# U.S. looks to Russian technology for reactive power control

When the blackout hit the U.S. Northeast and eastern Canada last August the role of reactive power in assuring the stability of the power grid was highlighted. Now U.S. researchers are encouraging utilities to take a look at a technology used in Russia.

At the present time, U.S. utilities use static var compensators (SVCs) to meet reactive power load and voltage control requirements. The major component of the SVC is a controllable shunt reactor with the reactor controlled by thyristor switches.

The magnetically controlled electric shunt reactor (MCR) is another technology that offers significant advantages over the thyristor controlled reactor (TCR). The MCR technology was originally developed in the former Soviet Union and is currently used in Russia and other countries in the region as well as in China and Brazil.

The Electric Power Research Institute is prepared to collaborate with any U.S. utility that wishes to adopt the MCR technology. EPRI is in discussions with Wisconsin-based American Transmission Co. regarding the technology, EPRI Technical Leader for Transmission and Substation Asset Utilization Aty Edris said.

MCRs are superior to TCRs in reliability, efficiency and cost, EPRI believes. The MCR technology avoids the TCR's use of gate turn-off thyristors. These thyristors have a high rate of failure during operation, and are especially prone to failure in the six-month period after initial installation.

In addition, MCRs have a much greater overload and overvoltage capability. The Russian developers of the MCR technology claim that no MCR has needed replacement in the more than 20 since they began to be deployed in the field.

Other advantages include:

- MCRs reportedly experience only half the internal power loss of TCRs,
- An MCR installation takes up only one-tenth the space of an equivalent TCR, and
- For typical grid var requirements the output of the MCR could cost only one-half as much as from a TCR.

"MCRs cost half as much as TCRs to install, operate and maintain," concluded a study prepared by the Russian developers of the MCR technology.

The study cited the installation of an MCR at an 80-MVA substation in Russia as an example of the technology's promise. Prior to installation, power fluctuations required over 800 manual switching events per year with commensurate degradation of switching and transformer equipment. After MCR installation, the system stabilized substantially; only 12 manual switching events have been required on average annually since then.

In addition, the study reported that MCR installation resulted in energy savings over the first two years of operation that virtually covered the cost of the MCR, and postponed the need to construct a planned power line.

The study also noted that the MCR technology is particularly useful in systems characterized by long extra-high voltage (400-kV and above) AC lines; hence the interest from Brazil and China.

Edris said that in addition to the MCR technology, EPRI also hopes to interest utilities in another reactive power project: a low-cost emergency VAR compensator. This project aims to develop a shunt compensator with the ability to mitigate voltage dips and instability at the substation level by using a number of series-connected capacitor banks.

This technology, known by the acronym CAPS, mitigates voltage dips and voltage instability by temporarily shorting a portion of these banks. SM

## ATC taking serious look at MCR technology

ATC is looking at a variety of technologies that could help it address dynamic reactive support needs on its system, ATC engineer Charles Lawrence said.

In his view, the MCR technology potentially offers some important advantages. He pointed out that this technology is a proven one that uses standard conventional components. He also said that it costs less than other dynamic reactive power devices on the market in the U.S. now and promises to be more reliable.

In addition, he noted that the MCR has an important "fail-safe" aspect that other devices don't. If the dynamic control feature of the MCR becomes disabled, it will still provide a fixed amount of reactive support.

Still another advantage he cited is that an MCR device can be installed relatively quickly, and certainly more quickly than a permanent fix involving transmission expansion.

But ATC is not ready to commit to the MCR technology just yet. Lawrence said that as good as the technology looks, there is no MCR technology model that ATC can plug into its system simulations. ATC would want to see how the MCR technology performs in addressing dynamic support problems, and how its performance compares to other technologies, before adopting it. SM