

NFLA Policy

Briefing No. 229c



Date: 15 March 2022

Subject: Update on the Ukrainian Power Plants

Introduction

This is an update on NFLA Policy Briefings No. 229, 229a and 229b concerning the operational status and safety of the Ukrainian nuclear plants at Chernobyl and Zaporizhzhya.

General

The Ukrainian state inspectorate for nuclear regulation SNRIU (the regulator) has said eight of the country's 15 reactors remained operating, including two at Zaporizhzhya, three at Rivne, one at Khmelnytsky, and two at South Ukraine.

Last week International Atomic Energy Agency (IAEA) Director-General Rafael Grossi discussed with the Ukrainian and Russian Foreign Ministers Dmytro Kuleba and Sergei Lavrov a framework that would enable the IAEA to deliver technical and other assistance for the safe and secure operation of all of Ukraine's nuclear facilities. He is now working for an early agreement and implementation to the framework which is based on the 'seven indispensable pillars for nuclear safety' (see NFLA Briefing No 229b).

On 12 March, the Russian Federation informed the IAEA: *"management and operation of the Zaporozhskaya and Chernobyl nuclear power plants is carried out by the Ukrainian operating personnel. A group of several Russian experts provides them consultative assistance. In the framework of providing technical support, the priority needs of plants are being determined to ensure the safe and sustainable operation of nuclear power units. Thus, in particular, with the consultative assistance of Russian specialists, the restoration of the power supply of the Chernobyl plant and the physical protection system of the Zaporozhskaya plant is now being carried out. While implementing measures carried out at ensuring the safe and secure operation of Ukrainian nuclear power plants the Russia side maintains close contact with the IAEA"*.

See later for examples of Russian – Ukrainian interaction.

The radiation levels at all plants are in the normal range and safety systems are intact.

Aside from Chernobyl where communication is lost, the IAEA reports that it is receiving remote data transmission from its monitoring systems installed at the other plants in Ukraine.

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Chornobyl

Ukraine informed the International Atomic Energy Agency (IAEA) that on both the 13 and 14 March damage to power lines at the plant had been caused “by the occupying forces”. However, after intervention by specialist repair teams, at 13:10 CET yesterday it was reported that the external power had been restored and that staff at the plant had started operations to reconnect the plant to the electricity grid. Diesel generators have been providing back-up electricity to the site since it lost all off-site power on 9 March.

Media reports that diesel fuel shortages would mean cooling systems used to cool stored waste would fail appear unfounded. The regulator said Chornobyl’s disconnection from the grid did not have a critical impact on safety as the volume of cooling water in its spent fuel storage facility was sufficient to maintain heat removal without a supply of electricity. The regulator has also said a safety analysis report for the spent fuel facility concluded that there would be “no impact on essential safety systems” in the case of a total loss of power.

On 13 March, the regulator informed the IAEA that staff at Chornobyl were no longer carrying out repair and maintenance of safety-related equipment, in part due to their physical and psychological fatigue after working non-stop for nearly three weeks.

The staff of 211 technical personnel and guards have still not been able to rotate from the facility since the day before Russian forces entered the site on 24 February, and there are security concerns about transporting staff outside the Exclusion Zone set up after the accident. The regulator has no direct communication with the staff but receives information from off-site plant management.

To add further complications there is also now a requirement to closely monitor the situation in the Chornobyl Exclusion Zone as the annual “fire season” approaches when spontaneous fires often occur in the area.

Zaporizhzhya

At Zaporizhzhya, regular staff continue to operate the plant, rotate shifts and carry out their day-to-day work. However in a letter to the Director General of the IAEA, the President of the National Nuclear Energy Generating Company, Energoatom (the operator), Petro Kotin, said that around 400 Russian soldiers were “present full time on site” and confirmed that the plant remains under the control of the Russian military commander with whom plant management were required to coordinate on all operational issues, including technical matters.

At least 11 representatives of the Russian state company, Rosatom, are also present on-site ‘to assess the radiation situation there’. Ukraine expressed fears that Rosatom staff would take charge of the plant. However in a telephone call with Director General Grossi on 12 March, the Director General of Rosatom, Alexey Likhachev, denied that Rosatom had taken operational control, nor that it intended for the plant to be under Rosatom’s “management system”; so far they appear not to be interfering with the operation of the nuclear facilities.

There are reports that Russian forces have carried out munition explosions on-site. The ‘I’ newspaper quoted the operator as saying: “*[Racist] idiots blew up part of the ammunition on the site of the Zaporizhzhia NPP [nuclear power plant] near the ruins of the training centre and power unit No 1.*” However the regulator said that work had been carried out to detect and dispose of unexploded munitions found at the damaged training centre and elsewhere at the plant following the attack on 4 March, when Russian forces took control of the site.

