

Nuclear Power and Nuclear Powers: Lessons from Ukraine



MARCH 16, 2026

**Briefing of the
Commission on Security and Cooperation in Europe**

Washington: 2026

Commission on Security and Cooperation in Europe
234 Ford House Office Building
Washington, DC 20515
202-225-1901
csce@mail.house.gov
<http://www.csce.gov>
@HelsinkiComm

Legislative Branch Commissioners

SENATE

ROGER F. WICKER, MISSISSIPPI *Chairman*
SHELDON WHITEHOUSE, RHODE ISLAND
Ranking Member
JOHN BOOZMAN, ARKANSAS
KATIE BRITT, ALABAMA
JOHN FETTERMAN, PENNSYLVANIA
RUBEN GALLEG0, ARIZONA
JEANNE SHAHEEN, NEW HAMPSHIRE
THOM TILLIS, NORTH CAROLINA
MIKE ROUNDS, SOUTH DAKOTA

HOUSE

JOE WILSON, SOUTH CAROLINA
Co-Chairman
STEVE COHEN, TENNESSEE *Ranking Member*
ROBERT ADERHOLT, ALABAMA
EMMANUEL CLEAVER, MISSOURI
LLOYD DOGETT, TEXAS
JAKE ELLZEY, TEXAS
RICHARD HUDSON, NORTH CAROLINA
GREG MURPHY, NORTH CAROLINA
MARC VEASEY, TEXAS

Executive Branch Commissioners

DEPARTMENT OF STATE, *to be appointed*
DEPARTMENT OF DEFENSE, *to be appointed*
DEPARTMENT OF COMMERCE, *to be appointed*

ABOUT THE ORGANIZATION FOR SECURITY AND COOPERATION IN EUROPE

The Helsinki process, formally titled the Conference on Security and Cooperation in Europe, traces its origin to the signing of the Helsinki Final Act in Finland on August 1, 1975, by the leaders of 33 European countries, the United States and Canada. As of January 1, 1995, the Helsinki process was renamed the Organization for Security and Cooperation in Europe [OSCE].

The membership of the OSCE has expanded to 57 participating States, reflecting the breakup of the Soviet Union, Czechoslovakia, and Yugoslavia.

The OSCE Secretariat is in Vienna, Austria, where weekly meetings of the participating States' permanent representatives are held. In addition, specialized seminars and meetings are convened in various locations. Periodic consultations are held among Senior Officials, Ministers and Heads of State or Government.

Although the OSCE continues to engage in standard setting in the fields of military security, economic and environmental cooperation, and human rights and humanitarian concerns, the Organization is primarily focused on initiatives designed to prevent, manage and resolve conflict within and among the participating States. The Organization deploys numerous missions and field activities located in Southeastern and Eastern Europe, the Caucasus, and Central Asia. The website of the OSCE is: <www.osce.org>.

ABOUT THE COMMISSION ON SECURITY AND COOPERATION IN EUROPE

The Commission on Security and Cooperation in Europe, also known as the Helsinki Commission, is an independent U.S. Government commission created in 1976 to monitor and encourage compliance by the participating States with their OSCE commitments, with a particular emphasis on human rights.

The Commission consists of nine members from the United States Senate, nine members from the House of Representatives, and one member each from the Departments of State, Defense and Commerce. The positions of Chair and Co-Chair rotate between the Senate and House every two years, when a new Congress convenes. A professional staff assists the Commissioners in their work.

In fulfilling its mandate, the Commission gathers and disseminates relevant information to the U.S. Congress and the public by convening hearings, issuing reports that reflect the views of Members of the Commission and/or its staff, and providing details about the activities of the Helsinki process and developments in OSCE participating States.

The Commission also contributes to the formulation and execution of U.S. policy regarding the OSCE, including through Member and staff participation on U.S. Delegations to OSCE meetings. Members of the Commission have regular contact with parliamentarians, government officials, representatives of non-governmental organizations, and private individuals from participating States. The website of the Commission is: <www.csce.gov>.

Nuclear Power and Nuclear Powers: Lessons from Ukraine

MARCH 16, 2026

Page

COMMISSION STAFF PRESENT

Rachel Bauman, Senior Policy Advisor, Commission for Security and Cooperation in Europe	1
---	---

PARTICIPANTS

Robert Wagner, Researcher, Naval Postgraduate School	2
Mariana Budjeryn, Senior Researcher, Center for Nuclear Security Policy, MIT Security Studies Program	4
James Acton, Co-director, Nuclear Policy Program, Carnegie Endowment for International Peace	7

Nuclear Power and Nuclear Powers: Lessons from Ukraine

March 16, 2026

Commission on Security and Cooperation in Europe Washington, DC

The briefing was held from 10:31 a.m. to 11:34 a.m., Room 360 Cannon House Office Building, Rachel Bauman, Senior Policy Advisor, Commission for Security and Cooperation in Europe, presiding.

Ms. BAUMAN: All right. I think we are going to get started, if everyone is ready, it is about that time, 10:31. Good morning, everyone, and thank you for joining us today. My name is Rachel Bauman. I am a senior policy advisor at the Commission on Security and Cooperation in Europe, also known as the Helsinki Commission. By way of background, we are an independent U.S. government agency created in 1976, which makes this year our 50th anniversary. Our focus is security and human rights in Europe and Eurasia. Our congressional commissioners represent both parties and both chambers.

