ukraine: February 2022–February 2023* (IAEA: Vienna, Feb. 2023); IAEA, Board of Governors, 'Nuclear safety, security and safeguards in Ukraine', Reports by the director general, GOV/2023/30, 31 May 2023, GOV/2023/44, 5 Sep. 2023, and GOV/2023/59, 16 Nov. 2023; and Organisation for Economic Co-operation and Development (OECD), Nuclear Energy Agency (NEA), 'Ukraine: Current status of nuclear power installations', 22 Dec. 2023.

decay heat.[3] That figure drops rapidly, but the necessity for reactor cooling remains for months. Second, nuclear power reactors are not designed for frequent sudden changes in power output, which cause strain on the nuclear fuel rods and the reactor itself.[4]

ZNPP obtained its cooling water from the neighbouring Kakhovka Reservoir. This also served as its 'ultimate heat sink'—defined by the IAEA as 'a medium into which the transferred residual heat can always be accepted, even if all other means of removing the heat have been lost or are insufficient'.[5] The reservoir lay behind the Kakhovka Dam further down the Dnieper River in Kherson oblast. As well as cooling ZNPP, the dam and the reservoir, which

[3] Schnieder, M. et al., *World Nuclear Industry: Status Report 2022* (Mycle Schneider Consulting: Paris, Oct. 2022), p. 245.

[4] IAEA (note 2), p. 9.

[5] IAEA, *Design of the Reactor Coolant System and Associated Systems for Nuclear Power Plants, Specific Safety Guide*, IAEA Safety Standards Series no. SSG-56 (IAEA: Vienna, 2020), p. 5.

were completed in 1956 in what was at the time the Soviet Union, provided water for hydroelectric power generation, irrigation and navigation.

The Kakhovka Dam was destroyed on 6 June 2023 by a large explosion.[6] In addition to flooding at least 40 settlements downstream, which affected more than 16 000 people and massively disrupted farming and fisheries, the breach of the dam caused environmental, social and economic damage to the whole of Ukraine and into the Black Sea—described as 'a real ecocide' and a 'humanitarian catastrophe'.[7] It also affected the nuclear safety of ZNPP amid an already precarious situation.[8]

The loss of the ultimate heat sink can potentially lead to consequences like those that took place during the Fukushima Daiichi nuclear accident in 2011.[9] ZNPP was able to mitigate the lack of cooling water in the short and medium terms by using water sources available on site and by building multiple groundwater wells. The Konka River, which used to contribute to the Kakhovka Reservoir before destruction of the dam, now runs alongside the ZNPP site and can be used as an additional source of water.[10] The IAEA concluded in September 2023 that 'the abundant supplies of water will remain sufficient for many months' for ZNPP cooling purposes.[11] A long-term solution for this problem remains to be found.

The IAEA's legal and regulatory response to attacks on nuclear installations in Ukraine

The IAEA—including its policymaking organs (the General Conference and the Board of Governors) and the IAEA Secretariat headed by the director general—does not recognize Russian ownership of ZNPP.[12] This is a unique situation for the IAEA. The IAEA Secretariat has continued to treat ZNPP as a Ukrainian plant in all its work on nuclear safety, security and safeguards even though the Russian nuclear regulator, Rostechnadzor, has established

[6] Glanz, J., Santora, M. and Pérez-Peña, R., 'Internal blast probably breached Ukraine dam, experts say (cautiously)', *New York Times*, 6 June 2023; and Borger, J. and Sauer, P., 'Seismic data adds to evidence Ukraine's Kakhovka dam was blown up', *The Guardian*, 9 June 2023.

[7] Schaubenberg, T., 'Ukraine: Destroyed Kakhovka dam amounts to "ecocide"', Deutsche Welle, 7 June 2023.

[8] IAEA, 'Update 162—IAEA director general statement on situation in Ukraine', Press Release 52/2023, 7 June 2023.

