NUCLEAR SAFETY, SECURITY AND SAFEGUARDS IN UKRAINE

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IAEA
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Foreword

One year has passed since the beginning of the war in Ukraine, marking the first time in history that a war is being fought amid the facilities of a major nuclear power programme.

In the past year, several of Ukraine's five nuclear power plants and other facilities have come under direct shelling. Every single one of the IAEA's crucial seven indispensable pillars for ensuring nuclear safety and security in an armed conflict has been compromised, including the physical integrity of nuclear facilities; the operation of safety and security systems; the working conditions of staff; supply chains, communication channels, radiation monitoring and emergency arrangements; and the crucial off-site power supply. Two of Ukraine's nuclear power plants came under Russian control. The Chornobyl nuclear power plant (NPP) and its Exclusion Zone — the site of the 1986 nuclear accident — were under Russian control for five weeks between 24 February and 31 March 2022. Zaporizhzhya NPP, which Russian troops entered on 4 March 2022, remains under Russian control.

The IAEA has been closely monitoring the situation and assisting Ukraine every single day since the start of the war. This assistance has involved the continuous engagement of the IAEA's Incident and Emergency Centre; nine IAEA missions to Ukraine; the stationing of IAEA safety and security experts at every Ukrainian nuclear site, including Zaporizhzhya NPP on the front lines of the war; facilitating an international assistance package totalling over €7 million; and keeping the world informed of the situation at Ukraine's nuclear sites in more than 140 web updates, four reports and multiple briefings, including to the United Nations General Assembly and Security Council.

The IAEA is doing the important work of reducing the likelihood of a nuclear accident or incident in close cooperation with — and at the request of — the Ukrainian authorities.

The nuclear safety and security situation at the Zaporizhzhya NPP continues to be fragile and potentially dangerous. We are fortunate that a nuclear accident has not yet come to pass, and we must do everything in our power to minimize the chance that it does. Since returning from my first mission to the Zaporizhzhya NPP in September 2022, I have been urging all parties to swiftly implement a nuclear safety and security protection zone to reduce the risk of a nuclear accident at the Zaporizhzhya NPP. This proposal has found wide international support, and I continue my efforts in working with all parties to agree on the implementation of this vital precautionary measure.

While the international community is rightly focused on the precarious nuclear safety and security situation at the Zaporizhzhya NPP, we cannot forget Ukraine's other nuclear facilities. The complete and simultaneous loss of off-site power at all nuclear power plant sites in November 2022 shows the precariousness of the nuclear safety situation in Ukraine. In Kyiv in January 2023, I met with President Volodymyr Zelenskyy and Prime Minister Denys Shmyhal, at whose request I expanded the deployment of IAEA nuclear safety and security experts to all five Ukrainian nuclear power plant sites. Their presence allows us to provide the international community with reliable information on the safety and security situation at each site, while our experts assist the plants' technical staff with the numerous challenges they face in operation of nuclear facilities during wartime.

As this tragic war enters its second year, I want to reassure the people of Ukraine and the international community that they can count on the IAEA, and me as its Director General, to do everything possible within our remit to assist them and to avert the danger of a nuclear accident that could cause even more suffering where there is already far too much.

When we come to this time next year, I hope the hostilities will have ended and that I will be offering you insight into how the IAEA will help Ukraine rebuild what was lost and re-establish a sound and robust nuclear safety and security regime.

This report provides an overview of what the IAEA has done during an unprecedented war amid the facilities of a major nuclear power programme. I hope you will agree that, at this difficult time, the IAEA has rapidly stepped up and done everything within its mandate to assist Ukraine and to make a concrete difference.

Rafael Mariano Grossi
Director General, IAEA

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Introduction

On 24 February 2022, the International Atomic Energy Agency (IAEA), through its Incident and Emergency Centre (IEC), was notified by the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU), in its capacity as a national competent authority under the Convention on Early Notification of a Nuclear Accident, of the imposition of martial law on the territory of Ukraine and of an alert at the Chornobyl nuclear power plant (NPP). Since this information was received, the IAEA has activated the IEC and has taken all actions to fulfil its roles in responding to incidents and emergencies, including events with wide public and media interest and with potential or perceived radiological consequences for health, property or the environment.

The events of 24 February 2022 proved to be the start of a very difficult and challenging year with regard to the overall nuclear safety, security and safeguards situation in Ukraine. The IAEA and the international community faced for the first time a military conflict directly threatening the facilities of a large, established nuclear power programme. Throughout the year, there have been numerous events impacting the safe and secure operation of nuclear facilities and imposing difficult and demanding conditions in which Ukrainian staff need to fulfil their respective duties to maintain safe and secure operation of facilities and activities under their responsibilities.

This report aims to provide an overview of those events that have taken place since the start of the armed conflict and of the IAEA's response and activities. It also provides an overview of the nuclear safety, security and safeguards situation in Ukraine as known so far. It is based on information made available to and by the IAEA since the beginning of these unprecedented circumstances.

This report gives also an overview of relevant aspects of the implementation of safeguards under the current circumstances 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.

The IAEA's Incident and Emergency Centre: The global focal point for emergency preparedness and response to nuclear or radiological safety or security related incidents and emergencies, threats or events of media interest, including coordination of provision of international assistance, upon request.

Nuclear safety: The achievement of proper operating conditions, prevention of accidents and mitigation of accident consequences, resulting in protection of workers, the public and the environment from undue radiation risks.

Nuclear security: The prevention and detection of, and response to, criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities or associated activities.

Safeguards: Activities implemented on the basis of a safeguards agreement by which the IAEA verifies that a State is not diverting nuclear material to nuclear weapons or other nuclear explosive devices.

Ukraine's nuclear programme

Ukraine's civil nuclear fleet consists of four operational electrical generation NPPs, Khmelnytskyy (KNPP), Rivne (RNPP), South Ukraine (SUNPP) and Zaporizhzhya (ZNPP), which are operated by the National Nuclear Energy Generating Company "Energoatom" and consist of water cooled, water moderated (VVER) type of reactors.

In addition, the Chornobyl NPP (ChNPP) in Ukraine, operated by the State Specialized Enterprise Chornobyl NPP, consists of high-power channel-type reactors (RBMKs). The site also hosts a wet spent fuel storage facility (ISF-1) and a dry spent fuel storage facility (ISF-2).

Furthermore, the Kharkov Institute of Physics and Technology (KIPT) Neutron Source installation in Kharkiv and the research reactor at the Institute for Nuclear Research in Kyiv use and store nuclear material. At the beginning of the armed conflict, which started with the Russian invasion of Ukraine on 24 February 2022, KIPT was put into a deep subcritical state, while the fuel of the research reactor in Kyiv was unloaded and stored in a spent fuel storage facility at the site.

Ukraine also has a number of facilities in which radioactive sources are used. Such facilities are located across the country, including in major cities such as Dnipro, Kharkiv, Kyiv, Odesa and Lviv, where the RADON facilities specialized in the management of radioactive waste originating from the use of radiation sources in medicine, science and different industries in Ukraine are located.

All facilities and activities are regulated by the SNRIU. However, the armed conflict has created challenges for the management and the regulatory control of the ZNPP. On 12 October 2022, the United Nations General Assembly adopted Resolution A/RES/ES-11/47 with reference to the Russian Federation's attempted illegal annexation of four regions of Ukraine on 4 October 2022, declaring that it had no validity under international law, and the IAEA complies with this resolution.

Further to the attempted illegal annexation, an increasing number of Russian technical staff from the State Atomic Energy Corporation "Rosatom" and the Concern for Production of Electric and Thermal Energy at Nuclear Power Plants (Rosenergoatom) has been observed at the site. In October 2022, the Russian Federation announced it had established the Moscow-based Russian State-run Joint Stock Company (JSC) "Operating Organization of the ZNPP", claiming to have taken operational control over the plant from Energoatom. At the same time, the Russian Federation's nuclear regulator, the Federal Environmental, Industrial and Nuclear Supervision Service (Rostechnadzor), arrived at the site. Despite these changes, Ukrainian plant staff continue to operate the ZNPP, which the IAEA — in line with United Nations General Assembly resolution A/RES/ES-11/4 — continues to regard as a Ukrainian plant.

SUNPP has three reactors (each of 950 MW(e)), connected to the grid between 1982 and 1989.

KhNPP has two reactors (each of 950 MW(e)), connected to the grid between 1987 and 2004.

RNPP has four reactors (two of 950 MW(e) each, one of 381 MW(e), and one of 376 MW(e)), connected to the grid between 1980 and 2004.

ZNPP has six reactors (each of 950 MW(e)), connected to the grid between 1984 and 1995.

ChNPP has four reactors that have been shut down for decommissioning (Units 1 to 3), with Unit 4 severely damaged during the nuclear accident in 1986 and subsequently confined.

View the United Nations General Assembly resolution A/RES/ES-11/4 here:

Nuclear safety and security in Ukraine

Reported events to date

On 24 February 2022, an alert was declared at the ChNPP following the Russian invasion of the site, and the IAEA was informed. Shortly following the Russian occupation of the ChNPP, on 4 March 2022, Ukraine informed the IAEA that Russian forces had taken control of the ZNPP. Since then, military activities on the territory of Ukraine have continued intensifying and threatening the safe and secure operation of the ZNPP, the ChNPP, and other facilities and activities in Ukraine. The following timeline captures major events that have taken place in Ukraine in chronological order.

24 February

Ukraine informed the IAEA that Russian forces had taken control of all facilities at the ChNPP site. The connection of the radiation monitoring network with the IAEA's International Radiation Monitoring Information System (IRMIS) stopped functioning.

26 February

ZNPP lost the South Donbass 750 kV external power line. Prior to the conflict, ZNPP received offsite power from four external 750 kV power lines: South Donbass, Zaporozhska, Kakhovska, and Dniprovska.

4 March

Ukraine informed the IAEA that Russian forces had taken control of the ZNPP site. Ukraine reported that the facility's training centre — located a few hundred metres from the reactor units — had been hit by a projectile and a localized fire had broken out that was later extinguished. Representatives of Rosatom arrived at the Zaporizhzhya NPP site a few days after the Russian military took control.

6 March

The KIPT Neutron Source installation in Kharkiv came under significant shelling. As a result, significant damage to the building structure, including loss of power, was reported.

6 March

ZNPP lost the Zaporozhska 750 kV external power line.

9 March

The ChNPP site lost all off-site electric power, which was later restored on 14 March. Diesel generators were used to power systems that are important to the safety of the facilities.

15 March

Ukraine informed the IAEA that the Russian military had detonated unexploded munitions left on the site of the ZNPP following the events of 4 March.

31 March

Russian forces withdrew from the ChNPP.

29 April

Russian nuclear specialists from Rosenergoatom arrived at the ZNPP. Ukraine informed the IAEA that personnel were "working under unbelievable pressure".

19 and 20 May

SNRIU reported that direct communication between the national regulator and the ChNPP had been restored but that destroyed bridges and mine hazards continued to prevent the regulator from inspecting the ChNPP.

6 June

Local radiation monitoring stations in the ChNPP Exclusion Zone, the automated collection of radiation measurements and the radiation monitoring network's connection with the IAEA's IRMIS were re-established.

25 June

The KIPT facility was damaged by shelling. Damage to the facility infrastructure, including to the cooling system and to the diesel generator building, was reported; however, measurements showed no increase in radiation.

22 July

The IAEA reported that Ukrainian ZNPP staff faced increasingly difficult and stressful conditions.

5–7 August

The ZNPP was targeted in severe shelling. Ukraine reported:

- Several explosions near the electrical switchboard caused the shutdown of the electrical power transformer and two backup transformers.
- One reactor unit was affected. The emergency protection system of the affected unit was triggered, and diesel generators were put into operation to ensure the power supply for this unit.
- Fire at the nitrogen–oxygen station, quickly extinguished by firefighters.
- The injury of a staff member working in the area of the dry spent nuclear fuel storage facility.
- Damaged walls, a roof and windows in the area of the spent fuel storage facility, as well as communication cables that were part of its radiation control system, with a possible impact on the functioning of three radiation detection sensors.

The IAEA team observes the damage caused by shelling on the roof of the special building at the ZNPP that houses, among other items, the fresh nuclear fuel and the solid radioactive waste storage facility. (Photo: IAEA)

6 August

Ukraine reported that ZNPP staff had restricted access to the ZNPP on-site emergency crisis centre and that there had been very limited communication between the ZNPP and SNRIU.

7 August

The Kakhovska 750 kV power line providing offsite power to ZNPP is disconnected.

11 August

A new episode of shelling occurred, damaging one radiation monitoring detector at the ZNPP's fire station (approximately 500 metres from the industrial site).

20 and 21 August

Shelling damaged the ZNPP infrastructure, including walkways used by ZNPP staff to access the power units, as well as laboratory and chemical facilities.

25 August

Ukraine reported that the ZNPP had temporarily lost the power provided by the Dniprovska 750 kV power line, its last remaining operational external 750 kV power line. In the course of the day, the ZNPP lost power from the Dniprovska 750 kV power line at least twice. The power line was subsequently restored. During the power outages, the ZNPP remained connected to a 330 kV backup line from the nearby thermal power plant switchyard to provide backup electricity when needed. Ukraine also informed the IAEA that, as a result of the cuts in power delivered by the Dniprovska 750 kV power line, the ZNPP's two operating reactor units had been disconnected from the electricity grid and their emergency protection systems triggered, while all safety systems remained operational. All six units remained disconnected from the grid even after the power line was restored.

26 August

ZNPP staff began connecting Units 5 and 6 to the power grid of the Ukrainian energy system.

