ODUMUNC 2022 crisis brief

# Meltdown: Moving Parts in the Chernobyl Crisis

*by Michael Neczyporuk*
ODU Model United Nations Society

## Introduction

In the early hours of 26 April 1986 an explosion in Nuclear Reactor Number 4 at the Chernobyl Nuclear Power Plant (NPP) in the Soviet Republic of Ukraine threw tons of radioactive material into the air. As the reactor continued to meltdown, it soon became clear that managing this crisis would be a truly colossal undertaking. Ultimately, hundreds of thousands of people, know as the liquidators, would bravely venture into the irradiated zone around Chernobyl to help clean up the accident.

It is estimated that as many as 4,000 would die early from cancer as results of their heroic actions. The 1,000 square mile exclusion zone around the Chernobyl NPP and the abandoned town of Pripyat remain solemn reminders of the consequences of failing to prioritize safety when dealing with nuclear power.

After the exposition: Reactor No. 4 at Chernobyl Nuclear Power Plant. Behind it—intact—is Reactor No. 3

## State of the Union

The Chernobyl crisis came at an inauspicious time for the Soviet Union. Under the long and stable rule of Leonid Brezhnev (1964-1982), a period which new leader Mikhail Gorbachev called “The Era of Stagnation,” cracks had formed in the Soviet system. Overall Industrial and agricultural growth had begun to slow, as workers became unmotivated and unproductive without proper incentivization. The so-called “shadow economy” and corruption within the CPSU had grown tremendously. This growth in unregulated economic activity undermined the efficiency of the centrally planned Soviet economy. The long-standing focus on heavy industry rather than consumer goods meant that goods such as paper and electronics continued to be scarce. A lack of market competition meant that such goods were cheap and of low quality. Technological disparities with the West had also formed in the information technology sector, which was increasingly key to the defense industry.

Soviet Politburo meeting, 1987

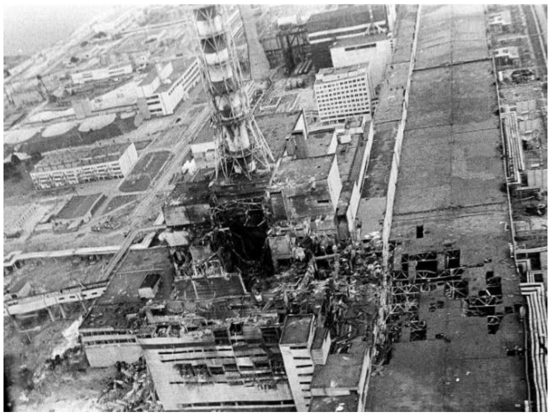
Abroad, the Soviet Union still wielded enormous military and diplomatic power and supported communist client states and proxies around the world. But despite the vast resources at its disposal the Red Army was proving unable to win the war in Afghanistan, which dragged on with no end in sight. This war against Mujahideen rebels, armed and financed by the CIA, was having a similar demoralizing effect on Soviet society as did the Vietnam war on

American society. Additionally, the increasing collaboration between the United States and the People's Republic of China posed a severe strategic threat to Soviet influence in Asia. As demonstrated by the 1979 normalization of US-PRC relations and the Sino-Vietnamese War, any hope of a united communist front against the West was long gone.

In early 1986, ethnic separatism in the USSR was still tightly controlled and mostly dormant. But the USSR, like the Russian Empire before it, was a diverse and multi-ethnic state with a long history of ethnic conflict and persecution of ethnic movements which resisted government policies. The leadership of the CPSU was dominated by Slavs, especially Russians, while other groups were underrepresented. Political instability and worsening economic conditions had the potential to catalyze dormant ethnic nationalist sentiments, especially in the volatile Caucuses region and other non-Slavic Republics.

The average age of Politburo members had increased greatly under Brezhnev. Many of the most important roles in government were filled by men in their 80s. The last two Soviet heads of state, Yuri Andropov and Konstantin Chernenko, each died within two years of taking office.

Mikhail Gorbachev was chosen to be the next leader in 1985 largely because of his relative youth among the Politburo members. Gorbachev recognized the necessity of reform to address the many problems of the USSR but would quickly prove to be more radical than many expected. At the 27th Party Congress he pushed through a number of new appointments to the Politburo and Secretariat, all of whom would take office at the end of the Congress on March 6, 1986.



## Background on Nuclear Power

It is important to have some understanding of nuclear science and the RBMK reactor design used at the Chernobyl NPP. The nucleus is the center of an atom and is composed of protons and neutrons. Therefore, a nuclear reaction is a chemical reaction which takes place in the center of the atom. *Nuclear fusion* occurs when two nuclei combine into one. This occurs in stars and was responsible for producing all of the heavy elements which compose our planet. Fusion is used by humans in modern nuclear weapons but has not been successfully harnessed for efficient power generation.

*Nuclear fission* is the splitting of atomic nuclei into smaller parts. This is the primary source of energy in a conventional nuclear reactor and was also used in the earliest nuclear bombs. *Nuclear decay* is the process by which unstable atoms reach a more stable state by releasing energy. It is used as a power source in radioisotope thermoelectric generators.

All nuclear reactions release energy in the form of heat and radiation. Radiation is all around us in everyday life. It can come in the form of electromagnetic (EM) waves or subatomic particles. There is ionizing and non-ionizing radiation. Non-ionizing radiation includes the less energetic part of the EM spectrum, such as radio waves, microwaves, infrared, and visible light. It is not dangerous to humans except in extremely high doses.