[9] IAEA, *The Fukushima Daiichi Accident*, Technical vol. 1/5, *Description and Context of the Accident* (IAEA: Vienna, Aug. 2015), pp. 2–32.

[10] Rzheutska, L., [ZNPP without water from the Kakhovka Reservoir: What can be expected?], Deutsche Welle, 13 June 2023 (in Ukrainian).

[11] IAEA, Board of Governors, 'Nuclear safety, security and safeguards in Ukraine', Report by the director general, GOV/2023/44, 5 Sep. 2023, para. 39.

[12] On earlier developments see Fedchenko, V., Maksymenko, I. and Sinovets, P., 'Attacks on nuclear installations in Ukraine and the response missions of the International Atomic Energy Agency', *SIPRI Yearbook 2023*.

a constant presence at ZNPP and in 2023 conducted multiple inspections of the plant, including some with the presence of the IAEA.[13]

The General Conference reinforced the IAEA's position in a resolution on nuclear safety, security and safeguards in Ukraine adopted on 28 September 2023.[14] This resolution recognizes ZNPP as belonging to Ukraine—referencing earlier resolutions by the Board and by the United Nations General Assembly[15]—and calls for the urgent withdrawal of military and other unauthorized personnel from the plant and for it to be immediately returned to Ukraine. In addition, the General Conference resolution provides political support for IAEA's response to the armed conflict in Ukraine: it endorses the continuous presence of IAEA personnel at the Ukrainian nuclear power plants and the IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources in Ukraine (ISAMRAD), as well as the provision of equipment and other technical support by IAEA member states to Ukraine through the IAEA.

Seven pillars and five principles

On 2 March 2022 the IAEA director general, Rafael Grossi, put forward the conceptual framework of 'seven indispensable pillars of nuclear safety and security': physical integrity of the facilities; functioning of the nuclear safety and security systems and equipment; autonomy of operating staff; security of off-site power supply; uninterrupted logistical supply chains; effective radiation monitoring and emergency preparedness and response; and reliable communications with the regulator.[16] The IAEA developed this set of principles quickly to deal with the consequences of attacks on nuclear installations in Ukraine with the aim of maintaining three main safety functions—containment, control and cooling—in the context of an armed conflict. In 2023 the IAEA widely applied the concept of the seven pillars as a benchmark in monitoring and assessing the nuclear safety and nuclear security situations at all of Ukraine's nuclear facilities, with a particular focus on nuclear power plants.[17] However, the IAEA also emphasized that

[13] On ZNPP oversight see Kovchegin, D., 'Russia attempts to normalize the operation of Ukrainian nuclear and radiation facilities under Russian control', VA/EE, Substack, 2 Feb. 2024.

[14] IAEA, General Conference, 'Nuclear safety, security and safeguards in Ukraine', Resolution GC(67)/RES/16, 28 Sep. 2023.

[15] UN General Assembly Resolution ES-11/4, 'Territorial integrity of Ukraine: Defending the principles of the Charter of the United Nation', 12 Oct. 2022; and IAEA, Board of Governors, 'The safety, security and safeguards implications of the situation in Ukraine', Resolution GOV/2022/71, 17 Nov. 2022.

[16] Grossi, R. M., IAEA director general, Introductory statement to the IAEA Board of Governors, 2 Mar. 2022. See also Fedchenko et al. (note 12), pp. 385–86; and, for a discussion of the framework and its context, Fedchenko, V., *Nuclear Security during Armed Conflict: Lessons from Ukraine* (SIPRI, Stockholm: Mar. 2023), pp. 8–11.

