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The influence of geomagnetic storms on transformers

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The aim of the article is to describe the influence of geomagnetic storms on transformers and connection with the magnetic field of the earth.

A geomagnetic storm is a temporary disturbance of the Earth's magnetosphere caused by a solar wind shock wave and cloud of magnetic field which interacts with the Earth's magnetic field.

Geomagnetic storm could be one of the biggest natural disasters. It will disrupt telephone communications, television, radio, and Internet.

On September 1-2, 1859, there was the largest recorded geomagnetic storm. From August 28 until September 2, 1859, numerous sunspots and solar flares were observed on the Sun, the largest flare occurred on September, 1. It is called a Solar storm of 1859 or the Carrington Event.

It can be assumed that a massive coronal mass ejection, associated with the flare, was launched from the Sun and reached the Earth within eighteen hours – a trip that normally takes three to four days. A prominence is a large, bright, gaseous feature extending outward from the Sun's surface, often in a loop shape. This is coronal mass ejection. Coronal mass ejections release huge quantity of matter and electromagnetic radiation into space above the sun's surface, either near the corona, or farther into the planet system, or beyond. More severe proton events can be associated with geomagnetic storms that can cause widespread disruption to electrical grids. Power grids are only sensitive to changes in the Earth's magnetic field.

The increase in the solar wind pressure initially compresses the magnetosphere and the solar wind's magnetic field interacts with the Earth's magnetic field and transfers an increased energy into the magnetosphere. Both interactions cause an increase in movement of plasma through the magnetosphere and an increase in electric current in the magnetosphere and ionosphere. Electric field weakens and starts to fall charged particles. Bulk charging occurs when energetic particles, primarily electrons, penetrate power grids and deposit their charge. Transformers connected to long, overhead power transmission lines, induced currents in the solar storm cause saturation of the core, and it begins to melt due to magnetic perturbations.

Modern power grids are working to maximum efficiency, which means that the system is not amortized, there are no additional transformers that do not have additional lines. Transformers will be destroyed and we cannot do anything but to create new ones. Today, large areas of the planet plunged into darkness for 10 years or more.

The solution of this problem is to build power grids to have more transformers. There is still an expensive option, transformers immersed in water.

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Tanishev, A.O., Tarasova, E.S. **Nuclear Contamination**

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Nuclear contamination (or sometimes it's called nuclear pollution) is a presence of radioactive substances on environment. It's the presence of radioactive substances on surfaces or within solids, liquids or gases (including the human body), where their presence is unintended [2]. Of course it's very harmful for our organism and for all living creatures that inhabit our planet. The environmental impact of nuclear power results from the nuclear fuel cycle, operation, and the effects of nuclear accidents.

The routine health risks and greenhouse gas emissions from nuclear fission power are small relative to those associated with coal, oil and gas. However, there is a "catastrophic risk" potential if containment fails which in nuclear reactors can be brought about by overheated fuels melting and releasing large quantities of fission products into the environment. The public is sensitive to these risks and there has been considerable public opposition to nuclear power [4].

Nuclear Contamination is pollution caused by nuclear waste which is generated from the unusable radioactive products from different fields. Unfortunately, humans are polluting the Earth... and radiation, which is dangerous, though there in nature.

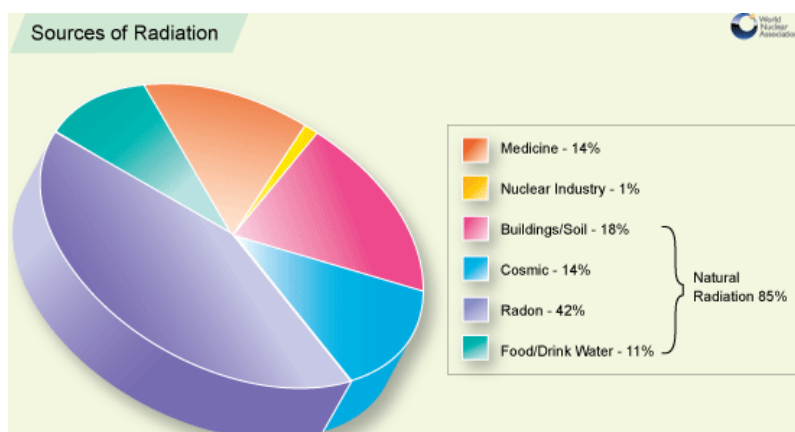


Fig.1 (left). "Sources of Radiation" diagram [6].

If radioactive material is not in a sealed source container, it might be spread onto other objects. Contamination occurs when material that contains radioactive atoms is deposited on materials, skin, clothing, or any place where it is not desired. It is im-

portant to remember that radiation does not spread or get "on" or "in" people; rather, it is radioactive contamination that can be spread. A person contaminated with radioactive material will receive radiation exposure until the source of radiation (the radioactive material) is removed [3].