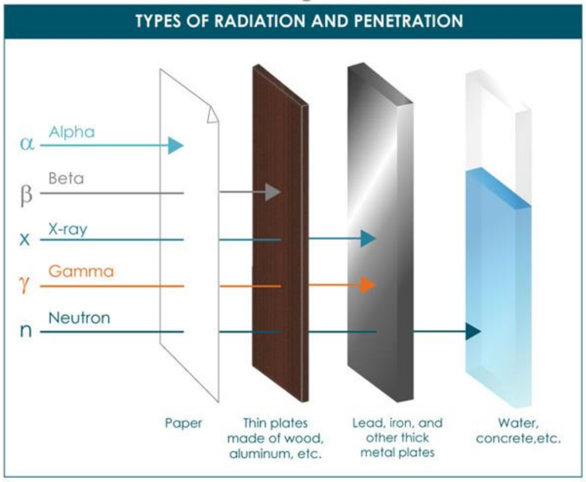
Ionizing radiation is radiation which has the potential to remove an electron from atom and it is much more dangerous to humans. Common types include alpha particles, beta particles, neutrons, X-rays and gamma rays.

- Alpha particles are composed of two protons and two neutrons. They can be stopped by paper or human skin. They are typically not dangerous unless the radioactive material from which is it emitted by has been inhaled in or ingested.

- Beta particles are composed of a single electron and can be stopped by sheet metal or special protective clothing. X-rays and gamma rays are the most high-energy parts of the EM spectrum. They can be stopped by thick plates of dense metals like lead.

- Neutrons have no charge and therefore neutron radiation does not directly ionize atoms. However, if it is absorbed by a stable nucleus, it can cause it to become unstable and decay, releasing more ionizing radiation. In this way, objects which are exposed to neutron radiation can gradually become radioactive themselves. Neutron radiation plays a critical role in sustaining a reaction in a reactor. It can be stopped with special neutron absorbing materials like boron and cadmium.

Receiving high dosage of ionizing radiation over a short period of time causes radiation burns and acute radiation sickness, which can be fatal within days or weeks. When ionizing radiation strikes DNA in a human cell it breaks down bonds and can alters its structure. These alterations in DNA structure are mutations, and they can cause cancer in the long term.




Materials which are suitable for use as nuclear fuel are called fissile materials and include isotopes of Uranium, Plutonium, and Thorium. These fuels are extremely energy dense, with 1 kilogram of pure fissile material typically containing over two million times as much energy as 1 kilogram of coal. The most common nuclear fuel is uranium 235. When struck with a neutron, U-235 will typically fission, releasing energy, two daughter nuclei, and three more neutrons. The daughter nuclei are also unstable and will continue to decay, releasing more energy. The neutrons can go on to strike other U-235 nuclei, which can release more neutrons, causing a chain reaction. When the reaction is self-sustaining it is said to have reached criticality. There is also a roughly 15% chance that a U-235 nucleus will not fission and will instead become U-236, which is not useful as nuclear fuel. U-236 becomes radioactive waste at the end of the fuel assembly's life.

To create the conditions necessary for a criticality to occur, reactors are designed increase the chance that the neutrons products of one fission reaction will be absorbed by other atoms. There are two main ways to do this:

The first way is to pack U-235 atoms more closely together in the fuel. The isotope U-235 is extremely rare in nature because of its relatively short half-life. The vast majority (~99.7%) of Uranium in nature is the less radioactive U-238 isotope. To increase the concentration of U-235 atoms in the reactor, most uranium fuel undergoes a process called enrichment. Enriched uranium has a higher proportion of U-235 to U-238 than natural uranium, with most reactors using fuel enriched to ~4% U-235. The byproduct of this process is called depleted uranium.

The second way to increase the neutron reaction rate in a reactor is by neutron moderation. *Moderators* are materials that slow down free neutrons which pass through them. The slower a neutron is travelling when it passes through a fuel assembly, the more likely it is to be absorbed and induce another fission reaction. The faster a neutron is travelling when it passes through a fuel assembly, the less likely it is to be absorbed. Common moderators are water, heavy water (a special type of water composed of 2H2O instead of H2O), and solid graphite.

Water also serves as a coolant in most reactors. A truly massive amount of heat energy is produced by the fission in a reactor core. Without a constant flow of water being pumped through it to remove that heat from the system the reactor could meltdown. In a meltdown the fuel literally changes states and becomes a liquid and can melt through its containment vessel. The water that is pumped directly through the reactor is called the primary. After being superheated in the core the primary passes through a heat exchanger and transfers its heat to a separate system of water, called the secondary, vaporizing it. The mechanical energy of the steam is used to spin a turbine, generating electrical power.

Despite the complex atomic physics behind nuclear reactors, the actual method of power generation is the same as with most other energy sources: heat is used to boil water, creating steam to spin a turbine. Nuclear power generation doesn't release carbon into the atmosphere, so it is a green energy source. It will likely play a crucial role in addressing the contemporary climate crisis because, unlike solar and wind power, it can reliably provide energy regardless of time of day or weather conditions.

Unlike an atomic bomb, in which all the energy in the fissile material is released instantaneously, a nuclear reactor uses a slower controlled reaction. All reactors contain control rods that can be inserted into and removed from the reactor to lower and raise the energy output and match demand for power. These rods are made of materials called poisons. Poisons have opposite effect of moderators. They stop neutrons completely, preventing them from causing other fuel atoms to fission. Common poisons are Boron and Cadmium. Some control rods also have sections made of moderator materials to provide another way increase the reaction rate.