[17] IAEA, *Nuclear Safety, Security and Safeguards in Ukraine: February 2022–February 2023* (IAEA: Vienna, Feb. 2023), pp. 10, 14, 19.

the seven pillars were specially derived for unprecedented circumstances in Ukraine from the existing IAEA nuclear safety standards and nuclear security guidance documents, and as such do not represent new guidance.[18]

The broad diplomatic effort launched by Grossi in 2022 that aimed at establishing a nuclear safety and security protection zone around ZNPP continued into 2023 but still did not yield any result. The original idea of the zone reportedly included 'a ban on heavy weapons at the plant and a cease-fire zone within a specifically defined radius', and then later shifted into a 'verifiable commitment . . . not to attack the plant'.[19] It became clear by early 2023 that neither Russia nor Ukraine was prepared to agree to establishing such a zone.[20] Although both states agreed with the idea in principle, they could not agree on specific details, such as the area of the zone and whether military equipment could be allowed within it.[21]

Instead of continuing to push for the protection zone, on 30 May 2023 Grossi informed the UN Security Council of a new approach. The IAEA had been working with both Russia and Ukraine on more specific application of the seven pillars framework to the task of prevention of any dangerous release of radioactive material from ZNPP or of a nuclear incident there. As a result of this work, Grossi put forward the following five concrete principles for application at ZNPP.

1. 'There should be no attack of any kind from or against the plant, in particular targeting the reactors, spent fuel storage, other critical infrastructure or personnel.'
2. ZNPP 'should not be used as storage or a base for heavy weapons' (e.g. multiple rocket launchers, artillery systems and munitions, and tanks) or 'military personnel that could be used for an attack from the plant'.
3. 'Off-site power to the plant should not be put at risk. To that effect, all efforts should be made to ensure that off-site power remains available and secure at all times.'
4. 'All structures, systems and components essential to the safe and secure operation of ZNPP should be protected from attacks or acts of sabotage.'
5. 'No action should be taken that undermines these principles.'[22]

Grossi went on to announce that the IAEA staff present as part of the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ) were tasked with monitoring and reporting on the observance of these principles.

[18] IAEA, GOV/2023/44 (note 11).
[19] Liechtenstein, S. and Hudson, J., 'IAEA chief pushes plan to secure nuclear plant ahead of Ukraine offensive', *Washington Post*, 22 May 2023; and Grossi, R. M, Paul C. Warnke lecture on international security, Council on Foreign Relations, 22 Mar. 2023.
[20] Liechtenstein and Hudson (note 19); and Grossi (note 19).
[21] 'Differences over Zaporizhzhia safety zone prospects', World Nuclear News, 7 Mar. 2023.
[22] United Nations, Security Council, Record of 9334th meeting, S/PV.9334, 30 May 2023, Statement by R. M. Grossi, IAEA director general, pp. 2–3.

The five principles received wide international support, including from all members of the Group of Seven (G7) large economies, the European Union (EU) member states and China.[23] However, neither Russia nor Ukraine explicitly committed to the five principles or rejected them. The Ukrainian ambassador to the UN called for the principles to be complemented with 'the withdrawal of troops and all other Russian personnel illegally present at the station', as well as 'guarantees of uninterrupted power supply to the power plant from the territory under the control of the Government of Ukraine' and 'a humanitarian corridor to ensure the rotation of management, operational and repair personnel' of ZNPP.[24] Russia's UN ambassador stated that the five principles are in line with Russian policies.[25]

The IAEA director general stated that the five principles were not supported by a legal mechanism, but rather by a 'political commitment that was crystallised at the Security Council' meeting.[26] Thus, with the failure of the protected zone to gain acceptance, Grossi achieved more success—or, at least, no outright rejection—with a different, more behavioural approach to applying the seven pillars to the specific circumstances of ZNPP.

Long-term implications for nuclear safety and nuclear security

The IAEA has not only made short- and medium-term responses to nuclear safety and security challenges in Ukraine in terms of missions and provision of technical assistance. It has also initiated an analysis of challenges in the application of existing nuclear safety and security standards and guidance in armed conflicts for the long term.[27] In 2023 the IAEA expanded the scope of this analysis to all types of nuclear facility and activity and began a review of its major safety standards and security recommendations.[28] It also initiated drafting of an IAEA Technical Document discussing challenges in implementation of nuclear safety and security requirements at nuclear facilities during an armed conflict, using the experience of Ukraine since February 2022.[29] This process of drafting the text and incorporating member state comments is likely to take a few years.

