**A'TRAIN MODEL UNITED NATIONS STUDY GUIDE FOR UN SECURITY COUNCIL**

**Topic** 1: The effects of radiation status in Chernobyl

***Dear Delegates;***  It is our pleasure to welcome you to Adana Train Model United Nations and our committee Historical UN Security Council. As the committee directors of the UNSC, we are sharing the great honor of having you here as a delegate. In our committee, we tried to mainly focus on problems that have a huge impact on our modern world. Intending to make this world a better place for the next generations we believe that we have to start from our past issues. We wish we will have influential debates concerning our past, thank you. And lastly, if you have any questions feel free to contact us via email:

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**Introduction to the Committee:**

The United Nations Security Council was established in October 1945 and it is one of the six principal organs of the United Nations. The security council was created following World War 2 to address the failings of a previous organization.UN Security Council's first objective is to ensure international peace. Its powers include establishing operations with the aim of peacekeeping, sanctions, also the authorization of military actions and imposing an embargo. Resolutions in the council are enforced by UN peacekeepers and military forces voluntarily provided by member states.

The security council consists of 15 members. 5 of the members are the permanent members which also have the veto power, the other 10 members are temporary members and those temporary members are being elected to serve a term of two years. All of these members must be present at all times at UN headquarters so that the Security Council can meet at any time as the need arises.

# How Nuclear Plant Works

The Chernobyl Power Complex, lying about 130 km north of Kyiv, Ukraine, and about 20 km south of the border with Belarus, consisted of four nuclear reactors of the RBMK-1000 design Units 1 and 2 were constructed between 1970 and 1977, while units 3 and 4 of the same design were completed in 1983. Two more RBMK reactors were under construction at the site at the time of the accident. To the southeast of the plant, an artificial lake of some 22 square kilometers, situated beside the river Pripyat, a tributary of the Dniepr, was constructed to provide cooling water for the reactors.

This area of Ukraine is described as Belarussian-type woodland with a low population density. About 3 km away from the reactor, in the new city, Pripyat, there were 49,000 inhabitants. The old town of Chernobyl, which had a population of 12,500, is about 15 km to the southeast of the complex. Within a 30 km radius of the power plant, the total population was between 115,000 and 135,000 at the time of the accident.