## The Accident

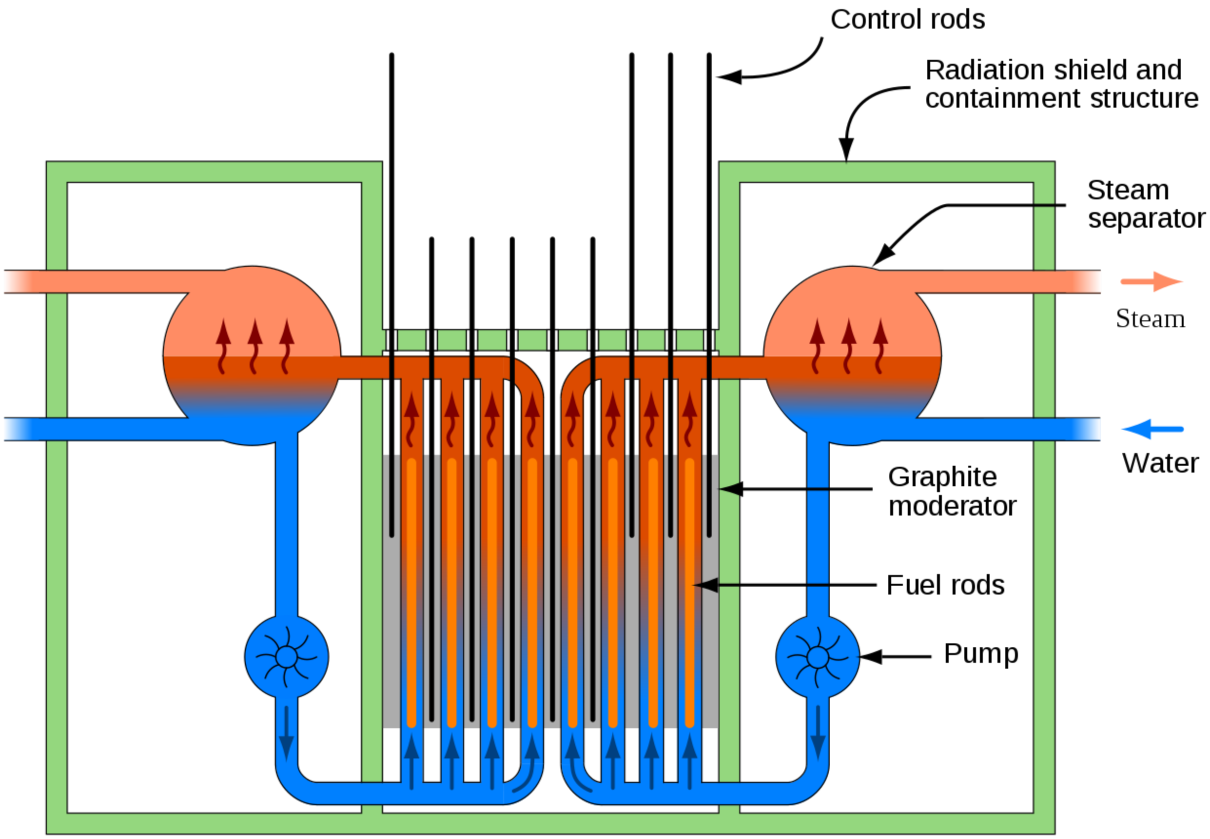

This brings us to the Soviet Union and the design of the RBMK reactor used at the Chernobyl plant. The whole world was shown the awesome power of the atom at the end of World War II and nuclear science quickly became top priority in the post-war Soviet Union. After becoming the second country to detonate an atomic bomb the Soviets became the first country in the world to bring a commercial nuclear power plant online in 1954.

The Soviets recognize that the geography of their country made nuclear energy highly desirable. While around 75% of the Soviet population lived on the European continent, most of their fossil fuel deposits were located east of the Ural Mountains in Asia. This forced them to use much of the capacity of their rail lines to ship in fuel from the East. Nuclear energy served as an excellent way to reduce the stress on their transportation infrastructure and diversity the energy production. Unfortunately, like in many aspects of Soviet society, a constant drive by higher ups to meet deadlines and budgets meant safety concerns often fell to the wayside. Soviet emergency planners generally ignored accident scenarios that were seen as unlikely to occur. For example, Soviet nuclear power plants did not have backup containment structures around them until the late 70s, meaning that minor damage to the reactor building could result in a radiation leak to the outside world.

Within Sredmash, the name for the ministry responsible for both nuclear warhead and reactor production, a culture of secrecy led to news of accidents being suppressed. Without open discussion of previous mistakes a general arrogance and a belief in the infallibility of Soviet nuclear technology developed. Perhaps, one of the most obvious faults in Soviet nuclear safety culture is the lack of a proper safety organization until 1983. Meanwhile, the Americans had the Nuclear Regulatory Commission (NRC) since 1974.

RBMK is a Russian acronym for "High Power Channel-Type Reactor." The RBMK was designed to be as cheap and as large as possible. To accomplish this, it uses completely unenriched natural uranium as fuel, skipping the costly enrichment process. To create a critical reaction with unenriched fuel, the fuel rods are surrounded by graphite, which serves as the main moderator and is a cheap and powerful substitute for heavy water. Water is pumped upwards through channels in the graphite.

The control rods move up and down in these same channels. The poison section of the RBMK control rods were made of boron-carbide, but they also have a shorter graphite moderator displacer at the end to increase their effectiveness. Because of their shorter length, when the graphite section of the rod has been inserted there are open spaces at the top and bottom of the channel which are filled by water. As water approaches the top of the channels it is vaporized. Water is both a moderator and an absorber of neutrons, but its primary purpose in an RBMK is simply to serve as coolant. As water is vaporized in the channels bubbles of steam are formed. The density of water in the bubbles is much lower than the rest of the channel. While water's moderating effect is negligible in the RBMK, its role as a neutron absorber is more significant. This means that steam bubbles increase the rate of reactivity in the core. In other words, the RBMK has what is called a "positive void coefficient." In fact, the RBMK has a positive void coefficient of 4.7 beta, the highest of any commercial reactor ever designed. Most reactors have a negative void coefficient, so steam bubbles in the core decrease reactivity. Ultimately this, makes the RBMK unstable and less responsive to controls when operating at low power.




