

## CHERNOBYL - THE CHRONOLOGY OF A DISASTER

The beginning of the Chernobyl accident goes back to the **25<sup>th</sup> of April** when the unit 4 of the reactor was shut down for purpose of a routine maintenance. The engineers wanted to conduct an experiment during which they would shut off the reactors emergency core cooling system (ECCS) to see whether, in the case of a power reduction/emergency, the cooling

### 25<sup>th</sup> of April 1986

system would still be able to cool the core.

**14:00 p.m.** The power of reactor operates at about half power and the ECCS is switched off.

**11:00 p.m. to 00:28 a.m. (next day)** – Further power reduction leads to operational error and the power falls to about 30 MWt, although it should be stabilized at about 1000 MWt. The operators try to raise the power by switching off the automatic regulators and freeing the control rods manually.

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**01:00 a.m.** – In order to retain the reactor control at least 30 control rods were necessary in the reactor core. During the experiment only 6 to 8 control rods were actually used, which made the reactor very unstable.

**01:03 a.m.** – The reactor is stabilized at about 200 MWt.

**01:23:04 a.m.** – The engineers decide to proceed with the experiment. Flow of the feedwater is reduced in order to maintain the steam pressure. Less cooling water is provided to the reactor, since the energy that powered the pumps was reduced. The loss of cooling water increases steam production in the cooling channels and the engineers are not able to prevent the runaway increase in power that was 100 times the nominal power output.

**01:23:40 a.m.** – The operator presses the emergency button. Control rods start to enter the core. Consequently the reactivity at the bottom of the core is increasing.

**01:23:43 a.m.** – Power exceeds 530 MWt and continues to rise. Sudden increase in heat production ruptures part of the fuel and small hot fuel pellets, which react with water. A steam explosion follows and destroys the reactor core. The rupture of several fuel channels increases the pressure in the reactor to such extent that the 1000 t reactor support plate becomes detached. The control rods, which were on the halfway down, are now jammed.

**01:24 a.m.** – A note of the Chief Reactor Control Engineer: *“01:24: Severe shocks; the rods stopped moving before they reached the lower limit stop switches; power switch of clutch mechanisms is off.”* The initial steam explosion is few seconds later followed by a second explosion. Fuel, core components, structural items, highly radioactive debris are sent into the air and the destroyed core is exposed to the atmosphere. The plume of the smoke and radioactive debris rise up to about 1 km into the air. In the remains of the Unit 4 building fire breaks out.

**01:28 a.m.** – First group of 14 firefighters arrives to the scene.

**02:10 to 02:30 a.m.** – The largest fires on the roof of the machine and the reactor hall are under control.

**05:00 a.m.** – The Unit 3 of the Chernobyl Nuclear Power Plant is shut down.

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**02:00 a.m.** - The second reactor on Chernobyl NPP was stopped

**11:30 p.m.(previous day) – 04:00 a.m.** - Motor transport departure in area of accident and its concentration on a boundary of Chernobyl buses – 1225; cargo and special cars – 250. It is prepared two diesel engine train on 1500 places at railway station Janov.

**morning**, after special conference Governmental commission prescribed that evacuation of Pripyat citizen began at 02:00 p.m.

**12:00 a.m.** – The army declared evacuation and started to give iodide pills.

**01:50 p.m.** - Gathering of inhabitants at entrances of the houses. Text of announcement: “Comrades, in connection with the Chernobyl accident appears the city evacuation. You should have itself the documents, necessary things and food for three days”.

**02:00 p.m.** - The evacuation begins.

**02:00 p.m. to 4:30 p.m.** - Carrying out the evacuation. A column of 20 buses and 5 lorries went for people and personal property to Pripyat with an interval 10 minutes accompanied by police.

