

The Chornobyl dictionary - too hot to hide

By Jeffrey Stephanniuk

Saskatoon, February 1993| April 26 is the anniversary of the Chornobyl nuclear disaster. The most important information agreed on at this stage is that the sixty three kilograms of radioactive material thrust into the atmosphere by the two explosions contaminated an area much larger than the arbitrarily set 30 km zone. While this may appear obvious to us in the west, it has meant that the population in some areas of Ukraine and Belarus' were not told of the health dangers or evacuated until after 1989. Decision-making power in the former Soviet Union's nuclear industry remained at all times with Moscow. The lack of a voice on site location or need for new reactors as well as the impact of all energy programs in the Ukrainian environment, became a strong reason among the general population to seek greater independence for Ukraine.

While Ukrainians in the West often place the ultimate blame on the communist system, my impression of some of the earlier post-accident Soviet literature is that the accident would not have occurred if in fact they had been better communists: disciplined and self-sacrificing workers, and humble before the powerful creation of technology.

The first edition of this dictionary was prepared for a short course on the nuclear disaster. The second edition is published on the occasion of a speaking tour of Saskatchewan on this subject by Mr. Mykhailo Prylut'skyi, editor-in-chief of "Zelenyi Svit (Green World), an ecological newspaper based in Kyiv.

Finally, an attempt has been made here to present English translations of Ukrainian names from the Ukrainian language, rather than from Russian. For example, Kiev becomes Kyiv, Lviv becomes L'viv, Chernobly becomes Chornobyl. Russification, as with the Five-Year Plan which set the pace for nuclear development, are legacies from the Lenin and especially Stalin eras that have exacted a terrible price from Ukraine and Ukrainians.

Abandoned



The unfinished nuclear reactor in Crimea near Shcholkino for five year hosted the peninsula's largest music festival, Kazantyp

As a result of the Chornobyl nuclear disaster, plans for stations at Odesa, Kyiv, Chyhyryn, Crimea, and Kharkiv were either postponed or abandoned. The Krasnodar (Armenia) nuclear plant was abandoned in January 1988 due to public protest, and at the loss of 14 million rubles of investment. A plant at Minsk (Belarus) was replaced with a thermal electric station burning natural gas after September, 1988, due to public fears that it was located too close to dense population.

Adamovich, Ales



Ales Adamovich

Writer. Native of Belarus'. Accused the authorities of playing down the scale of the disaster and the extent of the contamination "so that it would not affect the future program for the construction of nuclear power stations." (Marples) Based on information in his articles, authorities evacuated 20 villages in the Gomel and Mogilev oblasts of Belarus' early in 1989, twenty months after the accident. These areas had several "hotspots" of intensive radiation. By late 1989, Adamovich and filmmaker Kolinko revealed that radioactive food products were still being grown locally and sold throughout the Soviet Union.

Anniversary

On the third anniversary of the accident in 1989, 12,000 people gathered at the soccer stadium in Kyiv to commemorate the accident. The year 1989 became very important in post-Chornobyl Ukraine. In some areas, such as Narodychi, only in 1989 did the residents receive confirmation that they were living in highly contaminated areas and only later did evacuations occur. By 1989, 35 villages in Ukraine and Belarus' were designated for evacuation.

April 26, 1986

Date of the nuclear disaster at the Chornobyl Atomic Electric Station north of Kyiv. "This day will be remembered in history as the day the 'peaceful' atom brought catastrophe to civilization." (Serdytyi) The accident was the result of an experiment that went out of control. The experiment's objective was to determine how long the turbine, spinning due to the steam generated by water pumped over hot uranium fuel, would power the main water pumps. The experiment was conducted during a planned reactor shutdown, and if it had to be abandoned, the scientists would be forced to wait until the next shutdown time, one year later. When the power fell too low to conduct the test, graphite control rods were pulled out from the core to raise power. Six rods remained, against the rule that required 30. At 1:23 a.m., the reactor power surged to 100 times full power, excess steam broke the pressure tubes and the top shield of the reactor core was blown off.

Atom

The smallest fragment of an elemental substance to retain that element's characteristics, consisting of protons and neutrons. (Silver)

Background radiation

Is the amount of radiation in a natural environment, caused mainly by the rays from the sun, air, outer space.

Belarus (Belorussia)

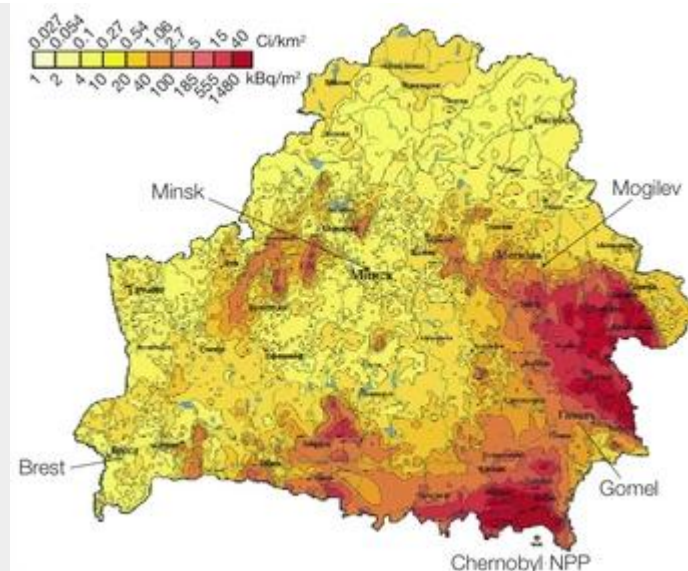


Figure 1: Radioactive contamination of Belarus with caesium-137 (1986)

One of the fifteen republics of the former Soviet Union. Its Gomel and Mogilev oblasts were severely contaminated by radiation. “This territory encompassed about one-fifth of the republic, with 415 population points and 103,000 people.” (Marples) 4,400 people were evacuated during the month of the accident, 19,000 between May and September, 1986. The rest occurred in February, 1989, determined to be necessary after analysis of 40,000 soil samples. Two-thirds of the fallout from the disaster landed on its territory, even areas 200 miles from the plant. Eighteen percent of the agricultural land of Belarus’ had been severely contaminated by the accident. Over 8,000 square kilometers of the Russian republic had high cesium content, and sicknesses caused by radioiodine to the thyroid gland had risen by up to five times among the population generally, and by eight times among children since 1986. (Marples) Belarus’ received 68-70% of the fallout.

Birth rate

In recent years, the birth rate in Ukraine has not exceeded the natural death rate. “In 1989, the natural increase of the population in Ukraine was 1.7 births per 1000 population, but in 1990 it was as low as 0.6 and in 1991 it was -0.7 An essential factor of its decline is the unfavourable state of the environment, aggravated by the consequences of the Chornobyl catastrophe.” (Ukraine National Report)

Bryukhanov, Victor

Director of Chornobyl at the time of the accident. Received a ten year jail term in 1987 for the delayed evacuation of Prypriat, and for releasing information about the fallout that was much lower than actually occurred.

Cancer

Radiation-related cases of cancer from the accident were reported as four times the republican average in 1988.

Center for Ecological Problems of Atomic Energy

V.K. Chumak, director. Tests on villages and food products for radiation proved to be 50-80% inaccurate.

Center for Radiation Medicine-USSR Academy of Medical Sciences, Kyiv

Chief agency engaged in monitoring the victims of high radiation background. Offered questionable and misleading information in the early days and months following the disaster. Accused of being overly secretive about the event and effects. It and its spokespeople such as Bebesko and I. Likhtarov became well-known for denying any long-term effects on humans of the accident. Its spokespeople considered its scientists to be experts and chided journalists and others for meddling in areas about

radiation in which they were not experts. In 1990, it admitted that information about the medical effects of the disaster were kept from the public.

In June, 1989, one of its institutes, the Institute of Clinical Radiology, was monitoring 209 patients who had radiation related diseases, and who worked at unit four at the time of the accident. These stay in the hospital twice a year for up to a month at a time. Others attend clinics once a year. In 1987, 100,000 people were being monitored at the Centre.

Chernobyl Disaster

(London: The Hogush Press, 1988): The authors stated that the pursuit of nuclear power in Ukraine is an irresponsible policy. Ukraine is situated in a seismically unstable region of the world, it is a country with high population density, and lacks an adequate water supply. Finally, Chornobyl proved that human error inevitable leads to accidents. Continued reliance on technology whose weaknesses have far less catastrophic effects and conservation measures are advocated. The disaster has had negative effects on the nuclear industry in the west, they said.

Chernobyl: A Documentary

By Iurii Shcherbak, 1989, Canadian Institute of Ukrainian Studies: English language translation of Shcherbak's articles on Chornobyl that appeared in Russian and Ukrainian magazines, "Yunost" (1987) and "Vitchyzna" (1988). He interviewed doctors, firemen, cooks, academicians, policemen, teachers, power workers, soldiers, and journalists associated with the accident. "It was the silent, unnoticed plodders who were the real heroes," Shcherbak writes. The translator, Ian Press, states that Chornobyl "reveals to us the potential scale of a catastrophe involving the peaceful use of nuclear energy and the dangers of the appeal of "technology for technology's sake." The Ukrainian language newspaper, "Literaturna Ukraina" became an important forum to question "nuclear power development that had not taken into account its effects upon the natural environment."