Schematic diagram of an RBMK reactor

The Chernobyl plant had four RBMK reactors, the first of which went online in 1977 and the most recent of which, Reactor No. 4, went online in 1983. The nearby city of Pripyat was largely built to house the employees of the plant. It is located on the Pripyat River and draws water coolant from an artificial pond. When the accident occurred on the morning of April 26, 1986 a safety test was being completed at Reactor No. 4.

This test, which had remained uncompleted for three years, was designed to ensure that the reactor could safely shut down in the event of a loss of power to the coolant pumps. Because of the decay of fission products in the reactor heat is still generated even when the control rods are completely inserted and fission of new U-235 has essentially stopped. This meant that coolant flow had to continue to prevent a meltdown from starting. Of the 8 main coolant pumps, 4 were to be shut down during the test. The coolant pumps had backup generators, but these generators would take 40 seconds to get up to speed. The main turbine would still be spinning immediately after the steam was shut off, but would soon lose its momentum and come to a stop. The objective of the test was to determine if the energy generated by the still-spinning turbine was enough to power the pumps for the 40 seconds until the backup generators kicked in.

In order to conduct the test, the emergency coolant system had to be disconnected and the thermal power in the reactor needed to be reduced to between 700 and 1000 MW. The plant normally operated at 3,200 MW. The plan was to slowly bring down the power over the early on the morning of April 25 and have the day shift, who had previously been informed about the special conditions required, conduct the test around 2:00 PM. But about halfway through the power reduction, the Kiev grid controller called and ordered the reduction be paused to meet an increased public demand.

This meant that larger amounts of fission products were generated in the reactor than was intended by the designers of the test. Among these fission products was Xenon 135, a poison which can "choke" the reaction by absorbing free neutrons. This poison is destroyed when it absorbs a neutron, so it is kept in check by the reaction during normal operation. However, because the reactor spent much of the evening of the 25th running at half power the Xenon was not destroyed at the same rate as usual, meaning that the large amounts of Xenon build up were still present in the reactor.

The Kiev grid controller only allowed the shutdown to resume around 11:00 PM, but by that time there was not enough time to run the test before the shift change at midnight. The night shift supervisor was Aleksandr Akhimov and the Senior Reactor control engineer, Leonid Toptunov, was only 25 years old. Anatoly Dyatlov, deputy Chief Engineer of the Chernobyl Plant was present to oversee the test. As the shifts changed the reactor was inadvertently stalled bringing its thermal power level to just 30MW, far below the level required for the test.

This is believed to be the result of operator error, as well as Xenon poisoning. At this point, the test should have been aborted, but the decision was made to push ahead regardless. To bring the power level back up, the control rods were pulled out the reactor, pulling the graphite moderator tips into the reactor. But increased reactivity somewhat, but in preparation for the test coolant flow was also increased. This increased neutron absorption, lowering reactivity and leading the operators to remove even more control rods. The number of control rods in the reactor was less than the amount required by safety standards at this point. The high velocity of the coolant meant it was at low pressure. The lower the pressure of a liquid is, the lower its boiling point, so the water entering the reactor was already close to boiling.

The test officially commenced at 1:23:04 and the pumps were shut off. The water flow rate decreased, increasing the temperature in the core and boiling it. Remember from earlier that the RBMK's positive void coefficient means that the presence of steam in the reactor increases the reactivity. Water in Reactor No. 4 boiled faster and faster, creating steam voids and increasing the reactivity further, causing water to boil even faster. In this way the energy output of the reactor shot up rapidly. Since almost all of the control rods had previously been pulled out there was nothing to limit the reaction. The remaining

Xenon poison was quickly burned away. The panicked operators pressed the emergency shutdown button, labeled AZ-5, which was designed to immediately lower all control rods into the reactor as quickly as possible. This decision would prove to be the trigger for an explosion in Reactor No. 4. As the rods were lowered, they displaced the water at the bottom of the reactor creating a zone of increased reactivity. By this point the entire volume of the reactor channels was occupied only by steam and the graphite moderator, with it being too hot for any liquid water to be present. This fed the chain reaction further and, in that instant, with nearly all of the poison control rods completely out of the reactor and the channels filled with only steam and graphite, the reaction increased exponentially.

The final recorded value of the thermal power in the core was around 33,000 MW, but in reality, it probably went much higher. So much energy was released that the structure of the reactor could not contain it. An explosion occurred, followed by a much larger one seconds later which blew the top off the reactor and the building above it. Two engineers standing above the reactor were killed instantly and radioactive material was ejected from the core. Chunks of red hot, radioactive graphite were blown onto the roof and the area surrounding the building. The top cover of the reactor, called the Upper Biological Shield came to rest vertically in the debris on top of the building. Observers nearby reported seeing a glowing blue pillar of ionized air rising from the reactor building.

The explosion started several fires around the building and firefighters soon arrived to put them out. The immediate priority was to prevent the fires from damaging the coolant system of the nearby Reactor No. 3. The firefighters did not know the magnitude of the disaster and although they noticed the chunks of graphite scattered around the building. They heroically put out the external fires within a few hours and saved Reactor No. 3, but over 100 firefighters were hospitalized with acute radiation sickness not long after.

## Challenges

The Central Committee has established a government commission to "liquidate" the consequences of this accident. In order to mitigate and cleanup this accident, there are a number of challenges that must be addressed by the committee. The high radioactivity around the plant is a serious concern to the lives of the liquidators, the personnel participating in the disaster response.