3 September

Ukraine reported that, as a result of shelling on 2 September, the Dniprovska 750 kV power line was unavailable, but the 330 kV backup line still remained. ZNPP Units 5 and 6 were consequently reduced to 500 MW so as not to overload the electrical grid.

4 September

Ukraine reported further shelling impacting the top of ZNPP special building 1 that houses, among other items, the fresh nuclear fuel and the solid radioactive waste storage facility (see photo), the railway and road in front of reactor building 2, and an elevated walkway for personnel between buildings 2 and 3.

6 September

One of the internal backup power lines was damaged due to shelling; the ZNPP switchyard was also damaged. Their repair required the disconnection of the site from external power and all units needed to be shut down.

10 September

Following the repair works, the backup power lines were reconnected to the ZNPP.

11 September

The last operating unit — Unit 6 of ZNPP — was shut down.

16 September

The Dniprovska 750 kV power line was reconnected to the ZNPP.

19 September

An explosion took place around 300 metres from the SUNPP, affecting some 150 kV backup power lines.

21 September

Shelling in the area of the spray cooling ponds for ZNPP Units 5 and 6, damaged one pipe and put the sprays out of service. Additionally, some shelling damaged the internal high voltage power line for Unit 6, which caused its diesel generators to start, before it was switched to a backup power line.

27, 28 and 29 September

Mine explosions near Units 2 and 3 caused broken windows at the ZNPP turbine hall of Unit 2, near the water intake channel and near the dry spent fuel storage facility.

30 September

The ZNPP Director General was detained by the Russian authorities. He was released on 3 October.

7 October

Some internal backup power lines providing power to ZNPP Unit 6 were damaged, which caused the unit's diesel generators to start before it was supplied with power from the other units.

8 October

The Dniprovska 750 kV power line was damaged and the ZNPP lost once again its external high voltage power supply, causing the diesel generators of all units to start.

(continued)

9 October

The repairs to the external power line, Dniprovska 750 kV, were completed, and the external power supply at ZNPP was restored.

11 October

The ZNPP Deputy Director General for Personnel was detained. He was released on 17 October.

16 October

IAEA staff learns at the site that a Moscow-based Russian State-run operating organization was created for the ZNPP, and the Russian Federation announced it had taken control of the facility and was now taking significant operational decisions.

17 October

The ZNPP Dniprovska 750 kV power line was disconnected due to a problem at a distant substation and was reconnected later that day.

19 October

The main ZNPP internal backup power line was lost due to shelling at a switchyard of the thermal power plant.

30 October

A mine explosion damaged the internal high voltage power supply to ZNPP Unit 4, and the unit was switched to backup power lines.

2 November

Shelling led to the Dniprovska 750 kV and 330 kV backup overhead lines being disconnected, and emergency diesel generators (EDGs) being started. Units 5 and 6 of the ZNPP were transferred to a cold shutdown mode.

2 November

When the ZNPP's main external Dniprovska 750 kV power line was disconnected following shelling on 2 November, SUNPP also lost its connection to the same 750 kV power line, one of three 750 kV lines used by the SUNPP to provide power to the grid, prompting the site to reduce the power of one of its three operating reactors by 50%. The Dniprovska 750 kV power line was repaired on 4 November. By 8 November, SUNPP's three operating reactors were at full power.

5 November

The external power lines were repaired and re-connected to the ZNPP switchyard, allowing the site to receive off-site power and to stop its EDGs.

12 November

A convoy of 24 trucks with supplies and spare parts arrived on ZNPP site from Zaporizhzhya city.

In November, a proposal by the Ukrainian operating staff to start operating reactor Unit 6 at low power to provide more steam, while still not producing electricity, was approved by Energoatom and SNRIU but ROSATOM did not grant permission stating that this was owing to the site's unreliable connection to the power grid.

14 November

IAEA learned at the site that that a Russian contractor had been undertaking modifications to the ZNPP physical protection system of the plant's dry spent fuel storage facility that had not been authorized by the SNRIU.

15 November

IAEA staff observed for the first time the concrete blocks installed at the ZNPP Unit 6 building, where the EDGs are located.

15 November

Missile attacks damaged Ukraine's electrical grid; in consequence KhNPP lost off-site power and the plants' EDGs were started to provide emergency power.

19 November

Shelling hit the spray cooling ponds and the guardhouse at ZNPP. Operation was not impacted.

Wall of the Unit 4 reactor building at ZNPP after the shelling on 19–20 November 2022. (Photo: IAEA)

20 November

Shelling hit the general area of ZNPP Units 4 (see photo), causing damage to condensate tanks, roads, railway tracks and an overpass. The roof of special building 2 was also hit, although the fresh nuclear fuel stored inside was not damaged. One of the EDGs was taken offline when its connection to the units was damaged by shelling; this connection was restored a few days later.

23 November

Both the 330 kV backup and the Dniprovska 750 kV electrical power lines were de-energized due to damage to the Ukrainian grid. Off-site power at the ZNPP was lost and the EDGs started to operate.

24 November

A total of four trucks delivering diesel fuel arrived at the site. Both the 330 kV backup and the Dniprovska 750 kV power lines were re-energized and ZNPP recovers off-site power. The EDGs were in operation for approximately 20 hours.

23 and 24 November

For the first time, all NPPs in Ukraine lose external power at — the ZNPP, the RNPP, the SUNPP, the KhNPP and the ChNPP — lost access to external power supply at the same time and relied on EDGs for reactor cooling and other essential nuclear safety and security functions. In response to the decrease in the grid's frequency, all power units at the RNPP, the SUNPP and the KhNPP were automatically disconnected from the power grid as a safety measure.

25 November

All NPPs had regained external power.

29 November

The first mobile diesel boiler arrived at the ZNPP site. Additional boilers arrived in the following days and began operation.

30 November

ZNPP's Chief Engineer informed IAEA staff that he had signed a contract with Rosatom and was named plant Director.

9 December

The ZNPP Director informed IAEA staff that damage from the shelling in November that constituted a safety concern had been repaired.

13 December

The ZNPP 330 kV backup power line was de-energized and re-energized the next day.

16 December

Missile attacks damaged the Ukrainian electrical grid, forcing the NPPs to decrease their electrical power output.

20 December

IAEA staff learned about the Russian Federation's nuclear regulator Rosteknadzor establishing a continued presence at the ZNPP.

23 December

The construction of additional physical barriers in the area of the ZNPP dry spent fuel storage facility was completed.

29 December

Damage to the Ukrainian electrical grid from shelling caused the NPPs to decrease their electrical power output.

29 December

The 330 kV backup power line at the ZNPP was de-energized due to shelling in a distant location. It was restored on 6 January 2023.

31 December

Missile attacks damaged the Ukrainian electrical grid, forcing the NPPs to decrease their electrical power output.

1 January 2023 (onward)

The Russian rouble became the only currency accepted in areas under temporary military control of Russian Federation, while Energoatom salaries are paid in Ukrainian hryvnia.

10–11 January

The ZNPP 330 kV backup power line was de-energized for unknown reasons and re-energized.

14 January

Missile attacks on the Ukrainian electrical grid caused the NPPs to decrease their electrical power output as a precautionary measure.

14 January

An air attack caused a fire on the premises of the Institute for Nuclear Research in Kyiv, which houses a WWR-M research reactor.

18 January

IAEA staff learned that approximately one third of all ZNPP operational staff had departed since the beginning of the armed conflict.

19 January

The ZNPP 330 kV backup line was de-energized and re-energized some hours later.

21 January

Owing to the rise in ambient temperature and sufficient heating provided by the mobile diesel boilers, approximately one third of the steam generated by ZNPP Unit 6 was redirected from the district heating system for use by the chemical department to treat around 100 m3 of wastewater per day in special building 1.

26 January

IAEA staff reported the water level in the Kakhovka reservoir, which provides cooling water for the ZNPP, to be to be 14.6m.

6 February

The steam from ZNPP Unit 6 was diverted back to the district heating system in preparation for a forecast drop in ambient temperatures. Wastewater treatment was suspended until the temperatures permit resumption.

8 February

IAEA staff reported the water level in the Kakhovka reservoir to be 13.9 m.

15 February

IAEA staff reported the water level in the Kakhovka reservoir to be 13.98 m.

Known impacts to date

The events detailed in chronological order show concerning developments regarding nuclear safety and security in Ukraine in the year since the start of the armed conflict. For example, the ChNPP and the ZNPP experienced occupation by Russian forces. While Russian forces withdrew from the ChNPP in March 2022, they have progressively been taking control of the ZNPP. Shelling, air attacks, reduced staffing levels, difficult working conditions, frequent losses of off-site power, disruption to the supply chain and the unavailability of spare parts, as well as deviations from planned activities and normal operations, have impacted each nuclear facility and many activities involving radioactive sources in Ukraine. The reliability of the national power infrastructure necessary for the safe and secure operation of the nuclear facilities has also been affected and, for the first time since the start of the armed conflict, all NPP sites, including the ChNPP site, simultaneously suffered a loss of off-site power on 23 November 2022.

Since the start of the armed conflict, the events that have arisen have either partially or fully compromised the IAEA's seven indispensable pillars for ensuring nuclear safety and security during an armed conflict ('Seven Pillars') for almost all nuclear facilities and many activities involving radioactive sources in Ukraine. However, during the first year of the armed conflict, there has been no nuclear incident or accident bearing radiological consequences that affect the public and the environment. This is in part due to the endurance and dedication of the Ukrainian staff at NPPs, who continue to ensure the safe and secure operation of nuclear facilities despite the difficult conditions in which they carry out their work.

The reported events that have arisen from the armed conflict highlight the need for the IAEA to further intensify and strengthen its technical work in Ukraine, with the aim of stabilizing the situation and preventing a nuclear incident or accident. Thus far, this has been achieved through delivering nuclear safety- and security-related equipment; establishing a continued presence of IAEA staff at all nuclear sites in Ukraine; efforts made to agree on the establishment of the nuclear safety and security protection zone around the ZNPP; producing impartial assessments of the situation pertaining to nuclear safety and security; providing technical expertise and advice; and sharing relevant information among the international community.

Major impacts and challenges concerning each of the Seven Pillars, and further details on the current situation for different facilities and activities in Ukraine with regard to the Seven Pillars, are discussed further in the text.

Broken pipe observed by the IAEA staff at the ZNPP site due to shelling on 21 September 2022. (Photo: IAEA)

The Seven Pillars

Since the armed conflict began, the IAEA has been assessing the situation in Ukraine with regard to nuclear safety and security referring to the IAEA Safety Standards Series and the Nuclear Security Series, in accordance with its Statute. Inevitably, the armed conflict has created unprecedented circumstances, with military forces located near or on the site of nuclear facilities, in particular at an operational NPP, and military activities having a direct impact on the safe and secure operation of nuclear facilities and activities involving radioactive sources.

In order to tailor the assessment of the nuclear safety and security situation in Ukraine to the context of an ongoing armed conflict, the IAEA formulated seven indispensable pillars for ensuring nuclear safety and security during an armed conflict ('Seven Pillars'), which derive from and are aligned with the IAEA safety standards and nuclear security guidance.

The Seven Pillars are outlines in more details in the Director General's second Summary Report on Nuclear Safety, Security and Safeguards in Ukraine published on 6 September 2022.

View the second Summary Report published on 6 September 2022 here:

At a special meeting of the IAEA's Board of Governors on 2 March 2022, the Director General outlined the Seven Pillars in relation to the situation to Ukraine.

They were also further described in a press conference held on 4 March 2022.

View Director General's press conference held on 4 March 2022 here:

Since then, the Seven Pillars have been applied when assessing the nuclear safety and security situation at nuclear facilities in Ukraine by providing an efficient way to focus the assessment on the most pressing and important aspects that need to be maintained for the safe and secure operation of those nuclear facilities.

Since the formulation of the Seven Pillars, several Member States, and the international community, have provided their support and recognized the need for the Seven Pillars to be maintained at all times at nuclear facilities in Ukraine.

The Seven Pillars are:

Pillar 1 – Physical integrity
The physical integrity of facilities — whether it is the reactors, fuel ponds or radioactive waste stores — must be maintained.

Pillar 2 – Safety and security systems and equipment
All safety and security systems and equipment must be fully functional at all times.

Pillar 3 – Operating staff
The operating staff must be able to fulfil their safety and security duties and have the capacity to make decisions free of undue pressure.

Pillar 4 – Off-site power supply
There must be a secure off-site power supply from the grid for all nuclear sites.

Pillar 5 – Logistical supply chain
There must be uninterrupted logistical supply chains and transportation to and from the sites.

Pillar 6 – Radiation monitoring and emergency preparedness and response
There must be effective on-site and off-site radiation monitoring systems, and emergency preparedness and response measures.

Pillar 7 – Communication
There must be reliable communication with the regulator and others.

Major impacts and concerns on the Seven Pillars from events arising from the armed conflict

Pillar 1: Physical integrity

Major impacts

- Damage, caused by shelling, to buildings and infrastructure, such as administrative or training centres, laboratories, reactor buildings, buildings housing fresh fuel or radioactive waste, the transformers of reactor units and roads at the site.
- Unauthorized structural changes at the site.

Major concerns

Ongoing shelling continues to represent a constant threat to the physical integrity of the facilities. It has real implications on daily operations and could give rise to a nuclear incident or accident.

Pillar 2: Safety and security systems and equipment

Major impacts

- Damage to important safety systems, such as mobile feedwater pumps for steam generators and nitrogen–oxygen stations.
- Presence of military equipment on-site, and the occurrence of kinetic military exchanges in close proximity to vital areas, destabilizing the designed physical protection system.
- Prevention of access to important facilities, such as Emergency Response Centres and Central Alarm Stations.