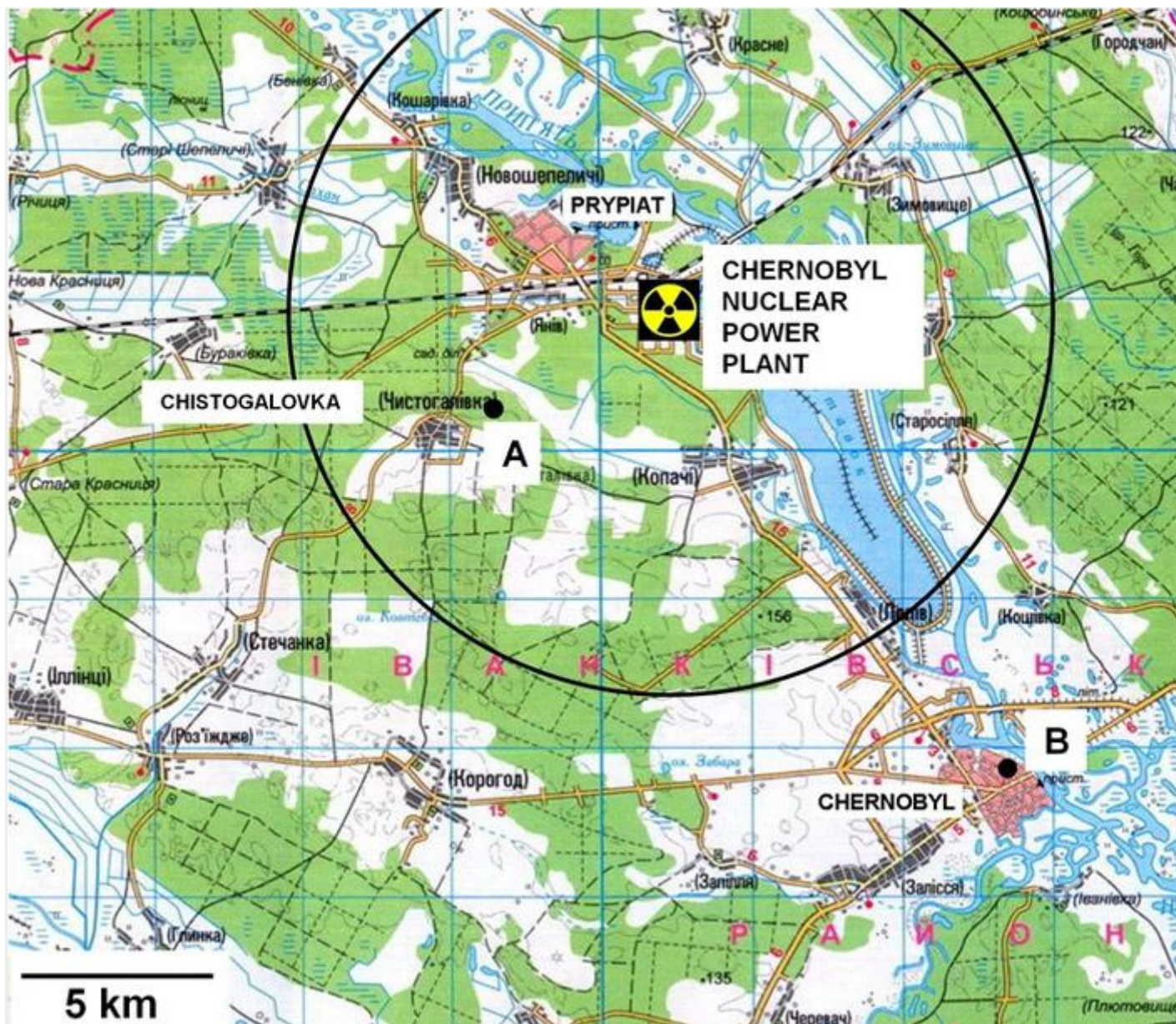
This book repeats the conclusion that the accident had a powerful psychological effect on people, and that the accident was the last mistake: next time it would be much worse. Their world seems to be divided now by the accident: B.C. Before Chornobyl: P.C. Post-Chornobyl, in much the same manner as the war once served to divide people's sense of time.

We in the west lay the ultimate blame for the disaster on communism, central planning, the evil system of five-year plans for the industrialization of the Soviet Union, and Russification as it extends to the exploitation of Ukrainian resources. My impression of this book, however, is that the accident was made possible due to neglect of communist principles and a deviation from a self-sacrificing communist work ethic. If the managers, operators, and workers were more disciplined communists, the suggestion seem to be, construction would not have been shoddy, managers not so arrogant, and operators would have understood the potential implications of their actions on the larger environment.

Chernousenko, V.M.

A well-known Ukrainian theoretical physicist who headed a commission that supervised the work around Chornobyl after the accident, and was the director of the exclusion zone. He supported the Chornobyl Union's registry of workers in order to document the health history of radiation victims. He blames the accident on design flaws in the emergency system. He fought for a 35rem lifetime dose of radiation at a time when the limit was set much higher. He has recently written a book on Chornobyl.

Chornobyl



Map of Chornobyl area

Town: 130 km north of Kyiv. The town was evacuated in May, 1986, and then was used to house workers brought in to decontaminate the area. By 1989, the background radiation ranged from 0.1 to 1 millirems per hour, or up to 100 times the normal level. 6,500 shiftworkers lived there in the summer of 1989. Nuclear complex: Built in the early 1970s. The first two reactors were reignited in November, 1986, brought back on line, and unit three was returned to the power grid in December, 1987.

As a town, it was first mentioned in 1198 A.D. A port city on the Prypiat river, and had a population of 10,000. Its industry included food processing, a pig-iron foundry, and ship repair base.

Chornobyl Aids

Biologist and Green World Deputy Chairman, Dmytro Hrodzynskyi, has used this designation; an increased radiation background reduces the ability of the human immune system to cope with diseases and Chornobyl Aids can develop. Patients often do not trust the medical professionals in Ukraine because of the risk of transmitting hepatitis or the HIV virus through reusable medical tools and accessories. Consequently, the shortage of disposable syringes and plastic gloves contributes to the health issues related to the accident.

Chornobyl Centre for International Research

Located in the small village of Zelenyi Mys, within the thirty kilometer zone, works in conjunction with the IAEA to conduct research into the post-accident environment. Most of the directors, administrators, and maintenance personnel are Soviet, and the Soviet Union funded the project initially. On Ukrainian soil, it, as with the entire nuclear energy program, was an all-Union concern administratively. The centre dealt with these projects: the sealed reactor, decontamination work, analyzing the long-term problems of reactor number four, consequences of radiation in the food chain and ground water, and the impact of radiation on health.

Chornobyl: Global Ecological Catastrophe

This is the official designation of the accident by the independent government in Ukraine. April 26 is designated for commemorations. Since 1991, and especially since independence, the official Ukrainian government position is radically different than the Soviet Ukrainian government's stand, or that of the former central government in Moscow. The Kyiv government now has a Ministry of Chornobyl, led by Heorhyi Hotovchyts. Information from the Ministry of Environmental Protection on this issue includes the following assessment: "The accident at the Chornobyl NPS, the first really global ecological catastrophe in the world's history, has become a great tragedy in the fate of the Ukrainian people. Its deep roots lie in the irrational socioeconomic and political relations that had been dominating in state, industrial, and scientific structures of the former USSR as well as in an uncontrolled build-up of power capacities of the 'peaceful atom' with imperfect technological systems." (Ukraine National Report)

Competitions

The Ukrainian government is using international competitions as a vehicle to generate ideas and action on such issues as a new sarcophagus, contamination within the exclusion zone, and how to close down and contain the stations.

Containment

The top of the structure was not strong enough to withstand the explosion, nor was it pressurized to retain radioactivity in the event of a different accident. (Silver)

Contamination

By 1990, the official from the Ukrainian Council of Ministers appointed to deal with the accident, K.I. Masyk, stated that 1,614 settlements in Ukraine had been contaminated, for a total population of 1.44 million people, of which 250,000 were children. In the worst regions of Zhytomyr oblast, 150,000 people showed symptoms from absorbing radioactive iodine. Contamination in square miles:

- Republic 5-15x 15-40X +40X
- Ukraine 1960 820 640
- Belarus' 10160 4210 2150
- Russia (RSFR) 5760 2060 310
- Total 17,880 7090 3100
- (Source: Serdydyti)

As of 1992, the statistics for land contaminated by radionuclides included 4.7 million hectares of farmland, 3.1 of which was arable land.

Crimea

Plans for nuclear plants came to be seen in Crimea, for example, "as yet another example of the workings of a centralized and uncaring bureaucracy." (Marples) In the fall of 1988, 250,000 signatures of those opposed to a nuclear plant were gathered. The

site was also in an area of high seismic and volcanic activity, which might cover the whole area in radioactivity dust in the worst case scenario. The project, well into the construction stage, was formally cancelled in late October, 1989, with plans to convert the site into a training centre for nuclear plant technicians.

Criteria for nuclear construction

Boris Kurkin, a Candidate of Juridical Sciences, concluded from Chornobyl that planners should take five factors into account: 1) direct capital investment; 2) the protection of the surrounding environment; 3) social and economic factors, including the building of the necessary infrastructure; 4) the health and safety of the nearby population; and 5) public opinion, that is, the desire or nondesire of the local population to have a nuclear plant built in the vicinity. (Marples)

Decontamination

The process of decontamination included spraying a special solution from helicopter around the reactor site to settle the dust; bury topsoil, leaves, contaminated equipment in concrete-lined pits, and build a concrete tomb or sarcophagus around the damaged reactor number 4. For the Soviet authorities, it was imperative to mount a massive campaign, risking thousands of lives, for these reasons: the nuclear power and military program could not be placed in jeopardy: the impact on the environment had to be contained: panic among the population must be minimized through the campaign with the impression that all that could be done was being done.