The three key ways to prevent people from getting a deadly dose when working in a high radiation environment are time, distance, and shielding. The shorter the amount of time someone spends in close proximity to a source of radiation the lower the dosage. As explained earlier, different levels and types of shielding can protect against different types of radiation. Specially armored vehicles may be effective shielding in some scenarios. Unfortunately, the types of shielding required to effectively protect against gamma and neutron radiation are too heavy to be plausibly worn as PPE by a worker. Other PPE, such as Respirators designed to prevent the inhalation of radioactive material, should be considered. Workers will need to be hosed down to remove radioactive particles after leaving highly contaminated areas.

The graphite still in the core of Reactor No. 4 is now exposed to open air, providing the oxygen necessary for it to burn. The burning reactor is actively releasing radioactive material into the air, adding to the material that was ejected into the atmosphere by the explosion. This material will become nuclear fallout. It will be carried by the wind and could travel for hundreds of miles and contaminate large tracts of land.

As of April 26, the fire appears to be carrying the fallout north into Belarus. This fire must be put out. Water will not be enough. In theory, neutron absorbers like boron could be used to lower the reactivity of the core and materials like sand or clay cut off the fires supply of oxygen. However, the large amount of radioactive material on the roof of the reactor and the constant stream radiation still being emitted by the core will kill anyone who gets too close. A method must be devised to smother the fire with as little risk to the liquidators as possible. The same goes the chunks or core material on the roof. They will continue to irradiate the environment unless they are removed but sending human workers onto the roof would certainly result in them receiving high doses.

The core is also still melting down. It will gradually melt its way down through basement of the building and into the ground below if nothing is done to stop it. This presents two serious issues. Firstly, the floors below the core contain pools used as reservoirs for the coolant system. Damaged pipes and water from the firefighting effort on the morning of the 26th have caused even more water to accumulate in the basement. When the melting core contacts this water, it could possibly cause a steam explosion and eject more material from the core or cause irradiated steam to rise of out the top of the building. The reservoir tanks could be drained via sluice gates, but the controls are located beyond a corridor flooded with radioactive water. Secondly, if the core melts through the basements and into the ground it could contaminate the local ground water. The contamination could gradually spread out even further via this water. If that happens, water in the area could become undrinkable and unusable for agriculture. This presents a threat to the entire Eastern Bloc, seeing as Ukraine is a major food producer.

One health concern is the iodine 131 that was ejected into the atmosphere. I-131 is a radioactive decay product from the reactor. The human thyroid gland collects and concentrates iodine. If I-131 is inhaled or ingested it will be collected in the thyroid gland, which could cause thyroid cancer. This possibly is magnified by the low iodine diet of the people of the Soviet Union. One way to prevent this is by distributing iodine tabs to people in affected regions. Filling the thyroid gland's iodine reserves with non-radioactive iodine will prevent the I-131 from being absorbed.

Some of the most important decisions this committee will make will revolve around evacuations and public relations. To provide citizens maximum protection from the radiation nearby population centers such as the nearby Pripyat could evacuated and public events in the path of the fallout could be cancelled until the fire is putout and the threat diminishes, but this could also have serious political consequences. News that could be seen as potentially embarrassing to the Soviet government has often been suppressed in the past. If word gets out about the dire situation in Chernobyl it could cause a general panic and the people's faith in socialism and Soviet technological prowess could be shaken. So far, no public announcements about the accident have been made but the hospital in Pripyat will soon be full of patients displaying signs the of radiation poisoning.

Relations with the West must also be managed. It would be ideal if they did not come to understand the severity of the accident as well. The Soviet Union cannot afford to look weak to the outside world in this time of economic decline, especially with the aggressively anti-communist Reagan and Thatcher governments in power. At the same time, the West may have technologies or resources that could be useful in the cleanup. There may debate on how much information should be shared and if aid should be requested.

In the end the cause of the disaster must be determined, and preventative action taken, so other Soviet RBMK reactors do not suffer a similar fate. At present there is uncertainty over who, if anyone, is responsible.

## Conclusion

In the end, around over 300,000 people had to be evacuated from the area surrounding the Chernobyl plant. The human cost of Chernobyl is difficult to calculate because of the long-term nature of the effects of radiation exposure. While the accident only caused 31 direct deaths, thousands of liquidators and others across Europe would die early deaths from cancer. In particular, large portions of Belarus were irradiated, as the wind carried much of the fallout north. The nearest city to the Chernobyl plant, Pripyat, will not be safe for human habitation for thousands of years.

The Chernobyl disaster played a part in exposing the cracks in the Soviet system, both to the people behind the Iron Curtain and to the world beyond. Afterwards, Gorbachev would accelerate his reform programs. Ultimately, the Glasnost and Perestroika reforms would drive a wedge into these cracks, tearing the social fabric of the Union apart until it collapsed entirely.

The new political freedoms of Glasnost allowed dissidents and resurgent nationalist movements to weaken the Communist Party. Gorbachev acquiesced to demands for decentralization by the individual republics of the USSR until so much power had been devolved that they could challenge the authority of the central Soviet government. A last-minute coup in August 1991 by communist hardliners came too late to save the system. After the coup's failure, the Ukrainian and Belarusian SSRs declared independence and CPSU assets in the Russian SFSR were seized by Yeltsin's government. The Soviet Union was effectively dead, and it would be formally dissolved by Gorbachev a few months later, on December 25, 1991.

In 2006, Gorbachev had the following to say about Chernobyl: "The nuclear meltdown at Chernobyl 20 years ago this month, even more than my launch of Perestroika, was perhaps the real cause of the collapse of the Soviet Union five years later… The Chernobyl disaster, more than anything else, opened the possibility of much greater freedom of expression, to the point that the system as we knew it could no longer continue. It made absolutely clear how important it was to continue the policy of glasnost, and I must say that I started to think about time in terms of pre-Chernobyl and post-Chernobyl."