Today we will be discussing nuclear power in the context of Russia's war against Ukraine, with a particular focus on the Zaporizhzhia Nuclear Power Plant, or ZNPP, in southeastern Ukraine. Of course, Ukraine has had a long and complex relationship with both civilian and military uses of nuclear power. Most obvious is the Soviet Union's gross mismanagement and lack of transparency surrounding the disaster at Chernobyl, which was not only an environmentally and psychologically traumatic event for the region but reminded the entire world of the destructive power of the atom, even in a peaceful context.

Ukraine inherited additional nuclear baggage from the Soviet Union. Nuclear weapons, infrastructure, and a wealth of native expertise made newly independent Ukraine a potential nuclear superpower in its own right in the early 1990's. Ukraine's political leadership at the time chose to relinquish its nuclear arsenal inherited from the Soviet Union and joined the Non-Proliferation Treaty in exchange for security guarantees and respect for sovereignty and territorial integrity from Russia, the United States, and the U.K. This was 1994, and though the historical context deeply informed the decision at the time, some Ukrainians have recently lamented Ukraine's loss of its nuclear potential as a hedge against Russia.

Coming to the present, and to Ukraine's current energy situation in wartime, it is worth noting that the Zaporizhzhia Nuclear Power Plant generated at least 20 percent of Ukraine's electricity before Russia's full-scale invasion of Ukraine and subsequent occupation of the plant in 2022. Considering the devastating energy shortages this past

winter caused by Russian attacks on civilian energy infrastructure, Russian control of the plant continues to be a huge blow to Ukraine. As I have suggested, this is bigger than just the ZNPP. We will be talking about Russia's lack of nuclear transparency and what it means for energy security, warfare, and even the future of international nuclear regulatory frameworks. All this and more from our distinguished panelists today. I am going to introduce them briefly. You can find their extended bios in the audience handouts.

First, we have Bob Wagner, who is a senior defense analyst, emergency manager, and Navy Reserve officer who specializes in Eastern European security and countering weapons of mass destruction. From 2022 to 2024, he supported the Cooperative Threat Reduction Program as a nuclear and chemical security expert in Ukraine, Kazakhstan, and Armenia. In the Navy Reserve, he has been assigned to both U.S. European Command and NATO. He currently chairs the Homeland Security and Defense Consortium at the International Association of Emergency Managers, which researches the domestic security implications of foreign adversary threats. He is an alumnus of the Naval Postgraduate School.

Next, Mariana Budjeryn is senior researcher with the Center for Nuclear Security Policy at MIT's Security Studies Program. She is the author of *Inheriting the Bomb: The Collapse of the USSR and the Nuclear Disarmament of Ukraine*, 2023. Formerly, she held appointments with the Project on Managing the Atom at the Harvard Kennedy School's Belfer Center, at Harvard's Davis Center for Russian and Eurasian Studies, and served as a visiting professor at Tufts University and Peace Research Institute, Frankfurt. Mariana holds a Ph.D. in political science and an M.A. in international relations from Central European University, formerly in Budapest.

Finally, James Acton holds the Jessica T. Mathews Chair and is codirector of the Nuclear Policy Program at the Carnegie Endowment for International Peace. His book on the nuclear escalation risks of advanced non-nuclear weapons and practical risk mitigation measures is set to be published by Oxford University Press late this year or early next. Acton has testified to the U.S. House of Representatives Armed Services and Appropriations Committees and the U.S.-China Economic and Security Review Commission. He holds a Ph.D. in theoretical physics from the University of Cambridge.

For our format today, each of our guests will give a short presentation. I will ask a question or two to get things started. Then we will turn over to the audience for questions from the audience. We will start with Bob, and—please.

Mr. WAGNER: Congressional staff and distinguished guests, thank you for this opportunity to share. If you were standing outside the administrative building of the Chernobyl Nuclear Power Plant today, you would see a weathered bronze statue of Prometheus, the Titan from Greek mythology who stole fire from the gods and gifted it to mankind. That statue came to symbolize the Soviet Union's belief that it had mastered nuclear power, that it had metaphorically learned to harness fire itself. After the Chernobyl disaster in 1986, however, it came to represent something else entirely—a warning of what can happen when nuclear technology is grossly and hubristically mismanaged, and how far the consequences can spread both physically and politically.

For the Soviet Union, those consequences ultimately proved existential. Today, however, the Russian Federation is ignoring that warning. When Russia launched its full-scale invasion of Ukraine in February 2022, it did something unprecedented in the history of warfare. Within hours of crossing the border from Belarus, Russian forces seized the decommissioning Chernobyl Nuclear Power Plant. Days later, in southeastern Ukraine,

they captured the Zaporizhzhia Nuclear Power Plant, the largest nuclear plant in Europe. So far, this war is showing us that nuclear plants are no longer just energy infrastructure. They are now potential military targets.

Of course, nuclear reactors are designed with robust containment systems, but they still rely on external infrastructure for emergency core cooling, including power lines, backup diesel generators, and water supplies. As seen when Russia destroyed the Kakhovka Dam in 2023, this infrastructure is particularly vulnerable to military activity, including artillery fire, missile strikes, and drone attacks that can cause critical damage, intentionally or accidentally. In a worst-case scenario, such disruptions could cause a reactor meltdown and release of radioactive material, much like the 1986 disaster. Managing a radiological emergency is difficult in peacetime. In the middle of a war, it becomes exponentially harder.