Drach, Ivan

Poet, activist in Rukh. In 1974, two years after the Chornobyl plant was constructed, he wrote a book of poems about the plant and the new city, Prypiat, entitled *The Root and the Crown*.

Emergency measures

Safety drills and contingency plans do not appear to have been part of the over-all Soviet industrial plan. Such an absence has been justified by the Soviet fear of panic. Information about accidents could only be released after careful and exhaustive study, the argument goes, so that neither extreme optimism nor extreme pessimism is generated. Concretely, this meant that fire and emergency drills were not practiced, and information was released about the accident only after nearly two weeks.

Soviet confidence in the infallibility of science was also a factor, and the accident caused a major crisis of belief in that myth. Further, “Marxist-Leninist ideology... stood as a guard against all evil.” The ultimate dismissal of the accident was in the phrase “the advancement of knowledge requires victims,” a statement made by A.M. Petros’iants, an official with the union government.

Emergency shutdown rods

The reactor relied on thirty rods which were 80 percent effective in ten seconds. (Silver) Modifications after the accident included some permanently placed rods.

Environment

F. Shipunov, of the Scientific Council on Questions of the of the Biosphere with the USSR Academy of Sciences in Moscow, warned of an impending nuclear disaster in Ukraine. Soviet nuclear reactors, he said, released 350% more tritium, a biologically active substance, into the atmosphere than other nuclear plants. As well, the various energy projects on the Dnipro River “may be recouping profits of some million rubles annually, but the amount of damage they were causing to the environment amounted to over 25 billion rubles annually.” (Marples)

The organization Green World claimed that 5 ecological disasters occurred in Ukraine: 1) ruin of the Dniester River; 2) Chornobyl; 3) unexplained sicknesses among the children of Chernivtsi; 4) contamination of the Dnipro River; 5) salination of

the soil in southern regions of the republic. (Marples) The Donetsk-Dnipro region, the heartland of industry in Ukraine, was also of concern.

Yurii Shcherbak claimed that 40,000 pregnancies in Ukraine per year were lost as a result of ecological damage done by heavy industry: women involved in heavy industry, miscarriages, illnesses. In the months following the accident, women chose to have abortions against the wishes of their doctors, for fear that radiation caused mental retardation in their babies.

Estonians, military reservists

In 1986 their term of work was extended from one to two months and then again to six months. In 1986, workers were allowed to accumulate 25 rems of exposure; by 1987-88 5 rems. The story of one man, a Russian by nationality, called up for service in Tallinn, is indicative of their fate: he was hospitalized in April 1986. By May 30, he had a hacking cough, drowsiness, and lack of appetite. He was given a commendation, a certificate, for service at Chornobyl, which his mother saw among his belongings. Later, his superiors would deny that he was ever at Chornobyl. By July, 1987, his hair and 22 teeth fell out. He died a year later, in 1988. The symptoms suggested radiation poisoning, but the Ministry of Defence would not even confirm that he was involved in decontamination work. (Marples)

Toms Avikson, a foreign affairs correspondent for at Tartu newspaper, wrote a series of articles in 1986 about workers used at the clean-up site. The Estonians he interviewed at Chornobyl were conscripted without warning to work there. Some of those present did not really qualify under military regulations, because they were either over the age of 45, or had families with three or more children. Lithuanians were likewise conscripted. The workers lived in tents, worked fourteen hour days, and had two days off a month. When their work period was extended to six months, 200-300 men went on strike for two weeks. Armed guards were later reportedly posted to shoot those who refused to work. Yuri Medvedev, a member of the Academy of Sciences from Moscow, stated: “The military situation at Chornobyl signifies that the fate of the people in the zone, the question whether people live or die, is decided by military tribunal. If people begin to go on strike, they risk being shot on the spot.” (Marples) Thousands of conscripts from the Red Army worked at the clean-up operation, in addition to the volunteers.

Energy Problems

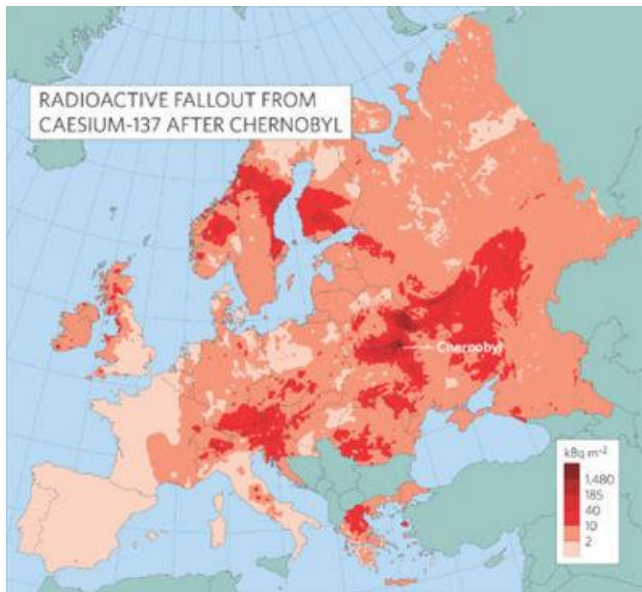
Excessive use of electricity, great amounts lost in transmission, refusal to consider alternative sources of power and energy-saving technology plagued the defunct Soviet Union.

Evacuation

There was talk on 26 April that Prypiat would be evacuated; the authorities were claiming the evacuation would be for three days. Chornobyl was evacuated on 4 and 5 May. Children were not warned to stay indoors initially. When some would ask advice, the response would be typically bureaucratic: “This is not your affair... The decision will be taken in Moscow.” (Shcherbak) Also on this topic Shcherbak writes: “The doctrine of universal prosperity and obligatory and immutable victories, joys and successes, which entered, over the last decades, the heart and soul of many leaders, here played a fateful role, stifling in them the voice of doubt and the orders of professional, party, and civic duty... The mechanism for taking responsible decisions connected with the protection of people’s health, has not withstood serious test. It is cumbersome, many-layered; too centralized, slow, bureaucratic and ineffective when events are developing swiftly. Innumerable agreement and co-ordination led to almost twenty four hours being spent taking an entirely obvious decision on the evacuation of Prypiat.”

By the end of 1989, seventy three population points in Narodychi raion were slated for evacuation. By 1992, 200,000 people were moved from the contaminated zone around Chornobyl. 2.8 million people were now living in contaminated areas.

Fallout



The two explosions that resulted from a power surge of 100 times the normal capacity thrust a minimum of 3% of the physical contents of the reactor into the air, or 63 kilograms of radioactive material. A radioactive cloud formed nearly a kilometer into the air and a wind carried it north. These contents were 90 times greater than the amount from the bomb at Hiroshima in 1945, which contained 74 grams of radioactive content. It would take an explosion of 60% of the world's nuclear arsenal to equal the amount of cesium released. Around the reactor, exposure for 30 seconds would cause death. Also released were strontium-89, 90, cesium 141, 144, cesium 134, 137, ruthenium-103, iodine-131, among others. Radiation gathered unevenly in leaves, on dust and soil, on buildings and equipment. Dangers were also caused by 'hotspots', small, highly concentrated units. While a thirty kilometer contaminated zone was declared, some authors have been calling for a 2,000 kilometer zone. Although reassuring, it proved deceptive to think that all the radiation was contained the the thirty kilometer zone.

Current estimates are that 1.4-1.8 million people in Ukraine have been exposed to fallout from Chornobyl, among whom are 380,000 children. The republics of Ukraine (1.8 million people affected), Belarus' (2,400,000) and Russia (nearly 1 million) were affected, accounted for 5 million people.

Five-Year Plan

"Five year plan for the development of the national economy of the USSR" The first five-year plan was initiated by Stalin in 1928. Often very grand in scope and ambitious, these plans were meant to industrialize the USSR, bring it into the modern world, and especially to catch up to the industrialized west, namely Britain and the United States. The Soviet nuclear energy program as well was very ambitious, justified by its proponents in terms of keeping pace with the west. The first five-year plan resulted in collectivization of agriculture. For Ukrainians, this meant the man-made famine of 1932-33 in which an estimated six million people died. The accident at Chornobyl can be viewed as a similar tragedy for Ukraine, Belarus', and Russia. Another consequence of the cursed five-year plan. In 1989, officials reported that nuclear energy accounted for 13% of Soviet energy generation, while nuclear energy accounted for 16-18% in the US and Canada, and 25-30% in Japan. Thus their expansive nuclear energy program was justified as a way of catching up with the more advanced nations of the west, a general motivation in the USSR that was cited by Lenin and Stalin decades earlier.

In 1971, Ukraine started its ninth Five-Year Plan, during which construction at Chornobyl began. The 1960s were characterized by rapid industrial growth, but the energy and economic reserves that sustained that drive were nearing depletion in the 1970s. Much of the Ukrainian economy, including nuclear energy policy, was an All-Union concern, not a republican or even a union-republican concern. "The need to replace depleted sources of energy, minerals, and water called for highly capital-intensive projects... Ukrainian decision-makers and planners, in the face of hyper-centralization, could do little to encourage managers to

be more economical in the use of resources. Industrial enterprises were wasting fuel, metal, timber, and other key materials. Since the net result of this practice was an increase in both volume output and labour productivity, managers and workers were actually rewarded for wasting resources through the system of success indicators and incentives.” (Krawchenko)

Ukraine accounted for under 3% of the territory of the former Soviet Union, with 18% of its population. In Ukraine was located 22% of its collective farms, and 17% of the heavy industry of the USSR, the electricity generating stations, metallurgy, chemical plants, all of which heavily taxed the republic’s natural resources with immense negative consequences for the environment. In fifty of 190 cities, pollution exceeded the accepted norms by 5-20 times, equal to 18 million tonnes of pollutants annually, and 11 times higher than the Soviet average. Rivers as well became heavily polluted.

