УДК 811.111:621.315.1.027.3

HIGH-VOLTAGE DIRECT CURRENT TRANSMISSION LINES

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Historically, it has been very difficult to efficiently transform DC power to a high-voltage, low-current form, whereas with AC this can be done efficiently with a simple transformer. This was the key to the success of the AC system. However, technology improvements in the last few decades have allowed reliable generation of high-voltage DC (HVDC), resulting in its reemergence for power transmission systems.

HVDC technology is superior to the more common AC technology for the transmission of bulk power over long distances or when transmitting between nonsynchronous AC systems. HVDC advantages overall include: lower electrical losses, lower transmission line costs, reduced environmental impact from more compact ROWs(right-of-way), no AC electromagnetic field issues, the possibility of interconnecting power systems with different nominal frequencies (50 and 60 Hz) and systems using various frequency-regulating standards.

Construction of HVDC transmission line systems typically takes from 3 years for large, thyristor-based systems, to just 1 year for voltage sourced converter -based HVDC systems. Modern HVDC links with microprocessor-based control systems can be operated remotely, and some existing installations in operation are completely unmanned. Modern HVDC transmission lines can be realized with several terminals. These are called multi-terminal HVDC transmission systems. The multiple terminals can be configured in series, parallel, or as a hybrid (a mixture of series and parallel). Parallel configuration tends to be used for large capacity stations, and series for lower-capacity stations. For bulk power transmission over land, overhead transmission lines are most frequently used. Recent developments have produced a new type of HVDC cable, which is available for HVDC underground or submarine power transmissions.

HVDC lines have some characteristics that can be considered as “positives,” while other HVDC characteristics may be “negatives” from an environmental point of view, relative to corresponding characteristics of HVAC lines. Characteristics of HVDC include impacts from electrical

and magnetic fields, radio interference, audio noise, visual impacts, and land use impacts from siting transmission line towers and substations.The ability to transform voltages is an important economic and technical consideration as the lower currents required with high-voltage transmission for a given level power require smaller cables and result in less loss of power in the form of heat.

УДК 811.111:621.039

NUCLEAR ENERGY

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Nuclear energy, also called atomic energy, is the powerful energy released by changes in the nucleus (core) of atoms. The heat and light of the sun result from nuclear energy. Scientists and engineers have found many uses for this energy, including the production of electric energy and the explosion of nuclear weapons. Scientists first released nuclear energy on a large scale at the University of Chicago in 1942, three years after World War II began. This achievement led to the development of the atomic bomb. Since 1945, peaceful uses of nuclear energy have been developed. The energy released by nuclei creates large amounts of heat.

Most countries depend mainly on fossil fuels. But fossil fuels are a non-renewable resource. Nuclear power plants have two main advantages over fossil-fuel plants. Once built, a nuclear plant can be less expensive to operate than a fossil-fuel plant, mainly because a nuclear plant uses a much smaller volume of fuel. Uranium, unlike fossil fuels, releases no chemical or solid pollutants into the air during use. However, nuclear power plants have two major disadvantages. Because of the need to assure that hazardous amounts of radioactive materials are not released, nuclear plants must meet certain government regulations that fossil-fuel plants do not have to meet. Used nuclear fuel produces dangerous radiation long after it has been removed from the reactor. Under normal economic conditions, a nuclear plant’s savings in fuel eventually make up for its higher construction expenses. At first, these expenses add to the cost of producing electricity. But after some years, a plant will have paid off its construction costs.