Major concerns

Ongoing shelling could damage critical plant systems and equipment and lead to radiological consequences on-site and off-site. Extensive efforts are continuously required by operating staff to maintain the normal operation of safety systems and to keep the physical protection system operational under very difficult circumstances.

Pillar 3: Operating staff

Major impacts

- Difficult working conditions imposed by ongoing shelling, the presence of military personnel, damage to access roads, and damage caused at the site, such as broken windows. These represent a continued hazard to operating staff.
- Constant high stress and pressure among operating staff, causing anxiety.
- Reduction in the number of operating staff available, resulting in an increased workload.
- Unclear chain of command, and decision making with conflicting messages being transmitted to operating staff.

Major concerns

The difficult conditions under which the operating staff at nuclear facilities are maintaining safe and secure operation during the armed conflict is not sustainable. It has implications on their physical and mental health, and increases the risk of a human error, with implications for nuclear safety and security.

Pillar 4: Off-site power supply

Major impacts

- Unavailability of redundant and reliable off-site power supply lines as per design.
- Frequent loss of off-site power supply, owing to damage caused by military activities.
- Damage to the national electrical grid, resulting in the loss of off-site power supply or leading to the de-energizing of the available power supply lines.
- Decreased reliability of EDGs under low temperatures and decreased availability of diesel fuel.

Major concerns

On many occasions, nuclear sites have lost, either fully or partially, their off-site power supply as a result of military activities in the area. Such occasions are frequent and place additional pressure on operating staff. In many cases, repairs to power supply lines are challenged by ongoing military activities in the area or the absence of spare parts. Maintaining a redundant and reliable off-site power supply is essential for the continued safe and secure operation of NPPs, but this remains a challenge.

Pillar 5: Logistical supply chains

Major impacts

- Increased need for spare parts and consumables for maintenance and repairs.
- Difficult logistics and transportation for the delivery of supplies.
- Deficit of providers of particular supplies, and compatibility issues.
- Lack of resources for procuring spare parts.

Major concerns

Maintaining functional and effective logistical supply chains remains a challenge. However, doing so is essential, as it supports the operability of critical nuclear safety and security systems, and ensures that any damage to them is repaired in a timely manner in order to avoid any adverse consequences on site or off site.

Pillar 6: Radiation monitoring systems and emergency preparedness and response

Major impacts

- Disruption of radiation monitoring stations owing to an unreliable power supply.
- Damage to power cables and the malfunction of detection sensors as a result of military activities in the area.
- Unavailability of Emergency Response Centres for their intended purpose.
- Damage to facilities and critical infrastructure for supporting effective emergency response (e.g. on-site fire stations).
- Reduced frequency of training and exercises to support effective emergency preparedness.
- Difficulties in safely implementing emergency arrangements because of ongoing military activity, with inconsistencies in the chain of command and decision making.
- Reduced staffing to support effective emergency response should an emergency arise.

Major concerns

Ensuring preparedness to respond effectively on site and off site to any nuclear or radiological emergency is of high importance under the current circumstances, which constantly threaten the safety and security of NPPs. However, maintaining effective preparedness is challenged by the armed conflict, which impacts the critical infrastructure and facilities essential for an emergency response.

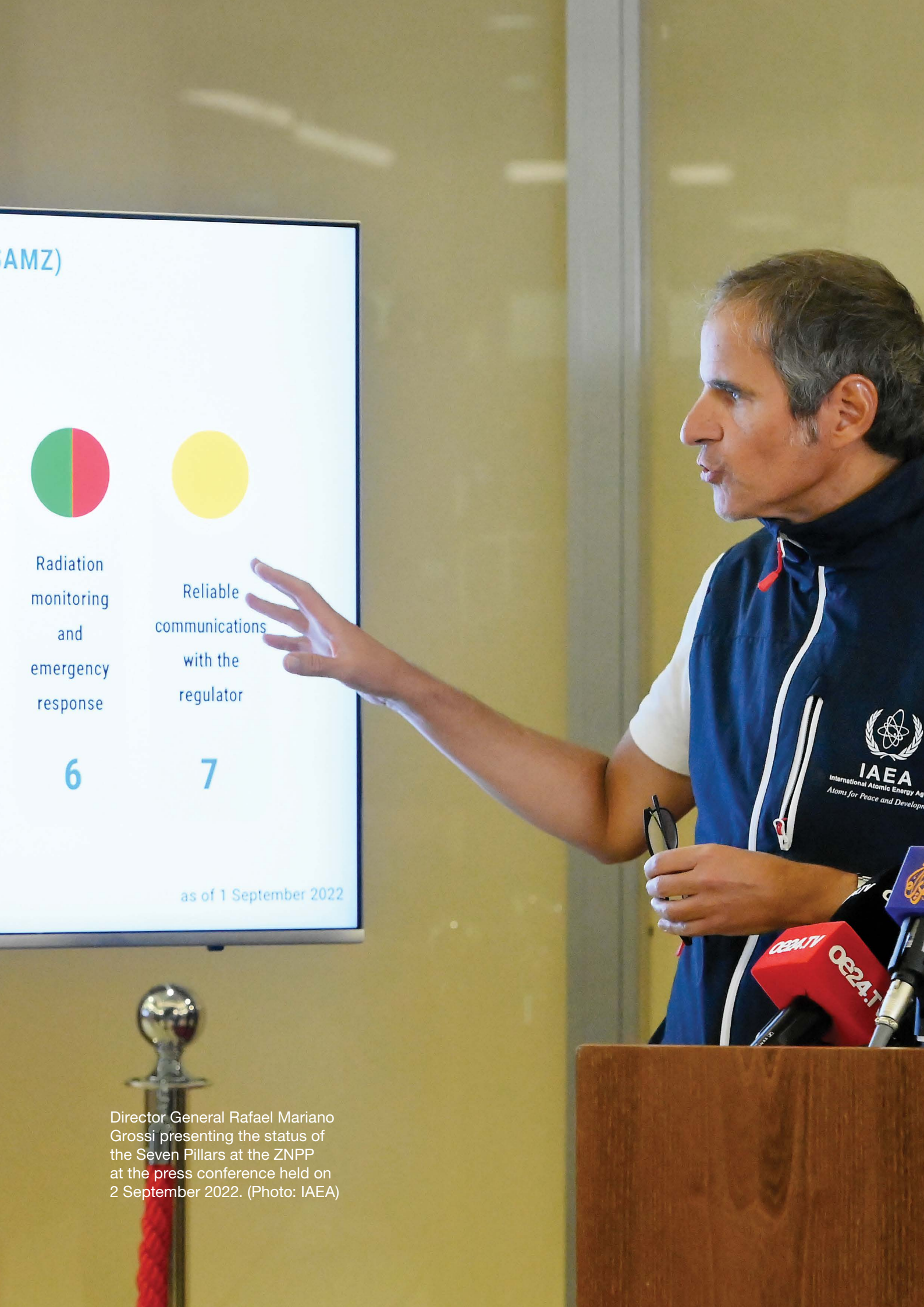
Pillar 7: Communication

Major impacts:

- Disrupted and unreliable communication lines (e.g. phone, fax, internet and satellite).
- Loss of communication with the Ukrainian regulator, operator and off-site authorities.
- Loss of regulatory oversight and of control over facilities and activities.

Major concerns

Since the start of the conflict, there has been a lack of means and channels for communication. This critical shortcoming only serves to exacerbate the current challenges in maintaining the safe and secure operation of nuclear facilities with adequate regulatory oversight, and in ensuring an effective response to any nuclear safety or security event at the local, regional, national and international levels.

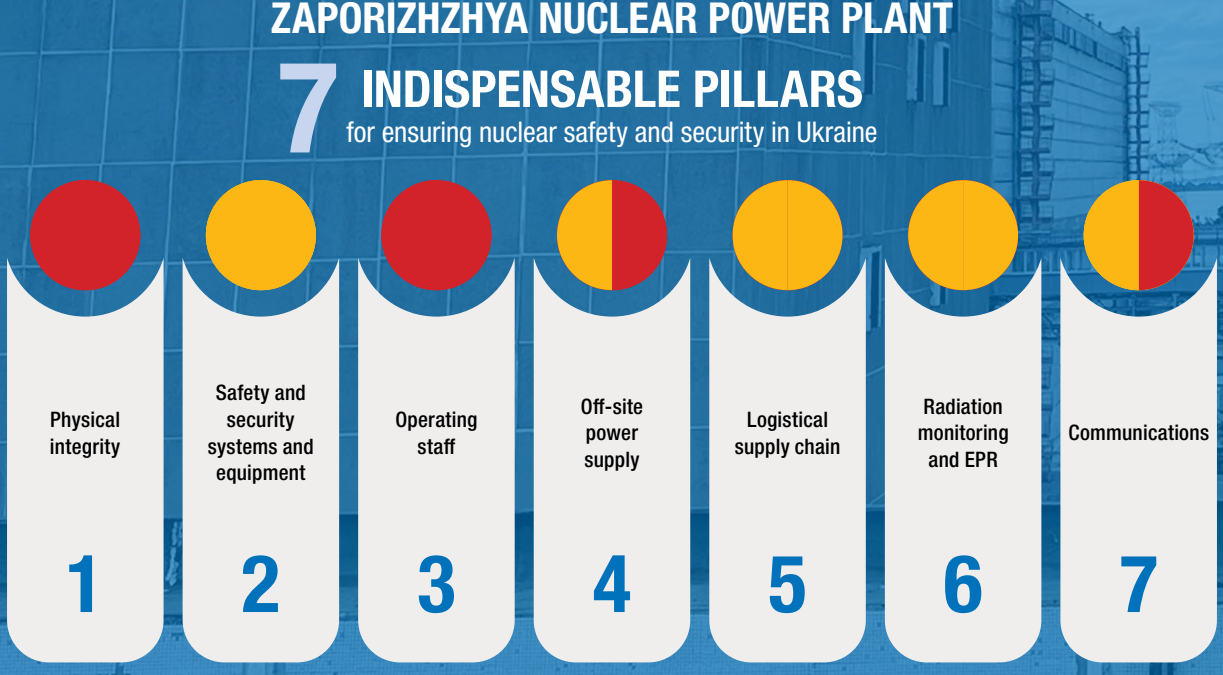


Director General Rafael Mariano Grossi presenting the status of the Seven Pillars at the ZNPP at the press conference held on 2 September 2022. (Photo: IAEA)

Zaporizhzhya Nuclear Power Plant

"The reduced ZNPP staffing levels combined with psychological stress due to the on-going military conflict and the absence of family members who fled the area have created an unprecedented situation that no NPP staff should have to endure."

Rafael Mariano Grossi
Director General, IAEA
13 January 2023



Assessment of the nuclear safety and security situation at ZNPP against the Seven Pillars as of 1 February 2023.

The situation at the ZNPP remains dangerous, precarious and challenging, with the Seven Pillars being compromised at all times. Operating power at the ZNPP has been reduced since the start of the military conflict. All units are currently in shutdown, two of which are operating in a state of hot shutdown in order to produce steam for the plant's operations during the winter.

The Seven Pillars have been impacted at this site as follows:

Physical integrity: Although ongoing shelling and landmine explosions have not triggered a nuclear emergency, such incidents continue to present a constant threat to nuclear safety and security. Damage at the site's reactor buildings, special facilities housing nuclear fuel and radioactive waste, switchyards and spray cooling ponds has been observed, as well as further damage to the reactor units' power supply connections and the EDGs' cable connections to the reactor units. 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 — is currently confirmed, the ZNPP's physical integrity continues to be severely compromised as a result of ongoing military activity.

Safety and security systems and equipment: Maintaining the operation of all safety systems as per design is extremely challenging, owing to continued damage from ongoing military activity either at or in the vicinity of the site, difficult working conditions, an unclear chain of command and a lack of spare parts. There is a continued presence of military personnel and equipment at the site, with unauthorized military vehicles and stores still present in the turbine halls of the Unit 1 and 2 buildings. Recently, modifications to the physical protection system of the plant's dry spent fuel storage facility and the installation of concrete blocks at the Unit 6 building, where the reactor's EDGs are located, were initiated and undertaken from the Russian side without authorization from the SNRIU. The water level in the Kakhovka Reservoir, which provides cooling water for the ZNPP, has decreased since the start of the armed conflict. Although the decreased water level does not pose an immediate risk to nuclear safety and security, it may become a source of concern if it is allowed to continue.

Operating staff: Ukrainian staff at the ZNPP continue to perform their duties under constant high stress and pressure; there are limited staff available and various plant staff have on several occasions been detained. Ukrainian staff also face constant demands from Rosatom to sign employment contracts with the company in order to keep their jobs, while Energoatom urges them not to do so. Changes in the ZNPP's operational control and management have led to ambiguity in the chains of command and control at the plant on several occasions. Worrying levels of fatigue among staff, arising as a result of increased working hours and additional shifts as well as the stress of close proximity to armed conflict, have been reported. High levels of fatigue can potentially lead to human error and subsequent consequences for nuclear safety and security.

Off-site power supply: Military activity at and in the vicinity of the site has impacted the ZNPP's connections to off-site power on a number of occasions. The ZNPP has experienced a total of five instances when off-site power was lost and the EDGs were relied on to provide the required electricity. With only two power lines available — the Dniprovska 750 kV and the 330 kV backup —the ZNPP's off-site power supply remains highly vulnerable in terms of its redundancy and reliability. The mere presence of landmines in the vicinity of the ZNPP presents challenges and dangers for the Ukrainian operating staff and causes delays to any maintenance work on the power lines. While some temporary improvements have been reported recently, the ZNPP's power supply remains far from reliable.