| April 25 |
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| 01:06 | The scheduled shutdown of the reactor started. The gradual lowering of the power level began.
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| 03:47 | The lowering of reactor power halted at 1600 MW (thermal).
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| 14:00 | The emergency core cooling system (ECCS) was isolated (part of the test procedure) to prevent it from interrupting the test later. The fact that the ECCS was isolated did not contribute to the accident; however, had it been available it might have reduced the impact slightly.The power was due to be lowered further; however, the controller of the electricity grid in Kyiv requested the reactor operator to keep supplying electricity to enable demand to be met. Consequently, the reactor power level was maintained at 1600 MWt and the experiment was delayed. Without this delay, the test would have been conducted during the day shift.
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| 23:10 | Power reduction recommenced. |
| 24:00 | Shift change. |
| April 26 |
| 00:05 | The power level had been decreased to 720 MWt and continued to be reduced. Although *INSAG-1* stated that operation below 700 MWt was forbidden, sustained operation of the reactor below this level was not proscribed. |
| 00:28 | With the power level at about 500 MWt, control was transferred from the local to the automatic regulating system. The operator might have failed to give the 'hold power at the required level' signal or the regulating system failed to respond to this signal. This led to an unexpected fall in power, which rapidly dropped to 30 MWt.
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| 00:43:27 | Turbogenerator trip signal blocked by operational and test procedures. *INSAG-1* incorrectly reported this event occurring at 01:23:04 and stated: "This trip would have saved the reactor." However, it is more likely that disabling this trip only delayed the onset of the accident by 39 seconds. |
| 01:00 | The reactor power had risen to 200 MWt and stabilized. Although the operators may not have known it, the required operating reactivity margin (ORM) of 15 rods had been violated. The decision was made to carry out the turbogenerator rundown tests at a power level of about 200 MW.
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| 01:03 | A standby main circulation pump was switched into the left-hand cooling circuit to increase the water flow to the core (part of the test procedure).
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| 01:07 | An additional cooling pump was switched into the right-hand cooling circuit (part of the test procedure). The operation of additional pumps removed heat from the core more quickly leading to decreased reactivity, necessitating further absorber rod removal to prevent power levels falling. The pumps delivered excessive flow to the point where they exceeded their allowed limits. Increased core flow led to problems with the level in the steam drum.
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| 01:19 (approx.) | The steam drum level was still near the emergency level. To compensate, the operator increased feedwater flow. This raised the drum level but further reduced reactivity to the system. The automatic control rods went up to the upper tie plate to compensate but the further withdrawal of manual rods was required to maintain the reactivity balance. System pressure began to fall and, to stabilize pressure, the steam turbine bypass valve was shut off. Since the operators were having trouble with the pressure and level control, they deactivated the automatic trip systems to the steam drum around this time.
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| 01:22:30 | Calculations performed after the accident found that the ORM at this point proved to be equal to eight control rods. The operating policy required that a minimum ORM of 15 control rods be inserted in the reactor at all times.
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| 01:23 (approx.) | Reactor parameters stabilized. The unit shift supervisors considered that preparations for the tests had been completed and, having switched on the oscilloscope, gave the order to close the emergency stop valves.
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| April 26: the test |
| 01:23:04 | Turbine feed valves closed to start turbine coasting. This was the beginning of the actual test. According to Annex I of *INSAG-7*, for the following approximately 30 seconds of the rundown of the four coolant pumps, "the parameters of the unit were controlled, remained within the limits expected for the operating conditions concerned, and did not require any intervention on the part of the personnel."
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| 01:23:40 | The emergency button (AZ-5) was pressed by the operator. Control rods started to enter the core, increasing the reactivity at the bottom of the core. |
| 01:23:43 | Power excursion rate emergency protection system signals on; power exceeded 530 MWt. |
| 01:23:46 | Disconnection of the first pair of main circulating pumps (MCPs) being 'run down', followed immediately by disconnection of the second pair. |
| 01:23:47 | The sharp reduction in the flow rates of the MCPs not involved in the rundown test and unreliable readings in the MCPs involved in the test; sharp increase of pressure in the steam separator drums; sharp increase in the water level in the steam separator drums.
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| 01:23:48 | Restoration of flow rates of MCPs not involved in the rundown test to values close to the initial ones; restoration of flow rates to 15% below the initial rate for the MCPs on the left side which were being run down; restoration of flow rates to 10% below the initial rate for one of the other MCPs involved in the test and unreliable readings for the other one; further increase of pressure in the steam separator drums and of water level in the steam separator drums; triggering of fast-acting systems for dumping of steam to condensers.
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| 01:23:49 | Emergency protection signal 'Pressure increase in reactor space (rupture of a fuel channel)'; 'No voltage - 48 V' signal (no power supply to the servo drive mechanisms of the EPS); 'Failure of the actuators of automatic power controllers Nos 1 and 2' signals.
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| 01:24 | From a note in the chief reactor control engineer's operating log: "01:24: Severe shocks; the RCPS rods stopped moving before they reached the lower limit stop switches; power switch of clutch mechanisms is off." |