The more immediate danger posed by reactors and war zones may not be radiation. It may be darkness. Before the war, the Zaporizhzhia Nuclear Power Plant produced roughly one quarter of Ukraine's electricity. After Russian forces seized it, the reactors were eventually placed into cold shutdown, removing a major source of electrical power from the Ukrainian grid. Compounding this loss has been Moscow's relentless targeting of Ukraine's broader energy infrastructure. The goal here is not battlefield advantage. Rather, it is sustained pressure on the Ukrainian population, particularly during the winter months when heat becomes necessary for survival. In effect, Moscow is attempting to weaponize winter, having learned that turning off the lights can sometimes be more powerful than launching another missile.

Perhaps the most striking lesson from Ukraine is not simply that nuclear plants can be targeted. It is that they can be deliberately leveraged as instruments of military strategy and foreign policy. Russian forces have transformed the Zaporizhzhia Nuclear Power Plant into a fortified military position. This has created an unusual dynamic on the battlefield. Russian forces operate from the plant while daring a Ukrainian counter-attack. In essence, it is a giant adult game of "I'm not touching you." The strategic implications are anything but childish. Control of the plant has become a bargaining chip in negotiations because whoever controls the facility ultimately controls when and whether its electricity returns to the Ukrainian grid.

By manipulating the nuclear safety risks surrounding the facility, Moscow can create dilemmas that force outside actors to weigh escalation risks against the costs of restraint. This is hybrid warfare in practice, combining physical control of the plant with disinformation that amplifies fears about a potential nuclear emergency. We saw this dynamic when Russia accused Ukraine of using its nuclear facilities to construct a dirty bomb. Ultimately, the goal of this strategy is to make the West blink first. Meanwhile, Russia is attempting to legitimize its control of the plant by issuing its own operating licenses for the facility. The logic is simple. If Russia licenses the plant, it must own it. This mirrors the tactic Moscow has used elsewhere, known as passportization, the distribution of Russian passports in occupied territories to manufacture claims of authority and control.

In all this, Moscow has transformed a critical piece of Ukraine's civilian infrastructure into an instrument of nuclear coercion, piracy, and blackmail. Taken together, Ukraine's experience in this war points to three important lessons about nuclear plants in war zones. First, nuclear power plants are no longer just civilian infrastructure. They have become instruments of military strategy and foreign policy. Second, the more imme-

diate danger may not be a radiological disaster but a regional loss of electricity, especially during harsh winters. Third, if this strategy continues to prove successful in Ukraine, it is highly likely to be repeated elsewhere. This is particularly concerning in Russia's near abroad, especially Armenia, where a 123 Agreement with the United States was signed earlier this year.

The weathered bronze statue of Prometheus at Chernobyl reminds us that playing with fire can have dire consequences, especially when that fire is harnessed in a nuclear reactor. The Soviet Union learned that lesson the hard way in 1986. Russia now appears determined to ignore it. History suggests that those who play with fire can get burned. In geopolitics, the fallout from a nuclear disaster can last far longer than any advantage that Moscow hopes to gain. On that upbeat note, I look forward to your questions. I would be happy to submit the Naval Postgraduate School report with policy recommendations for the record.

Thank you.

Ms. BAUMAN: Thanks, Bob.

Mariana.

Ms. BUDJERYN: Yes. Thank you so much to the U.S. Helsinki Commission for convening this meeting. Thank you all for coming here this morning to listen to this briefing. Bob, thank you for starting us off on recounting the main facts of the Russian seizure and occupation of Zaporizhzhia Nuclear Power Plant.

I will proceed in making three points, or focusing on three issues, rather. One is what is not new about this attack. The second one about what is new and unprecedented about this attack. The third one about the broader consequences for international rules and regimes governing civilian nuclear energy. To begin with, attacks on critical infrastructure in wartime are not a new phenomenon. They happened in World War II, in the Korean War, and the Gulf War. The states deliberately target civilian infrastructure in armed combat. Attacks on nuclear facilities are also not new. In 1980, during the Iran-Iraq War, Iran undertook strikes on Iraqi Osirak Reactor. It did not do much damage, but that particular attack was followed up in 1981 by Israeli attacks on the Osirak Nuclear Reactor in Iraq, that did cause quite a bit of damage. Now, to note, that reactor—Osirak Reactor, at the time, was not loaded with fuel. It was not going hot.

In 1991, coalition forces in Operation Desert Storm destroyed Iraqi Nuclear Research Center at Al-Tuwaitha. In 1991, during the Yugoslav wars, Yugoslav Air Force did low overflights over the Krsko Nuclear Power Plant in Slovenia. As a precaution—it was an operating nuclear power plant. It was operating at the time. As a precaution, the reactor was scrammed for two weeks, and then worked on reduced power for some time, until it was deemed safe to restart it on full capacity a few months later. Most recently, in June 2025, we saw combined U.S. and Israeli strikes on Iranian nuclear facilities in Fordow, Natanz, and Isfahan.

Attempts to account for those, and attempts to ban attacks on civilian nuclear facilities under international humanitarian law, have also been underway in several different international fora. Most notably under the Geneva Conventions on Laws of War, Additional Protocol One, adopted in 1977 under Article 56, the protection of works and installations containing dangerous forces. The signatories of this additional protocol, which include Russia and Ukraine, undertake not to use military force, not to target these

works and installations that contain dangerous forces, including dams and dikes and nuclear electrical generating stations, as it is written in Article 56.