Logistical supply chain: The ZNPP's supply chains and associated logistics continue to be severely impacted by the conflict. Since the beginning of the plant's occupation by Russian forces, there have been several successful attempts to deliver spare parts and diesel fuel to the site. However, these were only undertaken on a case-by-case basis and in an unpredictable manner. Supplies have been provided by both Ukraine and the Russian Federation. As a result, critical maintenance activities have been conducted as scheduled, but non-critical tasks have been postponed, owing to a lack of personnel and spare parts. This situation is not sustainable in the long term and may impact overall nuclear safety and security at the site.

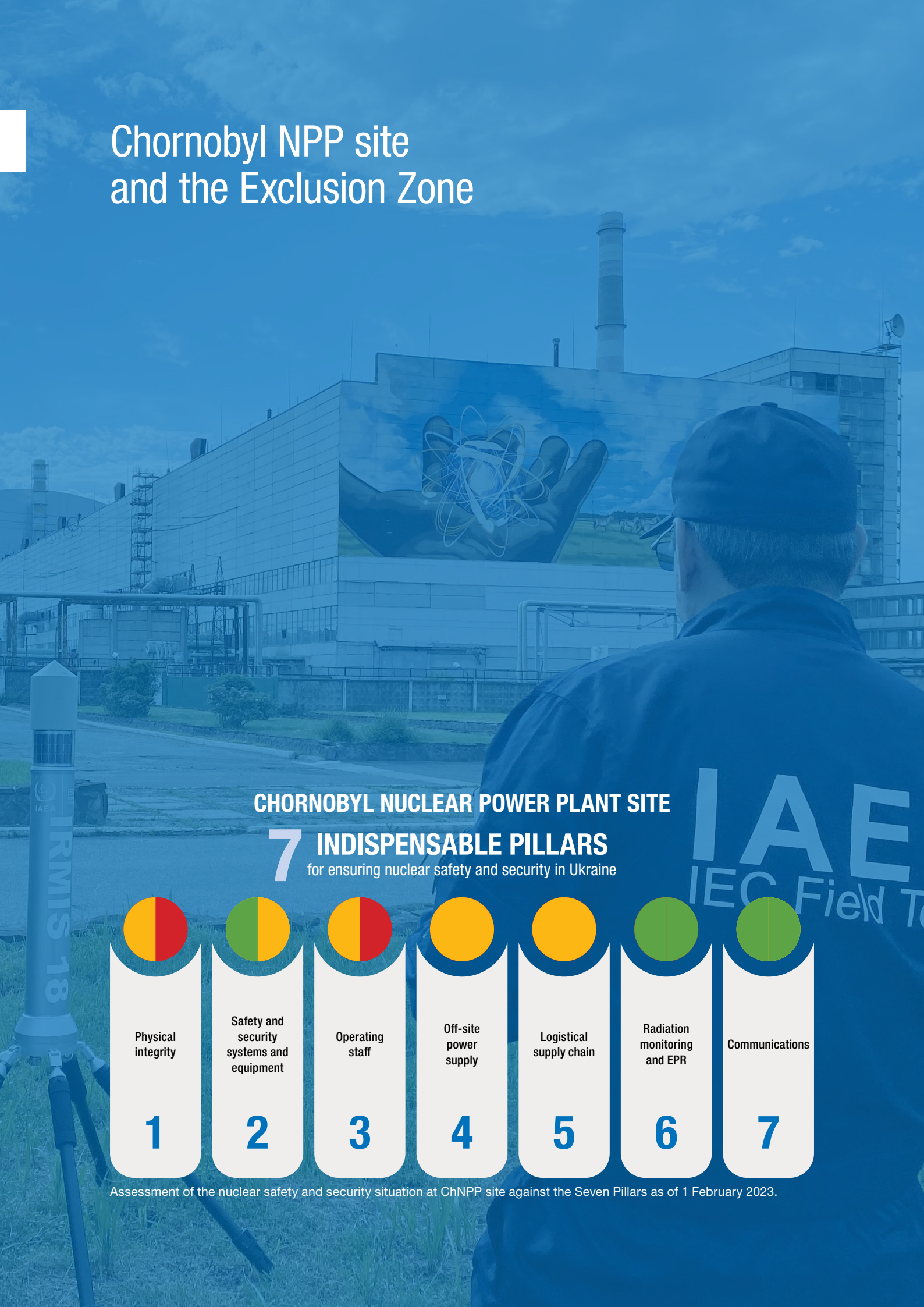
On-site and off-site radiation monitoring system and emergency preparedness and response: Access to the ZNPP's on-site crisis centre is still not possible. Since the Russian Federation's seizure of the facility, the chain of command and responsibility for emergency response has been removed from the control of the Ukrainian authorities. Such a situation could prove detrimental to emergency response effectiveness should a nuclear incident or accident happen; a lack of clarity surrounding which personnel or organization(s) have the responsibility and authority to notify off-site authorities and issue instructions on the relevant protective actions to the public may result in delays. While the on-site and off-site radiation monitoring network was operational for most of the observed period, interruptions to the power supply resulted in the loss of some off-site monitoring points. However, some of these monitoring points have been gradually reconnected. Radiation levels have remained normal at all times throughout the past year.

Communications: Communication between the ZNPP and the SNRIU has been severely impaired since the start of the conflict. While this was initially the result of a lack of communication means and channels, the situation was exacerbated after the Russian Federation announced changes in operational control and command. There have been no SNRIU inspections at the ZNPP since 4 March 2022.

Radiation monitoring data gathered in IRMIS by IAEA staff at the ZNPP site. Radiation levels are normal. (Image: IAEA)

IAEA staff visiting the emergency diesel generators room at the ZNPP during the first mission to the site. (Photo: IAEA)

Chornobyl NPP site and the Exclusion Zone



CHORNOBYL NUCLEAR POWER PLANT SITE

7 INDISPENSABLE PILLARS
for ensuring nuclear safety and security in Ukraine

1	2	3	4	5	6	7
Physical integrity	Safety and security systems and equipment	Operating staff	Off-site power supply	Logistical supply chain	Radiation monitoring and EPR	Communications

Assessment of the nuclear safety and security situation at ChNPP site against the Seven Pillars as of 1 February 2023.

The Russian occupation of the ChNPP site lasted until 31 March 2022. During that period, Ukrainian staff continued to manage day-to-day operation. However, they were not able to rotate for a long period, creating extremely stressful and tiring conditions. Communications were disrupted and the physical protection system was sabotaged and vandalized, and safety and security equipment in laboratories was destroyed or stolen. Extensive mining of the facilities and the surrounding Exclusion Zone was done that required de-mining activities to be given priority following the withdrawal of Russian forces. Surrounding infrastructure also suffered devastation owing to military activity, making daily the functioning of the site difficult and challenging.

The Chornobyl Exclusion Zone is gradually recovering from the Russian military actions. The road to the Exclusion Zone is being repaired in places, power lines are being overhauled, voice communication is already in place around the ChNPP, and mobile telephone networks are operational.

The impacts on each of the Seven Pillars at this site are as follows:

Physical integrity: Damage has occurred to structures and infrastructure at the ChNPP site and the Exclusion Zone. A preliminary assessment has been made to assess the damage and identify corrective actions and technical support and assistance to be provided, but a detailed assessment and repairs will take time and resources. Operating staff have been working to repair the damage on structures and infrastructure and to return to normal operation. However, this is still challenged with the ongoing military activities and a lot remains to be done.

Safety and security systems and equipment: While systems and equipment are now available to continue normal operation, work needs to be done to upgrade them to ensure sound safety and security at the site in light of new threats and risks imposed by the armed conflict.

Operating staff: During the period of Russian presence, for nearly four weeks, operating staff were not able to rotate and return to their homes, and were subject to constant high stress and pressure. Following the withdrawal of Russian forces, operating staff at the ChNPP site maintains two-weeks shifts during which they live in improvised conditions on site. The main reasons for this are the damaged infrastructure and long travel times to the site imposed by the military activities in the area. This situation adds to the stress and anxiety among the ChNPP staff. ChNPP guards were detained with the withdrawal of Russian forces and, up to date, very few of them have returned. This adds additional layers of workforce stress among the staff.

Off-site power supply: On 9 March 2022, the ChNPP site lost all off-site electrical power. Diesel generators were used to power systems that are important to the safety of the facilities. Despite the difficult situation outside the site, the off-site electric power lines were restored, and the power supply to the ChNPP was stable from 14 March. The situation changed on 23 November, when the impact of military activities on the national power infrastructure was felt at the ChNPP site the same time as at the other NPPs in Ukraine.

Logistical supply chain: Logistics and supplies for the ChNPP site are still being challenged. For example, with regard to the proper collection and treatment of solid and liquid radioactive waste at the ChNPP site, a serious issue was identified in relation to accessibility to cement, canisters and containers (cement and metallic) as the only factory/supplier was located in Slavutych, whose connection with Chornobyl is impacted by the situation.

On-site and off-site radiation monitoring system and emergency preparedness and response: Radiation monitoring at the ChNPP site was restored on 6 June 2022, and radiation levels remain low and within the operational range measured in the Exclusion Zone before the start of the conflict.

Communications: Regulatory control of nuclear and radiation safety of the ChNPP site and the Exclusion Zone facilities and activities is being restored gradually. The ChNPP site reported short interruptions in landline telephone and internet connections following the country's electricity network breakdown on 23 November 2022. The SNRIU inspector is present at the site.

Potential doses of individuals occupying the Exclusion Zone between 24 February and 31 March 2022

The Agency performed a dose assessment of potential doses that may have been received by individuals occupying the Chornobyl Exclusion Zone from 24 February until 31 March 2022. It was based on radiation measurements and analysis of samples performed following the IAEA's visits to the site. The results showed that the estimated additional total effective doses were low. At this dose level, no health effects would be expected to be observed in individuals occupying the area that can be attributed to radiation exposure.

Potential doses received by individuals in Scenarios A and B

	Estimated total effective dose [mSv]	Dominant pathways	Radionuclides
Scenario A assuming individuals digging excavations in the occupied area	0.6	External (97%) Inhalation (3%)	Caesium 137 Americium 241
Scenario B assuming individuals occupying the excavations for the entire period of the occupation	0.3	External (88%) Inhalation (12%)	Caesium 137 Americium 241

For more details on the assessment, please see the second Summary Report published on 6 September 2022 **here:**

IAEA staff performing radiation measurements in the Exclusion Zone during the mission in April 2022. (Photo: IAEA)

IAEA staff visiting the control room of Unit 4 at the ChNPP in January 2023. (Photo: ChNPP)

Khmelnytskyy, Rivne and South Ukraine Nuclear Power Plants

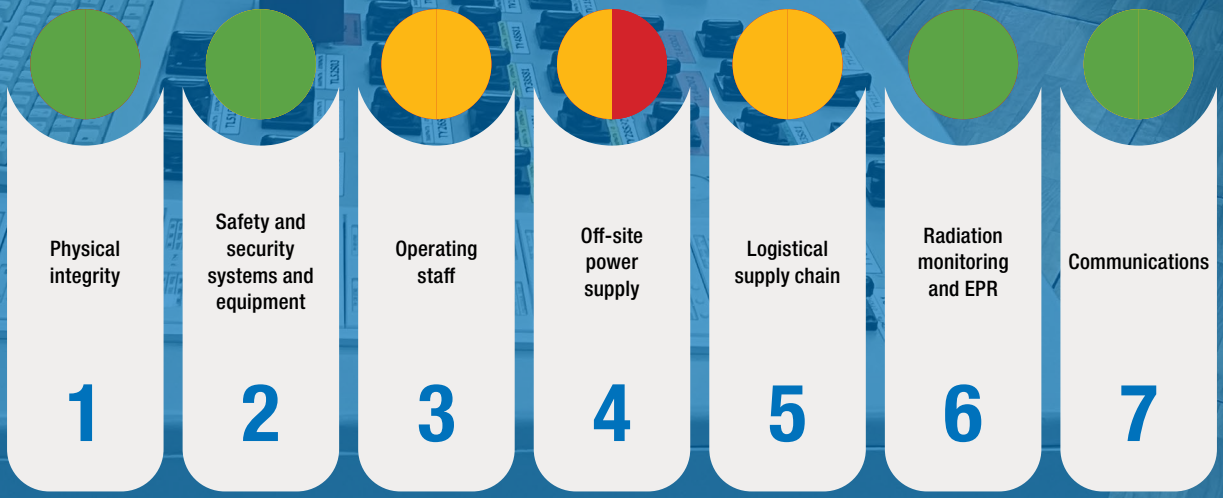
"It is the first time that all the plants suffer a loss of external power at the same time. This would have been completely unimaginable before this tragic war. It is extremely concerning. All military action threatening the safety and security of Ukraine's nuclear facilities must stop immediately."

Rafael Mariano Grossi
Director General, IAEA
24 November 2022

RIVNE, KHMELNYTSKYY AND SOUTH UKRAINE NUCLEAR POWER PLANTS

7 INDISPENSABLE PILLARS

for ensuring nuclear safety and security in Ukraine



Assessment of the nuclear safety and security situation at the RNPP, KhNPP and SUNPP against the Seven Pillars as of 1 February 2023.

