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ANALYSIS

A Ukrainian nuclear plant is facing a water shortage

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Geoff Brumfiel

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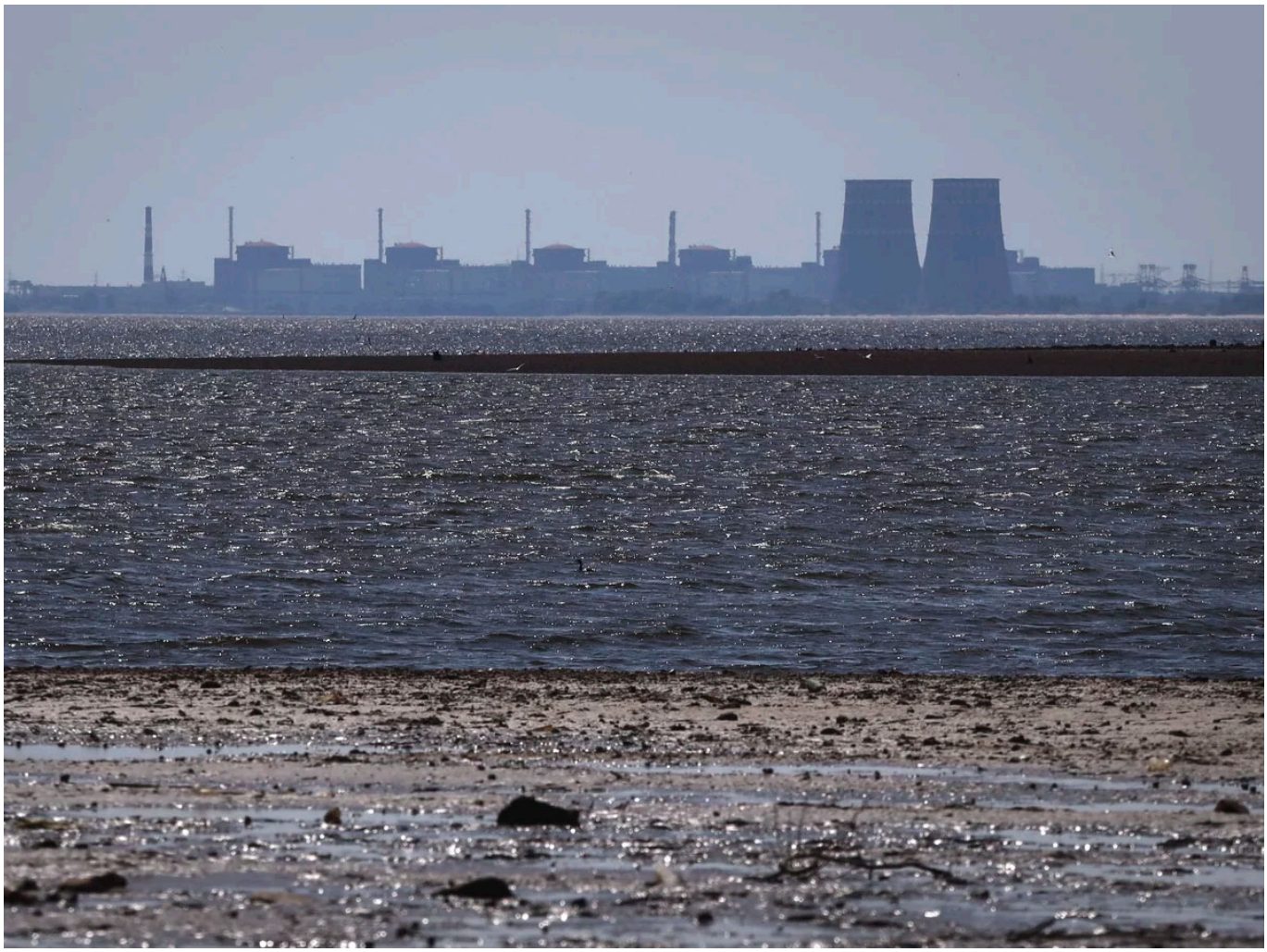

The Zaporizhzhia nuclear power plant, Europe's largest, is seen in the background of the shallow Kakhovka Reservoir. Water levels in the reservoir have been falling rapidly after a critical dam collapsed.

