*Can You Imagine . . .*

. . . a power control device that will help electric utilities reduce power outages and double the capacity of transmission lines.

# ELECTRICITY-SAVING CIRCUITS HELP UTILITIES UPGRADE POWER GRIDS

Investigating a flexible alternating current transmission system (FACTS), the Electric Power Research Institute (EPRI) and other groups expect to improve the switching capabilities, capacity, and security of electric utility transmission lines. FACTS controllers also prevent power outages that cascade throughout the distribution system. These devices require highly advanced power electronics to control the flow of current over the transmission lines.

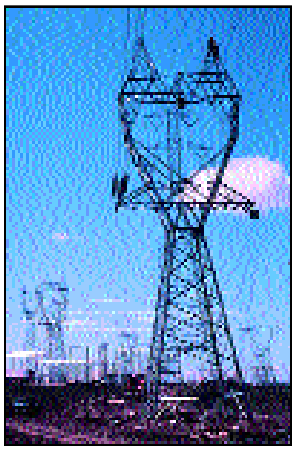
One of the nearest term technologies for FACTS controllers is a high-powered variable switch marketed by Harris Semiconductor Corporation (Melbourne, FL), called the metal oxide semiconductor–controlled thyristor (MCT). Originally funded as a power control device for BMDO's directed energy weapons, MCTs will instantly reroute power to avoid outages and double the capacity of transmission lines. These rugged, reliable, efficient thyristors can operate at higher temperatures and permit faster switching speeds than such conventional thyristors as the silicon-controlled rectifier, the insulated gate bipolar transistor, and the gate-turnoff device.

HARRIS FOCUSES ITS MARKETING EFFORTS FOR THE MCT ON AUTOMOTIVE, ELECTRIC UTILITY, AND MANUFACTURING APPLICATIONS.

Harris launched its first line of MCTs (a 600-volt p-type MCT) in September 1992 and added three more MCT devices, including one 1,000-volt, 65-ampere p-type MCT and two 35-ampere devices (one with and one without a built-in diode). The company soon expects to release a 600-volt, 75-ampere device in a second generation of MCTs. This device will offer a fourfold improvement in switching speed over current generation devices. Harris primarily focuses its marketing efforts for the MCT on automotive, electric utility, and manufacturing applications.

In September 1995, Harris announced plans to invest $250 million in its power semiconductor operation to construct a metal oxide semiconductor (MOS) eight-inch wafer fabrication facility in Mountain Top, Pennsylvania, for MCTs, MOS field effect transistors, and insulated gate bipolar transistors. When fully operational (scheduled for 1997), the facility should create about 120 new highly skilled manufacturing jobs for the community.

Through U.S. Navy funding and a project sponsored by the Defense Advanced Research Projects Agency, Harris and EPRI continue to address further development and packaging requirements for high-power MCTs. Forming much smaller and more powerful power electronic building blocks (PEBBs), the team plans to package MCTs with semiconductor rectifiers and high-performance gate-driver integrated circuits. With such smart power devices as PEBBS, utilities could save $6 billion compared to the cost of adding the same capacity with new lines.[1]



■ Harris' MOS-controlled thyristor may be one solution for upgrading utilities' transmission and distribution systems.

## ABOUT THE TECHNOLOGY

Serving as variable-gain switches, thyristors regulate current flow with a technique known as phase control. A significant advance in high-powered electronics, Harris' MOS-controlled thyristors switch much faster, operate at higher power levels, and withstand higher temperatures than conventional thyristors, such as silicon-controlled rectifiers. They handle up to 1,000 volts at more than 100 amperes. Further development could lead to individual devices that handle 2,500 to 4,500 volts at comparable currents. In addition, Harris expects these silicon-based devices to be more easily manufactured than competing power semiconductors.

[1]Hingorani, N. and Karl Stahlkopf. 1993. High-power electronics. *Scientific American*. November, 78–84.