The Conference on Disarmament has also undertaken this question as part—in the early 1980’s as part of negotiating a convention on radiological weapons. A few countries at that time raised the question that while radiological weapons could be a danger, right, at that time they did not exist in the arsenals of any major powers—and still do not as far as we know. Radiological warfare is very much a thing and a danger, and could provide an advantage to one of the belligerents when, instead of hurling a large amount of radioactive material across long distances, all you have to do is target an operating nuclear power plant and release all of that radiation. There was a concerted effort to negotiate a ban on radiological warfare that unfortunately did not go anywhere.

Finally, at the International Atomic Energy Agency, the IAEA, during the emergency general conference that immediately followed the Chernobyl Nuclear Power Plant accident in 1986, a group of 77, that is roughly speaking, the Global South representatives, raised, again, a question of banning attacks on civilian nuclear facilities, since everyone was very much seeing at the time what a large scale release of radioactivity from an operating nuclear reactor can—the extent of damage it can cause, and that that kind of damage does not obey and observe borders. Radiation travels far and wide depending on weather conditions.

This is where we stood before the Russian seizure and takeover of the Zaporizhzhia Nuclear Power Plant. What is new and unprecedented about this particular attack? One is that it is a direct military assault on an operating nuclear power plant. At the time, on the night of March 3rd to March 4, 2022, when the Russian armed column approached the nuclear power plant, ZNPP was operating four reactors, two of which were scrambled that night as an emergency response. Subsequently, once the power plant was taken over, it was militarized—something Bob already mentioned—with about 500 military personnel, Russian military personnel, stationed at the power plant, and heavy equipment, and live ammunition stored in turbine halls of the power plant.

As Bob already mentioned, the Russian military used the vicinity of ZNPP to deploy multiple rocket launch systems and stage attacks on Ukrainian forces across the river and across the line of contact, knowing full well that using the power plant as a shield and as a sanctuary, that would deter Ukrainian response. More broadly speaking, Russia’s concerted attacks on Ukraine’s grid endangered not only the Zaporizhzhia Nuclear Power Plant, that shut down all of its reactors on September 12, 2022, but the other three operating nuclear power plants—operating nine 1000-megawatt reactors—well, sorry—seven 1000-megawatt reactors and two 440-megawatt reactors, on which Ukrainian energy system relied to a much greater extent during the war, since the war started, than even before.

Nuclear power contributed up to 50 percent of Ukrainian generated electricity before the war. It is higher now, simply because other generating capacities have been degraded so greatly—thermal, hydro, and so forth. The offsite power on which the safe and secure operation of nuclear power plants depends is in constant peril, as are the adjacent electrical substations where the power plants offload their electricity. If you have no place to offload electricity, you have to scram the reactors down. Beyond that—and this has been the particular attention—particular focus of my research, and be happy to answer further questions on that—one of the most unprecedented things that happened is the mistreatment of the staff of a nuclear power plant. That is something that has been a

blind spot for many of the, you know, rules and regulations, and the ways in which we, as kind of on a national level and international level, think about nuclear safety and security.

The fact of the matter is that in a large-scale conflict, nuclear power plants are a category of their own. They are not—they do not belong in the same list as dams and dikes, for the simple reason that their safe and secure operation depends to a great extent on the availability of a very specialized staff that has to carry out duties of very high responsibility in keeping the plant safe. What happened after the Russian seizure of the plant is that the Ukrainian staff came under incredible physical and psychological duress. I have traveled to Ukraine many times since the beginning of the war. I had the honor of talking to some of these evacuated nuclear operators. I have talked to people who were tortured, who were held without reason in a dungeon for a long time, without the provision of food and water and adequate conditions. I talked to people whose family was threatened if they did not sign a contract with Rosatom or take a Russian passport. These people had to return to their control rooms and operate a nuclear reactor afterwards. This is absolutely and wholly unprecedented.

Let me touch a little bit in my final point about the broader consequences of what has happened in ZNPP and what continues to happen with the Ukrainian grid, and other operating nuclear reactors in Ukraine. When I was preparing for this briefing, I thought—it occurred to me that there are very few countries in the world that have been marked by the atom to the same extent as Ukraine. Beginning in 1986 with the accident—the worst, thus far, hopefully remains so—the worst nuclear accident in history in 1986 at Chernobyl. Then the tensions of the entire world turned to Ukraine in the early 1990's concerning the fate of the world's third-largest nuclear arsenal, which was left on Ukraine's territory by the defunct Soviet Union. In 1994 Ukraine actually made the right decision, made the decision to disarm and to join the nonproliferation regime, and to join the international community as an international citizen in good standing.

Fast forward 20 years. Ukraine gets invaded. In 2024, the full-scale invasion by a nuclear power, that happened to be one of the guarantors under the Budapest Memorandum, was part of Ukraine's nuclear deal, breaches its commitments, and does so under—while using nuclear threats to dissuade Ukrainian partners, potential partners, and allies to extend assistance to Ukraine. At the same time, it creates a set of unprecedented perils to civilian nuclear facilities in Ukraine that—to which, to the development of which, the development of civilian nuclear energy, Ukraine has absolute right under the Treaty on the Non-Proliferation of Nuclear Weapons, as a non-nuclear weapons state.

The lessons are still in the making, right? The war is still ongoing. It is not an exaggeration to think that we, as an international community but also national nuclear regulators and operators, need to rethink how nuclear safety and security looks in war-time, account for the paradigm shift, think very hard about securing the nuclear operators in these contingencies, and making the—generally the energy system and the electrical grid a lot more resilient than it is today.

Finally, Ukraine stands, unfortunately, as a negative example that international law and international regimes might not serve as a set of restraints for major, especially nuclear power and a major stakeholder in international system, which makes it also very difficult for the rest of the international community to enforce these laws and norms. As we all know, enforcement is the best deterrence.