[23] Group of Seven (G7), Foreign Ministers' Meeting, Statement, 19 Sep. 2023; EU Delegation to the International Organizations in Vienna, 'EU statement at IAEA Board of Governors on nuclear safety, security and safeguards in Ukraine', 7 June 2023; and United Nations, S/PV.9334 (note 22), Statement by Geng Shuang, Chinese ambassador to the UN, pp. 11–12. For lists of members of the G7 and the EU see annex B, sections I and II, in this volume.

[24] United Nations, S/PV.9334 (note 22), Statement by S. Kyslytsya, Ukrainian ambassador to the UN, pp. 15–16.

[25] United Nations, S/PV.9334 (note 22), Statement by V. Nebenzya, Russian ambassador to the UN, p. 6.

[26] 'Grossi reports on situation at Zaporizhia NPP', *Nuclear Engineering International*, 16 June 2023.

[27] On the lack of existing regulation on this issue see Fedchenko (note 16), p. 16.

[28] IAEA, Board of Governors, 'Nuclear safety, security and safeguards in Ukraine', Report by the director general, GOV/2023/30, 31 May 2023, annex I, para. 1.

[29] IAEA, GOV/2023/30 (note 28), annex I, para. 2.

The IAEA response and assistance missions to Ukraine

Safety and security of nuclear power plants

In 2022 the IAEA conducted several ad hoc support and assistance missions to Ukrainian nuclear power plants and other nuclear installations, some of which were headed by the director general himself. In connection with one of the missions—ISAMZ—the agency maintained a continuous presence of its staff at ZNPP from 1 September 2022. In December 2022 it agreed with the Ukrainian government to set up similar presences at all other Ukrainian NPPs.[30] These four missions were deployed to Chornobyl, Khmelnytsky, Rivne and South Ukraine NPPs between 16 and 23 January 2023.[31] The five teams, totalling up to 13 IAEA staff, were constantly present in Ukraine throughout 2023.

The purpose of all five support and assistance missions is to help decrease the risk of a nuclear accident. The IAEA teams meet with and interview NPP management and staff and observe key plant areas to understand the nuclear security and safety situations at the NPPs, as well as the requirements for provision of equipment and other technical assistance. The IAEA assesses the information collected by the teams and directly from the Ukrainian and Russian governments against the seven pillars concept. In 2023 all of the IAEA director general's quarterly reports to the Board of Governors on nuclear safety, security and safeguards in Ukraine contained updates on the situation at the NPPs according to each pillar.[32]

ZNPP—the most precarious of all Ukrainian nuclear power plants—is in a unique situation, making ISAMZ special. In addition to the tasks described above, this mission is also monitoring observance of the five concrete principles for protection of ZNPP, and it does so in especially difficult conditions.[33] ISAMZ reported lack of cooperation by the Russian authorities in terms of denial or long delays in proving access to crucial locations at the ZNPP site.[34] The IAEA has also reported concern with the level of staffing at the ZNPP, which at the end of 2023 was less than half of the 11 500 staff that worked there in 2021.[35] In 2023 Russia replaced ZNPP workers employed by Ukraine's national operator, Energoatom, with newly recruited personnel.[36]

[30] Fedchenko et al. (note 12), p. 387

[31] IAEA, Board of Governors, 'Nuclear safety, security and safeguards in Ukraine', Report by the director general, GOV/2023/59, 16 Nov. 2023, para. 14.

[32] IAEA, Board of Governors, 'Nuclear safety, security and safeguards in Ukraine', Report by the director general, GOV/2023/10, 22 Feb. 2023; IAEA, GOV/2023/30 (note 28); IAEA, GOV/2023/59 (note 31); and IAEA, GOV/2023/44 (note 11).

