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21. Control, supervision and protection

There are two ways of handling tie breakers in the DELOMATIC:

1. Tie breaker supervision
2. Tie breaker control

Tie breaker supervision

The TB DGU supervises the position of the tie breaker.

The tie breaker is expected to be in ON position. Otherwise the DELOMATIC system is unable to carry out normal and safe control of the power plant, e.g. common frequency/load control.

If the TB DGU detects an OFF status at the "TIE BREAKER POSITION" binary input during SEMI-AUTO, AUTOMATIC or SECURED plant modes, *all* DGUs are forced into SWBD control and remain there, until the tie breaker is in ON position again.

Supervision of the tie breaker position is controlled via the following hardware interface:

- Input "**TIE BREAKER POSITION OFF**"

If the binary input is in OFF status, the following alarm message is displayed at the DU (TB DGU):

- Alarm "**BREAKER OFF FAIL**"

Tie breaker control

The TB DGU handles the tie breaker control according to a number of semi-automatic sequences. Altogether the semi-automatic sequences form a complete cycle of operation for the tie breaker.

The tie breaker can only be closed in SEMI-AUTO mode and only by request from the operator. Dependent on the situation on the busbar the tie breaker will either close immediately (dead busbar) or be synchronised (live busbar). If the tie breaker is disconnected without any DGs being connected to both sides of the busbar, a blackout start of DGs is performed by the system.

When the plant mode is changed from SEMI-AUTO mode, the tie breaker cannot be operated from the DU, but will remain in the present position.

If e.g. the voltage or frequency on either side of the tie breaker is outside the acceptable limits, the DELOMATIC system will not complete the TB ON sequence, but will display an alarm.

In case the tie breaker is tripped by a protective function and a blackout occurs at one side of the busbar, the system will perform an automatic blackout start of DGs (except in the presence of a short circuit alarm).

The TB DGU is able to carry out the following semi-automatic sequences for control and supervision of the tie breaker operation:

- TB ON sequence - dynamical synchronisation
- Tie breaker protection
- TB OFF sequence

All the above-mentioned semi-automatic sequences are controlled according to a number of programmable set points and delays, which enable the operator to adjust the operation of the tie breaker.

Controlling, supervision and protection of tie breaker

The DELOMATIC system handles the tie breaker as a normal GB. The basic controlling and VTA structures are the same as described in the “COMMON GENERATOR SET PROTECTION”.

Load supervision during open TB

The load dependent start/stop function is *disabled*, when the tie breaker is open.

Calculation of the predicted available power is disabled, when the tie breaker is open.

Connection of heavy consumers during open tie breaker

Connections of heavy consumers are disabled, when the tie breaker is open.