Thank you.

Ms. BAUMAN: Thank you. Thank you, Mariana.
James.

Mr. ACTON: Thank you very much. I very much appreciate the invitation on an issue that is incredibly important, but has been crowded out over the last few years, really. I want to zoom out a bit and ask the question, what do we do about this problem? The problem of attacks against nuclear power plants. Because the attack against ZNPP, I think, is an outrage in and of itself, but it is also a harbinger of a potential risk out there. As international relations become more stressed, as the possibility of international conflict rises, as nuclear power spreads to more states, for very good reasons, the possibility that nuclear power plants become targets in a war becomes more likely.

What would happen, for example, in a war between the United States and China over Taiwan? All of the states and nonstate entities involved in that conflict have nuclear power plants. Moreover, when we are thinking about threats to nuclear power plants, we are not just thinking about the threats to the actual physical plant itself, as both Bob and Mariana have mentioned. Nuclear power plants are not islands. To be safe, resources from outside the plant have to be moved into the plant, of which the most important is electricity, but not just electricity. Personnel, for example.

One cannot just focus purely on the actual physical plant itself, but the entire state's electricity grid also has important implications for the safety and security of individual plants. The challenge of restraining states' behavior during a war is a really difficult one. I am not going to sit here and tell you there are any easy or good solutions. It strikes me that in addition to a lot of the very sensible and thoughtful measures that Mariana suggested, including thinking about enhancing the resilience of electricity grids, ensuring that workers are protected. We should think about how to try to restrain attacks against nuclear power plants, and it strikes me there is two basic ways you can think about this problem.

One is deterrence, which is punishing states, finding some way of punishing, inflicting costs on states that attack nuclear power plants. The other is to try to create legal and normative barriers. These are not mutually exclusive. In fact, I think these are mutually reinforcing. The stronger the norm against attacks on nuclear power plants is, the more credible punishment after the events become. Exactly how we would punish states that attack nuclear power plants is going to be a really case-by-case, specific discussion. It is a fascinating one, but I want today to focus on trying to strengthen the legal and normative barriers against attacks on nuclear power plants, fully recognizing that this is an imperfect solution to a very real problem.

Now, as Mariana has already mentioned, there is a prohibition—a legal prohibition against attacks on nuclear power plants and other kinds of dangerous installations in the first additional protocol to the Geneva Conventions. There are two problems with this language as it stands, beyond just kind of a general disregard for international law. The first one is this seemingly absolute qualification against attacking nuclear power plants is qualified by a statement that basically says, if the electricity from the plant supports military operations, and if there is no other way of depriving your enemy of that source of electricity, then attacks against nuclear power plants are potentially legal. That is a significant problem. Second, as I have already mentioned, the problem is not just attacks against the plant directly, it is attacks against the state's electricity grid.

There have been various other attempts. Mariana, I think, summarized them very adroitly. There are other statements of political force. There is no other legal prohibition against attacks against nuclear power plants. Frankly, there is very little prospect of any new legal prohibition in the near future that would qualify—that would close some of the loopholes in the Additional Protocol to the Geneva Conventions. That should not stop individual states from adopting a very clear policy that they will not attack nuclear power plants in time of war.

I think the United States can and should do this. We should just say that we will not attack nuclear power plants in a time of war, and we should encourage as many other states as possible to join this policy. A recent example of this is a commitment by the United States not to conduct antisatellite tests that would produce debris. This was a unilateral U.S. policy statement, and to date, 38 states have joined it. It is not a perfect approach. A unilateral policy against attacking nuclear power plants would not be perfect. I think it would set a higher normative barrier than exists today.

Then there is the question about how you deal with the problem of attacks on electricity grids. You know, in terms of publicly, the statement that I would advocate is just saying very simply, we will never attack a nuclear power plant, period. The United States believes that electricity grids can be legitimate targets in times of war. For example, in Operation Allied Force against Serbia in 1999, the United States attacked the Yugoslav electricity grid. The United States is never going to rule out attacking another country's electricity grid. What it should do, for example, in a document like the Law of War Manual, is explain that in deciding whether or not to attack a country's electricity grid, it will examine and take into account the effect that such attacks would have on the safety of nuclear reactors. That should be an explicit part of our policy for deciding whether or not to attack another country's electricity grid in a time of war.

The problem is that today, U.S. policy is moving in exactly the opposite direction. Only earlier this month, there was a resolution before the International Atomic Energy Agency Board of Governors that expressed concern about, "attacks targeting Ukraine's energy infrastructure critical for the offsite power supply of nuclear power plants, including at ZNPP, which represent a direct threat to nuclear safety." There were only four countries that opposed this resolution on the Board of Governors—Russia, China, Niger, and the United States. It may seem like an easy thing to say we should not attack other countries' nuclear power plants. We should have a very clear policy of that. In fact, we are kind of moving in the opposite direction.

The other—and this is a much more controversial issue—is whether there is a connection between attacks on nuclear power plants and attacks on other kinds of nuclear facilities, and Mariana has given you a whole bunch of examples of those. Now, the attack on ZNPP, as Mariana said, is unprecedented because there has never been an operation mounted against an operating nuclear power plant before. I also want to emphasize here, because I do not want to be misunderstood, that the effects of attacking nuclear power plants are unique, potentially uniquely awful. The attacks last year against the Iranian facilities at Fordow at Natanz had no, to my knowledge, detectable offsite radioactivity detected. There are very, very different effects from attacking operating nuclear power plants and for attacking other kinds of nuclear facilities.