[33] IAEA, GOV/2023/44 (note 11), paras 11–12.

[34] IAEA, GOV/2023/59 (note 31), paras 7, 9.

[35] IAEA, GOV/2023/59 (note 31), paras 47–48.

[36] 'Energoatom staff banned from ZNPP', Modern Power Systems, 6 Feb. 2024.

Recovery and security of radioactive sources

On 28 April 2023 the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) requested the IAEA's assistance in improving security and radiation safety of radioactive sources in Ukraine. This led to the creation of the IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources in Ukraine.[37] Between 23 July and 1 August 2023 ISAMRAD conducted a fact-finding mission to assess the risks and needs associated with radioactive sources in Ukraine. It focused on search for and recovery of orphan radioactive sources, detection of and response to nuclear and other radioactive materials out of regulatory control, and transport and storage of radioactive sources.

The SNRIU is implementing a strategic plan for searching for and securing orphan radioactive sources in Ukraine, including in de-occupied territories.[38] The IAEA plans to assist the SNRIU in implementation of this plan, particularly focusing on high-activity radioactive sources in categories 1–3 (extremely dangerous, very dangerous and dangerous to the person).[39] Meanwhile, Rostechnadzor started working with organizations using radioactive sources in the occupied east of Ukraine.[40]

Medical missions

In February and March 2023 the IAEA assessed medical services and capabilities of the three operating Ukrainian NPPs and the Chornobyl NPP site and nearby hospitals. It found a need for assistance in a number of areas, in part because the medical services there were designed for peacetime.[41]

On 26 April Ukrainian President Volodymyr Zelensky and the IAEA director general discussed the health implications of the harsh conditions that have to be endured by operating personnel at all nuclear installations in Ukraine in the context of an active armed conflict.[42] They agreed to deploy a new IAEA programme of medical assistance for operating personnel at the Ukrainian NPPs that would aim to ensure sufficient support to maintain the physical and mental health of staff, and therefore that they remain fit for duty in the conditions of the armed conflict. Such a medical assistance programme would therefore contribute to one of the seven pillars: that the 'operating staff must be able to fulfil their safety and security duties'.[43]

[37] IAEA, GOV/2023/44 (note 11), paras 25–27, 100–103.

[38] IAEA, GOV/2023/44 (note 11), para. 102.

[39] IAEA, GOV/2023/59 (note 31), para. 119. On the 5 categories of sealed radioactive sources see IAEA, *Categorization of Radioactive Sources*, Safety Guide no. RS-G-1.9 (IAEA: Vienna, 2005), pp. 30–33.

[40] Kovchegin (note 13).

[41] IAEA, GOV/2023/44 (note 11), paras 104–108.

[42] IAEA, 'Update 155—IAEA director general statement on situation in Ukraine', Press release 36/2023, 28 Apr. 2023.

[43] Grossi (note 16).

The first assistance mission under this programme was conducted by the staff of the IAEA's medical service and the IAEA Department of Safeguards on 3–16 June 2023. It assessed health screening and surveillance capabilities at Khmelnytsky, Rivne and South Ukraine NPPs and observed the challenges faced by the medical services of NPPs in providing continued physical and mental health support and care for their operating personnel during armed conflict. The mission also identified the types, scope and priority levels of assistance that needed to be provided by the IAEA. The IAEA estimated the total cost of the required medical assistance to be about €15 million ($16.2 million).[44]

The second medical and coordination assistance mission took place on 6–10 November 2023, focusing on the Chornobyl NPP site and health facilities in the nearby town of Slavutych. Based on its findings, the IAEA focused on increasing mental health support capabilities at all operating Ukrainian NPPs and the Chornobyl site, particularly in terms of helping staff there to address the topics of trauma, post-traumatic stress disorder and living with the armed conflict.[45]