Despite the unprecedented circumstances, the other three operational NPPs (the KhNPP, the RNPP and the SUNPP) have continued operating safely and securely since the beginning of the conflict. However, frequent attacks on Ukraine's energy infrastructure in November 2022 affected the reliability and availability of the off-site power lines to each of the operating NPPs. There was one occasion when a total loss of off-site power was experienced at all sites simultaneously. On many occasions, the impact of these events led to the disconnection of the power units of the operating NPPs from the grid and/or power reduction in operating power units.

The impacts on each of the Seven Pillars at these sites are as follows:

Physical integrity: No physical damage to the facilities at the KhNPP, the RNPP or the SUNPP has been observed as a result of military activities, and no challenges to maintaining the physical integrity of these plants have been reported. However, each of these plants implemented additional physical protection measures to further protect some of the vital structures, systems and components (e.g. transformers) from potential attacks.

Safety and security systems and equipment: All safety and security systems at the KhNPP, the RNPP and the SUNPP operate as designed and are fully functional. There have been no reports of failure of these systems or challenges to their operation since the start of the armed conflict.

Operating staff: Plant staff at these facilities are conducting their work in accordance with the normal routine, while dealing with the burdens imposed on their personal lives by the ongoing armed conflict, as well as with constant stress and anxiety. A reduced staffing level was noted at all plants, as some personnel had left their homes. However, facilities are maintaining the appropriate staffing level to ensure safe and secure operation at these sites.

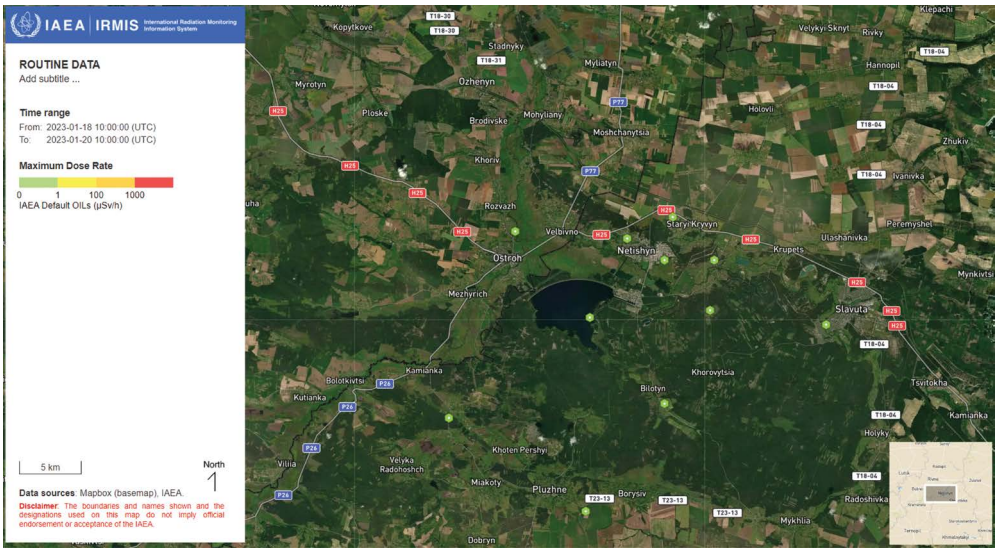
Off-site power supply: Damage to the Ukrainian electrical grid has forced these plants to reduce their power level and electricity output on several occasions. In each such instance, plant operating staff and systems have performed these power output reductions as needed and as expected by design. A loss of off-site power was experienced at all plants on at least one occasion.

Logistical supply chain: In comparison to the ZNPP, the three plants are located on Ukraine-controlled territory and may receive shipments of critical supplies as needed. Thus far, it has been possible to supply or replace all critical parts at these sites. However, the armed conflict has had an impact on the supply chain, rendering some suppliers unavailable and necessitating additional efforts to allocate alternative suppliers, or challenging the execution of existing contracts for supplying spare parts owing to difficult logistics or unavailability of financial resources.

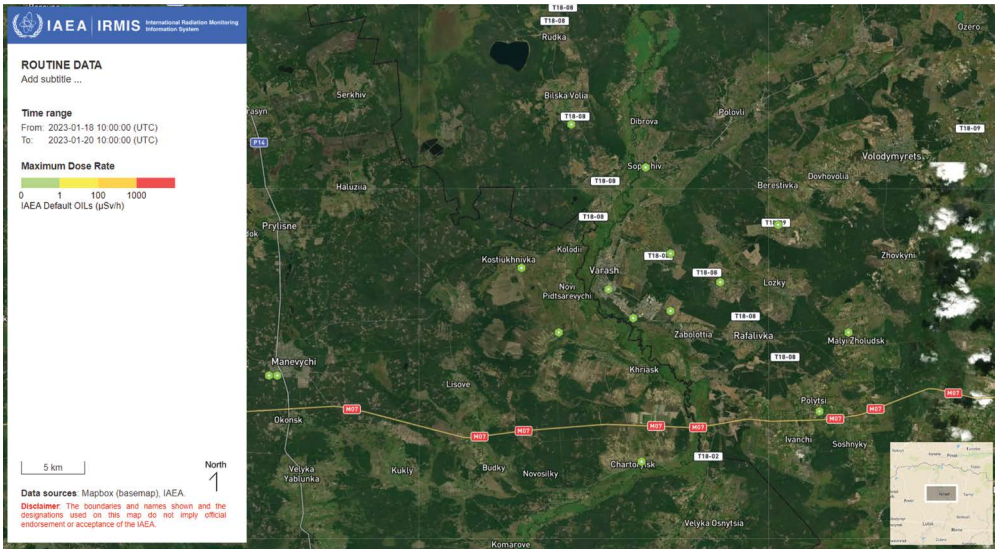
On-site and off-site radiation monitoring system and emergency preparedness and response: The on-site and off-site radiation monitoring systems have remained operational, without significant interruptions, since the start of the armed conflict. Radiation levels at each of the sites have remained normal. It appears that the main emergency arrangements put in place at these sites remain operational and are regularly maintained. However, additional provisions have been reported to be under consideration to enable sites to implement them effectively during the armed conflict.

Communication: Diverse communication lines have been ensured most of the time at each of the sites. The SUNPP reported short interruptions in landline telephone and Internet connections following the country's electricity network breakdown on 23 November 2022. Communication between the SUNPP and the SNRIU and other authorities is currently in place. The Ukrainian inspectors continue to be present at each site.

Radiation monitoring data from the monitoring stations in the 20 km radius around the SUNPP. Radiation levels are normal. (Image: IAEA)



Radiation monitoring data from the monitoring stations in the 20 km radius around the KhNPP. Radiation levels are normal. (Image: IAEA)



Radiation monitoring data from the monitoring stations in the 20 km radius around the RNPP. Radiation levels are normal. (Image: IAEA)

IAEA and RNPP staff observing reactor safety systems at the RNPP in January 2023. (Photo: RNPP)

Other facilities in Ukraine

The KIPT endured 101 instances of missile attack and shelling in the first 22 days of the conflict. Owing to the wide variety and calibre of ordnance directed at the damaged buildings, many of these buildings are most likely beyond repair. The shelling did not result in any radiological consequences or loss of confinement of radioactive material. The site experienced a total loss of power and water for over a month.

Air attacks caused a fire on the premises of the Institute for Nuclear Research in Kyiv. The fire affected a warehouse at the site and caused no damage to the reactor or to its fuel. No personnel were injured. Radiation monitoring was performed, and radiation levels were confirmed to be normal.

No events that have an impact on nuclear and/or radiation safety and nuclear security have been reported for other facilities in Ukraine. However, it should be noted that it is not possible to assess the situation of a number of facilities and activities using radioactive sources in Ukraine, as they are located in areas under Russian occupation or active battle.

IAEA staff observe damage from a rocket attack at the KIPT subcritical assembly on 22 November 2022. (Photo: KIPT)

The IAEA's response

Since 24 February 2022, the IAEA, through its IEC, has had regular contact with Ukrainian authorities and has been closely monitoring and assessing the situation at nuclear facilities, as well as the situation regarding activities involving radioactive sources on the territory of Ukraine, focusing on the implications for nuclear safety and security. In addition, the IAEA has been sharing transparent, factual and authoritative information by publishing relevant information on its 24/7 secure communication channel, the Unified System for Information Exchange in Incidents and Emergencies (USIE), issuing public statements and updates, publishing summary reports and issuing reports to the IAEA's Policy-Making Organs regarding the situation concerning nuclear safety, security and safeguards in Ukraine. In doing so, the IAEA has responded to heightened media and public interest, supported public understanding and contributed to counteracting potential misinformation regarding the ongoing situation in Ukraine.

Soon after the start of the armed conflict, the IAEA expressed its readiness to provide technical support and assistance to Ukraine in maintaining nuclear safety and security for nuclear facilities and activities involving radioactive sources during the armed conflict. In March 2022, the IAEA and Ukraine agreed on a comprehensive technical plan for the provision of technical support and assistance in nuclear safety and security. The plan was focused on remote assistance through external support, delivery of nuclear safety- and security-related equipment, in-person technical support and assistance through on-site expert missions in various areas of nuclear and radiation safety and nuclear security, and deployment of rapid assistance in case of an emergency at a nuclear facility or related to radioactive sources.

The IAEA has made significant progress in the delivery of technical support and assistance to Ukraine. It implemented nine in-person missions to Ukraine in 2022 and established a continued presence of IAEA staff at the ZNPP. Following the concerning developments in November 2022 highlighting the fragile situation at all nuclear sites, the IAEA agreed to further intensify and deepen its technical work in Ukraine with the aim of helping to stabilize the situation and prevent a nuclear incident or accident from happening. In January 2023, the IAEA established a continued presence of IAEA staff at all nuclear sites in Ukraine, to include the RNPP, the SUNPP, the KhNPP and the ChNPP site in addition to the ZNPP. All these missions have enabled the IAEA to have a better understanding of the nuclear safety and security situation in Ukraine and corresponding needs and to share impartial and verified information with the broader international community.

IAEA flag at the RNPP marking the IAEA's presence. (Photo: RNPP)

9 in-person missions

360 person-days spent in Ukraine

20 IAEA staff

8 sites in Ukraine

5 nuclear sites with continued IAEA presence since January 2023

During the first year of the armed conflict, the IAEA received seven requests for nuclear safety- and security-related equipment. Additional needs for equipment were identified during respective in-person missions. Continuous discussions between the IAEA and the Ukrainian counterparts enabled the IAEA to better understand the priority needs of Ukraine and, thus, to guide the IAEA's further steps in mobilizing adequate resources and mechanisms to provide the requested equipment in a timely manner, under the statutory functions of the IAEA and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention). The IAEA had arranged ten deliveries of requested nuclear safety- and security-related equipment to Ukraine by February 2023. It comprised equipment donated by Member States and equipment procured using extrabudgetary cash contributions from Member States and one intergovernmental organization.

The IAEA's response to Ukraine's requests for assistance has highlighted the essential role the IAEA and its Response and Assistance Network (RANET) play in providing prompt assistance to prevent a nuclear or radiological emergency and to restore nuclear safety and security under armed conflict conditions. The provision of assistance under such circumstances imposes significant challenges and requires flexibility in identifying needs, priorities, and associated risks, as well as available logistical arrangements. It also highlights the need for intensive cooperation among all involved parties to ensure the efficient provision of assistance and to secure the necessary technical, human and financial resources.

The IAEA plays a central role in the provision of technical support and assistance to help maintain nuclear safety and security in Ukraine despite the difficult circumstances imposed by the armed conflict. This role requires strong cooperation with Ukrainian authorities, Member States and relevant international organizations to ensure efficient provision of assistance to Ukraine, without duplication.

Equipment

7

requests
for assistance

16

offers for equipment from

12

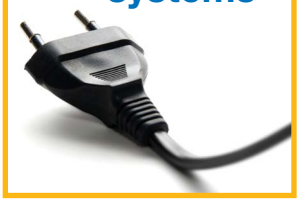
assisting States

13 Assistance Action Plans

10 deliveries of equipment

Deliveries to Ukraine to date

14 portable power systems



4 air sampling kits

160 means of communication (phones and laptops)

8 donors and procurements

35 000+ items of PPE

10 end users

900+ dosimeters and radiation meters, spectrometers and contamination monitors

More than €2.4 million

10 deliveries

Next deliveries to Ukraine

Dosimeters and radiation monitors

150 000+ items of PPE

Mobile laboratories

80+ means of communication

IT equipment

Vehicles and security equipment

13 end users

4 donors and procurements

Approximately €5 million

IAEA donated equipment to ChNPP during the first mission to the site in April 2022. (Photo: IAEA)

Major IAEA response activities

The following timeline captures major IAEA's response activities in a chronological order.

The IEC invoked a response comprising IEC staff who were on call and enhanced standby staffing to ensure that an escalation to full response mode could be achieved expeditiously. Since then, the IAEA has been maintaining close contact with its Ukrainian counterparts, monitoring the situation and sharing information through updates by the Director General.

The IAEA's Board of Governors adopted a resolution on the safety, security and safeguards implications of the situation in Ukraine, which "deplore[d] the Russian Federation's actions in Ukraine".

View the IAEA's Board of Governors resolution adopted on 3 March 2022 here:

The IAEA's Incident and Emergency System was activated at full response mode.

Russian Federation Minister of Foreign Affairs, Sergei Lavrov, and IAEA Director General Rafael Mariano Grossi meeting in Antalya, Türkiye, 10 March 2022. (Photo: IAEA)

The IAEA posted the first request for assistance to Ukraine on the USIE to 31 of the 39 Assistance Convention States Parties that were registered in RANET at that time, as requested by Ukraine.

