

Tanjung Bin & Bukit Batu 500 / 275 kV Substations Successfully Commissioned

Tenaga Nasional Berhad (TNB), the National Utility of Malaysia is in charge of power generation, Transmission and Distribution for the whole Peninsula Malaysia. The transmission grid of TNB operates at voltage levels of 500, 275, 132 & 66 kV.

In February 2004 inCONTROL Tech Sdn. Bhd. (formerly known as VA TECH SAT Sdn. Bhd.) received the order from Hyundai Engineering for design, manufacture and supply of Control and Protection Panels (CRP), the Substation Automation System (SAS) and the Substation Interrogation and Monitoring System (SIMS) for TNB's 500 / 275 kV Tanjung Bin and Bukit Batu substations, both located in the southern part of Malaysian Peninsula near Singapore. These two substations are part of the 3 x 700 MW Tanjung Bin Power Plant (IPP) as a turnkey basis awarded to Toshiba Corporation. The power plant is built by Toshiba Corporation and the substations are awarded to Hyundai Engineering as a turnkey project.

Substation Configuration:

Tanjung Bin 500 / 275 kV substation is a new substation having 3 diameter of 500 kV one and half breaker system and 4 bays of 275 kV double bus bar system. In 500 kV comprising of 3 x 750 MVA Generator Transformer, 2 x 2800 MVA OH feeders and 1 x 750 MVA, 500 / 275 kV supergrid auto transformer. In 275 kV comprising of 1 x 4000 Ampere Bus Coupler bay, 2 x 1000 MVA OH feeder bays and 1 x 750 MVA, 500 / 275 kV supergrid auto transformer bay.

Bukit Batu 500 / 275 kV substation is an existing substation having 5 existing diameter of 275 kV one and half breaker system. The new extension is of 3 diameters of 500 kV and 3 diameters of 275 kV one and half breaker system. In 500 kV comprising of 3 x 1050 MVA, 500 / 275 kV supergrid auto transformer and 2 x 2800 MVA OH feeders. In 275 kV comprising of 3 x 1050 MVA, 500 / 275 kV supergrid auto transformers and 2 x 1000 MVA OH feeders. The engineering is including of extension of existing 275 kV main 1 & 2 ABB make Busbar protection and the manual synchronizing system.

Primary Equipment:

- 500 & 275 kV Circuit Breakers from ABB – SWEDEN.
- 500 & 275 kV Disconnectors & Earth switches from AREVA – ITALY.
- 500 & 275 kV Current Transformers from Trench – FRANCE.
- 500 & 275 kV Voltage Transformers from Trench – CANADA.
- 500 / 275 / 33 kV Auto Transformers from Hyundai – KOREA.

Control & Protection Panels:

Tanjung Bin 500 / 275 kV substation is supplied with 21 Protection panels, 7 Control panels and 3 metering panels for 500 kV one and half breaker system. 10 Protection panels and 5 Control panels for 275 kV double bus bar system. Apart from the above supply 6 Protection panels for Generator Transformer and overall 22 MK panels are included.

Bukit Batu 500 / 275 kV substation is equipped with 21 Protection panels and 7 Control panels for 500 kV one and half breaker system. 15 Protection panels and 6 Control panels for 275 kV one and half breaker system. Apart from the above supply 1 lot Protection modification for existing 275 kV Busbar protection and overall 23 MK panels are part of the scope.

The total Control & Protection and MK panels supplied for both the substations are 146 panels. These panels are provided with all the modern numerical protection relays and control system from Reyrolle, ABB, Siemens and etc., and BCU from VA TECH SAT.

Key points of the Project:

The contract was awarded to iTEC in February 2004 by Hyundai Engineering. The Tanjung Bin 500 kV SS is the first substation attached to the Generating Station which has been fully designed locally in Malaysia. This is also the first 500 / 275 kV substation design & engineering made as per the new engineering standards set up by TNB as the so called Code of Practice version 2 (COP2).

The Conceptual design for Tanjung Bin 500 / 275 kV substation made ready within 4 months from the contract awarded date and got approval within two months from the submittal date successfully with minimum changes. The detailed scheme made ready for typical bays within two months from the date the conceptual approved and all the manufacturing drawings released for panels manufacturing within a month period. The panels manufactured and ready for internal test on December 2004, i.e. eight months from the date of contract awarded. The internal tests and integration tests completed and all the panels were ready for FAT on January 2005. The FAT completed on February 2005 and all the panels dispatched to site on March 2005.

The Conceptual design for Bukit Batu 500 / 275 kV substation was made ready by April 2005 and after manufacturing and testing the FAT was completed on November 2005 and all the panels dispatched to site on December 2005. The existing 275 kV Busbar protection was upgraded to accommodate for 3 new diameters and interfaced the entire tripping scheme on December 2005 without any major issues.

The Tanjung Bin substation PIAT (Pre-commissioning Inspection and Acceptance Test) carried out by TNB and passed with very minor comments. This was the first time in Malaysia that 500 / 275 kV substation secondary PIAT passed with very minor comments.

The Bukit Batu substation PIAT carried out by TNB and passed with no comments. This was the first time in Malaysia that 500 / 275 kV substation secondary PIAT passed with no comments.

The Tanjung Bin substation was commissioned and energized on June 2005. First the 275 kV lines energized along with 500 / 275 kV 750 MVA transformers to supply to electrical power to Power plant construction. The 500 kV feeders energized on January 2006 to interconnect with Bukit Batu substation.

The Bukit Batu substation was commissioned and energized on January 2006.



Figure-1: FAT Tg.Bin



Conclusion:

The execution of the project went very well under the fantastic engineering team under the extraordinary leadership of iTEC's project manager and in a very friendly atmosphere with the owner's engineers. This is the first time in the TNB Malaysia history that two 500 / 275 kV substation commissioned within contract period with no comments and by implementing the new Code of Practice Version 2 simultaneously.