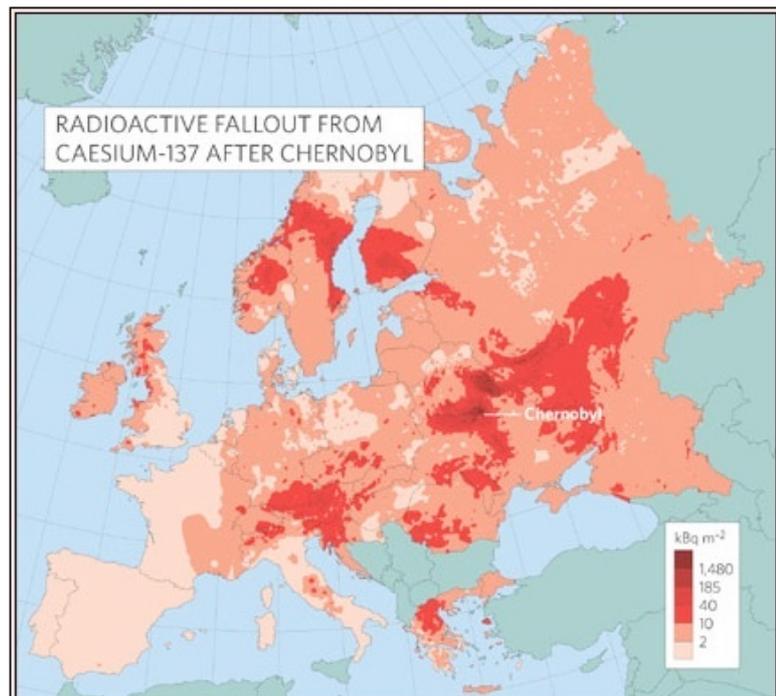
**04:30 p.m.** – The evacuation of population ended

**06:20 p.m.** - Door-to-door detour of houses by police officers (about 20 people who tried to evade from evacuation are revealed).

**the afternoon** - hourly investigation in the city of Pripyat has been developed. Dabs from asphalt and dust from roadsides of roads were taken and tests of air were made. The analysis showed that fifty percent of radioactive splinters it was necessary on iodine-131. Activity closely to an asphalt surface reached 50 X-ray at an o'clock. On distance of two meters from the earth — about one X-ray at an o'clock

**all day long** - All meteorological stations in the European part of the USSR start to work in a special regime

**the same day** - The first report of Governmental meteorological



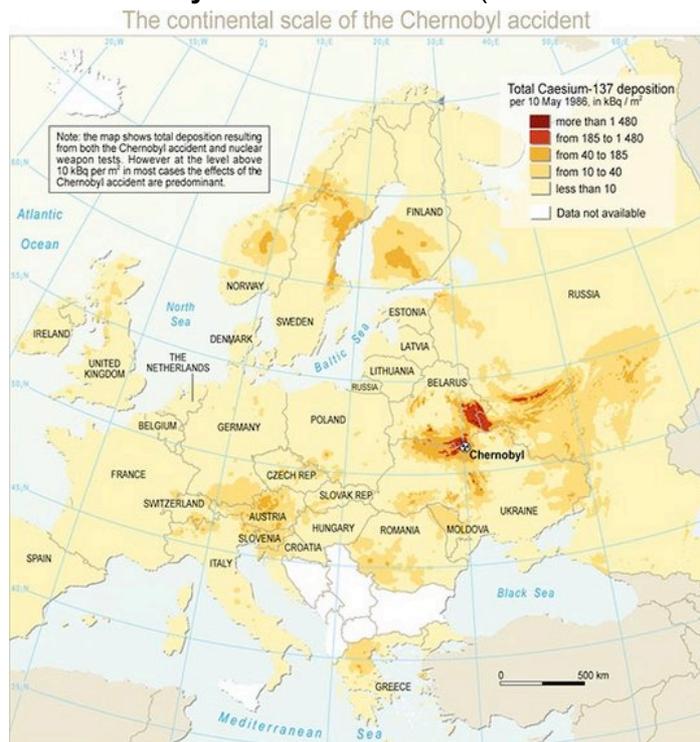
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committee of the USSR about radiating conditions in the territory adjoining to Chernobyl NPP and trajectories of carrying over of the polluted air weights there was offered in Council of Ministers of the USSR

**the same day** - Movement of a radioactive cloud proceeds. The cloud reaches Sweden where on the NPP the raised level of radiation has been registered. The radioactive dust drops out to Stockholm

**the same day** – a group of 80 helicopters under command of general Antoshkin arrives at Chernobyl on order dump on the blown up reactor 150 tons of sand and boric acid, for reduction of level of radiation.