Radiated and untouchable: contaminated vehicles used in liquidation operations had to be abandoned

But maybe things could have gone differently. As delegates on this committee, you will fill the roles of Communist Party officials and technical experts seeking to mitigate the disaster. You will have to race against time to coordinate a disaster response across the labyrinthine political structure of the Soviet government to limit both the literal and political fallout. You must protect the Soviet people by stopping the meltdown and evacuating and decontaminating affected regions. However, you must also protect the image and national integrity of the Soviet Union at a time when the future is increasingly uncertain.

# Characters

**Viktor Afanasyev** – Editor-in-Chief of Pravda

Pravda, ironically meaning "truth" in Russian, is the official newspaper of the Communist Party. As editor-in-chief Afanasyev has published moderately critical articles on Mikhail Gorbachev's reform policies. Afansyev served as a paratrooper in the Second World War and lectured on Marxist theory before being given his current post in 1976. As of yet, no public statement has been about the Chernobyl incident.

**Alexandra P. Biryukova** – Head of Light Industry Department of CPSU, Secretariat Member

One of only a few women ever to reach the highest ranks of the CPSU, Biryukova is extraordinarily driven. She was appointed to the Secretariat less than two months prior to the Chernobyl accident and placed in charge in of light industry (manufacturing of items such as clothing, furniture, home appliances, and electronics). She was charged with increasing production of consumer goods as part of Gorbachev's reforms. Biryukova is an advocate for trade unions and supports strengthening workplace health and safety culture. She is a graduate of the Moscow State Textile Institute and has a background in the textile industry.

**Viktor Brukhanov** – Director of the Chernobyl Plant

Beginning in 1970, Brukhanov oversaw construction of the Chernobyl Plant, officially the Vladimir I. Lenin Nuclear Power Plant. When Reactor No. 1 went operational, he became director of the plant while also continuing to oversee construction of more RBMK reactors. To bring Reactor No. 4 online in 1983 and meet the government's deadline, he postponed a final safety test. On April 26, 1986 it was during this very safety test that the accident occurred. Brukhanov is still in charge of the Chernobyl plant and its workers and seeks to ensure the continued safe operation of the other three reactors while the aiding with the efforts to deal with Reactor No 4.[1]

**Sergei Burenkov** – Minister of Health

As Minister of Health, Burenkov has his work cut out for him. His top priority is to determine the potential health hazards the from the radiation leak at Chernobyl and mitigate them however possible. He seeks the population in the surrounding area from fallout, even if it means taking drastic measures and risking public panic. Firefighters who were called to the plant on the night of the explosion are already showing signs of acute radiation sickness. Liquidators who are sent into the plant could also be exposed to radiation from both the ongoing meltdown and debris surrounding Reactor 4. He has the resources of the hospital system at his disposal, although due to chronic lack of funding the quality of Soviet healthcare lags behind that of the West.

**Viktor Chebrikov** – Chairman of the Committee for State Security (KGB), Politburo Member

In 1982, when Yuri Andropov left his position as KGB head to become leader of the USSR, he chose Chebrikov to be his successor. The two men had much in common; they were both fiercely intelligent and committed hardliners. Under Chebrikov's leadership the KGB has rooted out dissidents and corrupt officials and expanded its foreign intelligence operations. Especially during the late Brezhnev era, the KGB amassed a high degree of political power, which has since waned somewhat. It controls the elite Spetsnaz units "Alpha" and "Vympel," which specialize in counterterrorism and foreign covert action respectively. Chebrikov is not likely to allow any signs of weakness in the Soviet system to be shown to the West. He also served extensively in World War II, in which he was wounded three times.

**Anatoly Dobrynin** – Head of International Department of the CPSU, Secretariat Member

Dobrynin is one of the most experienced diplomats in the Soviet Union and the world. He served as the Soviet ambassador to the United States from 1962, when he helped resolve the Cuban Missile Crisis, until his appointment to the Secretariat in March 1986. During his time in the USA, he had many backchannel discussions with Henry Kissinger about everything from Vietnam to arms limitation, and they became good friends. As newly appointed head of the International Department of the CPSU, Dobrynin now manages the Party's relations with foreign communist parties and communist front organizations around the world.

**Vladimir Dolgikh** – Head of Metallurgical Department of the CPSU, Secretariat Member, Politburo Candidate Member

[1] Roberts, Sam. 2021. 'Viktor Bryukhanov, Blamed for the Chernobyl Disaster, Dies at 85', *New York Times*, 27 October 2021, https://www.nytimes.com/2021/10/27/world/europe/viktor-bryukhanov-dead.html

Hailing from Siberia, Dolgikh spent much of his early career as an engineer supporting the mining and metal processing industries in Krasnoyarsk and the arctic city of Norilsk. He was recognized for his efficient and straightforward nature and rose through the ranks of the CPSU. He was originally made a Politburo Candidate Member under Leonid Brezhnev and has remained in the position since. As head of the Metallurgical Department of the CPSU, Dolgikh controls much of the nation's mining and refining equipment and resources, which may be useful in tackling the Chernobyl disaster. He is also a veteran of the Second World War, in which he suffered serious injuries from a mortar.

**Yevgeny Kulov** – Chairman of State Committee for Safety in the Atomic Power Industry (Gosatomenergonadzor)

Gosatomenergonadzor is responsible for ensuring the safe operation of nuclear power plants in the USSR, the Soviet equivalent to the American Nuclear Regulatory Commission (NRC).[2] Compared to the USA, nuclear safety culture in the Soviet Union is severely lacking, as demonstrated by the fact that Gosatomenergonadzor was only formed in 1983, while the NRC was formed nearly a decade earlier in 1974. Before Gosatomenergonadzor nuclear safety protocols were divided among various organizations and there was no overarching safety agency. Kulov's immediate goal is to determine what happened at Reactor No. 4 and stop it from happening at other power plants. He and Legasov both worked in the closed city of Tomsk-7.