# What Caused the Explosion

**The General Overview:**

The nuclear disaster in the 4th reactor occurred after midnight due to some testings as previously mentioned. The tests were supervised and controlled by deputy chief engineer Anatoly Stepanovich Dyatlov. The test was a simulation of an electrical power outage to aid the development of the safety procedure. The same kind of tests was being simulated since 1982 but all of them failed due to not finding a proper solution. And even though the tests were failed the power plant continued to work until the explosion without proper safety tests. On the fourth attempt of the tests due to the circumstances and the financial costs it was decided that the tests will be delayed until midnight, and because of that the operating shift prepared for the tests was not there by the time of the accident. And because of the delay, the test was already dangerous enough, to begin with. The element of xenon which is a poisonous substance was beginning to form in the reactor because the power of the plant was lowered, it created an environment for xenon to stay in its poisonous form and not burn in the process , and that was considered one of the reasons why the test should be highly supervised or should have been delayed or canceled before the accident. But the dep. chief engineer Dyatlov condoned the risks and failed to follow the right procedure creating even more unstable conditions. Combined with the characteristics of the RBMK reactor design flaws, it was likely that the tests will fail its fourth time. And in the end, all of these unstable conditions lead to what will be considered as the world's most harmful nuclear catastrophe of all time. On the day of the accident, there were other engineers and operators in the tests such as Aleksandr Akimov, Leonid Toptunov, Nikolai Fomin, Valery Khodemchuk and other authorities such as Viktor Bryukhanov (plant manager). Akimov was the unit shift chief in the power plant and he was in charge of the test himself. He was also in charge when the power in the reactor dropped from 1500 MWt to 30 MWt in a short amount of time. He and Toptunov supported that the poisoned reactor should be shut down but the decision was overruled by Anatoly Dyatlov and they were forced to continue and to follow the given orders. At 1.23.40 a.m. Akimov himself pressed the AZ-5 button which should, in theory, stabilize the situation, instead, it made it worse and seconds after the button was pressed, the graphite tips of the control rods were inserted into the reactor and it highly increased the reactivity, therefore, caused the explosion. The initial damage report was reported by two men who first saw the roof of the reactor was gone and there was water everywhere. The radiation levels were tested as 400 times more powerful than seen in the Hiroshima atomic bomb released in a steam blast as an open-air fire raged on top of the exposed uranium core. After acknowledging the situation, firefighters were sent to the power plant knowing absolutely nothing about the conditions in the power plant and the reports showed that after horrific burns two of the firefighters died on the same night of the accident and 28 of them perished from acute radiation syndrome within a month. Until May 10, the reactor kept burning and pumping extreme amounts of radiation into the air and it was eventually realized that they had to stop it to prevent radiation contamination spread. Using helicopters more than 5.000 metric tons of sand, clay and boron were dumped onto the burning reactor. The fire was suppressed to a point but that created another problem which is the meltdown of the core with the groundwater underneath the plant. And that may have caused another explosion that could have a much bigger impact on Europe than the first explosion in Chernobyl did.

After that, three volunteer divers were sent into the depths of the power plant to open valves that would drain the water and prevent the second explosion. 400 miners also had to be brought in to dig underneath the power plant and install a cooling system as the groundwater was still threatened by contamination. They completed the work knowing they were being exposed to radiation poisoning and the efforts of those heroes helped to save millions of lives.

**The Evacuation Process After The Disaster:**

The exclusion zone was established as a 19 mile (30 km) zone of radiation around the power plant. And the zone was established in 1994 after the last people were evacuated from the area.

Most of the residents (with several residents estimated at almost 50.000 residents including 17.000 of them being children) of Chernobyl and nearby Pripyat were evacuated to provinces around Kyiv in Ukraine. The evacuation announcements said: To ensure the safety of our citizens, children first and foremost, it has become necessary to carry out a temporary evacuation of the city's residents to nearby settlements.

