

Maximum Utilization of Power Transmission Systems by the introduction of On-line Transient Stability Control System

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Abstract

In the early stage of Chubu Electric Power Co. Inc's (CEPCO) history, system stabilization procedures to prevent the spread of failures in the power system relied on relatively simple methods, such as the use of out-of-step relays. All this had to change in 1965 when a major power outage was caused by a power plant accident in Japan and another major blackout took place in northeastern U.S. After this, CEPCO began taking various steps to improve our system stability control so as to prevent the spread of system failures. These system stabilization procedures are classified into two methods. One is for the case of system isolation after fault clearance. And the other is for the case the system isn't isolated after that. In 1968, CEPCO introduced an SSC (System Stabilizing Controller) that maintains the proper frequency in the former case. In 1975, an older type TSC (Transient Stability Control) system which monitors system after their network expansion in the latter case. This system was initially the type for which settings were determined in advance based on dynamic transient stability simulation. In 1995, an online-processing type TSC system was developed and introduced, for the first time anywhere in the world. This system offers the function of recognizing the power system conditions and deciding in advance the proper system stabilization procedures, in response to assumed phenomena (possible faults and failures). Moreover, this system has succeeded in raising the TTC of one transmission line by 2,000 MW. As a result, the transmission line whose transfer capability was once determined by the transient stability limit, can be used up to its thermal capacity limit, and it is possible to avoid uneconomical operation by restricting the output of the units connected with the line. For example, the increase of transfer capability by adapting the on-line TSC system is about 30 GWh/day, which is equivalent to an 80% increase in electric power.

This on-line TSC system is not restricted to use in the power systems in Japan, but can be utilized in any other power system, with a stability problem, in the world. In case funds for equipment investment are limited, this system could prove very beneficial, as a means to ensure an adequate power supply capacity, while making full use of the physical capability of the existing transmission lines.

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