I do think that attacks against other kinds of nuclear facilities weaken the normative barrier against attacks against any kind of nuclear facilities. I think when you look at this history of attacks, including Osirak, including the Syrian reactor, 2006 or 2007,

including the Iranian facilities, it seems to me it sends out a general message that nuclear installations can be legitimately targeted in times of war. That weakens the normative barriers to attacks against nuclear power plants. There is no easy solution to this problem. The United States and other countries are not going to have a blanket—are not going to commit to not attacking other kinds of nuclear facilities. I apologize for the double negative in that sentence. You know, there may be circumstances in which you decide you have no choice but to attack another country's nuclear facilities.

It strikes me that in the previous discussions, for example, last summer, there was—about whether to attack Iran's nuclear facilities—the fact that may weaken the normative barriers against attacking nuclear power plants was not even a factor in the discussion. What I am saying here is it should have been a factor in the discussion. It is a significant and concrete downside of attacks against other kinds of nuclear facilities that it weakens the norm against attacking nuclear power plants. What I am saying is not that countries can or should commit to never attacking other kinds of nuclear facilities, but it is a—but the weakening of the normative barrier is a factor that ought to be considered in those decisions, but really has not been to date. Very much look forward now to the discussion of these really important issues.

Ms. BAUMAN: Thank you, everyone, for these comments and your presentations. I will start out with a question, and then we will send it out to the audience. Mariana, as you mentioned, the employees of the Zaporizhzhia Nuclear Power Plant were essentially forced to transfer their employment to Rosatom. I want to talk a little bit about Rosatom as a state organ of Russia, and a little bit about its global hold on the civilian nuclear energy sphere, particularly—not only—but particularly in the former Soviet Union, where there is the Soviet continuity legacy there, as well as in sort of the developing world right now. Sort of the personality of Rosatom, the dangers of Rosatom being used as a guarantor of safety and security in these areas, and creating these dependencies in other countries. I do not know if that is too off topic, but something that I am interested in. I think the Rosatom element is an important one, the Russian state.

Ms. BUDJERYN: Absolutely, Rachel. I am actually really glad you asked this question. Yes, Rosatom is part of the occupying force. Now, on the Russian side, there are multiple actors, and those actors have their own interests. Those interests do not always coincide. There is the political leadership that has its own ends and puts pressure on both the nuclear operator, Rosatom, and the military. The military itself has its own objectives. There are security forces too, the FSB, the Federal Security Bureau, that operates in tandem, but also has its own particular interests. Then, of course, there is Rosatom, which is the operator at the Zaporizhzhia Nuclear Power Plant.

Also, it basically has the whole city of Enerhodar, the satellite city of the ZNPP, on its books. It basically runs the city. It is the city government. It supports, you know, the services there, whatever municipal services, and so forth. In working with conjunctions, there has been—recently, this past September, Ukrainian NGO Truth Hounds published a very important report documenting the complicity of Rosatom, essentially, in war crimes perpetrated against the Ukrainian staff. Where, you know, people were being pointed out who is more critical, who is less critical to the operation on the plant, who could be dragged off to the torture chamber, and so forth, by the Rosatom employees.

Now, the Ukrainian staff, essentially, only a small percentage by now, remains at the plant. The vast majority have evacuated, especially after the reactors were scrambled down and put in cold shutdown in September 2022. There is a category, about 2,000, of

the original ZNPP employees that could not evacuate for a variety of reasons. Some of them are personal. Some of them are they—simply people do not have the means to establish a new life elsewhere. These people have been banned from—these people have refused to sign contracts with Rosatom, and they have been banned from entering the plant and working there since February 1, 2024. They have essentially stranded in occupied Enerhodar, with very little means to provide for their life.

Sanctioning Rosatom, as, for instance, Russia's other energy industries have been sanctioned, proved to be quite difficult. Not only because Rosatom holds a big portfolio of pending contracts in Turkey, in Egypt, in Bangladesh, and elsewhere, but also because Rosatom accounts for over 40 percent of world's uranium enrichment markets. French nuclear fuel, you know, the French nuclear fuel manufacturer company, Framatome, cooperates with Rosatom in the supply of this fuel. It is very difficult to substitute it overnight. Now, there has been a statement by five states of the G-7, I believe, after possibly the Tokyo G-7 meeting—that included Canada, the U.K., France, the United States, and Japan—to try and reinvigorate fuel enrichment production in the West. A lot of these capacities have gone dormant simply because Russian nuclear fuel services have been so cheap, I suppose. I am not quite sure where it stands right now.

Thank you.

Ms. BAUMAN: James, you are waving me down for a comment.

Mr. ACTON: Yes, I wanted to speak to exactly that issue that Mariana finished on because I am actually a bit more—I am not an optimist by nature, but on this particular issue, I am actually quite optimistic. Urenco, the consortium—British, Dutch, German consortium, now co-owned by the French—has great enrichment technology. The only operating civilian enrichment plant in the United States is Urenco Technology. There are now really serious plans to expand enrichment in Western states, which is a thoroughly good thing. Plus, the other stranglehold that the Russians have typically had is they are the only ones that manufacture a particular kind of fuel for Russian reactors, and now Westinghouse is getting into that game as well.