Kateryna Klochko/AP

Workers at a Ukrainian nuclear power plant are in a race to secure water for the plant's safe operation.

Following the destruction of a critical dam in Ukraine, water levels at a large reservoir used by the power plant are dropping fast. Workers have slurped up as much of it as they can. They've filled up ponds, canals and a small artificial lake next to the plant.

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The situation is not an immediate crisis, says Edwin Lyman, director of nuclear power safety at the Union of Concerned Scientists, an environmental group. Still, Lyman believes the loss of an important water supply is putting more strain on the already beleaguered nuclear plant – which has been under Russian occupation for over a year.

The plant has already endured power failures, fires, shelling and abuse of workers by Russian occupiers, all of which are eroding its defenses, Lyman says. And now this.

"It's a kind of a slow-motion train wreck," he says.

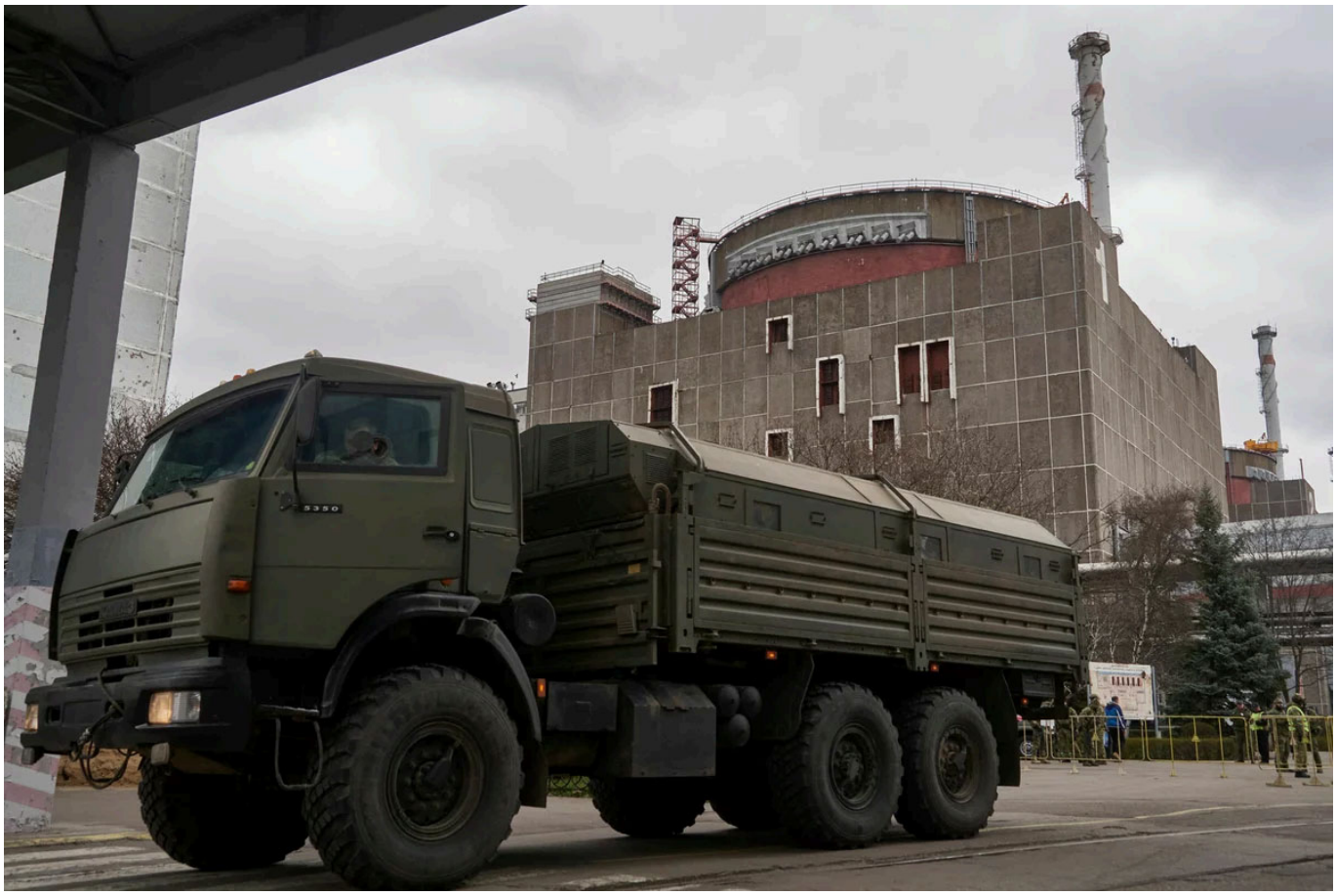
Nuclear power plants generate a lot of heat. Keeping them cool takes lots of water, which is why the Zaporizhzhia nuclear power station sat on one of Ukraine's