Fokin, Victor

Served as Prime Minister of Ukraine for much of 1992. Earlier, was a deputy of the Ukrainian Council of Ministers and published on the topic of nuclear power in Ukraine. He sensed that after Chornobyl, the entire nuclear power program froze, and that the nuclear industry could no longer ignore public sentiment in Ukraine. Clean-up of Chornobyl, in all its aspects, was so costly that the Soviet nuclear power program had become economically unfeasible.

Gale, Robert

American doctor who attempted to anticipate the number of likely illnesses or casualties that might result from the accident. One of the first western physicians to take a keen interest in the post-accident situation.

Geiger counters

Measure levels of background radiation. Soviet-made ones were notoriously scarce and of poor quality. One journalist noted that “even the instrument used at Chornobyl was thought highly of. On several occasions I saw people beg workers to sell or exchange their ‘peepers’ – in the zone it became a kind of hard currency, as valuable as a field set of fatigues worn by our men in Afghanistan.” Dosimeters made in Kyiv cost three months wages for the average rural worker.

Glasnost

Program of openness initiated by Mikhail Gorbachev. In 1986, according to Yuri Shcherbak, the tradition of regulating and rationing the truth as if it were something in short supply, was still alive. One thing was permitted in the centre (Moscow and the CPSU), and another – far less of it and far worse- in the localities. For that reason, Shcherbak worked to have his stories on Chornobyl printed in the Moscow-based ‘Iunost’, a magazine with a circulation of 3 million copies. As this program continued, for the first time in Soviet history the average citizen had a voice, especially as evidenced in the new role of newspapers. Chornobyl was the first major test for Glasnost. Openness about the accident was hailed by the international community at the IAEA meeting in August, 1986, yet at the same time much of the information and impact was classified and minimized.

Gorbachev, Mikhail

General Secretary of the CC CPSU since 1985. The cover-up of accurate information after the disaster showed that Glasnost was far from being a reality in the USSR. Even as late as the fall of 1987, the KGB was rounding up members of the “Glasnost” group. Following a visit by Gorbachev to Chornobyl in February, 1989, the Information Department of the Ukrainian Council of Ministers published the first accurate accounts of the accident. For the first time it was revealed that 274 extra doctors worked in the affected areas of Kyiv oblast and 352 in the Zhytomyr oblast in 1988, as result of growing concern over health problems.

Gubarev, Vladimir

Science correspondent for Pravda, and author of the play about Chornobyl, “Sarcophagus”. The setting for the play is a radiation clinic, and the main character is called Immortal. It was a critical account of the station before the accident.

Green Party

Formed on the fourth anniversary of the accident in 1990. Nuclear energy was opposed for its danger to ecology, and for its alleged administrative command structure, whereby all decision on planning, location and operation of stations have been made in Moscow.

Green World (Zelenyi Svit)

Active as an ecological association since 1987; has had major policies adopted by the Ukrainian government: closure of the Chornobyl NPS, construction stop of the Crimean NPS and Odesa NTES, the ecologically hazardous Danube-Dnipro channel, and the dam between the Black Sea and Sea of Azov.

Grodzinsky, Dmytro: (Hrodzynskyi)



Dmytro Grodzynsky

Biologist and member of the Ukrainian Academy of Sciences. Deputy Chairman of the ecological association Green World (Zelenyi Svit). Interviewed in the summer of 1988 about his views on the disaster. His comments: 1) the radioactive fallout landed in a predominantly agricultural area, with 10-40% forested; 2) The two explosions thrust 450 types of radionuclides into the atmosphere, among which was short-lived iodine-131, longer living isotopes such as ruthenium and rhodium, and long-living cesium-137 and strontium-90. These “everlasting wanderers” are carried by the wind from place to place. The nature of the radionuclides and the amount of territory contaminated make the accident at Chornobyl unique in the world; 3) He opposed the view of the body capable of absorbing a threshold dose of radiation. Even low doses pose health threats. “For a human being to become accustomed to such additional doses would require an evolutionary change.” (Marples); 4) Some effects may not become evident until the next generation; 5) Exposure to radiation can generally weaken the immune system since radioactive iodine accumulates in the thyroid gland. The rat and mouse population of Kyiv died after the accident as a result of epidemics that overcame them due to their reduced immune systems. Vitamins to combat this are found in vegetables, but the residents of Kyiv oblast stopped eating them for fear they were contaminated; 6) He recommended the use of potassium fertilizer to combat cesium uptake into the food chain and calcium to prevent similar absorption of strontium.

Honchar, Oles

Novelist, writer, elected people’s deputy in 1990. He stated that the Chornobyl accident was made possible in Ukraine because the government of the republic was highly submissive to all-union demands, and exhibited all the worst aspects of bureaucratization. That same lethargy toward republic needs allowed the construction of all of the other nuclear plants in Ukraine, such as Crimea, Chyhyryn, Rivne, South Ukraine.

Hotspots

Accumulations of radioactive particles such as strontium-90 and cesium-137, sometimes with the dimension of only a micron. Extremely small in size, they can be very harmful.

IAEA

International Atomic Energy Agency, consisting of 113 member states. Based in Vienna, it is a U.N. organization. Held a meeting in August, 1986 with a Soviet delegation, to hear an explanation of the accident. Soviet response to the accident was directed at safeguarding the future of nuclear power in the USSR, upon which they had become over-dependent, as evidenced by the presence of unqualified workers at major nuclear power plants. The IAEA first visited a Soviet nuclear power plant in 1985 and has never recommended closure or stoppage of work for safety reasons.

Ignalina, Lithuania

Site of nuclear power complex, based on RBMK-1500. Located near the junction of the Belarus', Lithuanian, and Latvian borders. A fire broke out in unit two in 1988. 287,000 people signed a petition for an international commission to investigate the plant.

Ilyin, Leonid

Vice-president, USSR Academy of Medical Sciences. He made premature statements in April and May 1986 that there would not be adverse health consequences from radiation exposure for the population of Ukraine or Belarus. By April, 1989, he was releasing information about amounts of radiation absorbed by people in the Gomel oblast of Belarus', and that 3,400 people would be seriously affected, the number of Chernobyl-related thyroid cancers in the next 30 years would be 60, and the number of fatal cases of cancer and leukemia would be 64. Shcherbak said he was guilty of criminal offenses: allegedly prevented the prompt evacuation of children from Kyiv in early May, 1986; tries to prevent information from reaching the public; it was treacherous of him to set a 35 rem per person limit over seventy years.

Independence

At a popular level, the Chernobyl accident greatly contributed to the movement towards independence for Ukraine. "Chernobyl created in the public a sense of responsibility, a belief that it was possible to control one's own destiny and that otherwise a catastrophe was imminent." (Marples)

Institute for the Operation of Atomic Energy Stations

Officials reported that there were not structural flaws with the RBMK, only human error that caused the accident. The Soviet concept of the infallibility of technology dates back to Lenin. The nuclear energy program has been revered as the technological key that would bring the Soviet Union into the 21st century.

Institute of Nuclear Research

Commissioned by Green World in the summer of 1989 to investigate the extent of radioactive fallout. The team was led by Evgenii Korbetsky.

International Chernobyl Project: An Overview

Final report by IAEA's international advisory committee on the health effects from the disaster. Released in May, 1991. Evacuees and clean-up crews were not monitored by the committee.

"Introduction of Special Private Farms on Contaminated Territories"

Pamphlet outlining uses of manure, phosphorous, and potassium to help prevent cesium from entering the food chain from the soil.

Kachura, Borys

Secretary of the CC and a member of the Politburo of the Communist Party of Ukraine. By February, 1989, he was attempting to change the “official” story of Chornobyl. “All the republican leaders worked directly in the disaster area,” he told the newspaper, “Radyanska Ukraina”. Nothing of this activity had been revealed earlier, he said, and their bravery went unnoticed, unlike that of the pilots, miners, builders, and soldiers, because the communist party leaders “did not have the time to grant interviews.” He, like Romanenko, claimed changes to the state of peoples health as a result of the accident would be minimal.

Khmelnyskyi

Nuclear reactor site. A fire started at the construction site of the third reactor in 1989, but officials assured the public that the fire did not spread to the active reactors. Radiation is carried by smoke, so fires around reactors are dangerous.

Kombinat Production Association

9,000 member decontamination and reconstruction crew. Its current name is Prypiat Industrial Research Association.

Korosten

A raion as well as a city of 75,000 people. Similar to Narodychi and Luhyny, the area was designated as contaminated only in 1989. Tests on its soil were conducted in 1990.