24 February 2022: At 6.41 a.m., the IAEA Emergency Response Manager was informed that the SNRIU had reported that Russian troops were at the ChNPP site.

2 March 2022: The IAEA's Board of Governors convened a meeting at which the safety, security and safeguards implications of the situation in Ukraine was covered. On this occasion, the Director General outlined the seven indispensable pillars for ensuring nuclear safety and security in relation to the situation in Ukraine.

3 March 2022: The IAEA's Board of Governors adopted a resolution GOV/2022/17 on the safety, security and safeguards implications of the situation in Ukraine, which expressed "grave concern that the Russian Federation's aggression is impeding the Agency from fully and safely conducting safeguards verification activities", and requested "that the Director General and the Secretariat continue to closely monitor the situation, with a special focus on the safety and security of Ukraine's nuclear facilities and report to the Board on these elements, as required".

4 March 2022: The IEC received a notification from Ukraine that Russian forces had taken control of the ZNPP site.

10 March 2022: Director General Grossi held talks on nuclear safety and security matters with the Ministers of Foreign Affairs of Ukraine and the Russian Federation — Dmytro Kuleba and Sergei Lavrov — in Antalya, Türkiye.

7 April 2022: The IAEA received a request for assistance from the State Emergency Service of Ukraine for a limited number and type of equipment for their use through the USIE, the IAEA's 24/7 secure communication channel.

20–22 April 2022: The IAEA's Commission on Safety Standards requested that the Secretariat perform a review of the challenges regarding the application of IAEA safety standards in armed conflicts. The topic was also discussed at the regular meetings of the review Committees.

22 April 2022: The IAEA received a request for assistance from the SNRIU, pursuant to the statutory functions of the IAEA and the Assistance Convention, comprising a comprehensive list of equipment for various end users in Ukraine.

The Director General's first Summary Report on Nuclear Safety, Security and Safeguards in Ukraine made public the consolidated information that the IAEA had been communicating since 24 February 2022, including on actions taken by the IAEA in response to Ukraine's request for assistance in re-establishing, as appropriate, a sound nuclear safety and security regime at its nuclear facilities and in activities involving radioactive sources.

View the first Summary Report published on 28 April 2022 here:

IAEA Director General Rafael Mariano Grossi with Russian officials in Istanbul, Türkiye on 4 May 2022. (Photo: IAEA)

The request for assistance was shared on the USIE with 31 of the 39 Assistance Convention States Parties that were registered in RANET at that time

Following significant logistical and other hurdles, the first delivery of equipment arrived in Ukraine, marking a milestone in IAEA-led efforts to ensure nuclear safety and security during the current armed conflict in Ukraine.

The request for assistance was shared on the USIE with 31 of the 39 Assistance Convention States Parties that were registered in RANET at that time.

28 April 2022: The Director General published the first Summary Report on Nuclear Safety, Security and Safeguards in Ukraine covering the period 24 February–28 April 2022.

4 May 2022: The Director General met with Alexey Likhachev, Director General of Rosatom, and other senior Russian officials in Istanbul, Türkiye, to discuss the urgency of ensuring the safety of the ZNPP.

5 May 2022: The Director General met with Oleh Korikov, the Head of the SNRIU, to discuss the IAEA's efforts to help ensure the safety and security of Ukraine's nuclear facilities during the current conflict.

6 June 2022: At a meeting of the IAEA's Board of Governors, the Director General presented an oral report on the nuclear safety, security and safeguards implications of the situation in Ukraine, as well as on the third IAEA mission to Ukraine.

8 July 2022: The IAEA received a second request for assistance from the SNRIU pursuant to the statutory function of the IAEA and the Assistance Convention through the USIE.

13 July 2022: The first delivery of equipment to Ukraine took place. It consisted of dosimeters and radiation monitors as well as hundreds of items of personal protective equipment (PPE) for three end users in Ukraine.

26 July 2022: A working group was established to review challenges in the application of IAEA safety standards and nuclear security guidance in armed conflicts.

9 August 2022: The IAEA received a third request for assistance from the SNRIU pursuant to the statutory function of the IAEA and the Assistance Convention.

The IAEA Director General, addressing the United Nations Security Council on 11 August 2022, said: “The international community has taken a stance against attacks on nuclear facilities since the early days of the United Nations. Additional Protocols I and II to the 1949 Geneva Conventions prohibit such attacks against ‘nuclear electrical generating stations’ in armed conflict. And there are a number of later IAEA General Conference resolutions considering such attacks as violations of the principles of the UN Charter, international law and the Statute of the Agency, as well as a resolution from this very body (UN Security Council Resolution 487).”

The second Summary Report focuses mainly on the events at the ZNPP site, the preliminary nuclear safety and security findings by the Director General led IAEA Support and Assistance Missions to Zaporizhzhya, and the findings from the second IAEA mission to the ChNPP site and Exclusion Zone. In this report, the IAEA issued recommendations to help re-establish sound nuclear safety and security at the ZNPP. Crucial among the recommendations was the call to establish a nuclear safety and security protection zone around the ZNPP.

View second Summary Report published on 6 September 2022 here:

View Director General’s report to the IAEA’s Board of Governors published on 9 September 2022 here:

View IAEA’s Board of Governors resolution adopted on 15 September 2022 here:

11 August 2022: The Director General briefed the United Nations Security Council on the nuclear safety and security situation at the ZNPP site and on the IAEA’s efforts to agree and lead an expert mission to the site.

6 September 2022: The Director General issued the second Summary Report on Nuclear Safety, Security and Safeguards in Ukraine.

6 September 2022: The Director General informed the United Nations Security Council of the situation in Ukraine, stressing the need for a nuclear safety and security protection zone to be established around the ZNPP and highlighting the importance of a continued IAEA presence at the ZNPP site, with IAEA staff on the ground at the site providing first-hand, neutral, impartial and technical information on the site’s status in relation to nuclear safety and security.

6 September 2022: The kick-off meeting of the working group to review challenges in the application of IAEA safety standards and nuclear security guidance in armed conflicts was held. This meeting was followed by five additional meetings of the working group.

9 September 2022: The Director General delivered a report on nuclear safety, security and safeguards in Ukraine (document GOV/2022/52) to the IAEA’s Board of Governors, in order to update the Board on the situation in Ukraine and the actions taken by the IAEA.

9 September 2022: The second delivery of equipment arrived in Ukraine. It comprised personal dosimeters, PPE, dosimeters and contamination meters for three end users in Ukraine.

15 September 2022: The IAEA’s Board of Governors adopted resolution GOV/2022/58 on the safety, security and safeguards implications of the situation in Ukraine, which “[d]eplore[d] the Russian Federation’s persistent violent actions against nuclear facilities in Ukraine” and expressed “grave concern that the Russian Federation has not heeded the call of the Board to immediately cease all actions against and at nuclear facilities in Ukraine”.

View IAEA General Conference resolution GC(66)/RES/6 here:

View IAEA General Conference resolution GC(66)/RES/7 here:

View IAEA General Conference resolution GC(66)/RES/10 here:

View the Director General's report to the IAEA's Board of Governors from 10 November 2022 here:

29 September 2022: The third delivery of equipment to Ukraine took place. It comprised radiation detectors and spectrometers intended for two end users in Ukraine.

30 September 2022: At its 66th regular session, the IAEA General Conference adopted nuclear and radiation safety resolution GC(66)/RES/6 and nuclear security resolution GC(66)/RES/7. They address, inter alia, the need for all Member States "to be mindful of the importance of nuclear safety and security regarding peaceful nuclear facilities and materials in all circumstances". The safeguards resolution (GC(66)/RES/10) urged all Member States "to refrain from attacks or threats of attacks on, against or in the vicinity of nuclear facilities devoted to peaceful purposes in order to ensure that the IAEA is able to conduct safeguards activities in accordance with relevant safeguards agreements".

10–11 October 2022: The fourth delivery of equipment to Ukraine took place. It comprised portable power supplies systems, radiation detectors, and dosimetry and communication systems, intended for four end users in Ukraine.

19 October 2022: The IAEA received a request from Ukraine's Ministry of Energy for the deployment of expert missions at all NPP sites in Ukraine.

10 November 2022: The Director General delivered a report on nuclear safety, security and safeguards in Ukraine (document GOV/2022/66) to the IAEA's Board of Governors, in order to update the Board on the situation in Ukraine and the actions taken by the IAEA.

10–11 November 2022: The fifth delivery of equipment to Ukraine took place. It comprised radiation dosimeters, contamination monitors and PPE delivered to three end users in Ukraine.

11 November 2022: The IAEA and Ukraine agreed for the IAEA to dispatch teams of nuclear safety and security experts to conduct fact-finding missions at the SUNPP, the KhNPP and the RNPP, in addition to a follow up mission to the ChNPP site.

15 November 2022: The IAEA received a request from the SNRIU regarding a priority need for physical protection equipment requirements for enterprises in the Chornobyl Exclusion Zone, the Radon Association and the KIPT.

The request comprised uncrewed aerial vehicle neutralization systems, access control and video surveillance systems, body armours and vests, communications systems, diesel generators, sensors and IT equipment.

Resolution GOV/2022/71 adopted by the IAEA's Board of Governors "deplore[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".

View IAEA's Board of Governors resolution adopted on 17 November 2022 here:

17 November 2022: The IAEA's Board of Governors adopted resolution GOV/2022/71 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".

28 November 2022: The IAEA received a request from Ukraine requesting priority equipment for the energy sector in Ukraine, such as autotransformers, high voltage circuit breakers, disconnectors and related items. This equipment was requested in order to enable the reliable functioning of the energy infrastructure in Ukraine and to maintain a reliable external power infrastructure for the safe and secure operation of the operating NPPs in Ukraine.

9 December 2022: The sixth delivery of equipment to Ukraine took place. It comprised PPE, dosimeters and spectrometers intended for three different end users in Ukraine.

20 December 2022: The seventh delivery of equipment to Ukraine took place. It comprised communication means intended for one end user in Ukraine.

22 December 2022: The first phase of the review of challenges in the application of IAEA safety standards and nuclear security guidance in armed conflicts was completed.

18 January 2023: The working group to review challenges in the application of IAEA safety standards and nuclear security guidance in armed conflicts initiated the second phase of the review, which is expected to be completed by the end of 2023.

27 January 2023: The eighth delivery of equipment to Ukraine took place comprising of PPE intended for one end user in Ukraine.

9 February 2023: The night delivery of equipment to Ukraine took place comprising of IT equipment intended for one end user in Ukraine.

17 February 2023: The tenth delivery of equipment to Ukraine took place. It comprised hand-held spectrometers intended for two end users in Ukraine.

22 February 2023: The Director General delivered a report on nuclear safety, security and safeguards in Ukraine (document GOV/2023/10) to the IAEA's Board of Governors, in order to update the Board on the situation in Ukraine and on the actions taken by the IAEA.

Major IAEA missions to Ukraine

The following timeline captures major IAEA missions that have taken place in Ukraine in chronological order.

An agreement was reached on the scope of the technical support and assistance to Ukraine for safety and security, and on the fact that the IAEA, working with Member States, would be the single point of contact for this technical assistance.

IAEA Director General Rafael Mariano Grossi meeting with the staff of the South Ukraine NPP during his visit to Ukraine, 30 March 2022. (Photo: IAEA)

29–31 March 2022: The Director General led a high-level delegation to Ukraine to initiate the implementation of the IAEA's assistance, aimed at reducing the risk of a major nuclear accident.

5 April 2022: The IAEA received a request for assessing the state of the Neutron Source installation located at the KIPT in Kharkiv in terms of safety and physical protection through an in-person mission. It was subsequently agreed that it would be implemented when the security situation allows to do so. This commitment was fulfilled from 8 to 10 November 2022, when the first in-person mission to the KIPT took place.

IAEA Director General Rafael Mariano Grossi meeting with the staff of the ChNPP during his visit to Ukraine, 26 April 2022. (Photo: IAEA)

25–28 April 2022: The Director General led the second IAEA mission to Ukraine, which took place at the ChNPP site. It comprised a high-level delegation of IAEA experts in the areas of nuclear safety, security and safeguards. This mission allowed the IAEA to donate radiation monitoring equipment and to carry out an assessment in the field to enable it to have a better understanding of the current nuclear safety and security issues in relation to nuclear facilities in Ukraine.

Ukrainian President Volodymyr Zelenskyy and the IAEA Director General Rafael Mariano Grossi meeting to discuss the safety and security situation at Ukrainian facilities, 26 April 2022. (Photo: www.president.gov.ua)

26 April 2022: The Director General met with the President of Ukraine, Volodymyr Zelenskyy, reiterating the IAEA's continued support to Ukraine in ensuring the safety and security of its nuclear sites.

IAEA staff being provided with an overview of the waste management activities at the Vektor site during May-June mission to Ukraine. (Photo: IAEA)

30 May–4 June 2022: The third IAEA mission to Ukraine took place at the ChNPP site and the Exclusion Zone to assess in more detail the nuclear safety and security situation at the site and to conduct monitoring and sampling.

The first mission to the Russian-occupied ZNPP took place, giving the ISAMZ team a unique opportunity to closely observe the current situation related to nuclear safety and security at the plant.

On 1 September 2022, the continued presence of IAEA staff at the ZNPP was established. The continued presence of IAEA experts at the plant helps further deepen the understanding of the nuclear safety and security situation.

29 August–3 September 2022: The fourth IAEA mission to Ukraine, the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ), took place. It was led by the Director General and comprised a high-level delegation and technical team to help stabilize the nuclear safety and security situation at the ZNPP site. On this occasion, the Director General again met with President Zelenskyy.