largest reservoirs. The Kakhovka Reservoir is roughly the size of Utah's Great Salt Lake and was the plant's source of cooling water for decades.

Then on June 6, something destroyed the dam holding back the reservoir. Seismic signals indicate there was an explosion, and a U.S. official tells NPR that a spy satellite also detected a blast.

It remains unclear who was responsible for the dam's destruction.

Regardless, large sections of the dam were swept away. In just a matter of days, the water level in the reservoir has dropped by more than 20 feet.



Russian forces have occupied the nuclear plant for over a year. It has endured fires, shelling, and blackouts. Now it will have to go without easy access to water.

ANDREY BORODULIN/AFP via Getty Images

The Zaporizhzhia reactors aren't in trouble just yet. Olexiy Kovynyev, a former operator at the plant, says the facility has its own two-mile-wide "cooling pond" that is separated from the reservoir. The Ukrainian nuclear utility, Energoatom, says that water levels in the pond remain stable, even as the main reservoir empties out.

The International Atomic Energy Agency believes the water in that pond, and other parts of the plant, should be enough to last for several months.

That's also because the reactors also require less water at the moment than they do during normal operation, Kovynyev says.

"The plant is shut down, so all six reactors are in this shut down state," Kovynyev says.

But even shut down, radioactive fuel in the reactors can continue to produce heat for years – meaning that operators can't just walk away. The plant also needs water to cool spent fuel, which is kept in pools located near the reactors, and critical equipment such as the diesel generators used to keep the plant running when the external power goes out.

With the reservoir soon to be unavailable for the foreseeable future, the plant will need to find more water at some point. The IAEA says options include wells, the local water system, and even mobile pumps bringing water from elsewhere.

Setting up those alternative systems will take manpower, though, and the plant's workforce has dwindled under a brutal Russian occupation.

"The question is: Do they have enough people to perform these actions that will have to be performed if they get to these sorts of scenarios?" says Jacopo Buongiorno, a nuclear engineer at MIT. "I think they do, but who knows?"

If the reactors do run out of water, then the fuel inside could start to melt down. That could lead to some kind of radioactive release, says Lyman. He thinks it might be a kind of "slow seepage" of radioactive gasses out of the reactor containment.

But Buongiorno says that because the reactors have been shut down for months, it won't be anywhere near the type of catastrophic meltdown that took place at the Ukrainian Chernobyl site in 1986.

"There's just not enough heat at this point, so those scenarios are just not in the cards," he says.

Still, he says, any meltdown would permanently ruin the Zaporizhzhia reactors, leaving Ukraine without a vital source of electricity.

"That station, pre-invasion, provided a good chunk of the electricity that Ukraine uses," he says. "It would not be possible to ever operate those reactors again."

NPR's Tom Bowman contributed to this report.

nuclear power zaporizhzhia nuclear power plant kakhovka reservoir kakhovka dam