Since 1988, the Public Utilities Board (PUB) of Singapore has operated two static var compensators (SVC) of the thyristor-controlled reactor type (TCR) in its 230 kV cable transmission network. The TCRs, one rated at 100 Mvar located to Kallang Basin s/s and one rated at 50 Mvar and located to Labrador s/s, were supplied by ABB on a turnkey basis.

The Singapore 230 kV transmission network is 100% cable-based, with heavy reactive power generation within the system as a consequence. The subsequent need for reactive power absorption is considerable, as well as complex, due to the variations in the reactive power balance during varying load conditions ranging in between peak load and light load.

Before the advent of TCR, the need for reactive power absorption was solved by extensive incorporating of shunt reactors at vital points in the network, fixed as well as mechanically switched. This had not been fully satisfactory in certain respects, however, and mainly the following:

- A need for frequent switching of reactors, with the associated switching transients, circuit breaker wear, and requirements for maintenance of the breakers.
- Limited dynamic capability in situations where fast operation of reactors would be advantageous from a system point of view.
- Only stepwise switching of reactive power was possible, which did not admit optimum utilization of the power system with respect to losses as well as active power carrying capability.

**Single-line diagrams**

![Single-line diagrams](image-url)
In order to improve the system behaviour of the 230 kV cable network as regards the above listed points it was decided to install the two thyristor-controlled reactors. The ability of these TCR of continuously varying the reactive power absorption on an instantaneous basis brings the following benefits to the operating of the network:

- Automatic compensation of load variations on a continuous basis, with the optimum utilization of the power system equipment.
- Stabilization of the network under abnormal load conditions
- Less need for operating of circuit breakers, with subsequent savings of maintenance costs as well as increasing operational reliability.

By means of a power logic unit integrated into the control system of the TCR at Labrador, sequential switching of a number of existing mechanically switched reactors is achieved as well, thereby optimizing the utilization of these.

Both these SVCs are installed in a partially indoor environment using compact designs to fit into the confined space available at the substations.

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