# How disaster was handled

* Although 25 years have passed since the explosion in Chernobyl, the issue of controlling radioactive materials in the region has required constant struggle. After years of efforts, construction of a building that would confine radiation to the region for 100 years and cost $ 2 billion was started. The French consortium Novarka will build a 100-meter structure near the damaged reactor building and then slide it over the top of the reactor to cover it.
* According to officials, the Soviet Union did not publicize the true extent of the disaster in the first few days to prevent panic in the country. This was also due to the high-level plant managers who tried to cover up the truth (later on, these people were tried and punished).
* As of April 27, the closest settlement to Chernobyl, the city of Pripyat, with a population of 49,360, 132 kilometers east of Kyiv, was evacuated. In the following weeks and months, 67,000 people from indigenous people in areas contaminated with radioactive material were released by state order.
* Months after the explosion, the Soviet authorities organized a construction project of remote cranes and 100,000 workers. Despite the experts' warning that there could be another explosion, a concrete-steel structure was temporarily built to surround the reactor. The project, which was developed to support the sarcophagus walls and to block the holes against radiation leakage, was completed in 2008. The ruins inside the sarcophagus remain fragile. In the event of a collapse, it will be impossible to transport the embedded radioactive materials to a permanent warehouse.
* After the explosion, more than 600,000 Soviet citizens sacrificed themselves either because they wanted or were assigned to them, and took part in activities such as firefighting, cleaning the area from radioactive pollution and building arch roofs. 28 firefighters and emergency services workers who passed to the region to extinguish the fire lost their lives within three months following the disaster. One of the victims died because of sudden cardiac arrest, while others died of acute radiation syndrome.
* The Chernobyl explosion was followed by significant efforts to detect the weaknesses of RBMK type reactors and improve design safety. To eliminate the design flaws involved in the Chernobyl accident, all of the RBMK reactors that were also found in other Soviet republics at the time were examined and strengthened. Besides, several new inspection mechanisms were developed and closed systems that did not function as expected during the accident in Chernobyl.
* The last Chernobyl reactor number 3 was not closed until 2000. 20 thousand containers consumed fuel accumulated over the years, should be kept cold to prevent the fire that can trigger radiation. As part of the improvement project, fuels will be transferred to the structures shown here with more robust steel-concrete drums. Drums are expected to keep this waste safely for 100 years.

**Countries views and assistance upon the issue**

* On April 28, 1986, at 07.00, Swedish authorities reported that the abnormal level detected in work clothes (especially the high level of shoes) during routine radiation inspection of off-site personnel at the Forsmark Nuclear Power Plant, 120 km north of Stockholm. It was not possible to see such a situation at the end of the investigation. Afterward, meteorological reports were examined to find the origin of airflow over Sweden. As a result of the investigations of the USSR radiation, It was found to originate from the Ukrainian region. Sweden officially asked the USSR for information on the matter. While the Soviet authorities were hiding the accident from both its citizens and other countries until then, Sweden demanded information at the Chernobyl Nuclear Power Plant on the banks of the Pripyat River 130 km north of Kyiv. explained that an accident occurred.
* It has been observed that the UK is not prepared for an overseas nuclear accident and has no emergency action plan. On 6 May 1986, the secretary of the Ministry of the Environment in the UK parliament said, the effects of this cloud have been predicted and have no impact on the health of the UK people. The event seems to be finished for this country by the weekend. ” However, in the following days, the government has taken various measures to determine that radiation levels have increased in higher areas. The consumption of ovine meat is prohibited and the public is advised not to consume rainwater.
* On April 30, 1986, Federal Foreign Minister Hans Dietrich Genscher called the USSR to shut down all Chernobyl-type power plants where the accident occurred, after a two-day meeting of the foreign and defense ministers of Western European countries. Besides, the USSR will provide information on the causes of the disaster and the Vienna-based International Atomic Energy Agency He was asked to allow him to conduct investigations in Chernobyl.

**THE LONG TERM EFFECTS OF THE CHERNOBYL CATASTROPHE**

1. Health and death rates

a.1. Death rates: According to WHO ( The World Health Organization) 4.000 people died due to being very close to the power plant by the time of the accident and 31 died in the immediate aftermath. The Chernobyl Union based in Ukraine said the long term death number Is closer to 845.000.

a.2. The Chernobyl Forum: The new numbers were presented in a landmark digest report released by the Chernobyl Forum. The forum was made up of 8 UN specialized agencies including: International Atomic Energy Agency (IAEA) , World Health Organization (WHO) , United Nations Development Programme (UNDP) , Food and Agriculture Organization (FAO) , United Nations Environment Programme (UNEP) , United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA) ,United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the World Bank as well as the governments of Belarus, The Russian Federation and Ukraine.