The IAEA Support and Assistance Mission to the Kherson Oblast

On 9 June 2023, three days after the destruction of the Kakhovka Dam, the IAEA director general announced a new programme of assistance to Ukraine to use nuclear techniques in managing the consequences for Kherson oblast of the dam's destruction and subsequent flooding. An IAEA proposal for the IAEA Support and Assistance Mission to the Kherson Oblast (ISAMKO) was presented to and approved by the president of Ukraine on 13 June 2023.[46]

The IAEA proposed to procure and deliver equipment, technical advice and training to contribute to integrity assessment of civilian infrastructure, safety of potable water, human health and agriculture in the region. The total cost of this assistance was estimated to be about €9 million ($9.7 million).[47] Little progress had been made by the end of the year.

Conclusions

In 2023 most of the nuclear installations in Ukraine continued to be exposed to military attacks or their consequences. In comparison with 2022, they experienced fewer direct attacks, such as missile strikes or shelling, and less direct damage due to hostilities. Those types of attack still happened in 2023, alongside the continued occupation of Zaporizhzhia NPP, but most of

[44] IAEA, GOV/2023/44 (note 11), paras 21–23, 108.
[45] IAEA, GOV/2023/59 (note 31), paras 121–24.
[46] IAEA, GOV/2023/44 (note 11), paras 110–12.
[47] IAEA, 'IAEA director general statement on assistance to Ukraine', 9 June 2023; and IAEA, 2023/44 (note 11), paras 20, 81, 110–12.

the disturbances were caused by attacks on the Ukrainian electricity grid that necessitated sudden and frequent changes in power output or reactor shutdowns. The single largest event with nuclear safety consequences in 2023 was the destruction of the Kakhovka Dam, which necessitated urgent measures to secure sources of cooling water for the already impaired ZNPP.

The IAEA continued and expanded its assistance to Ukraine in 2023. It resolved the issue of the legal ownership of ZNPP after the annexation claim by Russia: building on a UN General Assembly resolution, both the IAEA Board of Governors and the General Conference have now adopted resolutions rejecting the annexation as illegal and confirming that ZNPP should be regarded as a Ukrainian plant in all of the IAEA's work on nuclear safety, security and safeguards.

The IAEA's assistance to Ukraine took shape in terms of both administrative mechanisms and conceptual planning. In terms of specific nuclear safety and security measures, the IAEA established a constant staff presence at all Ukrainian nuclear power plants, including ZNPP. This is an unprecedented deployment of IAEA resources aimed at ensuring nuclear safety and security in Ukraine. In addition, the IAEA launched a programme of physical and mental health assistance for operating personnel at the Ukrainian NPPs, and proposed a separate mission to help assess the integrity of civilian infrastructure, the safety of potable water and human health and agriculture in Kherson oblast after the destruction of the Kakhovka Dam. A separate IAEA programme is aimed at recovery of radioactive sources that fell out of regulatory control, which is a particularly pertinent problem in the Black Sea region in general and in Ukraine in particular, driven by the existence of occupied or otherwise disputed territories in the region.[48]

Because of the particularly precarious situation at ZNPP, the IAEA director general applied the earlier conceptual framework of 'seven indispensable pillars of nuclear safety and security' by formulating five concrete principles to help ensure nuclear safety and security at ZNPP in order to prevent a nuclear accident and ensure the integrity of the plant. The five principles approach came as a replacement for the unsuccessful proposal for a nuclear safety and security protection zone around ZNPP. While not legally binding or as robust as a formal agreement on the protection zone could have been, the principles are nevertheless expected to be useful for implementation of the seven pillars concept at the ZNPP site. The ISAMZ personnel monitor observance of these five principles and report to the IAEA.

[48] Fedchenko, V. and Anthony, I., *Nuclear Security in the Black Sea Region: Contested Spaces, National Capacities and Multinational Potential*, SIPRI Policy Paper no. 49 (SIPRI: Stockholm, Dec. 2018).