These two strangleholds of enrichment and fuel manufacturing, there are, like, real plans underway to break the Russian stranglehold on that. That is a thoroughly good thing, in my opinion. Now, initially, it is obviously going to be primarily Western states that benefit from that, but over time, if you know, you expand fuel manufacturing, if you expand enrichment, you can then start selling to other states that Russia has been the traditional supplier of.

The area that it is harder to break Russia's stranglehold over is reactor sales. Now, Russia has lost reactor sales as a result of the invasion. The most obvious example being Finland, which had a contract with the Russians for a new reactor. That was canceled for reasons that were entirely commercial, had nothing to do with the war whatsoever. You know, the advantage that Russia has is it can offer ridiculous financing arrangements to other states because, you know, it all comes from the Russian state. That is actually a disadvantage for the Russians, right? They are actually losing money on the reactor sales because they are giving financial terms that are not what you would get on the open market.

Part of it has always been, primarily, I think, about Russian great-power politics, but, you know, also it has been because they thought they could then make money back on enrichment and fuel sales. If we break their stranglehold over that, then, you know, the

Russians selling reactors at a loss, because then other countries can supply the fuel, is not, like, a terribly good situation for the Russians to be in. If there is one area in which, you know, obviously I wish we could have weaned ourselves off Russian fuel and enrichment a lot faster. Actually, this is an area in which I have some optimism that the future of the Russian nuclear industry internationally does not look nearly as good as it may appear to be right now.

Ms. BAUMAN: Thank you.

Unless you have something quick to say, Bob, I was going to turn over to the audience for questions. You are free to say something.

Mr. WAGNER: I think I am ready to stand before the firing squad out there.

Ms. BAUMAN: [LAUGHS.] Perfect. Sounds good. We are running a little low on time, but if anyone has a question, please come up to the podium here. Turn the mic on so we can hear you, and ask away.

Mr. ACTON: Are people going to be asking their questions under oath? [LAUGHTER.]

Ms. BAUMAN: Oh, and state your name and affiliation, even if I do know who you are.

QUESTION: Alanna Novetsky, U.S. Helsinki Commission.

You know, several other democracies and countries in the region, including Lithuania, have recently started investing more in civilian nuclear power. You know, Lithuania contracted with a U.S.-Japanese provider, but the war has certainly not scared them off from developing more civilian nuclear infrastructure. Given ongoing Russian active measures in the region, and also the fear that Russia will expand its war beyond Ukraine, are there more precautions on a technical and policy level that Lithuania and others should be taking as they expand civilian nuclear infrastructure?

Mr. WAGNER: Thanks, Alanna. I can take some of that. I will focus more on the technical level, maybe dabble in the policy, and then I will kick it off to these folks. Absolutely, right? In my opening statement, I specifically mentioned Armenia. As a policy right now, we, the United States, are trying to expand our reach geopolitically with nuclear power, and I am not here to suggest that we should not. I am just here to suggest that we should do so wisely, paying attention to the potential risks that you have outlined. I hope my opening statement made the point that nuclear power plants are ripe hybrid warfare targets, period, and for a number of reasons.

The Russians have made the argument that Ukraine was using their nuclear facilities to make dirty bombs. Now, as outrageous as that may sound, that is a sound bite that they can use to sell to their population why they have to do what they are doing. They are an informational target. Also, goes back to that big adult game of "I'm not touching you" that I talked about, and Mariana hit on. You can use it as a military facility while manipulating the risk of a nuclear emergency, or at least the idea of one, if there is a counterattack on such a facility.

Those risks need to be considered as we move forward in those areas, building nuclear plants, especially U.S.-backed plants, right? If we are going to engage in further 123 Agreements in Russia's near abroad we probably need to build some kind of nuclear safety and security resilience requirements into those agreements. I will kick it off over to my colleagues, but do not feel obligated. [LAUGHS.]

Ms. BUDJERYN: If there are more questions, maybe we should.

Ms. BAUMAN: Yes. Come up and state your name and affiliation.

QUESTION: Hello. I am Myroslava Gongadze, foreign policy, Fitzpatrick office.

I have a couple of questions, actually. I am not sure I should ask all of them, but I will start with strategic and security angle, probably. What are the global security implications of Russia continuing to occupy Zaporizhzhia Nuclear Power Plant? How does this unprecedented militarization that you just talked about of a civilian nuclear facility reshape the international nuclear safety norms?

I have a question about more human and environmental risk. With Zaporizhzhia remaining under military occupation for more than, I mean, three years, four years? Three-plus years. How serious is the risk of nuclear accident? Are existing IAEA monitoring mechanisms sufficient to prevent a catastrophe? I will stick to that.

Thank you.

Ms. BAUMAN: Whoever wants to start.

Mr. WAGNER: I am going to set Mr. Acton up, because he mentioned potential future war scenarios which I think goes to her first question, which I think is perfect to answer that.

Mr. ACTON: Yes. Thanks. I appreciate it. There are kind of two different angles to the Zaporizhzhia occupation. There is the one that applies everywhere in Ukraine, related to Ukrainian territory that is illegally held by Russia, and how you manage that. Then there are obviously the specific complications introduced by the illegal occupation of an actual nuclear power plant. I am talking a bit slowly here because I do not have a good answer to this problem. You know, there has been discussion, for example, of the United States owning the plants and selling the electricity, which I think is not workable and a very bad idea both technically and geopolitically. I think Mariana explained extremely well why the occupation is both dangerous and sets a very dangerous precedent.