a.3. Long term health issues and problems that may cause fatality overtime:

Ionizing Radiation has sufficient energy to affect the atoms in the living cells and therefore damaging the genetic material (DNA). The damage could be repaired with the bits of help of our cells however if the damage is not repaired correctly a cell may die or become cancerous. Exposure to high levels of radiation may cause effects such as extreme skin burns, acute radiation syndrome (also known as radiation sickness) or cancer and cardiovascular diseases. Exposure to low levels might not cause immediate health problems but it is a minor contributor to overall cancer risk.

b. Food and Agriculture: After the accident in the reactor no.4 in Chernobyl a plume of highly radioactive materials were sent into the atmosphere were first detected outside the immediate region by atomic workers in Sweden. Contamination arrived in Britain through light nuclear rain and cesium 137 was deposited in mainly upland areas of Wales, Scotland, and England where it seeped into the peaty soil used mainly to breed livestock.

The European Commission ruled that a maximum level of 1.000 becquerels per kilogram of cesium 137 should be allowed in sheep being reared for meat to safeguard the consumer. Similar guidelines were given for fish affected by contaminated rivers. Continuous assessments of restrictions on farms have taken place for over 23 years and the number of affected has gradually reduced. Animals have been checked by hand monitors and if lower levels of radioactivity have been found throughout the farm, the farm would be considered to be released from the restrictions. And even to this day in 2019 some of the restrictions are still qualified as mandatory and being continued.

c. Economic impacts:

c.1. The impacts caused directly by the accident: After the accident, the fourth reactor was not safe to use this, a repair or at least something to seal the reactor was urgent. If the reactor was not covered there would be high risks of exposing the environment to contamination again. Therefore The European Bank for Reconstruction and Development and a group of foreign donors built a replacement. The replacement sealing was completed in 2017 with the cost estimated at 2.35 billion euros.

c.2. Economic expenditure for the needs of the evacuated citizens: There were a lot of expenses for the resettlement of 333.000 people and also for the health care of those citizens. The leak immediately doused 1.000 people with high levels of radioactivity and afterward with an approximate amount of 4.000 children were diagnosed with thyroid cancer due to drinking contaminated milk. Also with an amount close to 600.000 emergency workers were exposed and many of them died or suffered from radiation sickness or other health issues.

c.3. Economic expenses that specifically effected Russia, Ukraine, and Belarus: Seven million people are still receiving benefit payment from Russia, Ukraine, and Belarus to this day. The costs are estimated as at least 5 percent of Ukraine's annual budget and at least 6 percent of Belarus' annual budget.

c.4. Other Expenses : There were a lot of expenses caused after the accident with the examples such as the creation of an exclusion zone of 30 kilometers around the plant, research to find out how to produce uncontaminated food, monitoring of environmental radiation levels, the opportunity cost of removing farmland and forests from use, loss of power from the plant itself ,after unit 4 was shut down reactors 1,2,3 were restarted in October 1986 and they produced power until December 2000 and lastly the cancellation of Belarus' nuclear power program. Belarus estimates total losses of 235 billion USD.

 d. Impacts on Tourism: After the exclusion zone was established, the area did not have any touristic activity for a while due to unsafe circumstances. Approximately 20 years after the accident the area around was open for tourism again and visiting there was possible. These kinds of touristic activities are known as "dark tourism" and after the area was opened for visitors dark tourism became much more common than it used to be. Today tourists throng through the city of Pripyat nearby Chernobyl to see the abandoned buildings, funfairs, streets full of shops that are abandoned since the evacuation. Though traveling to Pripyat, specifically to see Chernobyl is pretty common nowadays, it is not easy to go there especially for people under the age of 18 since there is an age limit for most of the tours in there. Besides that, in some areas, the radiation levels are very high to this day and it is very dangerous and most of the time forbidden to go to those areas. Keeping in mind that while the tourists are visiting, they still have to carry hand monitors to detect radiation and they also have to sign documents to prove that they will take responsibility for any kind of danger.