Director General led mission, ISAMZ, at the ZNPP on 1 September 2022. (Photo: IAEA)

The mission provided the IAEA with an opportunity to assess and observe directly and for the first time the extent of the damage to the KIPT site as a result of the heavy shelling since the start of the armed conflict.

8–10 November 2022: The IAEA conducted a nuclear security expert mission to the KIPT and RADON radioactive waste facilities in Kharkiv.

IAEA staff at the radiation protection control room of ChNPP Unit 3. (Photo: IAEA)

The objective of the fact-finding missions at these operating NPPs was to independently assess the nuclear safety and security situation at the plants and the corresponding needs, as well as to provide technical support and assistance, as needed, in order to help maintain a continued high level of nuclear safety and security at the sites and to reduce the risk of a nuclear incident or accident.

IAEA and RNPP staff during the fact-finding mission held from 6 to 8 December 2022. (Photo: RNPP)

The main objectives of the strengthened IAEA presence at all nuclear sites in Ukraine is: (1) to continue to monitor key nuclear safety and security systems, and specific conditions as appropriate (e.g. winter conditions); (2) to report on the impact of any military action against the facilities on-site and off-site, or against supporting infrastructure; (3) to provide an in-person presence at the sites, as appropriate, capable of delivering expert nuclear security and safety assurance to both the Ukrainian general public and the wider international community; and (4) to enhance communication flow with IAEA Headquarters, and facilitate the provision of technical support and equipment.

22–24 November 2022: The follow-up expert mission to the ChNPP and the Exclusion Zone was conducted; it was the third mission to this site since the armed conflict began. The objective of the mission was to ensure continued technical and in-depth dialogue on various nuclear safety-and security-related matters, building upon the accomplishments of the previous missions and follow-up actions.

28 November–1 December 2022: A fact-finding mission to the SUNPP took place, comprising two nuclear safety and security experts.

6–8 December 2022: Fact-finding missions to the KhNPP and the RNPP took place.

13 December 2022: The Director General, in a meeting with the Prime Minister of Ukraine, Denys Shmyhal, agreed to strengthen the IAEA's presence at all nuclear site in Ukraine, with the aim of further assisting in ensuring nuclear safety and security during the armed conflict. The decision followed the discussions of the Director General with the Minister of Foreign Affairs of Ukraine, Dmytro Kuleba, on 29 November 2022.

The continued presence of IAEA staff at all five nuclear sites in Ukraine involves the ongoing presence of 11 to 12 IAEA staff in Ukraine, with the objective of providing assistance in nuclear safety and security. Staff rotate regularly, and this constitutes a significant undertaking for the IAEA.

IAEA Director General Rafael Mariano Grossi at ChNPP site during the establishment of IAEA continued presence. (Photo: IAEA)

The Director General met with Prime Minister Shmyhal on 18 January 2023 to reaffirm the IAEA's readiness to continue with its support to Ukraine.

Ukrainian Prime Minister Denys Shmyhal and IAEA Director General Rafael Mariano Grossi meeting in Kyiv, 18 January 2023. (Photo: IAEA)

Watch a video on the continued presence of IAEA staff at all nuclear power plants here:

16–23 January 2023: The IAEA Support and Assistance Missions to the RNPP (ISAMIR), to the SUNPP (ISAMISU), to the KhNPP (ISAMIK) and to the ChNPP site (ISAMICH) were deployed, establishing the IAEA's continued presence at the sites. The purpose of the continued presence of IAEA staff at these four nuclear sites is to decrease the risk of a nuclear incident or accident through the provision of technical support to the Ukrainian operators in fulfilling their national responsibilities for ensuring nuclear safety and security.

"Across Ukraine – from north to south – this week has seen a major expansion in the IAEA's on-the-ground support for the country's efforts to prevent a severe nuclear accident during the war. At Ukraine's request, the IAEA flag is now flying at these important nuclear facilities. For the first time, we will have our top experts permanently present at all of Ukraine's nuclear power plants as well as the Chornobyl site. Their vital work will help reduce the very real nuclear dangers the country is facing."

Rafael Mariano Grossi
IAEA Director General
20 January 2023

Nuclear safety and security protection zone

Following an analysis of the situation and the first in-person mission to the ZNPP (ISAMZ) led by the Director General, it became apparent that the armed conflict represents a constant threat to nuclear safety and security, with potential impacts on critical safety functions that may lead to radiological consequences with significant implications for safety. Such a situation is untenable in the long term. Pending the end of the conflict and the re-establishment of stable conditions, the need for an interim solution to help prevent a nuclear incident or accident has arisen. The establishment of a nuclear safety and security protection zone around the ZNPP appears to be a necessary and pressing complement to the continued presence of IAEA staff at the ZNPP that has already been established. The Director General first called for the establishment of such a zone on 2 September 2022 following his return from the ZNPP mission. He expressed the readiness of the IAEA to immediately begin the consultations necessary for reaching an agreement on the urgent establishment of the nuclear safety and security protection zone.

The Director General's call was made formally through a recommendation given in the second Summary Report and was brought to the attention of the IAEA's Board of Governors and the IAEA General Conference in September 2022. It was also brought to the attention of the wider international community on occasions such as the meetings in September 2022 of the United Nations General Assembly and the United Nations Security Council. The international support given to the call for the establishment of a nuclear safety and security protection zone on each of these occasions indicated a broad interest in finding ways to keep the ZNPP safe and secure.

The talks on the establishment of the nuclear safety and security protection zone began during the week of the United Nations General Assembly meeting in New York, only a few weeks after the call had been made for its establishment, when the Director General met high-level officials from Ukraine and the Russian Federation on separate occasions. Since then, significant efforts have been made through discussions and consultations with high-level officials from Ukraine and the Russian Federation aimed at agreeing and implementing the nuclear safety and security protection zone around the ZNPP.

While progress has been made during these discussions, with both parties agreeing that the ZNPP should be protected during this armed conflict and that there should be no attacks either from or against the nuclear safety and security protection zone, more work is required to agree on practical and technical aspects pertaining to the zone, such as its size. It is expected that the IAEA staff at the ZNPP will support the integrity of the nuclear safety and security protection zone, once it is agreed, by reporting to the Director General on the compliance of both parties with the commitments they have made.

Recommendation 1

The IAEA recommends that shelling on the site and in its vicinity should be stopped immediately to avoid any further damages to the plant and associated facilities, for the safety of the operating staff and to maintain the physical integrity to support safe and secure operation. This requires agreement by all relevant parties on the establishment of a nuclear safety and security protection zone around the ZNPP.

View the second Summary Report published on 6 September 2022 here:

Major actions taken by the IAEA in order to agree on the establishment of the nuclear safety and security zone around ZNPP are presented in chronological order.

View the Director General's press conference held on 2 September 2022 here:

View the second Summary Report published on 6 September 2022 here:

View the Director General's report to the IAEA's Board of Governors from 9 September 2022 here:

View IAEA's Board of Governors resolution adopted on 15 September 2022 here:

IAEA Director General Rafael Mariano Grossi at the event in New York hosted by French President Emmanuel Macron. (Photo: IAEA)

29 August–1 September 2022: The Director General led the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ), during which the continuous presence of IAEA staff at the ZNPP was established.

2 September 2022: Upon his return from the ZNPP, the Director General held a press conference to announce his call for the establishment of a nuclear safety and security protection zone around the ZNPP.

6 September 2022: The Director General gave a briefing the United Nations Security Council about the findings and recommendations from the ISAMZ, during which he stressed the need for a nuclear safety and security protection zone to be established and for the shelling at and around the ZNPP to cease.

6 September 2022: The Director General published a summary report on Nuclear Safety, Security and Safeguards in which he recommended the urgent establishment of a nuclear safety and security protection zone as an interim measure to prevent nuclear incident or accident.

9 September 2022: The Director General provided the IAEA's Board of Governors with the report Nuclear Safety, Security and Safeguards in Ukraine (document GOV/2022/52) that elaborated, inter alia, on the recommendations concerning the situation at the ZNPP, including the establishment of the nuclear safety and security protection zone as a strategy to avoid any compromise of nuclear safety and security measures in the event of attacks on, against, aimed at or from the ZNPP.

15 September 2022: The IAEA's Board of Governors adopted resolution GOV/2022/58, in which the Director General's call for the establishment of a nuclear safety and security protection zone around the ZNPP was underscored.

21 September 2022: The Director General raised his proposal of a nuclear safety and security protection zone during a side event in New York on the safety and security of civilian nuclear facilities in armed conflicts, hosted by French President Emmanuel Macron on the occasion of the regular session of the United Nations General Assembly, where he received broad international support.

22 September 2022: The Director General began official talks with Ukraine and the Russian Federation aimed at agreeing on and implementing a nuclear safety and security protection zone). During that week the Director General met separately with the Russian Minister of Foreign Affairs, Sergei Lavrov, and the Ukrainian Minister of Foreign Affairs, Dmytro Kuleba as part of these official talks.

IAEA Director General Rafael Mariano Grossi addressing the IAEA General Conference on 26 September 2022. (Photo: IAEA)

26 September 2022: The Director General gave a statement at the 66th regular session of the IAEA General Conference calling for the urgent establishment of a nuclear safety and security protection zone and the start of high-level meetings with Ukraine and the Russian Federation aimed at agreeing and implementing such a zone.

View IAEA General Conference resolution adopted on 30 September 2022 here:

30 September 2022: The IAEA General Conference adopted resolution GC(66)/RES/10, urging all Member States to "refrain from attacks or threats of attacks on, against or in the vicinity of nuclear facilities devoted to peaceful purposes in order to ensure that the Agency is able to conduct safeguards activities in accordance with relevant safeguards agreements".

6 October 2022: The Director General held a meeting with Ukrainian President Volodymyr Zelenskyy in Kyiv to continue discussions on the situation at the ZNPP and the IAEA's proposal to set up a nuclear safety and security protection zone around the facility.

President of the Russian Federation Vladimir Putin meeting IAEA Director General Rafael Mariano Grossi in St Petersburg on 11 October 2022. (Photo: kremlin.ru)

11 October 2022: The Director General held met with Russian President Vladimir Putin in St Petersburg to continue discussions on the situation at the ZNPP and the IAEA's proposal to set up a nuclear safety and security protection zone around the facility.

IAEA Director General Rafael Mariano Grossi at the United Nations Security Council on 27 October 2022. (Photo: IAEA)

View the Director General's report to the IAEA's Board of Governors from 10 November 2022 here:

View IAEA's Board of Governors resolution adopted 17 November 2022 here:

Ukrainian Prime Minister Denys Shmyhal meeting IAEA Director General Rafael Mariano Grossi in Paris on 13 December 2022. (Photo: IAEA)

Ukrainian President Volodymyr Zelenskyy meeting IAEA Director General Rafael Mariano Grossi in Kyiv on 19 January 2023. (Photo: www.president.gov.ua)

27 October 2022: The Director General provided an additional briefing to the United Nations Security Council on the nuclear safety, security and safeguards situation in Ukraine, during which he again emphasized that it was critical to immediately establish a nuclear safety and security protection zone around the ZNPP in order to prevent a nuclear incident or accident from happening.

10 November 2022: The Director General provided the IAEA's Board of Governors with the report Nuclear Safety, Security and Safeguards in Ukraine (document GOV/2022/66), in which he provided an update on progress made since 6 September 2022.

17 November 2022: The IAEA's Board of Governors adopted resolution GOV/2022/71, supporting the Director General's efforts to establish a nuclear safety and security protection zone around the ZNPP.

23 November 2022: The Director General met a Russian delegation led by Rosatom Director General Alexey Likhachev in Istanbul, Türkiye, for, inter alia, consultations on the establishment of a nuclear safety and security protection zone around the ZNPP.

13 December 2022: The Director General met the Ukrainian Prime Minister, Denys Shmyhal, and Ukraine's Minister of Energy, Herman Haluschenko, in Paris, France; the primary focus of the meeting was the establishment of a nuclear safety and security protection zone around the ZNPP.

22 December 2022: The Director General met senior Russian Government officials, including Alexey Likhachev, Director General of the State-run Russian nuclear energy company Rosatom, in Moscow to further discuss the creation and establishment of a nuclear safety and security protection zone around the ZNPP as a matter of urgency.

19 January 2023: The Director General met Ukrainian President Volodymyr Zelenskyy in Kyiv, Ukraine to further discuss, inter alia, the proposal for a nuclear safety and security protection zone and the urgency of an agreement on the topic in light of the deepened nuclear safety and security concerns in the preceding months.

9 February 2023: The Director General held talks with senior Russian officials in Moscow as part of his ongoing efforts to agree and implement a nuclear safety and security protection zone around the ZNPP. He met with Alexey Likhachev, Director General of the State-run Russian nuclear energy company Rosatom, and an intragovernmental group and further discussions were held at the Ministry of Foreign Affairs the day after.

Safeguards in Ukraine

Ukraine acceded to the Treaty on the Non-Proliferation of Nuclear Weapons as a non-nuclear-weapon State in December 1994. It concluded a comprehensive safeguards agreement (CSA) with the IAEA, which entered into force in January 1998, and an additional protocol (AP) to its CSA, which entered into force in January 2006.[1]

At the beginning of 2022, the IAEA approved an Annual Implementation Plan (AIP) for Ukraine, specifying all inspections, complementary access (CA) and design verification (DIV) visits planned to be performed in Ukraine pursuant to its CSA and AP, as well as the activities to be carried out at Headquarters (e.g. review of Ukraine's reports and declarations, and data transmitted from IAEA equipment installed at nuclear sites in Ukraine) foreseen for the calendar year.