<https://www.msn.com/en-gb/news/world/ukraine-war-russians-blow-up-ammunition-at-zaporizhzhia-nuclear-power-plant-state-operator-claims/ar-AAV2WB8?ocid=msedgdhp&pc=U531>

There are four high voltage (750 kV) offsite power lines operational, plus an additional one on standby, but two of the four have been damaged. The operator has informed the IAEA that the plant's off-site power needs could be provided with one power line available. Diesel generators were also ready to provide back-up power. Rosatom Director General Likhachev has stated that repair work is being carried out on the damaged lines and that Russia has brought in more fuel supplies for the generators.

The regulator can however no longer provide independent on-site regulatory safety oversight of the plant, in part because its working premises there were – conveniently? - damaged in the attack by Russian forces on 4 March.



A photo showing damage caused by Russian forces to the training facility (source: Nucnet)

Excerpts of two on-line articles providing an analysis of the possible impact of an attack on the power plant follow (with thanks to Peter Burt for providing me with access to the second).

Nucnet recently featured an interesting article on the power plant and the nuclear risks from which I quote:

'The six nuclear plants at Zaporizhzhia are VVER-1000/V320 units. These "water-water energetic reactors" (WWER), or VVER units, are a series of pressurised water reactor designs originally developed in the Soviet Union, and now Russia, by OKB Gidropress. VVERs were originally developed before the 1970s, and have been continually updated. As a result, the name VVER is associated with a wide variety of reactor designs spanning from Generation I reactors to modern Generation III+ reactor designs.

'VVER power stations have mostly been installed in Russia and the former Soviet Union, but also in China, the Czech Republic, Finland, Germany, Hungary, Slovakia, Bulgaria, India,

Iran and Ukraine. Units are under various stages of planning or construction in Finland, Hungary, Belarus, Bangladesh, Egypt, Turkey, India, Iran, and China.

“The chances of explosion, nuclear meltdown or radioactive release are low”, said Tony Irwin, an honorary associate professor at the Australian National University. Professor Irwin, who operated nuclear power plants in the UK for three decades, said the PWR reactors are “a lot safer” than the reactors at Chernobyl, and did not appear to be damaged yet. The reactors have large concrete contaminants and built-in fire protection systems, he said.

‘The PWR [pressurised water reactor] type is a much safer sort of reactor, because it’s a two-circuit design reactor. The water that keeps the reactor cool is on a separate circuit to the second one, which actually supplies the power to the turbine and the outside.’

“These reactors have back-up emergency cooling systems as well. In addition to the normal reactor cooling, they’ve got a passive system, they’ve got high-pressure injection systems, they’ve got low-pressure injection systems.”

<https://www.nucnet.org/news/everything-you-need-to-know-about-what-s-happening-at-europe-s-largest-nuclear-power-station-3-5-2022>

Zaporizhzhia Nuclear Power Plant



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|---|--|
| 1 Reactor Building (Unit 1) | 9 Gate (Checkpoint) 1 and Administrative Buildings |
| 2 Turbine Building (Unit 1) | 10 Gate (Checkpoint) 2 |
| 3 Diesel Generator (Unit 1) | 11 Dry Spent Fuel Storage Facility |
| 4 Pumping Station (Unit 1) | 12 Spray Ponds |
| 5 Radioactive Waste Treatment Buildings 1 and 2 | 13 Cafeteria |
| 6 Solid Radioactive Waste Storage | 14 Full Scope Simulator |
| 7 Auxiliary Buildings | 15 Training Center |
| 8 Laboratory and Services Buildings 1 and 2 | 16 750 kV Substation |

Based on information retrieved from the operator’s website
<https://www.npp.zp.ua/index.php/uk/about-us/diagram>

The building that was hit and caught fire is at #15. The camera viewed live on YouTube (i.e. taking the photo shown earlier) is at #9.

From an article by Tom Bielefield: *‘Many colleagues have spoken to the media about the events at Zaporizhzhia, stressing that there was never a risk of nuclear detonation, and that the robust construction of the reactor containments is designed to withstand impacts as destructive as aircraft collisions. What we and the expert community are most concerned about is the real risk that shells or missiles could destroy less-protected components of the reactor cooling systems, or destroy the offsite power transmission systems needed to operate them. This could lead to a station blackout, meltdowns, and massive radioactive releases like those that happened at Fukushima.*

(The regulator) released results (5 March) of simulations showing what would happen if such an accident occurred at Zaporizhzhia. With current wind conditions, most of the radioactive plume would blanket southern Russia. We hope the Russian leadership thinks that sort of scenario is worth avoiding”.



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