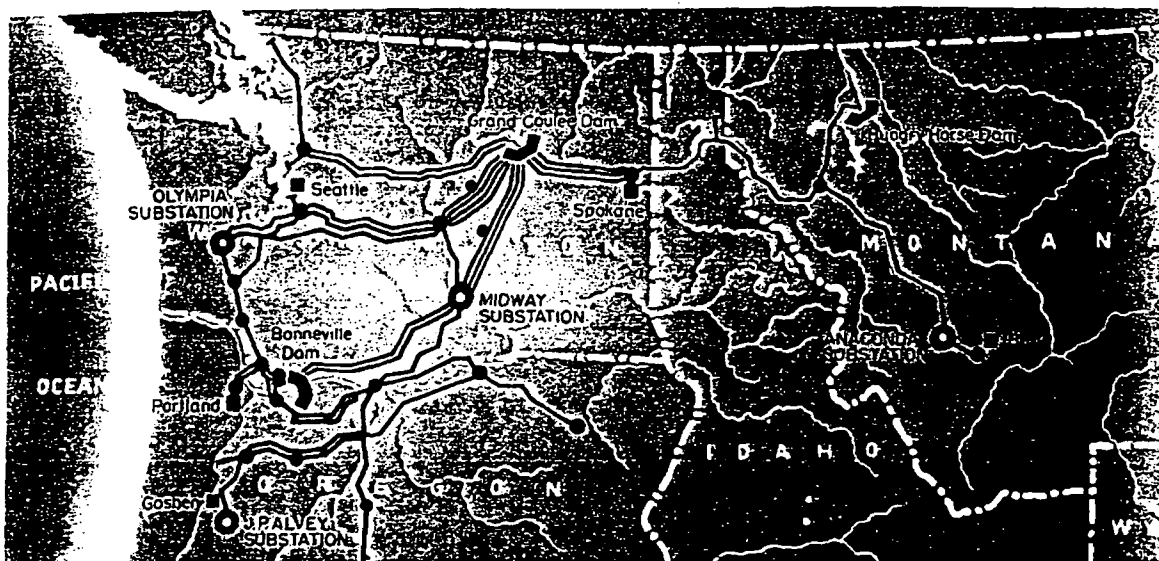




This simplified map of the Bonneville system shows the location of the four Elliott 50,000-kva synchronous condensers. The Olympia substation is located at the base of the Olympia peninsula, the J. P. Alvey substation in midwestern Oregon, the Midway substation lies at the hub of the system in central Washington, and the Anaconda substation is in Montana.

Elliott synchronous condensers on the Bonneville power system

by W. P. VanVranken, Application Engineer, Ridgway Division, Elliott Company

FOUR Elliott synchronous condensers serve as "balance wheels" on the extensive power network of the Bonneville Power Administration in northwestern United States. Under normal or "static" conditions, the condensers merely act like static capacitors, delivering about half their capacity to the system in leading kilovars. In the event of unusual load fluctuations or of a fault on the system, however, the condensers automatically pitch in to help maintain system stability.

Each of the Bonneville condensers is a hydrogen-cooled unit, rated 50,000 kva at 0.5 psi or 60,000 kva at 15 psi. They are among the largest of this type in operation today. Engineering studies of present and potential system requirements indicated that for best system stability the condensers should be located at four widely separated points on the system, as shown on the accompanying simplified sketch of the system.

At each of four substations—Olympia, J. P.

Alvey, Midway, and Anaconda—a 3-phase, 60-cycle, 13,800-volt condenser is connected to the 230-kv bus through a suitable transformer. Each condenser is intended to help stabilize voltage under either steady-state or transient conditions. For example, the lagging reactive capacity of the Anaconda unit generally serves to limit voltage rises which are induced by light loads and the effects of line-charging current. The J. P. Alvey condenser, on the other hand, is called upon to deliver leading reactive kva, thus preventing voltage drop in this more heavily loaded area of the system.

All of the condensers perform perhaps their most important function in the event of faults. System faults are usually accompanied by a severe drop in line or bus voltage. High-speed (3-cycle) reclosing circuit breakers are installed which disconnect a faulted line and lock it open if the fault has not cleared after a certain number of automatic reclosings of the breaker.