Law on the Chornobyl Catastrophe

Passed in late 1990, encompassing the following: improvement of medical services, preventive medicine and dietary methods of removing the radionuclides from the body, improved methods to reduce radiation and its spread, unified government system of benefits and compensation, and a system of reporting the radiation levels to the public. Other laws passed include “On the legal status of the territory subjected to radioactive contamination as a result of the Chornobyl Catastrophe” and “On the status and social protection of the citizens who have suffered from the Chornobyl Catastrophe.” Related new laws include “Om Environmental Protection” and others meant to create “a united, integral, legislator system of protection of water, air, land, ecosystems, and human health.” (Report)

Legacy

1.4-1.8 million people in Ukraine alone have been exposed to dangerous doses of various forms of radionuclides. Also, “Chornobyl inspired Ukrainians to look at a number of issues more carefully, from the number of nuclear power plants being built in the republic to their environmental situation generally. It nurtured a lasting distrust for officials representing the leadership of the Communist Party of Ukraine, and for official accounts of what happened at Chornobyl... Chornobyl poisoned the mind of the public against nuclear power irrevocably.” (Marples) This accident occurred in a republic that accounted for less than 3% of Soviet territory, yet 25% of Soviet agricultural production.

The accident “spelled an end to the myths and illusions about the reliability and infallibility of science and technology.” (Marples)

Legasov, Valerii



Valerii Legasov

One of the main architects of the Soviet report to the International Atomic Energy Agency in Vienna in August, 1986. The accident was a turning point in his life and career. He began to advocate long-range principles for industrial safety “that would overcome a perceived stagnation in Soviet science.” (Marples) After the accident he still supported the nuclear industry. “I am profoundly convinced that nuclear power stations are the pinnacle of achievement in power generation... the future of civilization is unthinkable without the peaceful utilization of nuclear power.” (Marples) He preferred nuclear energy to hydroelectric and thermal electric stations. He began to question the morality of large scale technological expansion in late 1986 and the low moral level of the ‘technocrats’: “The need for electric power is great. It was necessary quickly to introduce and master power (production) on a new scale... The number of people involved in the preparation of installations and their running increased sharply. But the teaching and training methods could not keep up with the pace of development.” (Marples)

His death “forms an integral part of what has become the psychological effect of the Chernobyl disaster upon Ukrainians as a nation.” (Marples) His suicide on April 27, 1988, perhaps a form of protest against the state of the Soviet nuclear industry, revealed a rift among the scientific community about the real results of the tragedy. He was well known throughout the Soviet Union in his role as First Deputy Chairman of the Kurchatov Institute of Atomic Energy with the USSR Academy of Sciences. His suicide was reported three weeks after it occurred.

About Legasov, Yuriy Shcherbak said this: “It is only individual, very far-seeing scientists who recently began to dwell on the catastrophic consequences of an incredible concentration of industrial and scientific forces.”

Leningrad

(St. Petersburg: Sosnovy Bor) The RBMK-1000 that exploded at Chornobyl was preceded by the one at Leningrad, the first commercial plant of its kind in the USSR. The station reached its capacity of 4,000 megawatts in 1981. Similar units are at Kursk, Smolensk, and Lithuania. An accident occurred at this plant in 1992.

Leukemia

Estimated by Dr. Robert Gale to be the main cause of future Chornobyl-related cancer deaths, signs of which were predicted to become evident by 1988, with the largest number of cases in 1993. Later, other cancers, such as breast, lung, gastroenteric and thyroid would appear. He expected 5,000-75,000 cancer deaths worldwide from Chornobyl over the next 70 years. (Marples) The March 1992 issue of the Edmonton-based *Ukrainian News* carried an article, “Ukraine can’t cope with Chornobyl fallout”, which stated that both “Ukraine and Belarus’ have reported skyrocketing rates of leukemia and other associated diseases.”

Literaturna Ukraina

The forum of the Union of Ukrainian Writers. For years prior to the accident it ran a regular column on Chornobyl, clarifying the various events around the station. On 27 March, 1986, L. Kovalevska wrote an article warning about the shoddy work at the 5th block: “for example, in 1985, suppliers had fallen short by 2,358 tonnes of metal components. And what they supplied had most

often been defective... The best of the construction workers went into management. For the sake of the wages... And if you were at the power station you received an apartment more quickly than if you were at the construction site.” (Shcherbak)

May-Day Parade



May 1 parade in 1986, Kyiv

Held as in past years on 1 May, 1986 to commemorate Soviet workers. It is estimated that the radiation levels were about 100 times above the maximum on the day of the May-Day parade in Kyiv. Party leaders knew this and proceeded nonetheless.

Medical Effects

The first medical effects of the Chernobyl disaster manifest themselves in 1989. These effects are separate from the radiation poisoning and burns that resulted in the deaths of 31 people, mostly firefighters, immediately after the accident on 26 April, 1986. By the fall of 1989, committees in the Supreme Soviet acknowledged that “for a lengthy period, medical experts had not provided an objective figure of the health effects of Chernobyl.” (Marples) Many prominent journalists claimed that this cover-up of the effects constituted a crime. As of March, 1992, some of the personalities involved may be facing court cases for their role in the cover-up.

Medical workers

Workers such as ambulance attendants stationed at Chernobyl and Prypiat did not have much information about nuclear accidents, nor were they informed that special clothing would be necessary to deal with casualties at nuclear accident sites. “Who needed radiation hygiene?” one driver told Yuri Shcherbak, “Hiroshima, Nagasaki, all that was so remote from us.”

Medvedev, Hryhorii

Author. He wrote that other directors of nuclear power stations declined to run the experiment that was conducted at Chornobyl and resulted in the explosions. Experiments were conducted successfully in the past. M.M. Fominym, the chief engineer that night, did not follow essential emergency procedures.

Mi-Kro-Fon! (Microphone)

A documentary made in 1988 by Volodymyr Kolinko and Heorhii Shklyarevsky. They visited farms and medical centres, asking people about the effects of the disaster. They were accompanied by Yuri Shcherbak. The documentary explained that a wind blew the radioactive cloud over Narodychi on 26 April, 1986. In 1989, the topsoil contamination exceeded eighty curies per square kilometer – the maximum limit for safety was five-15 curies, depending on which Soviet source is cited. Radiation levels were almost 150 times that of Kyiv in 1989. Deformities among animals were reported.

Ministry of Atomic Power Engineering of the USSR

Successor to Ministry of Power and Electrification of the USSR as the responsible organization for the nuclear power program. Based in Moscow, there was no representation at the regional level.

Ministry of Power and Electrification of the USSR

This all-union agency was responsible for the Soviet nuclear power program before the accident. Nuclear weapons construction was the responsibility of the Ministry of Medium Machine Building of the USSR. In 1989, the Ministry of Power and Electrification adopted a new law preventing the press from publicizing accidents at nuclear power plants.

Narodychi



A district in Zhytomyr oblast, west of Chornobyl. Only between 1990-1992 have eighty settlements been evacuated. Official secrecy meant that nearly four years after the accident, residents were exposed to radiation. Public concern forced the government to act. Patches of farmland in the area had radiation levels of around 40 curies per square kilometer. Some of its villages that were declared unfit for human habitation include: Khryplya, Khrystynivka, Mali Klishchi, Velyki Klishchi, Mali Minky, Nozdryshche, Peremohy, Poliske, Rudnya-Ososhyna, Shyshelivka, Stare Sharne, and Zvidal. Nozdryshchi, for example, is a village that borders the “zone of alienation.” People were reported working very near the barbed wire fence that demarcates the zone. Common situations included areas where the contamination was ten times higher at one end of the street than the other. In local forests, hotspots had developed in fallen leaves. On local farms, cattle were not tested for radiation, yet were being milked, and children were taken by their mothers into fields in which radiation levels were very high.

In June, 1989, a study by the newspaper, *Literaturna Ukraina*, found radiation in Narodychi town of more than 200 times the natural background. Lyubov Kovalevska found radiation 450 times the natural background. People could not evacuate voluntarily without legal and financial means to do so.

Not all evacuees from Chornobyl were in the official register. For example, while 206 lived in Poliske and area, only 54 were on the register.

Norms

The lifetime limit was set at 35 rems in 1990. The issue of what is acceptable for the body to absorb before dangers to health are caused was very political after the accident because lower limits would mean that more villages and towns would need to be evacuated. It was estimated that \$1000 (US) was saved by the government each time the upper limit was raised one rem. These norm setting exercises failed to account for those who may have accumulated large doses of radiation in the first hours and days after the accident.

Nuclear Power

The USSR had important plans for its nuclear power industry, to meet domestic needs and keep the federation a modern state, as well as earn hard currency for the union government (though the republics did not benefit), through sales to such countries as Hungary and Bulgaria. Construction of the first plants began in 1954. Before the Chornobyl accident, plans for location of reactors was not something the government discussed publicly, partly because there was a key military dimension involved. In fact, the RBMK reactors were converts from military applications.

Prototype plants from the late 1950s and early 1960s include Beloyarsk and Novovoronezh, the former converted the military graphite type of reactor (RBMK) to the civilian industry, while the latter saw the development of water-pressurized reactor (VVER) of 440 megawatts capacity. Other plants were at Kolsk, Rivne, South Ukraine, and Kalinin.

Seventeen stations with a total of 47 nuclear reactors were in operation in 1989 for 13% of the USSR energy output. By 1991, nuclear power accounted for 25.5% of the total.

Boris Kurkin estimated that by 1989, costs of building nuclear plants rose 400 percent from fifteen years previous, especially due to the need to build roads and residences. The costs of decommissioning the plants should also be factored in, he said. Existing sites were expected to contain radioactive materials for nearly 100 years. In addition, delays occurred between the site selection and construction, sometimes five or ten years.