It is also known that the government will crack down on corruption by introducing an electronic ticket system for visitors. President Zelensky mentioned that the exclusion zone was a symbol of corruption and they will stop this pretty soon. President also mentioned that Chernobyl should no longer be considered as a dark tourism destination and it should be considered as a legitimate tourist attraction.

e. Today in Chernobyl: Today in the year 2019, the city of Pripyat, Chernobyl is a tourist attraction, the reactor has been sealed and life restarted for the former citizens of the area as some people came back to their villages years after the accident. And most of them are still living there. Many people in Ukraine, Belarus and European countries have been victims of cancer or radiation sickness, after the accident many food sources and agricultural goods were empoisoned by radiation and some of those long term effects still have a huge impact on our world.

**HOW CAN WE PROHIBIT NUCLEAR CATASTROPHES IN THE FUTURE?**

According to Bulletin of the Atomic Scientists which is is an organization that equips the public with the demanded information believes that to prohibit nuclear catastrophes in the future can there are 5 main ways:

* 1. Stabilizing the electricity supply systems: Nuclear disasters in the past happened because of various reasons. Such as the Fukushima accident, the government of Japan said that it occurred because of an earthquake followed by a tsunami and that is considered one of the reasons but also the power plant ran out of electricity. Offsite power was cut off due to natural disasters and that caused the power plant batteries to be emptied within several hours. To prevent such a power loss in the future it is suggested that plant operators should install multiple connections to the offsite power grid; station emergency diesel generators on high ground and deploy plenty of mobile emergency diesel generators.
1. Storing spent-fuel in dry casks: To minimize the possibility of the cooling system fails plant operators should remove spent fuel from pools after 5 years. By the time the fuel is cool enough to be stored in dry casks.
2. Installing filtered vent systems: According to the Bulletin of Atomic Scientists in 1982 filters must be installed into the power plant vent systems. These filtered vent systems trap the most dangerous radioactive species and it also reduces the possibility of building explosions by releasing radioactive gases to the atmosphere through a large filter.
3. Preventing sabotage at nuclear facilities: Nuclear power plants usually rely on water for cooling. Any issue in the power plants' emergency cooling system such as a terrorist attack, aircraft attack, etc. can lead to a catastrophe. Considering the possibly catastrophic consequences it is necessary to address the situation. After the terrorist attack in 2001, the Nuclear Regulatory Commission reviewed security standards for nuclear power plants and approved new regulations in 2008. These regulations ensured that necessary security measures do not compromise plant safety. And the regulations aimed to prevent cyber attacks, respond to an aircraft attack, mitigate the effects of large explosions and fires, etc. These kinds of regulations should be implemented worldwide to become one step closer to solving the issue.
4. Ratifying a treaty to prohibit military attacks: A military attack on a power plant can cause various problems such as damaging spent-Fuel pools by hydrogen explosions. The consequences could be grave and could spread beyond national boundaries. Therefore a treaty should be ratified by global communities to prohibit military forces against civilian nuclear facilities in IAEA member states. Some states already have an agreement upon this such as India and Pakistan but it is still necessary for other member states to take any action in the said treaty.

 **MEASURES TO ENSURE SAFETY IN CASE OF A DISASTER**

 With the help of winds and rains, radiation can contaminate more than one country, therefore, the cultivated areas in other states can be polluted with radiation causing plants and food growing in those areas to be contaminated. And that could have a huge impact on cancer ratio and the babies to be born with some kinds of radiation-related conditions. The most accurate way to ensure safety and health is by not eating or drinking possibly contaminated foods and drinks with the help of a hand monitor considering contaminated milk lead to thousands of children to die. Keeping in mind that for example after Chernobyl, the Black Sea was polluted resulting in food and other products growing in Turkey and other countries to be dangerous to consume. The most accurate thing to do in this situation would be exterminating these products.