

Ukraine: What's the worst-case scenario for Zaporizhzhia?

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Kyiv has warned that Russia might be planning detonations at the Zaporizhzhia nuclear power plant. What could happen if Russia goes ahead with these plans?

Kyiv has warned that Russia may be planning to detonate land mines at the Zaporizhzhia nuclear power plant

Image: Str./AFP/Getty Images

When Russia first occupied the **Zaporizhzhia nuclear power station** in early 2022, the Ukrainian operator Energoatom reported that Russian forces had likely mined the compound. After the nearby **Kakhovka**

dam was destroyed in early June

- purportedly by Russian military forces
- Kyiv announced that Russia had also placed land mines in the power plant's cooling ponds.

Now, military staff in **Ukraine** have warned that **Russian soldiers have supposedly also affixed "objects resembling explosives"** to two blocks of the power plant.

In late June, the **International Atomic Energy Agency reported that it had found no indication of mines or other explosives at the power stations.** IAEA Director General Rafael Mariano Grossi has announced that agency experts now require access to further parts of the power plant to conduct a more thorough inspection and rule out the presence of any explosives.

Cooling system is Zaporizhzhia's weakest spot

Olha Kosharna, a Ukrainian nuclear safety expert, has emphasized that placing land mines in the most important cooling segments poses a direct threat to the power station. She added that the water in the cooling pond played a decisive role by cooling the fuel rods within the reactor, thus preventing them from melting by overheating.

The Zaporizhzhia **nuclear power plant** is made up of six blocks, which have been out of operation since last fall. Five blocks are in "cold shutdown" — a state in which they no longer generate electricity.

Dmytro Humeniuk of Ukraine's State Scientific and Technical Center for Nuclear and Radiation Safety explained that while the

reactors must still be cooled, as the fuel rods are still emitting heat, the water cannot be vaporized. If the cooling system were to be destroyed, water could escape, and the expert estimated a nuclear accident would occur within eight days.

According to experts, the sixth reactor is still in "hot shutdown," in which power units generate thermal power — although the IAEA had ordered its cold shutdown four weeks ago. If this is the case, the cooling water can reach 280 degrees Celsius (536 degrees Fahrenheit) and would evaporate in the event of a leak. This would leave experts just 27 hours to prevent radiation from escaping.

"I think all this blackmail and all these threats are happening to halt **Ukraine's counteroffensive** in the region," said Kosharna.

Is a disaster like Fukushima possible?

Experts believe a detonation in any part of Zaporizhzhia's cooling system **could lead to a disaster** such as the one in Fukushima, Japan. **In 2011, an earthquake and subsequent tsunami** interrupted the cooling sequence of three reactors of the Fukushima Daiichi Nuclear Power Plant, resulting in a core meltdown that released radiation.

"Following this, an evacuation zone was established which people had to leave. Three years later, they returned due to the low radiation, and now, the zone has been reduced to one-third," said Mark Zheleznyak, a visiting professor with the Institute of Environmental Radioactivity at Fukushima University.

Zheleznyak believes the risk potential at Zaporizhzhia is smaller than it was in **Fukushima**. "There wouldn't be a radiation disaster, because a shutdown block cannot emit radioactive iodine," he said, advising against succumbing to panic and buying iodine tablets meant to protect the thyroid gland against radioactive iodine.

How much of the surrounding area is at risk?

Ukraine's Center for Nuclear and Radiation Safety has developed two possible scenarios in case of a nuclear accident at the Zaporizhzhia plant.

In the first scenario, the 1-meter-thick (3.2-foot) protective encasing of the reactor stays intact, while the facility beneath it melts. This could be the case if the power went out completely, or

the cooling systems were damaged. Experts estimate that in such a scenario, an area of about 2.5 kilometers (1.6 miles) surrounding the power plant would be contaminated with radiation.

"Basically, this would only affect the staff working at the power station," the center said in a recent statement, adding that these people would have to leave the area. "Iodine prophylaxis is not necessary."

**'The world has to do something':
nuclear plant worker**

01:39

The other scenario considers a **nuclear accident** accompanied by a damaged protective shell. "In this scenario, radiation would affect a much wider radius and have far more serious consequences. The

contaminated area would depend on weather conditions," the center explained.

Ivan Kovalets is an expert in environmental modeling at the National Academy of Sciences in Ukraine. He has calculated that, depending on wind force and direction, an area of up to 20 kilometers (12.5 miles) surrounding the nuclear plant could be heavily affected.