Nuclear Accident



The nuclear reactor after the disaster. Reactor 4 (center). Turbine building

Two explosions occurred at Chernobyl just after 1 a.m. on the morning of 26 April, 1986, while safety experiments were being conducted. It is estimated that six errors were committed: 1) the emergency cooling system of the reactor was turned off; 2) reactor power output was inadvertently lowered too much. It was not designed to operate below 700 megawatts of power; 3) all water circulation pumps were turned on, exceeding recommended flow rates; 4) the automatic signal that shuts down the reactor if turbines stop was blocked; 5) the safety devices that shut down the reactor if steam pressure or water levels become abnormal were turned off; 6) all but six of the control rods were pulled out of the core; the minimum to remain at all times was 30. Safety at Chernobyl and at USSR nuclear sites in general was highly praised, so the accident was a tremendous psychological blow: it should not have happened.

The first news by the government was made on 28 April, 1986, in this manner: “An accident has occurred at the Chernobyl nuclear power plant – one of the atomic reactors has been damaged. Measures are being undertaken to liquidate the consequences of the accident. Those affected are being given aid, and a government commission has been created.” (Marples) Other Soviet nuclear accidents include: 1958-59: explosion of a nuclear waste dump near Smolensk, which wiped out several villages and contaminated lakes and vegetation; 1981: Rivne- nuclear steam generator broke down. Two accidents occurred at Chernobyl in late 1991. All reactors at Chernobyl will be shut down by 1995.

Nuclear War

On 14 May, 1986, Mikhail Gorbachev stated that Chernobyl gave him more reason to remove all nuclear weapons from the earth by the year 2000. Robert Peter Gale, an American doctor interested in the effects of Chernobyl, made the same connection in *Final Warning: The Legacy of Chernobyl* (Warner Book, 1986) RBMK reactors were initially designed for military purposes.

Obninsk, Russia

Location for IAEA data bank on the Chernobyl accident. It is significant that the IAEA chose to work predominantly with the central government in Moscow and with Russia. The IAEA consequently became alienated by the republics.

Official Response

The first statement made that an accident occurred at Chernobyl was very short and included the line that “steps are being taken to liquidate the consequences of the accident.” Since the accident, the government’s concern was how to survive on contaminated territory, and not to jeopardize the nuclear power program.

Pavlychko, Dmytro

Poet, prominent member of Rukh, the Popular Movement to Promote Perestroika in Ukraine. On the third anniversary of the accident, he stated that there was much to learn yet about the effects of the accident and complained that the other reactors at the site should not have been reignited. “Anyone being sent to work at Chornobyl should go there for one of two reasons,” he said, “either to dismantle the station, or to assist in sanitizing the zone.”

Physics in Canada

An article in July 1991 issue of this journal states that “a one-time dose of 1 SV which is 10% of the acute lethal dose induces loss of life expectancy of only 1-2 years.” This assessment has been criticized by some, including Dr. Marko Horbatsch, Chair of the Chornobyl Commission (Education and Research) of the World Congress of Free Ukrainians.

Porih (Threshold)

First documentary about the accident, followed by Mi-kro-fon! And Zapredel (Beyond the Limits), about Narodychi, made in May, 1989.

Post-accident improvements to Chornobyl

1) use of additional absorber rods in fuel assemblies; 2) fuel was enriched with 2.4 percent of uranium-235 instead of 2 percent, to avoid the problem of the reactor becoming unstable at lower power; 3) shut down time at unit one reduced to 2 from 12 seconds; (CANDU shuts down in 2 seconds). Accident in 1986 occurred due to a power surge and explosion 4 seconds later; at that time, the reactor required a 20 second shutdown time; 4) personnel were retrained or replaced.

Power production

Ukraine, 1991: Electric Power: 278.7 billion KWj, 5.5% of which is exported: thermal power plants – 69% of total; nuclear power plants 27%: hydroelectric stations 4%.

Prypiat (Prypyat)

Evacuated in May, 1986. Remained contaminated, yet was used to house workers of the Kombinat production association. IN 1989, the background radiation was up to 200 times the nature level and “may never again be fit for residence.” The river became heavily contaminated by the fallout from the accident.

Radiation level

In the fall of 1988, Kyiv newspapers began to publish in their Friday papers the radiation levels in the city alongside the weather report.

Radioactive cloud

Soviet estimates state that 3.5% of the contents of the reactor core, or sixty-three kilograms of highly radioactive products escaped into the atmosphere. This estimate is the minimum now accepted, because the Soviets based their information on releases between 26 April and 6 May, 1986, but the releases continued until 10 May, 1986. The twenty kiloton bomb dropped on Hiroshima by the U.S.A.F. produced 740 grams of radioactive substances. Chornobyl exceeded that by ninety times. Three million times the quantity of radioactive iodine was released at Chornobyl than at the accident at Three Mile Island in Pennsylvania in 1979.

Radioactive isotopes

Those produced by the Chornobyl explosion include cesium, strontium, iodine, ruthenium, zirconium, tritium, and cerium. A radioisotope is a source of energy; it is any chemical whose atoms are out of balance, that is, radioactive, with a different number of neutrons at their core than the corresponding chemical. (Silver)

Radiophobia

Fear of radiation. A serious problem after the accident at Chornobyl. A term coined by government officials, it became a way of deflecting the need to address the question of exact amounts of radiation in inhabited areas and in foodstuffs, to reassure the population that the physical effects of the accident would not be great among the human population, and as a platform from which to suggest that conclusions and estimates about the accident be left to the experts.

Reactivated

A second reactor at Chornobyl was reactivated on 13 December, 1992, after a German company helped replace parts to improve safety standards. The first reactivated reactor produced 5300 million KWh of electricity in 1992. Plans of Ukraine's parliament to shut down the entire station in 1993 had not been cancelled.

Reactor Number 4

The reactor at Chornobyl that exploded on 26 April, 1986. A fifth reactor was under construction, and a sixth one was planned. Reactor Number 1 was kept in operation for a full day after the explosion, and was operating again before the end of 1986, two months before the damaged reactor was sealed completely in November, 1986.

RBMK

Reactor Bolchoie Molchnasti Kipiachie, which means cooled by water and moderated by graphite. Developed from a five-megawatt prototype at Obninsk in 1958-63 to four 950-megawatt units at Chornobyl and Smolensk from 1971-1975, (Silver) After the Chornobyl accident, 14 graphite reactors were still in operation. Due to structural problems, "another Chornobyl" could not be ruled out, according to Valerii Legasov: "The most important contributing factors to the Chornobyl accident have not been and cannot be removed. They include faults, resulting from poor construction and the lack of reliable emergency systems for similar plants, and the impossibility of constructing 'cones' to seal them at this stage," that is, after an explosion. By 1989, graphite reactors were no longer part of the planned nuclear energy program. Problems at existing reactors meant massive reconstruction of the fuel channels every fifteen years. They become unstable at less than 700 megawatts thermal power. The Soviet Union's oldest graphite plant is at St. Petersburg. The future lies with VVER reactors, scientists claimed, reactors moderated by helium.

Rem (Roentgen-equivalent-man)

A measure of the probable absorption of radiation by a human. Present formula (1992) allows for 0.1 rem exposure per year and 7 rems for the lifetime of the individual. By official government accounts, 150,000 people received doses to the thyroid which exceed the allowable limit.

Register

The Ukrainian Ministry of Health has a national register of those affected by the disaster. Clean-up workers: 134,033; an additional 5,423 people with doses of over 25 rads; 5,529 children with more than 75 rads, and 4,577 over 200 rads. (Dr. David Marples, *Ukrainian Weekly*, August 23, 1992)

Rivne

Nuclear station built on permeable limestone, an unstable foundation. Visited by the IAEA representatives from eleven countries, including Canada, in 1989.

Roentgen

Amount of radiation that produces a set amount of electric charge in dry air.

Romanenko, Anatolii

Ukrainian Minister of Health Protection until 1989. He made premature statements in April and May, 1986 that there would not be adverse health consequences from radiation exposure for the population of Ukraine or Belarus'. Politburo of the Central Committee of the Communist Party of the Soviet Union (CC CPSU) itself forced him to resign. By 1989 he was criticized for not warning the Ukrainian population about the accident sooner than 5 May, 1986, nine days after the two explosions. While Polish authorities were warning its population to stay indoors and take supplements against iodine radionuclides, Romanenko, the Director of the Center for Radiation Medicine, only repeated that "there had been no discernible anomalies among either evacuees or newborn babies that can be attributed to radiation exposure." (Marples)

He edited a book that arose from a conference in Kyiv in May, 1988 on the medical effects of the disaster, *Meditsinsie aspekty avarii na Chernobyl's'koi AES* (Kiev: Zdorovya, 1988)

Rukh

Popular Movement to Support Perestroika. Formed in 1989. Similar to popular movements in the Baltic states, it took longer to gain a foothold in Ukraine. It became a political party in December, 1992.

Sand

An attempt was made to bury the reactor in sand. Military pilots dropped 10,000 pounds of sand from helicopters. The weight of the sand made the structure fall down, and more radioactive dust was spread into the atmosphere.

Sarcophagus



New safe confinement under construction

Cement tomb over reactor number 4. It is 74 meters in height, made of 340,000 cubic meters of concrete. A makeshift solution to prevent the further escape of radioactive materials into the atmosphere, and to make possible the reactivation of reactor no. 1.

Both reactor one and two were placed back on grid before the damaged reactor number 4 was properly covered. Initially, workers could only remain exposed from 90 seconds to five minutes at a time. In 1987, the temperature of the reactor was said to be 95 degrees Celsius, down from 140 degrees in November, 1986. In 1989, background radiation was 1,000 times the natural level. It has already developed cracks, and was constructed with cracks. By 1992, it had a life expectancy of another 5 years. Radioactive dust will be released if it collapses. Water entering the sarcophagus becomes radioactive if it falls on melted fuel, and will pose a problem if it enters the groundwater. An international competition had been announced to rectify the problem, and the New Safe Confinement is set to be finished in 2017. A play written about Chornobyl also has this name.

