

Phase shifting transformers

Power flow control with phase shifting transformers

Today's large electrical high-voltage transmission systems have to provide reliable and efficiently electrical energy to the customers. Due to de-regulation of the market, existing systems are often stressed to the limit in order to maximize asset utilization. This results more and more often in transmission bottlenecks. To ensure under these conditions economical and reliable operation of the grid, the need for power flow control becomes evident.

Applications

Main benefits of phase-shifting transformers (PST) are the protection of lines and transformers from thermal overload and an improvement of transmission system stability. They allow controlling the power flow between different networks, for parallel long distance overhead-lines or for parallel cables. On top of that, a phase-shifting transformer is very often the most economic approach to power flow management.

- Independent power flow control in the electrical system (e.g. on transmission lines) without having control of generation
- Increase of total power transfer without violating the N-1 criterion
- Allow access of new generation to the grid (e.g. wind turbine parks)
- Removing bottle necks in the grid



Benefits

- Improve operating performance and grid reliability
- Save energy by optimizing losses in the electrical system
- Drastically lower costs than most FACTS devices
- Short pay-back period
- Reliable, long lasting ABB power transformer technology

Basic principle

Phase shifting transformers are used to control the power flow in electrical power systems. When power flows between two systems, there is a voltage drop and a phase angle shift between the source and the load that depends upon the magnitude and power factor of the load current.

If the systems are connected together in two or more parallel paths so that a loop exists, any difference in the impedances will cause unbalanced line loading. – IEEE C57.135-2001.



450MVA Phase shifting transformer KeySpan



Testing of a phase shifting transformer

Manufacturing and testing capability

- Rated through put power: < 1630 MVA
- Rated voltage: < 400 kV
- Maximum phase angle: < $\pm 85^\circ$
- PST types:
 - Single core
asymmetrical extended delta, symmetrical extended delta, polygon, squashed delta, full two-winding transformer (wye-wye)
 - Two core
quadrature booster, symmetrical grounded wye
- Low sound transformers with special sound enclosures
- One tank or multiple tank solutions
- ABB is the leader in phase shifting transformers

ABB's extra services

- One stop solution competence
- Turn key projects
- Develop and optimize economical transformer concepts during pre-tender phase
- Quick iterations of technical solutions for system planners
- Quick budgetary costing with special PST design tool
- System studies
- Professional project execution for PST projects
- After sales service

For more information please contact:

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