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Damaged Chernobyl Nuclear Plant, Occupied by Russia, Loses Outside Power

The site of the worst nuclear accident in history, where a yearslong cleanup is underway, is now dependent on power from diesel generators and backup supplies.

By David E. Sanger and Henry Fountain
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Ukrainian government officials said Wednesday that damage by Russian forces had left the defunct Chernobyl nuclear power plant “disconnected” from outside electricity, leaving the site of the worst nuclear accident in history dependent on power from diesel generators and backup supplies.

The International Atomic Energy Agency said Wednesday that there was no need for immediate alarm over the condition of the decommissioned plant, where workers have safeguarded nuclear waste since the Chernobyl disaster of 1986. But officials said the situation around the site remained a source of grave concern.

Russian troops have occupied the facility since the early days of the invasion last month. The I.A.E.A., a United Nations agency, said the loss of power violated a “key safety pillar” but said it saw “no critical impact on safety” at this time because the amount of water in cooling ponds and around radioactive waste was sufficient to keep the nuclear material under control, even without continuous power to the plant. Part of the reason is that the used fuel assemblies are old and not as dangerous as they once were.

The American Nuclear Society, a professional group, agreed. “The loss of power is a serious matter but it does not pose a threat to the public,” it said in a statement.

Russia’s Energy Ministry said Wednesday that Belarus, whose border is near the Chernobyl facility, was working on restoring power from its own grid.

Still, there were clearly deep worries in the nuclear community about the long-term fate of the facility, which is staffed by several thousand workers who oversee the plant and its fuel and waste storage, as well as other nuclear plants in Ukraine.

A control center at Chernobyl last year. Oleg Petrasyuk/EPA, via Shutterstock

The shelling last week of a different, operating nuclear power facility caused a fire at a training building, and led to calls from President Biden to the embattled president of Ukraine, Volodymyr Zelensky. Mr. Biden later denounced the military action, at the Zaporizhzhia nuclear complex in southern Ukraine, as “reckless.”

Chernobyl, which is in an “excluded zone” north of Kyiv, Ukraine’s capital, was right on the invasion path for Russian forces flowing south from Belarus. There have been reports from the Ukrainian government — which has called for a cease-fire around the plant to allow inspectors and other workers to get in — that the 200 or so staff members who were on duty at the time of the invasion are still there and are working under guard. They have not been rotated out in nearly two weeks.

“I’m deeply concerned about the difficult and stressful situation facing staff at the Chernobyl nuclear power plant and the potential risks this entails for nuclear safety,” the I.A.E.A.’s director general, Rafael Mariano Grossi, said in a statement on Tuesday.

Early in the day on Wednesday, Ukraine’s nuclear regulator said backup generators had fuel to operate for 48 hours, and painted a dire picture of what could happen if the plant remained off the power grid for longer than that. The less dire statements from the I.A.E.A. followed, and some other experts generally played down the risks.

A former longtime employee at the plant with knowledge of conditions, speaking on the condition of anonymity out of fear for his safety, said that in addition to the diesel generators, safety and monitoring systems are powered by batteries and other backup means.

The I.A.E.A. said that it had lost communications with its sensors at the plant. That may be the result of the loss of electric power. While that does not pose an immediate risk, it means there would be no comprehensive way of detecting a rise in radiation levels or quickly determining where it was coming from. The former employee said that, as of Wednesday, radiation monitoring could only be done using portable devices like Geiger counters.

The head of the International Atomic Energy Agency, Rafael Grossi, at a news conference in Vienna on Monday. Leonhard Foeger/Reuters

He also noted that the workers were facing daunting conditions, in part because of the loss of electricity. With temperatures well below freezing, there is no way to heat workplaces, he said, and provide hot meals to the staff, who have been working without a break since the Russian troops moved in. Replacement crews cannot reach the site because of the fighting, and some transport routes are blocked because of destroyed bridges.

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The most hazardous waste at Chernobyl is found in two locations.

Chernobyl once was home to four operating reactors. The last shut down in 2000.

As is common practice in the nuclear power industry, used fuel from all four reactors is stored in pools of water that dissipates the heat produced as the fuel decays radioactively. When fuel is newly removed from a reactor, there is a lot of decay and thus a lot of heat, so plants need power to run pumps to circulate the storage water.

The I.A.E.A. has said that the used fuel assemblies at Chernobyl — there are more than 20,000 of them — are old enough and decayed enough that circulating pumps are not needed to keep them safe.

“The heat load of the spent fuel storage pool and the volume of cooling water contained in the pool is sufficient to maintain effective heat removal without the need for electrical supply,” the agency said.

Russia-Ukraine War: Key Things to Know

On the ground. Russian forces, battered by the local resistance, have stepped up their bombardment across Ukraine. In Kyiv, artillery battles in the suburbs remained intense, though the Russian advance toward the capital seemed to be on pause.

The other main source of nuclear waste are the ruins of the reactor that was destroyed in the 1986 accident. An estimated 200 tons of fuel remain there, in a lava-like mix with molten concrete, sand and chemicals that were dumped on the reactor during the disaster. This mixture is found throughout the remains of the reactor. Some parts of it are completely inaccessible and have only been studied by boring into them.

A functioning reactor requires pumps that circulate water around the core, keeping it cool and moderating the nuclear reaction to avoid a meltdown. There is no cooling water in the chaotic, jumbled remains of the reactor, so the loss of power would not affect them.

But in recent years there have been incidents in which nuclear reactions have started spontaneously in pockets of these fuel-containing materials, leading to spikes in radiation levels. Without monitoring — of humidity in addition to radiation levels — workers would not know if any new incident was occurring.

Since 2017, the destroyed reactor has been covered by a large arched structure, intended to confine the waste and safeguard against any release of radiation. The structure is also meant to allow the work of removing waste to long-term storage.

The former employee said that ventilation systems at the arched structure that shelters the ruins had already stopped operating. Those systems help control humidity levels in the building, which can affect the fuel that remains there.

The safe confinement covering over the No. 4 reactor in 2021. Efrem Lukatsky/Associated Press

The facility was granted an operating license by Ukraine's authorities last year, so that work had only just begun, and will take decades to complete. There are several large cranes and other specialized equipment to allow crews to work safely. Without power, most if not all of that work could not proceed.

The occupation of the Zaporizhzhia nuclear complex also remains a source of concern to international authorities. Mr. Grossi told I.A.E.A. officials in Vienna on Tuesday that Russian forces were in control of the plant.

“This is not a safe way to run a nuclear power plant,” he said. “Nor is it safe or sustainable for internal and external communications to have been disrupted and cut off.”

Ukraine’s energy minister, Herman Galushchenko, said in a video message this week that roughly 500 Russian soldiers were in control of the complex, and had moved 50 pieces of heavy artillery to defend the site.

He said that employees of the plant were “physically and psychologically exhausted,” and that Russian forces were holding them hostage, a claim that was impossible to immediately verify. Attempts to reach staff in the plant by phone and email have been unsuccessful.

Marc Santora, William J. Broad and Ivan Nechepurenko contributed reporting.