Shcherbak, Yurii

Doctor, novelist, and chairman of a popular ecological association. In his collection of interviews with eyewitnesses, *Chernobyl: A Documentary Story* (1989), he reveals the chaotic and disorganized state of affairs following the tragedy. He served as Ukraine's first Minister of the Environment and is presently Ukraine's first Ambassador to Israel.

Shcherbyna, Borys

Chairman of the Government Commission that was established to eliminate the consequences of Chornobyl.

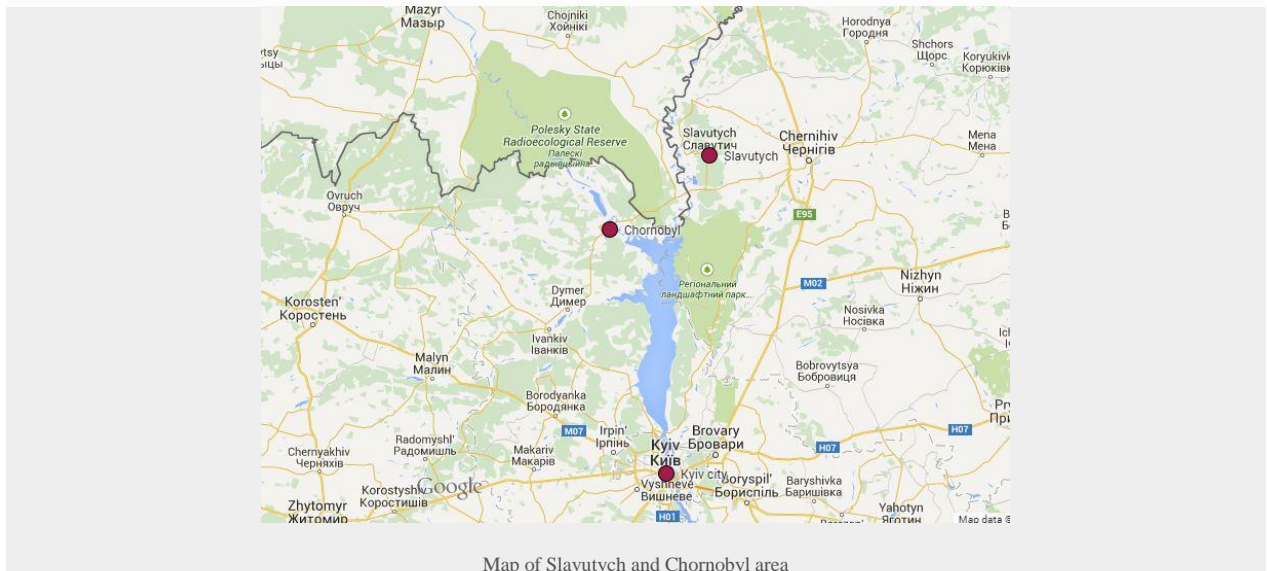
Shcherbytsky, Volodymyr

Leader of the Communist Party of Ukraine until 1989. He made only occasional visits to the 30 kilometer zone. He died in 1991.

Shevchenko, Volodymyr

Film director who died within a year of filming a documentary on-site at Chornobyl.

Slavutych



Map of Slavutych and Chornobyl area

A new city built after the accident to house those who were employed at the nuclear complex, located 40 miles to the northeast of Chornobyl station. It was located along the Dnipro river, so the transportation of supplies would be easy, and temporary living quarters could be maintained on river boats. There already was railroad access to the area, so it provided a good link with the power complex. The Central Scientific Research Institute of City Construction in Moscow created the initial plans. Then the Kyiv Zonal Scientific Research Institute of Standard and Experimental Planning was handed the project, assisted by 34 planning organizations.

3,500 plant employees travelled daily from Slavutych to Chornobyl by electric train. By 1989, there were 10,000 people in Slavutych, and 20,000 in 1990. It appears to have been built on a radioactive patch, discovered in March, 1989. Fifty million rubles had to be spent on the removal of 200,000 cubic meters of contaminated topsoil from the town, but the surrounding forests remained contaminated. (Marples) "Of the sixteen children born in the city in the first part of 1990, three were stillborn and five were seriously ill. Thirteen city children had leukemia. In addition, many would be losing their jobs when the station was decommissioned in a few years.

The nuclear complex could not be operated or expanded if there was no place to house its many workers. Therefore, Slavutych was planned and constructed extremely quickly. The results were shoddy construction, a discontented workforce, three killed at the construction site in the first year, and finally, allegations that it was built on a radioactive patch.

Slyunkov, Nikolai

Leader of the Communist Party of Belarus. He was more actively involved in the clean-up than his Ukrainian counterpart.

Smolensk

Site of a nuclear power complex.

South Ukraine

In Mykolaiv oblast, nuclear plan with investment from Romania. VVER reactors and hydroelectric power complex, which heavily taxed the local water reserves.

Soviet Report to the International Atomic Energy Agency (IAEA)

August, 1986. Defended the continued use and expansion of nuclear reactors in the USSR. Avoided issues such as the delayed evacuation process, the dangerous nature of the cleanup work, and radioactive fallout after 6 May, 1986.

Spizhenko, Yurii

Successor to Anatolii Romanenko as Ukrainian Minister of Health Protection in 1989. He finally supported the school of thought which said that one million Ukrainians had been affected by radioactive fallout, in addition to 200,000 cleanup workers who required medical attention. The health of cleanup workers was likely to be affected by premature aging, a rise in nervous diseases, heart vessel illnesses and digestive problems. Three and a half million hectares of agricultural land in the republic were contaminated by cesium and 1.5 million hectares of forest. The effects of strontium still had to be taken into account.

State Committee of Ukraine for Nuclear and Radiation Safety

Created in February, 1992 to regulate and control the use of nuclear power and radiation technology. “The committee has the task of elaborating the principles, norms and rules for the use, transport, and preservation of nuclear materials, radioactive deposits; and coordinating scientific research and radiological protection of the population. This committee replaces the jurisdiction of the former USSR Ministry of Nuclear Power and Industry on Ukraine’s territory.” (Dr. David Marples, *Ukrainian News*, 3 May, 1992.)

Symptoms of exposure to radioactive fallout

Swollen thyroid glands, tight throat, headaches, dryness, nausea, vomiting, and nosebleeds. In 1988, the Information Department of the Ukrainian Council of Ministers revealed that in the year 1986, there was “a distinct rise in anemia and diseases of the respiratory organs and the stomach in the areas under investigation.” Victims at Chornobyl were injected with relanium, aminazime, and were given potassium iodide. People should have been warned to stay indoors, because it is hard for radiation to penetrate buildings.

Tarakanov, Maj. Gen Nikolai

A military engineer and catastrophe control expert assigned to the clean-up operation in June, 1986. In his book, *The Chornobyl Notes*, he criticizes the nuclear plant management as incompetent, those who participated in information cover-up, and those who ordered hasty and botched clean-up efforts. He spent four months at Chornobyl, and then eight months in hospital for illnesses caused by extended exposure to radioactivity. “Scientists who made the ‘peaceful atom’,” he said in a lecture in the United States in 1992, “didn’t foresee accidents and don’t know how to deal with the consequences of those accidents. Our ability to deal with accidents is overrated. And I think America’s programs aren’t much better. (*Ukrainian Weekly*, April 26, 1992)

Trudovaya Vakhta

Newspaper of the Kombinat workers in the 30 kilometer zone. Not permitted to circulate beyond the zone, and hence much of the dangerous day to day work of the clean-up received little public recognition.

Ukraine

Ukraine is a large European country, 603.7 thousand sq. km in size, with a population of 58 million people, including more than 100 nationalities. It is a founding member of the United Nations, and is a member of 15 other international organizations. Its soldiers joined the UN peacekeeping mission in Sarajevo in 1992. The Ukrainian government report to the Earth Summit in Rio in 1992 describes Ukraine's ecological situation in this manner: "A high level of concentration of industry and agriculture, and unreasoned, ecologically unfounded depredatory colonialist economic activity of governing structures of the former USSR resulted in an ecological situation in Ukraine that is one of the most adverse among European countries. The situation has been greatly aggravated by the technogenous nuclear accident at the Chornobyl NPS, the world's worst nuclear disaster. The Ukrainian parliament declared the whole country an ecological disaster zone." The report also stated that an indisputable human right is the right of citizens to ecological safety.

Ukrainian Ministry of Foreign Affairs

By June, 1989, granted invitations to visit Chornobyl. Interviews at the site were granted, and it was possible to take radiation measurements with a Geiger counter. Its goal in doing so was to explain why the plant was still in operation.

Ukrainian Ministry of Health Protection

Offered questionable and misleading information in the early days and months following the disaster. Accused of being overly secretive about the event and effects.

Ukryttia

Replaces the Prypiat Industrial and Research Association, which monitored the station and the clean-up. Its task is to make the damaged reactor ecologically safe for the long term, including burial of nuclear fuel and radioactive deposits. The director is Vladimir Karasen. He stated that 10% of the reactor fuel, not 3.5% as originally thought, was released into the atmosphere. (*Ukrainian Weekly*, August 23, 1992)

Umanets, Mikhail

Director of the Chornobyl plant. He wanted the plant to last out its thirty-year lifespan, until 2007. Visited Canada in 1989. In an interview on CBC's *Newsworld*, he denied knowing about the predicament of citizens living just outside the zone, "a reflection of the official attitude that no serious health effects were acknowledged to have accrued from Chornobyl." (Marples) He is currently (1993) the president of the Ukrainian atomic energy industry.

