

November / December 2000

From ABB Power Automation Ltd., Baden, Switzerland
Paul Leimbach/CHPAU/ABB@ABB_CH01, CHPAU/NSV-7

Division Protection and Substation Automation Systems
Phone +41 56 205 42 85, Fax +41 56 205 33 24

ABB Power Automation Ltd Switzerland (CHPAU) Applications/Solutions for Customers success



Power Grid Singapore orders 10 numerical Busbar Protection Systems REB500 the outstanding solution also in case of resistive earthed networks

Background

Singapore is well known for its high standard of living and is regarded the number one in economic strength in South East Asia which goes hand in hand with the Power Quality of the network and a high technical standard of the electrical grid. Our client, PowerGrid Singapore is very concerned about a continuous and on-time power supply and is therefore relying on a leading edge technology and system.

PowerGrid operates a 400kV, 230kV and 66kV transmission network. The 400kV and 230kV networks are solidly earthed, the 66kV network is resistively earthed via a 19.5 ohm liquid resistor. Following the successful field testing on Sembawang 66kV we are able now to equip further substations with our busbar protection solution, type **REB500**

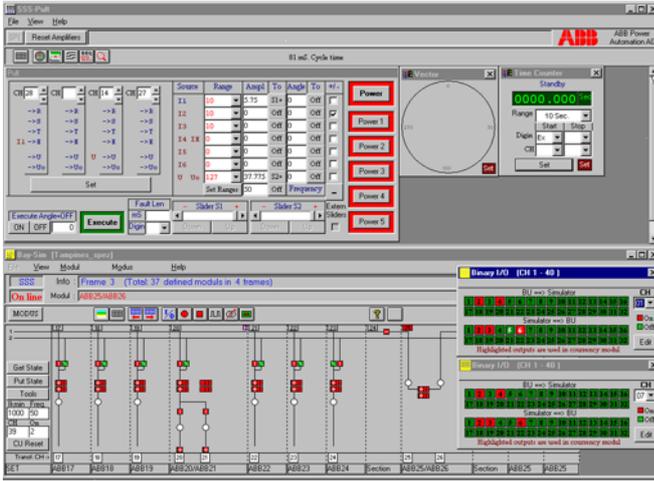
Decision for supplier

Due to our technical leadership and teamwork with our client PowerGrid in the field of neutral current measurement and the integration of neutral current criteria in the busbar protection functionality we have been chosen to be supplier for **10 Busbar Protection Systems**. The stations are:

<u>Stations</u>	nr. of bays	via ABB Singapore	
Jurong Island	44	Tampines Wafer	36
Pulau Merbau	10	Marina Centre	10
Jalan Eunus	11	Paya Lebar	25
Upper Jurong	30		

<u>Stations</u>	nr. of bays	via VA Tech-Elin	
Sengkang	20	Pulau Sakra II	16
Changi South	19		

ABB Power Automation



The MMI of the VSTAR testing equipment for the project Tampines Wafer 66kV S/S



Technical discussion in Baden during FAT for the project Jurong Island 66kV S/S

REB500 delivery

Generally the numerical busbar protection scheme adopts a phase-segregated measuring principle operation on a biased characteristic. The differential current operating magnitude is biased against the restraint component. (load and fault current). In a resistively earthed system, for a single-phase-to-ground fault the fault current is limited by the neutral grounding resistor. In the case of an external single-phase-to-ground fault the busbar relay measures a small differential current, but a large restraint current arising from the pre-fault load. In order to assure the necessary sensibility in case of internal fault the REB500 has an additional neutral current criteria.

REB500 technical scope

5 Stations are completely new and 5 stations are subject to a complete retrofit work with already installed busbar protection systems. All 10 above mentioned stations rely on the same functionality, basically consisting of the following:

Busbar protection

The algorithm is based on established measurement principles

- Current differential evaluation with stabilizing factor
- Current directional comparison

Breaker failure protection

The Breaker failure protection is integrated in the numerical bus-bar protection. This function utilizes the same current transformer and the trip logic as the bus-bar protection.

Disturbance recording

This function registers the currents, voltages and the binary inputs and outputs in each bay.

The recording can be triggered by edges of binary input or output signals or events generated by the internal protection algorithms.

Neutral current detection

For single-phase-to-ground faults a high-quality neutral current criteria is integrated in the busbar protection scheme.

Low-voltage check

An additional criteria based on low voltage is implemented as well. The REB500 allocates the correct low-voltage measurement to the corresponding bus zone automatically.

Summary

The teamwork with PowerGrid Singapore and the clients experience with REB500 busbar protection has been very successful and pleasant. The application of a low-impedance scheme for numerical BBP on the 66kV level has reached a breakthrough. The CT requirements have been reviewed in respect to the modified algorithm the low settings requested.

With its decentralised architecture the REB500 meets the demand on modern substation design to provide accurate information, better coordination, high availability and security, and it is able to communicate with the Substation control system.

For more information on REB500 please refer to the responsible sales engineer for your country or to substation.automation@ch.abb.com