**Valery Legasov** – Lead Scientific Expert on the Commission of Liquidation of Consequences of the Chernobyl Accident

Professor Legasov is an established radiochemist and First Deputy Director at the Kurchatov Atomic Energy Institute. He was appointed to the investigation commission the on the morning of the explosion at the Chernobyl plant on and was the first outside expert on scene. He bravely conducted radiation measurements around the Reactor No. 4 building on the night of the 26th from a BDRM vehicle, exposing himself to a high dosage. He is tasked with devising a plan to put out the fire and stop the meltdown and investigating the causes of the incident.

**Viktor Nikonov** – Chairman of State Agro-Indutrial Committee (Gosagroprom)

Nikonov is a trained agriculturalist who spent several years overseeing a tractor depot before climbing the ranks of the Party to the Central Committee. Gosagroprom was recently formed as part of Gorbchev's reforms to streamline the bloated Soviet bureaucracy. It is a merger of the Ministry for Agriculture, the Ministry for Fruit and Vegetable Production, the Ministry for the Meat and Dairy Industry, the Ministry of the

[2] 'Moscow Arms Official Gets Atom-Safety Post', *New York Times*, 14 August 1983, https://www.nytimes.com/1983/08/14/world/moscow-arms-official-gets-atom-safety-post.html

Food Industry, and the Ministry for Rural Construction. This gives Nikonov control of the Ministry of Agriculture's secret bioweapons program, which develops diseases with the capability to destroy enemy crops and livestock. He is responsible for ensuring the Chernobyl disaster does not damage food production.

**Vladimir K. Pikalov** – Commander of the Chemical Troops of the USSR

Colonel General Pikalov is a hardened veteran of World War II, in which he was wounded three times. He took part in some of the most important battles of the war at Moscow, Stalingrad, Kursk, and finally Berlin. As Chemical Troops of the USSR, he and his men are trained in dealing with radiological and chemical agents. He was placed in charge of the military response to the Chernobyl by Sergei Sokolov and arrived on scene mere hours after the explosion, along with Legasov and Shcherbina. He cares greatly about the lives of his men. He has already taken radiation readings around the reactor building. To ensure that the reading was correct, he personally used a BDRM-RKh reconnaissance vehicle to approach the reactor building and measure the radiation, exposing himself to a high dosage.

*Maria Protsenko, circa 1986.*
*Courtesy of Maria Protsenko*

**Maria Protsenko** – Chief Architect of Pripyat, Community Liaison

Protsenko was born in China to Sino-Russian parents in 1946. Her birth name is Mu Lan. Maria and her mother moved to the USSR after her father left them. There, she married a Ukrainian man. Although her Chinese birth barred her from CPSU membership, she became Chief Architect of Pripyat in 1979. As a result of this experience, Protsenko has an intimate knowledge of the city and the surrounding area. Circumstances have made her a community leader of the 50,000 citizens of Pripyat. Her primary goal is now looking out for their safety and making sure they have a place to live, even if it means leaving her beloved city.

**Nikolai Ryzhkov** – Chairman of the Council of Ministers, Politburo Member

Ryzhkov was a key Gorbachev ally under pervious leaders. His priorities now include introducing market reforms and promoting fiscal responsibility, by limiting government spending and increasing revenue. He has sometimes criticized Gorbachev's decisions as prioritizing ideology over pragmatism. The role of Chairman of the Council of Ministers is equivalent to the role of Prime Minister or Interior Minister in other countries. This gives him influence over a wide range of government functions, such as industry, law enforcement, and disaster response. He appointed Boris Shcherbina to head the Chernobyl investigation commission.

**Volodymyr Shcherbytsky** – First Secretary of the Communist Party of the Ukrainian SSR

Shcherbytsky has led the Ukrainian SSR since 1972, almost 15 years. He was one of the closest political allies of the late the Leonid Brezhnev. As a conservative hardliner, he sees no need for reform, and scoffs and the idea Perestroika. His position gives him great influence over what happens in the Ukrainian SSR, where the Chernobyl plant is located. Shcherbytsky is a veteran of the Second World War, in which he served as a tanker in the Caucuses front.

**Boris Shcherbina** – Head of Commission of Liquidation of Consequences of the Chernobyl Accident, Deputy Chairman of the Council of Ministers

Shcherbina played a key role developing the Siberian economy. In the 1950s he oversaw completion of two hydroelectric plants in the Irkutsk region. In the '60s and early '70s he turned the Tyumen region into one of the most successful producers of oil and natural gas in the USSR, which led to him becoming Minister of Oil and Gas Industry, a vital sector of the Soviet economy. In 1984 he was promoted to his current role of Deputy Chairman of the Council of Minister, in which he supervised several energy and mining related ministries. Now, Shcherbina has been chosen by the Chairman of the Council of Ministers to directly lead the liquidation efforts in Chernobyl. He may not have had much experience with nuclear power, but he has a reputation for getting results and is up to the task.

**Eduard Shevardnadze** – Minister of Foreign Affairs, Politburo Member

A native Georgian, Shevardnadze spent over decade as First Secretary of the Communist Party of the Georgian SSR. He gained notoriety for his anti-corruption campaign and was promoted to Secretary of Foreign Affairs when Gorbachev came to power. As a young Party member, he had look up to his leader and fellow Georgian, Joseph Stalin, and felt shocked and disillusioned when Khrushchev denounced Stalin in the "Secret Speech." Now, as Minister of Foreign Affairs, he supports Gorbachev's reforms and wishes to decrease tensions with the West, putting him at odds with hardliners like Sokolov and Chebrikov.