**the same day** – The first victims (19 workers of fire protection) delivered in the Moscow hospital №6



**28th of April 1986**

**09:00 a.m.** - A radioactive cloud containing traces of strontium, cesium and plutonium reaches Sweden and Finland. The first warning came in Sweden. The technicians from the Forsmark Nuclear Power Plant, 60 miles north of Stockholm, noticed disturbing signals blipping across their computer screens. Those signals revealed abnormally high levels of radiation, a sure sign of serious trouble. When other plants around Europe began to register similar high radiation readings, they contacted the Soviet Union to find out what had happened.

**early in the morning** - A massive accident management operation began in the Pripyat area. This involved dropping large amounts of different materials, each one designed to combat a different feature of the fire and the radioactive release.

The first measures taken to control fire and the radionuclides releases consisted of dumping neutron-absorbing compounds and fire-control material into the crater that resulted from the destruction of the reactor.

The total amount of materials dumped on the reactor was about 5000 t including about 40t of boron carbide, 2400 t of lead, 1800 t of sand and clay, and 800 t of dolomite. About 1800 helicopter flights were carried out to dump materials onto the reactor.

Mass evacuation begins of villages and towns within 30 kilometres of the reactor. More than 300,000 eventually leave their homes forever.

**09:00 p.m.** - The Soviets announced to the world that one of the reactors had been "damaged". Up to this moment they denied any knowledge about a nuclear disaster. The

report, from the official news agency, Tass, said there had been casualties but gave no details of numbers. It said aid was being sent to the injured. The report said that one of the reactors had been damaged in the accident, but gave no further details beyond saying that measures were being taken to "eliminate the consequences of the accident". It also claimed the accident was the first at a Soviet power station. The report was the first confirmation of a major nuclear catastrophe since monitoring stations in Sweden, Finland and Norway began reporting sudden high discharges of radioactivity in the atmosphere two days ago.

**29<sup>th</sup> of April 1986** - The message on failure is transferred for the first time in news on one of the European TV channels.

### And later on...

**Until 5<sup>th</sup> of May 1986** - Within the first 10 days after failure from a 30-kilometer zone near to the reactor 130 thousand persons are evacuated.

**6<sup>th</sup> of May 1986** - Radiation emission has sharply decreased.

**15<sup>th</sup> to 16<sup>th</sup> of May 1986** - The renewed fires lead to new emission of radiation.

**23<sup>rd</sup> of May 1986** - The Soviet governmental commission makes the order about distribution iodide preparations. By this time the given preventive measure from the medical point of view any more has no sense. Radioactive iodine is especially dangerous only in the first 10 days and already has had time to be postponed in a thyroid gland at inhabitants of the infected territories.

**15<sup>th</sup> of November 1986** - The construction of a concrete Shelter which should cover the destroyed reactor is finished.

### The next 10 years

**2nd of August 1990** - Resolution on conclusion of reactors 1, 2 and 3 until 1995.

**11th of October 1992** - Fire in unit 2, reactor closed

**21st of October 1993** - Sovereign Soviet Ukraine annulled the proposal for the conclusion

**23rd of February 1994** - Decree of President of Ukraine: "Important measures on the development of nuclear energy and the introduction of nuclear fuel cycle in Ukraine", which includes the resumption of operation of the reactor 2 until 1995.

**9th of April 1994** - U.S. Department of Energy announced an agreement with Ukraine on the closure of Chernobyl

**21st of April 1994** - International Atomic Energy Agency organized a meeting on Chernobyl

**31st of May 1994** - President Leonid Kravchuk said that Chernobyl will continue to operate

**25th of June 1994** - European Union heads of state appeal to close down Chernobyl and they give an assurance to assist 400 million ECU in loans and 100 millions ECU in grants

**9th of July 1994** - Heads of State of the G7 call for the closure of Chernobyl and offer support of 200 millions ECU in grants

**13th of April 1995** - President Leonid Kuchma announced the closure of Chernobyl by 2000, if the West will help with the payment options, approximately 4 billion USD.

**20th of December 1995** -G7 and the EU signed with the Ukrainian government, "Memorandum of Understanding" that calls for decommissioning of Chernobyl by 2000 and outlines an aid package worth 2.3 billion USD

**20th of April 1996** - President Leonid Kuchma announced closure of the reactor 1 by the end of 1996

**30th of November 1996** - Reactor no. 1 closed

**27th of December 1996** - State Committee for Nuclear Energy in Ukraine announces the planned reopening of the reactor no. 2 in April 1997.