"In this case, immediate evacuation would be required," said Kovalets. Even people living as far as 550 kilometers away from the power plant could face health risks. "At such distances, however, there is no need for immediate countermeasures or evacuations," he added.

Russia reducing its presence at nuclear plant, says Ukraine

Staff at Zaporizhzhia told to relocate, says Ukrainian intelligence, as Moscow accused of explosion plot

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Luke Harding in Kyiv

Fri 30 Jun 2023 12.24 BST

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- Rescue workers and police officers attend anti-radiation drills in case of an emergency situation at Zaporizhzhia nuclear power plant. Photograph: Reuters
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Russia is reducing its presence at the Zaporizhzhia nuclear power plant, Ukraine's military intelligence directorate (GUR) has claimed, with staff told to relocate to Crimea and military patrols scaled back.

The agency's chief, Kyrylo Budanov, has alleged Moscow has approved a plan to blow up the station and has mined four out of six power units, as well as a cooling pond. Last week Ukraine's president, Volodymyr Zelenskiy, said **Russia** was plotting a "terrorist attack".

According to the GUR, several representatives of Russia's state nuclear energy agency, Rosatom, have already left. Ukrainian employees who stayed at the plant and signed contracts with Rosatom had been told to evacuate by Monday, preferably to Crimea, it said.

The intelligence agency named three senior individuals – the plant’s chief inspector, the head of the legal department and the deputy in charge of supplies – who had already departed. It said the number of Russian soldiers at the station and in the nearby town of Enerhodar had been reduced.

Since seizing the plant last year, the Russian army has turned it into a military base. It moved hardware into the turbine halls, including armoured vehicles and ammunition. Soldiers **used the territory** to bombard Ukrainian towns across the Dnipro reservoir.

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The Ukrainians living on a nuclear frontline: ‘This is inhumanity’ – video

This has mostly dried up after the **Kakhovka dam** downstream was blown up this month. Western governments and Kyiv say Russia deliberately sabotaged the dam to impede Ukraine’s counteroffensive.

Former plant workers told the Guardian it would be difficult to damage the reactors, which were protected by thick steel and concrete. But they said the small cooling pond – which the Russians have allegedly mined – was more vulnerable, as was a dry storage area used for spent nuclear fuel.

An explosion in the cooling pond could lead to a partial nuclear meltdown similar to the **1979 Three Mile Island accident** in the US state of Pennsylvania, Oleksiy Kovynyev, a former senior engineer, said. In this scenario, most radiation would be contained.

But he added: “Of course, if you are an absolute maniac and open the ventilation channels this would throw out radiation.” Kovynyev said the dry storage area at the plant contained 24 spent “fuel assemblies”, sealed in 120 “hermetic” steel casks.

“In a normal situation, they are absolutely safe. If you wanted, you could destroy them. You could shell several times. This could cause a nuclear accident with radiation release.” He said he remained optimistic no disaster would take place.

Before the full-scale invasion, the plant employed 11,500 workers. An estimated 2,500 remain. Some, including the plant's Ukrainian director, have signed contracts with Rosatom. Others have refused and have had their security passes revoked. Staff currently receive salaries from both Russia and Ukraine.

The GUR said on Friday that personnel remaining at the station had been instructed to “blame Ukraine in case of any emergencies”. Russia has claimed Kyiv has endangered the station by shelling it.

Ukraine has urged the international community to pay attention to the situation at the plant and to put pressure on Moscow to step back from the brink. Officials point out that Zelenskiy warned last year the Kremlin was preparing to blow up the Kakhovka dam – something that happened seven months later.

The chief rabbi of Ukraine, Moshe Azman, warned the “entire world community” to do everything in its power to stop a possible catastrophe. This week Russia told the UN security council it had no plans to blow up the plant. It previously assured the council it would not invade Ukraine.

<https://www.theguardian.com/world/live/2023/jun/30/russia-ukraine-war-live-us-considering-sending-cluster-munitions-to-ukraine-reports>

3h ago
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Russia reducing number of personnel at Zaporizhzhia nuclear power plant – reports

Russia is gradually reducing the number of personnel at the occupied Zaporizhzhia nuclear power station in southern **Ukraine, Ukraine's military intelligence agency said on Friday.**

“According to the latest data, the occupation contingent is gradually leaving the territory of the Zaporizhzhia nuclear power plant,” the main directorate of intelligence at the defence ministry (GUR) said on the Telegram messaging app.

