

Energy Efficient Ultra High Voltage – The Future of Electricity Transmission

One of the dilemmas facing governments and utilities today is how to supply large amounts of electrical energy for growing populations in a way that is both efficient and has a minimal impact on the environment. In those countries, such as Brazil, China and India, the challenge lies in getting the electricity from the power generating stations thousands of kilometers away to the urban populations. “Ultra high voltage” offers the promise to meet this challenge.

The world’s experts on Ultra High Voltage are convening in Beijing, China from 18-21 July under the auspices of the International Electro technical Commission (IEC) and CIGRE, the International Council on Large Electric Systems, to map out the way forward for this new technology and its potential applications. This symposium is a further example of how the IEC and CIGRE are committed to the goal of increasing the efficiency of energy production, its transmission, distribution and use.

More power, fewer lines

Ultra High Voltage – or UHV – is defined as voltages of 1000 kV alternating current, or higher, and 800 kV direct current, or higher, and it is needed for two main reasons. The first is to deliver large distances with very little loss of power (higher voltage means lower current on the transmission line and therefore lower loss). The second is to deliver large quantities of power to cities without having a proliferation of transmission lines. If you can deliver lots more power with just one line, you don’t have to build more lines and the resulting overall impact is reduced. In places where demand is growing but room for transmission lines is limited, such as Tokyo in Japan, this is critical because it means only one power line corridor is needed, not several.

Since studies in the US indicate that the world’s electrical consumption is set to rise to 30 billion kWh by 2030 from the 15.4 billion kWh in 2006, any potential savings in electrical energy, and in the number of line installed, are welcome.

Standards for UHV do not exist yet, so they need to be developed to ensure the safe and efficient use of this technology. It is a technical challenge for manufacturers, utilities and, ultimately, a regulatory issue for governments. IEC and CIGRE are the bodies responsible for technical specifications for this technology.

The challenges

The first issue is to develop reliable equipment and systems that deliver electricity safely. At present, the highest voltages used for long-distance transmission are about 765 kV A.C. It would be easy if we could simply increase the voltage of the power lines, but technically this is impossible because today’s equipment will not withstand these higher voltages.

The challenge then is to develop new transformers, breakers and associated equipment, new transmission lines and insulating equipment designed for UHV. Experts admit that this will be expensive, but the alternative is having lots more transmission lines.

With much more power transmitted over on a line, the impact resulting from losing a line is much higher. System planners and operators need to be sure that the system will continue to function even when a line fails so keeping the system stable is the second challenge.

The IEC/CIGRE symposium is for utilities, transmission system planners and operators, contractors, equipment manufacturers, transmission design engineers, research and test laboratories, government regulators and universities. It is a further example of how the IEC and CIGRE are committed to saving energy with the common goal of increasing the efficiency of the energy use.

The International Electrotechnical Commission (IEC) is the global organization responsible for developing and publishing international standards and specifications for all electrical, electronic and related technologies. The membership consists of more than 60 participating countries, including all the world’s major trading nations and a growing number of industrializing countries. Its standards are used in more than 100 countries as the basis for national rules and standards.

Reference book:

Electrical India,
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