

Event 1: Dynamic System Characteristics of a 250 MW Unit Board during Grid Failure Condition – Protective Transfer initiated by Unit Lockout Relay

Explanation: Due to failure of Grid, the Unit Lockout Relay operated on process parameters. The Unit is already islanded with respect to the grid when the lockout relay operates and fast transfer is not possible due to non-availability of sync-check conditions.

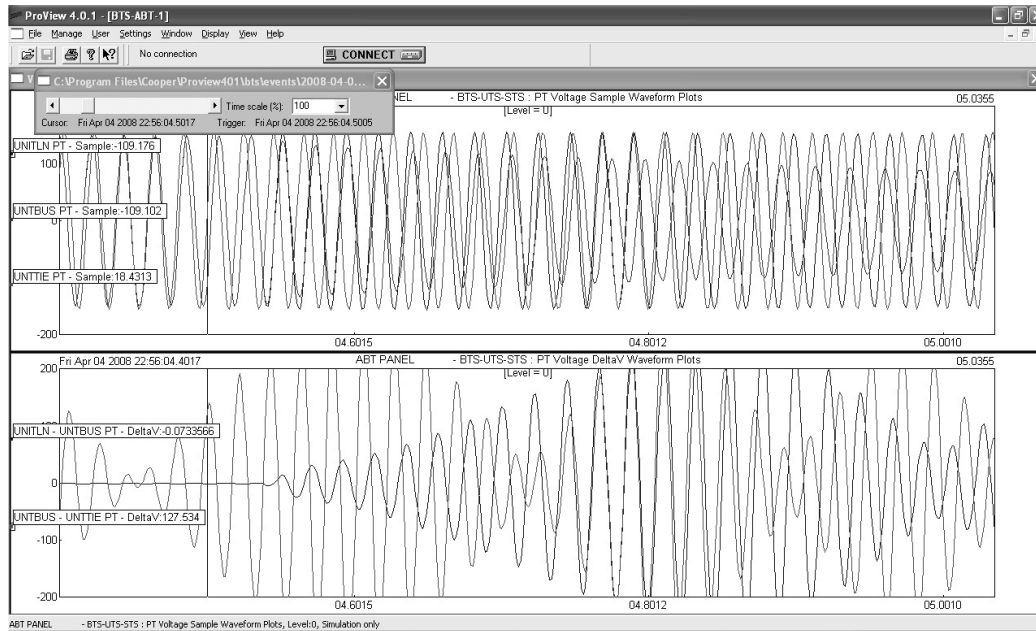


Fig. 1.1 : Voltage Waveform and Delta V Waveform – Note that Bus Transfer Initiation (vertical timeline cursor) from Unit Lockout Relay Operation (Protective Transfer) occurs when the unit is already operating in islanded condition with respect to the grid.