**Yesim Slavsky** – Minister of Medium Machine Building (Sredmash)

The Ministry of Medium Machine Building supervises both the peaceful Soviet nuclear power industry and nuclear warhead production.[3] The name was chosen as a cover designed to conceal the true nature of the ministry. Also known as Sredmash, it controls a network of strategic infrastructure used in the nuclear industry. This includes facilities for mining, refining, and the "closed cities" where nuclear weapons R&D take place. Slavsky was born to a Ukrainian Cossack family in 1898 and fought in the Russian Civil War. He has been involved in the Soviet nuclear program from the beginning. He was awarded the title Hero of Socialist Labor three times for his involvement in the first Soviet atomic bomb test, the first Soviet hydrogen bomb test, and the 50 megaton Tsarbomba test, which remains today the largest nuclear bomb ever detonated. Having recently turned 88 years old, the fact that Slavsky still holds such an important position is baffling to many.

**Sergei Sokolov** – Minister of Defense, Politburo Candidate Member

Having joined the Red Army since 1932, Sokolov has served for 54 years. He holds the rank of Marshall of the Soviet Union, the highest possible rank that can be attained in the military. He fought against both the Japanese and the Germans during World War II. In 1979, he led the Soviet invasion of Afghanistan and commanded Soviet forces there until his promotion to Minister of Defense in 1984. Although, his service in Afghanistan gained him the respect of his peers, the Soviet Union is still no closer to pacifying the country than they were

[3] 'Efim Pavlovich Slavsky', *Global Security*, n.d., https://www.globalsecurity.org/wmd/world/russia/slavsky.htm

in 1979. The Soviet military has long been prioritized in central economic plans, especially with the intensification of the Cold War under the American Reagan administration. The vast resources at its disposal will be useful in addressing the Chernobyl crisis.


**Boris Yeltsin** – First Secretary of the Moscow Communist Party, Politburo Candidate Member

Yeltsin's support for immediate and radical reform have put him at odds with not only hardliners, but even more moderate supporters of Perestroika. He has an extensive background in construction and has spent most of his career in Sverdlovsk, where he initiated and managed a number of infrastructure projects. Yeltsin has a reputation for going out in public to talk openly with everyday citizens about the country's problems and is consequently popular with the people. At this point in his career, Yeltsin has been in charge of construction and investment on the Secretariat before becoming First Secretary of the Moscow Communist Party. In this new post, he has significant say in the management of the Soviet capital. He is rumored to be quite fond of alcohol.

# Bibliography

Video: *Why Chernobyl Exploded - The Real Physics Behind the Reactor*, 2019, https://www.youtube.com/watch?v=q3d3rzFTrLg

'April 26, 1986: Face-to-face with radiation', *Chernobyl History*, 2019, https://en.chernobylhistory.com/april-26-1986-face-to-face-with-radiation/

'Efim Pavlovich Slavsky', *Global Security*, n.d., https://www.globalsecurity.org/wmd/world/russia/slavsky.htm

'Moscow arms official gets atom-safety post', *New York Times*, 14 August 1983, https://www.nytimes.com/1983/08/14/world/moscow-arms-official-gets-atom-safety-post.html

Nuclear Energy Institute, *Chernobyl Accident and Its Consequences, 2019*, https://nei.org/resources/fact-sheets/chernobyl-accident-and-its-consequences

J. E. Leonardson, 'Midnight in Chernobyl: The Untold Story of the World's Greatest Nuclear Disaster', *Studies in Intelligence*, Vol. 64 No. 1 (March 2020), https://www.cia.gov/static/c40e68bf193d2645efb86055e6a20d24/Midnight-in-Chernobyl.pdf

Thomas O'Toole, 'Soviet Approach to Nuclear Safety Is 'Different'', *Washington Post*, 8 October 1978, https://www.washingtonpost.com/archive/politics/1978/10/08/soviet-approach-to-nuclear-safety-is-different/ed65ff81-04b0-48d1-ac1d-e74126f8d905/?

William C. Rempel, 'Soviets Fear Computer Gap : Schools Main Target of Effort to Catch West', *Los Angeles Times*, 30 March 1986, https://web.archive.org/web/20150919062708/http://articles.latimes.com/1986-03-30/business/fi-1904_1_computers

Sam Robert, 'Viktor Bryukhanov, Blamed for the Chernobyl Disaster, Dies at 85', *New York Times*, 27 October 2021, https://www.nytimes.com/2021/10/27/world/europe/viktor-bryukhanov-dead.html

Theodore Shabad, 'Soviet seems to press expansion of atomic power', *New York Times*, 27 November 1983, https://www.nytimes.com/1983/11/27/world/soviet-seems-to-press-expansion-of-atomic-power.html

Philip Taubman, 'Kremlin reports unapproved tests ripped Chernobyl', New York Times, 20 July 1986, https://www.nytimes.com/1986/07/20/world/kremlin-reports-unapproved-tests-ripped-chernobyl.html

Types of Ionizing Radiation', *Mirion Technologies*, 3 April 2015, https://www.mirion.com/learning-center/radiation-safety-basics/types-of-ionizing-radiation

'Uranium 235 Fission', Nuclear Power, 2021, https://www.nuclear-power.com/nuclear-power-plant/nuclear-fuel/uranium/uranium-235/uranium-235-fission/

George Wojcik, 'Nuclear Safety in the Soviet Union', *Stanford University*, 7 March 2018, http://large.stanford.edu/courses/2018/ph241/wojcik1/