GUR said that among the first to leave the nuclear power station were three employees of Russian state nuclear firm Rosatom who had been “in charge of the Russians’ activities”, Reuters reports.

It said Ukrainian employees who had signed a contract with Rosatom had also been advised to depart. Employees should leave by 5 July, it said, and had been told to preferably head for the Crimea peninsula, which Russia illegally seized from Ukraine in 2014.

GUR said the number of military patrols was also gradually decreasing on the plant’s vast territory and in the nearby city of Enerhodar, and that personnel remaining at the plant had been told to blame Ukraine “in case of any emergency situations”.

Russian authorities declined to comment on the claims when approached by Reuters.



A Russian soldier at a checkpoint near the Zaporizhzhia nuclear power plant in June 2023. Photograph: Alexander Ermochenko/Reuters

Ukraine and Russia have repeatedly accused each other of shelling the plant and its vicinity. Russia has occupied the plant since March 2022, and Kyiv accused Russia this month of planning a “terrorist” attack at the nuclear plant involving the release of radiation, an accusation which Russia has dismissed.

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Since seizing the plant last year, the Russian army has turned it into a full-blown military base. It moved hardware into the turbine halls including armoured vehicles and ammunition. Soldiers **used the territory to bombard Ukrainian towns across the Dnipro reservoir**.

This has mostly dried up after the Kakhovka dam downstream was blown up earlier this month. Western governments and Kyiv say Russia deliberately sabotaged the dam, in order to impede Ukraine's counteroffensive.

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UN nuclear chief says situation at Zaporizhzhia plant is ‘serious’ but it can operate safely for ‘some time’

Rafael Grossi visited the Russian-controlled plant amid concerns for water levels in cooling pools after dam breach

Guardian staff and agencies

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- Rafael Grossi, head of the International Atomic Energy Agency (IAEA), visits the Russian-controlled Zaporizhzhia nuclear power plant in southern Ukraine. Photograph: Olga Maltseva/AFP/Getty Images

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The head of the UN atomic energy agency has said the situation at the Russian-controlled **Zaporizhzhia nuclear plant** in Ukraine is “serious” and that ensuring water for cooling was a priority of his visit, adding that the station could operate safely for “some time”.

Rafael Grossi, of the International Atomic Energy Agency (IAEA), was inspecting the state of Europe's largest nuclear plant following last week's **breach in the Kakhovka dam** downstream on the Dnipro River. He said IAEA inspectors would remain at the site.

“What is essential for the safety of this plant is that the water that you see behind me stays at that level,” Grossi said in two tweets issued from near the station, including next to a pond that supplies water for cooling.

“With the water that is here the plant can be kept safe for some time. The plant is going to be working to replenish the water so that safety functions can continue normally.”

Grossi said the visit, his third to the plant in southern **Ukraine** since Russian forces occupied it in the first days of their February 2022 invasion, had gathered “a good amount of information for an assessment”.



A member of the IAEA walking near the Zaporizhzhia plant during an official visit of IAEA director Raphael Grossi. Photograph: International Atomic Energy Agen/AFP/Getty Images

Russia and Ukraine have repeatedly accused each other of shelling near the plant, endangering its safe operation. The station's six reactors are now in shutdown.

An IAEA spokesperson said gunfire briefly halted Grossi's convoy as it headed back to Ukrainian-held territory after the visit, but the delegation was in no immediate danger.

A Russian energy industry official was earlier cited by Tass news agency as accusing Ukraine of opening fire at the convoy.

Earlier in the day, Grossi said it was unrealistic to expect Moscow and Kyiv to sign a document on the site's security while fighting raged nearby.

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The Kakhovka reservoir was normally used to refill the cooling pond adjacent to the plant but cannot do so now because of its falling water level after the breach, officials say.

Instead, the pond, which is separated from the reservoir, can be replenished using deep underground wells, they say.

Grossi was earlier quoted by Russian news agencies as saying the situation at the site was "serious".

"On the one hand, we can see that the situation is serious, the consequences [of the dam's destruction] are there, and they are real," he said.

"At the same time, there are measures that are being taken to stabilise the situation."

Grossi's trip was delayed by a day for security reasons amid heavy fighting.

Russian forces captured both the nuclear plant and the Kakhovka hydroelectric dam shortly after President Vladimir Putin sent them into Ukraine in February 2022.

Grossi has repeatedly called for an end to fighting in the vicinity of the facility to avoid any catastrophic accidents.

Power lines have been repeatedly cut. There are diesel generators at the plant, which also has alternative water sources.