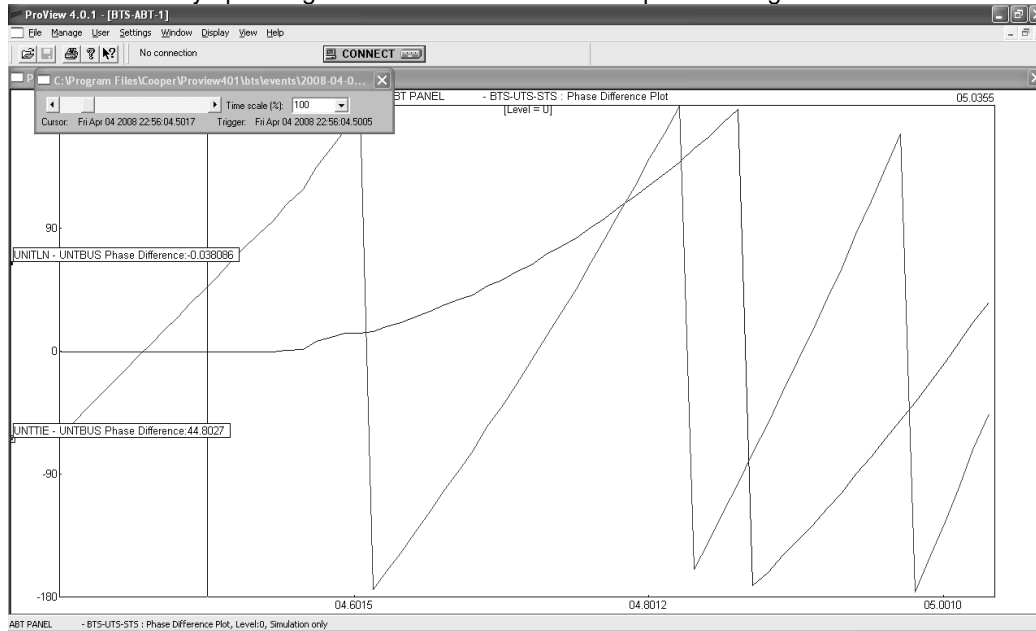


Fig. 1.2 : Phase Angle Drift – Note the slip cycles of the unit board with respect to the station board prior to initiation of protective transfer.

Solution – Since Bus Voltage does not decay appreciably until after Unit I/C Trip – an U/V detection is not a solution for detection of grid failure. However, $|df/dt|$ (with timer setting – say 100ms) initiated Auto Transfer as a primary transfer initiation method incase of grid failure conditions can provide earliest detection of contingency and may even permit fast transfer depending on the system dynamics.

Event 2: Dynamic System Characteristics of a 250 MW Unit Board during Grid Fault Condition – Protective Transfer initiated by Unit Lockout Relay

Explanation: Due to fault on Grid, and opening of EHV breaker, the unit experienced load throw-off condition and trips on over-frequency. The station board earlier connected to the grid is already experiencing a spin-down situation. The Unit-to-Station scheme sees an unhealthy new source and blocks the transfer.

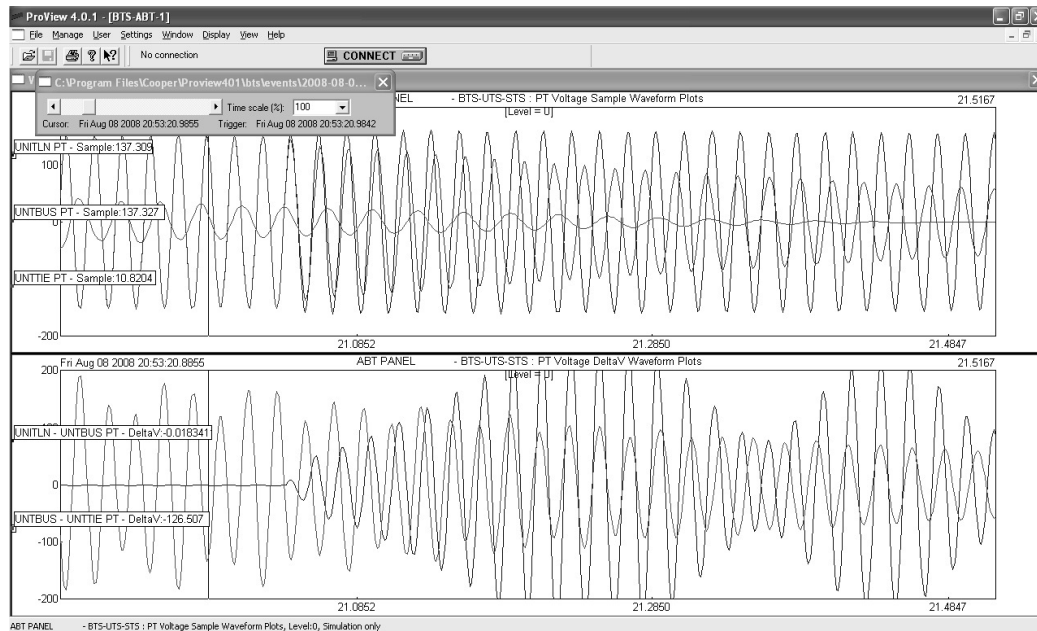


Fig. 2.1 : Voltage Waveform and Delta V Waveform for Unit-to-Station Scheme – Note that Station Voltage is already unhealthy at the time of bus transfer initiation (vertical timeline cursor).



Fig. 2.2 : Voltage Waveform and Delta V Waveform for Station-to-Station Scheme – Note that Alternate Station Voltage is available and healthy.

Solution – Since Alternate Station Supply is available, an automatic Station-to-Station transfer can restore the station board on detection of Grid Fault by U/V (with timer setting say 100ms). In case the unit trips on overspeeding due to load throw-off, the unit board will safely transfer to the station board now being fed from the Alternate Station Supply in Fast Transfer Mode thus avoiding any tripping to unit auxiliaries.