On 25 February 2022, Ukraine submitted to the IAEA a special report under Article 68 of its CSA informing the IAEA that "as a result of the temporarily occupied territory of Chernobyl region, Ukraine has lost control over nuclear material" at the Chornobyl site. Ukraine submitted two similar reports, in March and July 2002, regarding its loss of control over nuclear material at all facilities on the Zaporizhzhya site and at three LOFs in south-eastern parts of Ukraine.

In its resolution adopted on 3 March 2022, the Board of Governors, inter alia, expressed "grave concern that the Russian Federation's aggression is impeding the Agency from fully and safely conducting safeguards verification activities at Ukrainian nuclear facilities"[2] and called upon the Russian Federation to "immediately cease all actions against, and at, the Chornobyl Nuclear Power Plant and any other nuclear facility in Ukraine, in order for (…) the Agency to fully resume its safeguards verification activities, including the necessary verification of material accountancy and control".

The armed conflict made travel by the IAEA to some facilities and locations in Ukraine more dangerous and, for a time, precluded travel to other locations entirely. Initially, the IAEA postponed all non-essential inspections, CAs and DIVs. In many cases, facility operators altered or postponed planned activities due to the armed conflict, thereby reducing or postponing the need for IAEA in-field verification missions. However, essential activities continued.

Coverage of IAEA safeguards implementation effort in Ukraine

35 nuclear facilities within following major facilities:

- ChNPP site
- KhNPP
- RNPP
- SUNPP
- ZNPP

More than a dozen locations outside facilities (LOFs)

Zaporizhzhya NPP

The IAEA was initially unable to perform its planned verification activities at the ZNPP site because the site was heavily affected by military activities. Following the visit by Director General Grossi on 1 September 2022, and the establishment of the permanent presence, the IAEA was able to conduct its annual inspection when the reactor core was opened for refuelling (during a refuelling, IAEA inspectors verify nuclear fuel in the core and the attached spent fuel pond). On that occasion, two of the six power reactors were refuelled by the operator but left open pending a subsequent physical inventory verification (PIV) by the IAEA. The dry storage facility and the fresh fuel storage facility were also refuelled. The inability of the IAEA to conduct a PIV at the two reactors within the established timeliness of 12–14 months is being analysed as part of the IAEA's internal process for drawing safeguards conclusions for Ukraine.

Since the start of the conflict, the IAEA has strengthened its analyses of open source information and its acquisition and analyses of satellite imagery covering nuclear installations in Ukraine. This has proved to be essential for the preparation of in-field verification activities, in particular at the Zaporizhzhya site. The IAEA has been acquiring and analysing satellite imagery and continually monitoring all available open source information to track

[1] Documents INFCIRC/550 and INFCIRC/550/Add.1.
[2] Document GOV/2022/17.

developments and to assess the operational status of the plant, including the detection of damage caused by shelling at the site. Prior to the IAEA's mission to the ZNPP site at the end of August 2022, satellite imagery was acquired on a daily basis to support the mission. Evaluations resulting from the satellite imagery analyses were corroborated on the ground by the IAEA team.

On 28 October 2022, Ukraine informed the IAEA[3] of construction works of an unknown structure conducted by Russian forces at the dry storage facility at the Zaporizhzhya site. Ukraine noted that the construction of new structures is "contrary to the project of the dry storage facility for spent fuel" and was a "gross violation of the terms of the license for operating the [Zaporizhzhya] NPP". While the IAEA inspector continuously present at the ZNPP was informed and provided with technical details about the work carried out, changes to the design of a safeguarded facility must be notified to the IAEA in advance via an updated design information questionnaire (DIQ). Based on the observations made in the field, the safeguards measures in place at the dry storage facility remain adequate.

Chornobyl NPP

The Chornobyl site was also occupied by Russian forces in the first few days of the conflict and was initially not accessible. When the IAEA was able to return to Chornobyl in late April 2022, continuity of knowledge over all nuclear material on the site was re-established and technicians were able to repair unattended monitoring systems and install additional (satellite) communication channels for remote data transfer. The IAEA has made four further visits to the Chornobyl site since the visit at the end of April to verify nuclear material, and maintain safeguards equipment.

KIPT

In November 2022, the IAEA was also able to conduct in-field verification activities at the KIPT for the first time since the beginning of the conflict to verify nuclear material at two facilities, assess damage to the facilities on site, and conduct a CA. At the time of access, the KIPT site had been heavily shelled

[3] Document INFCIRC/1057 of 31 October 2022.

Allegations regarding radiological dispersal devices

At Ukraine's request, the IAEA conducted three CAs in order to assure the absence of undeclared nuclear activities and materials following allegations made by the Russian Federation related to the development of radiological dispersal devices — or 'dirty bombs' — at the Institute for Nuclear Research in Kyiv, the Eastern Mining and Processing Plant in Zhovti Vody and the Production Association Pivdennyi Machine-Building Plant in Dnipro. IAEA inspectors carried out all planned activities and were given unfettered access to the locations as requested. The IAEA paid particular attention to all hot cells and shielded containers capable of holding strong radioactive sources.

Inspectors also collected environmental samples at these locations. These samples were analysed at the Safeguards Analytical Laboratories in Seibersdorf, Austria, and at other laboratories within the IAEA's Network of Analytical Laboratories. For samples from the Institute for Nuclear Research in Kyiv, laboratory analysis identified only trace levels of nuclear materials and radioisotopes, consistent with past sampling results and declared activities. At the Eastern Mining and Processing Plant in Zhovti Vody, the IAEA found only natural uranium. At the Production Association Pivdennyi Machine-Building Plant in Dnipro, the IAEA found no traces of nuclear or radioactive materials. No evidence of high explosive compounds was found in any of the samples. The analytical results confirmed the findings from real-time radiation monitoring conducted during the CAs, which measured only background levels of neutron and gamma radiation. Based on the IAEA's evaluation of the activities performed during the CAs and of the results of the environmental sample analysis, the IAEA did not find any indications of undeclared nuclear activities and materials at these locations.

and was still largely without power or heat. The IAEA was able to successfully verify nuclear material at the research facility on site, which accounted for over 98% of the site's inventory, but it was not possible to access fuel in the subcritical Neutron Source without facility power to lift a five-tonne shield plug. The IAEA will return to verify this material when power is restored in early 2023. Real-time radiation monitoring across the entire KIPT site measured only background levels of neutron and gamma radiation.

Safeguards overall

Despite the very challenging circumstances, the IAEA continued to implement safeguards for Ukraine in accordance with the CSA and the AP and in line with the AIP. Some of the safeguards missions conducted in the field have allowed the IAEA to perform restoration, maintenance or upgrades of surveillance cameras, seals and unattended monitors used for the remote transmission of data to IAEA Headquarters. While the armed conflict has caused the temporary interruption of the transmission of safeguards data from the Chornobyl and Zaporizhzhya sites on several occasions, all safeguards data were ultimately recovered and transmitted to IAEA Headquarters once the transmission was re-established.

The IAEA has relied 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 sites has been possible over the past year. As mentioned earlier, the IAEA has maintained its continuous analyses of open source information and its acquisition and analyses of satellite imagery covering nuclear installations in Ukraine. This has proved to be essential for the preparation of in-field verification activities. The IAEA 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.

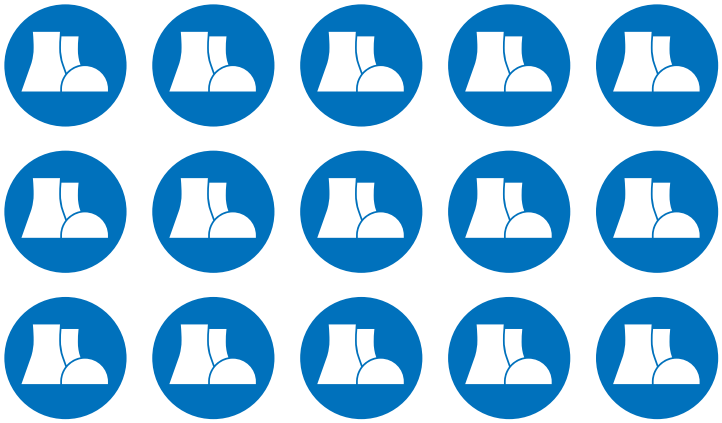
From the beginning of the armed conflict until the end of 2022, the IAEA organized 27 safeguards-related missions in the field and was able to accomplish almost all of the activities included in its original AIP for the year. Logistics considerations made it impossible to conduct any unannounced inspections, and three planned activities at LOFs were not conducted because these LOFs were situated in active conflict zones.

Based on the evaluation of all safeguards relevant information available to the IAEA to date, the IAEA has not found any indication that would give rise to a proliferation concern.

The new satellite communication system for RDT installed by the IAEA at the Chornobyl NPP, 27 April 2022. (Photo: IAEA)

Safeguards verifications in Ukraine in 2022

15 operating power reactors



5 associated fresh and spent fuel stores

ChNPP
Research Reactor in Kyiv
KIPT

9 complementary access visits in 2022

An aerial capture from satellite imagery showing Zaporizhzhya Nuclear Power Plant (Satellite Image: WorldView-3, contains Maxar Technologies materials, 16 October 2022)

Conclusions

It has been a difficult and devastating year for the people of Ukraine, as well as a challenging year for both the nuclear community and the broader international community. Armed conflict threatened the facilities of Ukraine's large, established nuclear power programme, giving rise to real and constant fear of a nuclear incident or accident resulting in transboundary radiological consequences as the risks increased. The current situation in Ukraine is unprecedented and continues to be dangerous. The events of the past year serve as a reminder to the world of the fragility of Ukraine's nuclear safety and security and our need to remain ready to provide assistance, should the need arise.

It is thanks to the extraordinary efforts of Ukrainian operating staff at the ZNPP, the KhNPP, the RNPP, the SUNPP and the ChNPP site that all nuclear sites have continued to operate safely and securely to date. The resilience and dedication they have shown by continuing to perform their crucial work to the best of their abilities under difficult and stressful conditions affecting their health and well-being is to be commended.

Since the start of the armed conflict, the international community and the general public have relied on the IAEA to assess the nuclear safety and security situation in Ukraine and provide them with information that is accurate, verified and timely. From the very beginning of the conflict, the IAEA has closely monitored and assessed the nuclear safety and security situation in Ukraine and published frequent updates on the IAEA's website. The IAEA has also carried out a number of in-person missions to assess the situation on the ground and provide technical support and advice. As part of these efforts, the IAEA has established a continuous presence at all nuclear sites in Ukraine, including the ZNPP. As a result, the IAEA has steadily improved and deepened its understanding of the current situation at each site and the related nuclear safety and security issues while reporting and sharing its observations in an impartial and independent manner.

The IAEA has continued to undertake its vital verification role to reach independent conclusions that nuclear material under safeguards in Ukraine remains in peaceful activities and that safeguarded facilities are not used for the undeclared production or processing of nuclear material. The IAEA 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 IAEA to date, the IAEA has not found any indication that would give rise to a proliferation concern.

The IAEA took prompt action following allegations made by the Russian Federation and the subsequent invitation by Ukraine to perform CAs at the locations related to those allegations. The IAEA has not found any indications of undeclared nuclear activities or materials related to the development of radiological dispersal devices at the three specified locations referred to above.

In addition, the IAEA has delivered much-needed nuclear safety and security related equipment to various organizations in Ukraine, coordinating and cooperating closely with the Ukrainian authorities and other Member States. It has proposed and conducted negotiations for the prompt establishment of a nuclear safety and security protection zone around the ZNPP. These efforts continue, and the IAEA considers the urgent establishment of the zone as an imperative.

However, the current situation is untenable and the best action that can be taken to ensure the safety and security of Ukraine's nuclear facilities is an end to the armed conflict. The IAEA remains committed to provide any support it can to help ensure the safe and secure operation of nuclear facilities and activities using radioactive sources in Ukraine both during the armed conflict and long after it ceases. The continued commitment and close cooperation of Member States with the IAEA is essential.

RNPP, January 2023.
(Photo: RNPP)

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IAEA Board of Governors resolution on the Safety, security and safeguards implications of the situation in Ukraine (document GOV/2022/17)

IAEA Director General's first Summary Report on Nuclear Safety, Security and Safeguards in Ukraine

IAEA Director General's second Summary Report on Nuclear Safety, Security and Safeguards in Ukraine

Nuclear Safety, Security and Safeguards in Ukraine (document GOV/2022/52)

IAEA Board of Governors resolution on the Safety, security and safeguards implications of the situation in Ukraine (document GOV/2022/58)

IAEA General Conference resolution on nuclear and radiation safety (document GC(66)/RES/6)

IAEA General Conference resolution on nuclear security (document GC(66)/RES/7)

IAEA General Conference resolution on safeguards (document GC(66)/RES/10)

Nuclear Safety, Security and Safeguards in Ukraine (document GOV/2022/66)

IAEA Board of Governors resolution on the Safety, security and safeguards implications of the situation in Ukraine (document GOV/2022/71)

Nuclear Safety, Security and Safeguards in Ukraine (document GOV/2022/52)

IAEA Board of Governors adopted resolution on the Safety, security and safeguards implications of the situation in Ukraine (document GOV/2022/58)

IAEA Proposal for Ukraine Nuclear Safety Zone Wins Support as Talks Begin on Its Establishment

IAEA Director General's statement to the 66th regular session of the IAEA General Conference

Nuclear Safety, Security and Safeguards in Ukraine (document GOV/2022/66)

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