You know, using a nuclear power plant, essentially, as a shield—so you are firing at adversaries from within the power plant, knowing that they will not dare attack you back—sets a terrible precedent. In a similar way, you know, just going back, which we have not even discussed very much, but I remember vividly the night of the—when the attack started, and we were seeing fires around the power plant. You know, there is equipment—I think people have an image that what is really dangerous about an attack on a nuclear power plant is some kind of munition falling actually on the reactor vessel itself. That is actually probably not the most dangerous thing that could happen. The most dangerous thing that could happen would be destruction of the cooling systems, which at Zaporizhzhia are particularly vulnerable. It is these spray ponds that squirt hot water up in the air to cool them down.

What Russia did that night in physically attacking a nuclear power plant was unbelievably reckless and dangerous. You know, it is entirely possible it could have caused a very large-scale nuclear accident, so, ultimately, a terrible precedent has been set through a very dangerous action. To my mind, the single best response is to punish the Russian nuclear industry long term. You know, this pride of Russia that is made Russia a whole load of money, for me, that is, a very appropriate way of responding to what has happened. Obviously, you know, you cannot ignore the fact that Zaporizhzhia is part of a much broader conflict. The way that the entire conflict is resolved will have a major impact on the way that Zaporizhzhia is resolved.

Ms. BUDJERYN: Let me just foot-stomp a couple of points that James has made. Even though the United States is not a signatory to the Additional Protocol One, under its Law

of War Manual, it says that it will still take into account the general principles of discrimination and proportionality in employing its nuclear power—its military force against any nuclear facility. I had the honor of talking to the commander of the National Guard unit who was in charge of defending the facility, the ZNPP, on that night of March 3rd to 4. He had 300 men under his command against 2,500 Russian military with 120 pieces of heavy armor. That was the column he was facing.

His task—he knew very well he could not defend the facility in this disproportionate force on the other side. He wanted to communicate to the Russian side that the facility is defended. Do not shoot at the facility. It is being defended. You can negotiate it, surround it, negotiate around it later on. At one point—the firing positions were set up outside of the perimeter of the plant, so not on the physical perimeter of the plant, right? Away from the nuclear reactors, with the thought that if Russians were to return fire, they would not be firing at the reactors themselves. At one point in the battle during that night, the Russians turned their guns, tanks, and heavy guns at the plant and started firing at random.

Ukrainians, seeing that, ceased fire. They communicated with the plant's management and so forth. They understood that they did not want to provoke any return. They ceased fire. Russians fired at the plant at random for another 45 minutes. That goes to show—[laughs]—not only that Russians were pursuing certain military objectives, and then taking the plant, is that they will go beyond any sort of restraint that is dictated by military objectives, right? Again, leaving that unanswered—that is essentially a war crime, right, by international humanitarian law—leaving these war crimes unprosecuted and unattended to, again, sets a terrible precedent.

Very quickly on the second question, the current risk of nuclear accident, because the reactors have been in cold shutdown since September 2022, sort of the residual heat and the residual power in the cores have greatly diminished, right? That only means that if all of the cooling systems were malfunctioning or disconnected, they lost offsite power, the pumps were damaged—water pumps were damaged, and so forth, there would be a greater time buffer to attend to the cooling needs of the core. At this point, I think it is probably a month or so. If even the backup diesel generators did not kick in, there would be a month to do something to try and keep the core cool. After that, the fuel will heat up, the water will evaporate, and the core will melt down.

The risks to safety and security stemming from the mistreatment of the staff have also diminished because over these four years, through their policies of cleansing, co-option, or replacement of the staff, at this point, Russia is firmly in control of the plant and all of the people who could leave, left, and all of the people who stayed basically agreed to stay. So—[LAUGHS]—ironically, the safety concerns there have diminished, but the plant is still the site of some 3,000 tons of nuclear material. For anyone who wants to stage an incident or an accident, for any sort of hybrid-type of operations about which Bob talked about, right, any false flag operations, there is plenty of opportunity for disaster.

Ms. BAUMAN: Bob.

Mr. WAGNER: Yes, I know we are running over time, so I will attempt to be brief. What James said is absolutely right. Something I want to highlight for you is we have a bad habit in this country of fighting the last war. If you look at the current design basis threat, that is what reactors are designed to defend against, it is doing just that. We need to readdress the design basis threat, even here in the United States, in what we are

defending against in designing our reactors. The other thing that I would draw your attention to is the vulnerability of spent nuclear fuel ponds. It is another huge vulnerability that does not get nearly enough attention.

Final thing I would probably draw your attention to is the civilian population protective actions when a nuclear emergency occurs in a war zone. What do you do? Do you evacuate and risk losing civilians to combat actions? Do you just keep people in place, knowing that they run the risk of being exposed to high levels of radiation exposure? What do you do? Will you even have the resources to implement an evacuation plan if those resources are being used to fight a war? There are just a number of questions here that have not been asked, and have not been thought through thoroughly. I think the good news is that everybody you see up here on this panel probably is going to be gainfully employed well into the future because of this.

Ms. BAUMAN: With that, thank you, everyone, for joining us. We are at time. Thank you to our panelists for the great discussion.

[Applause.]

[Whereupon, at 11:34 a.m., the briefing ended.]





The United States Helsinki Commission, an independent federal agency, by law monitors and encourages progress in implementing provisions of the Helsinki Accords.

The Commission, created in 1976, is composed of nine Senators, nine Representatives and one official each from the Department of State, Defense, and Commerce.

www.csce.gov

youtube.com/HelsinkiCommission

facebook.com/helsinkicommission

flickr.com/photos/helsinkicommission

x.com/HelsinkiComm