ELECTRIC POWER TRANSMISSION - II

Communications

Operators of long transmission lines require reliable communications for control of the power grid and, often, associated generation and distribution facilities. Fault-sensing protection relays at each end of the line must communicate to monitor the flow of power into and out of the protected line section. Protection of the transmission line from short circuits and other faults is usually so critical that common carriertelecommunications is insufficiently reliable. In remote areas a common carrier may not be available at all. Communication systems associated with a transmission project may use:

Microwaves

power line carrier

Optical fibres

Rarely, and for short distances, a utility will use pilot-wires strung along the transmission line path. Leased circuits from common carriers are not preferred since availability is not under control of the electric power transmission organization.

Transmission lines can also be used to carry data: this is called power-line carrier, or PLC. PLC signals can be easily received with a radio for the longwave range.

Sometimes there are also communications cables using the transmission line structures. These are generallyfibre optic cables. They are often integrated in the ground (or earth) conductor. Sometimes a standalone cable is used, which is commonly fixed to the upper crossbar. On the EnBW system in Germany, the communication cable can be suspended from the ground (earth) conductor or strung as a standalone cable.

Some jurisdictions, such as Minnesota, prohibit energy transmission companies from selling surplus communication bandwidth or acting as a telecommunications common carrier. Where the regulatory structure permits, the utility can sell capacity in extra "dark fibres" to a common carrier, providing another revenue stream for the line.

Electricity market reform

Transmission is a natural monopoly and there are moves in many countries to separately regulate transmission (see New Zealand Electricity Market). In the USA the Federal Energy Regulatory Commissionhad issued a notice of proposed rulemaking setting out a proposed Standard Market Design (SMD) that would see the establishment of Regional Transmission Organizations (RTOs). The

first RTO in North America is the Midwest Independent Transmission System Operator (MISO) [4]. MISO's authority covers parts of the transmission grid in the United States midwest and one province of Canada (through a coordination agreement with Manitoba Hydro). MISO also operates the wholesale power market in the United States portion of this area.

In July 2005, the new FERC chairman, Joseph Kelliher announced the end of SMD efforts because "the rulemaking had been overtaken by the voluntary formation of RTOs and ISOs" according to FERC.

Spain was the first country to establish a Regional Transmission Organization. In that country transmission operations and market operations are controlled by separate companies. The transmission system operator is Red Eléctrica de España (REE) [5] and the wholesale electricity market operator is Operador del Mercado Ibérico de Energía - Polo Español, S.A. (OMEL) [6]. Spain's transmission system is interconnected with those of France, Portugal, and Morocco.

Health concerns

It is argued by some that living near high voltage power lines presents a danger to animals and humans. Some have claimed that electromagnetic radiation from power lines elevates the risk of certain types of cancer. Some studies support this theory, and others do not. Most studies of large populations fail to show a clear correlation between cancer and the proximity of power lines, but a 2005 Oxford University study did find a statistically significant elevation of childhood leukaemia rates [7]. Recent studies (2003) connect DNA-breakage with low level AC magnetic fields.

The current mainstream scientific view is that power lines are unlikely to pose an increased risk of cancer or other somatic diseases. For a detailed discussion of this topic, including references to a variety of scientific studies, see the Power Lines and Cancer FAQ. The issue is also discussed at some length in Robert L. Park's book Voodoo Science.

Alternate transmission methods

Hidetsugu Yagi attempted to devise a system for wireless power transmission. Whilst he managed to demonstrate a proof of concept, the engineering problems proved to be more onerous than conventional systems. His work however, led to the invention of the yagi antenna.

Another form of wireless power transmission has been studied for transmission of power from solar power satellites to the earth. A high power array of microwave transmitters would beam power to a rectenna in an unpopulated desert area. Formidable engineering, environmental, and economic problems face any solar power satellite project.

There is a potential for the use of superconducting cable transmission in order to supply electricity to consumers, given that the waste is halved using this method. Such cables are particularly suited to high load density areas such as the business district of large cities, where purchase of a right of way for cables would be very costly. [8]

Special transmission grids for railways

In some countries where electric trains run on low frequency AC (e.g. 16.7 Hz and 25 Hz) power there are separate single phase traction power networks operated by the railways. These grids are fed by separate generators in some power stations or by traction current converter plants from the public three phase AC network. Sample transmission voltages include:

25 kV (United Kingdom)

25 and 50 kV (South Africa)

66 and 132 kV (Switzerland)

110 kV (Germany, Austria)

Source : http://engineering.wikia.com/wiki/Electric_power_transmission