UNESCO

Dec 1992 report entitled, "Ukraine's requirements for environmental education in the context of the Chornobyl NPS accident."

Uranium-235

Fuel used by most reactors in the former Soviet Union.

Uranium-238

Far more plentiful supplies than uranium-235. Used in BN series reactors, such as one on the Mangyshlak peninsula of the Caspian Sea. Such reactors have longer lifespan but are much more expensive to construct.

USSR Ministry of Health Protection

Offered questionable and misleading information in the early days and months following the disaster. Accused of being overly secretive about the events and effects. An all-union concern, it objected to the work done by journalists and by the republican counterparts in Belarus', Russia, or Ukraine.

USSR Ministry of Nuclear Energy

Formed in July, 1986 due to the accident, “had been a regular target of Ukrainian activists because of its apparent indifference to republican concerns, particularly the citing of nuclear power plants. In the summer of 1989 it was merged with the Ministry of Medium Machine Building, which was involved in the development of atomic weapons in the USSR.

USSR Ministry of Nuclear Power

Its Deputy Minister in 1988 was Evgenii Reshetnikov. Discontented plant workers began to turn with their questions to him about why, for example, supplies were so deficient, or obsolete, or merely junk.

Velikhov, Evgenii

Vice-President of the Soviet Academy of Science: involved in the initial decontamination program. In the fall of 1988, he concluded that the Crimean reactor should not have been built on the proposed area, one of high seismic activity.

Victims

26 sick people were evacuated from Prypiat that first day; the next day 106 were sent to Moscow. 31 people, mostly firemen, died soon after the accident.

VVER

Water-pressured reactors. In 1987, there were 26 such reactors in the USSR: Kalinin, Balakovo, the Tatar republic, Rostov, Bashkir, South Urals, Zaporishshia, Khmelnytsky, Rivne, South Ukraine, the Crimea. Gorky and Voronezh were being built at the time.

Windscale

Nuclear reactor site in Britain, and site of accident in 1957, kept secret for thirty years “because the British did not wish their US allies to believe that they were incompetent in the areas of nuclear weapons manufacturing.” (Marples)

Zaporizhzhia

Giant nuclear station – 5,000 megawatts in size in 1989, the largest in the republic. Plant workers began to question if extra planned reactors were necessary to the economy, because much of the extra generating capacity was being commissioned for external usage, either in other parts of the Soviet Union or to Poland, Romania, Hungary, and Bulgaria. The city of Zaporishshia was the subject of a documentary film about birth defects, entitled “Hostages”.

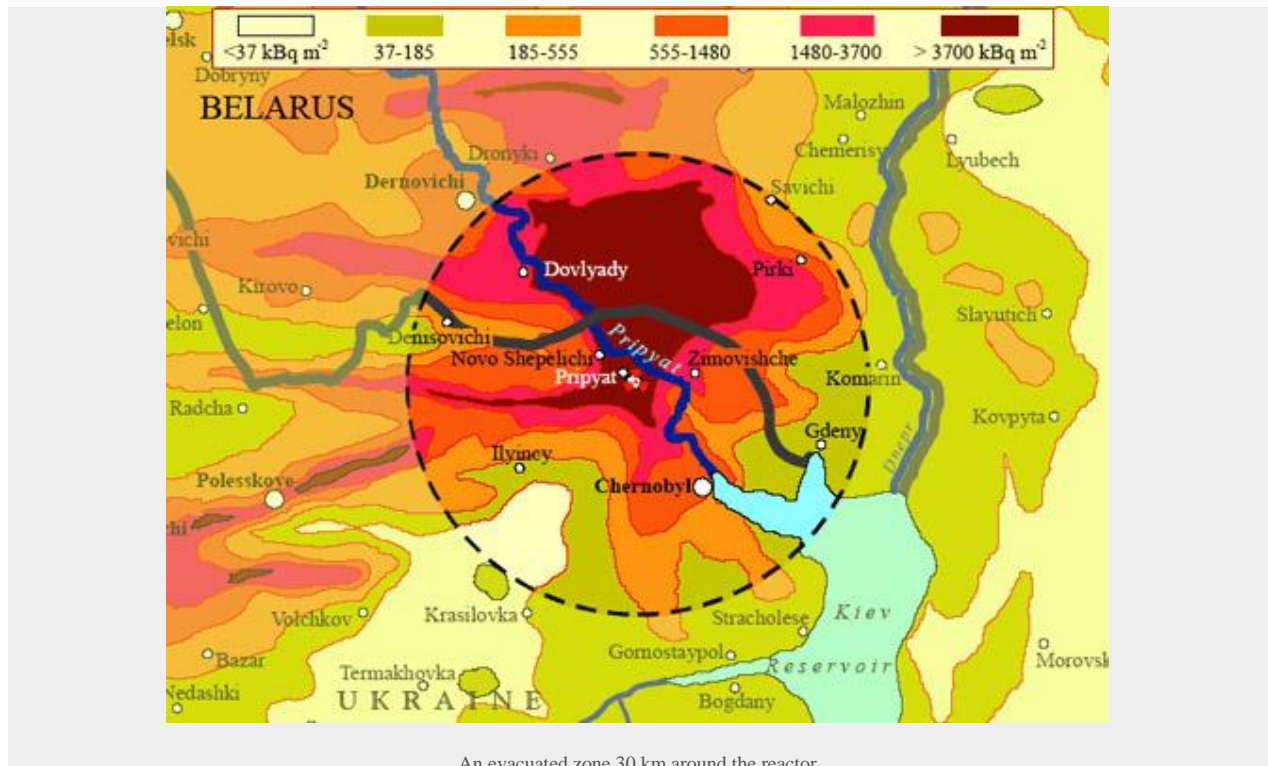
Zelenyi Mys

Built on the border of the special zone, close to the seventeenth-century village of Strakholissya. “Green Cape” was built to house 10,000 workers, but could only accommodate 850 people by October, 1986, and 3,000 in December. These had no decontamination site to attend after their work in the contaminated areas. It was also plagued by poor planning and carelessness. River housing was used during construction. Zelenyi Mys was eventually abandoned as a town site.

Zelenyi Svit

Green World. Officially formed in October, 1989. At its founding congress, Yuri Shcherbak disputed the official government data of a total of fifty curies of radioactivity and said it was really “something in the region of one billion.” (Marples) A minimum of 27,000 young children received between one hundred and two hundred rems. Green World organized a rally in Kyiv on 13 November, 1988 in which 10,000 people participated. They called for the Chornobyl station to be shut down and all the others on Ukrainian soil eventually dismantled, even though they admitted the technology to do so did not exist.

Zone, Thirty Kilometers



Arbitrary designation. The thirty kilometer zone does not account for all the contaminated areas, according to Ukrainian biologist, Dmytro Grodinsky. Within the zone, there appeared “unusually aggressive roosters; packs of dogs that range like wolves; and curious crop mutations that appear to defy the rules of nature. Thousands of ducks have flown into the zone, accumulated radioactive substances, and then spread them over a wide region. The radioactive particles now collected in silt can be carried by flood waters into fields.” (Marples) Fires are dangerous because the radioactive particles could be spread by the smoke.

Within a year of the accident, as many as 1000 persons returned to live in the zone, in villages such as Opachychi, where the radiation levels were two to three times higher than workers at the nuclear plant were all permitted exposure. Workers were allowed 25 rems exposure. Secondary radiation, the re-entry of radioactive particles into areas previously decontaminated, was also a problem.

The fallout region was divided into four zones:

1. zone of temporary evacuation, which was completely evacuated, but since it contained the reactors, workers were entering it all the time. They were bused in from the new city of Slavutych, and from Zelenyi Mys (Green Cape- a settlement for shift workers built on the Kyiv reservoir in 1986-1987), Kyiv and Chernihiv.
2. a zone of constant control: 1,100 people returned to this zone to live;
3. zone of constant control;
4. zone of periodic control

Zones II and IV were populated by 84,000 people in 176 settlements. Over 50% of the people were living in an area where cesium-137 exceeded the maximum limit. Food had to be brought in from the outside because items such as milk, mushrooms, meat and fish were contaminated higher than allowable limits. Some settlements in these zones were initially believed to be safe. Three years later, it was discovered that the residents, and those who had been resettled from other centres, were in a danger they

were never informed about. Parts of the Kyiv water reservoir were now off limits to fishermen. Several villages within a ten kilometer zone around the reactor were now “graveyards” for the 2,000,000 feet of contaminated soil collected and the steel and nonferrous metals as well, especially at Povesne and Lubianka.

The village of Opachycha is within the zone. Ten to fifteen people now live there during the winter. More come in the spring and summer, bringing the total to nearly 100. They are seniors who come to tend their gardens. For three years, soldiers were sent to force them to leave the area due to fears of continuing high levels of radioactivity. Now they are left alone. In fact, supplies such as bread, sugar, and oil are even brought to them once every three days from Zelenyi Klyn. Other food is grown locally. They also catch fish and pick mushrooms. The village church registers high radiation on dosimeters, so church services are held outdoors. When correspondents ask for interviews, the people give only their first names, for fear that someone will come to arrange re-settlement. Those who have relatives in other areas do spend months at a time visiting, but then they return to the zone. The only hard thing for them, they say, is that they are not allowed to bring presents out with them for the grandchildren. (Zelenyi Svit).