Facts about the Sharyland 150 MW Back-to-Back Asynchronous Tie

Location	Between the cities of McAllen and Mission, Texas, USA
Ownership	Sharyland Utilities
Start of Project	2005-12-21 (Final Notice to Proceed)
Commercial Operation	2007-10-10 The tie was available for operation from July 10th 2007 in power circulation mode.
Transmission Technology	HVDC by ABB
Transmission Capacity	150 MW
DC Voltage	+/- 21 kV
AC Voltage US Side	138 kV
AC Voltage Mexican Side	138 kV
HVDC Converter	Converts alternating current (AC) to direct current (DC) or vice-versa.
Power Direction	Power can be transmitted in either direction

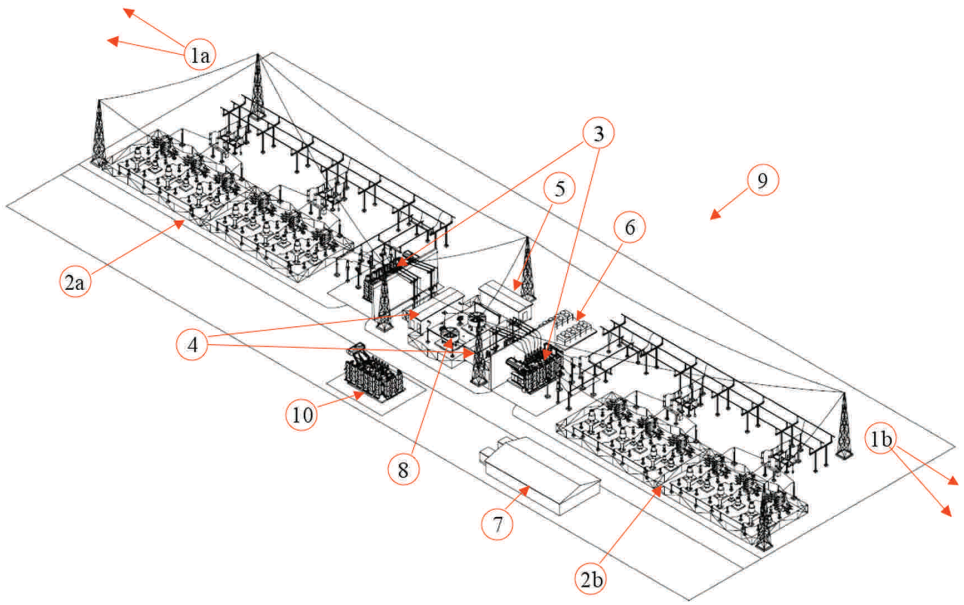
ABB AB
Grid Systems – HVDC
SE-771 80 Ludvika, Sweden
Tel: +46 240 78 20 00
Fax: +46 240 61 11 59
www.abb.com/hvdc

07MR0039

Sharyland 150 MW Back-to-Back Asynchronous Tie

The Sharyland 150 MW Back-to-Back Asynchonous Tie interconnects Electric Reliability Council of Texas (ERCOT) and Mexico's Comisión Federal de Electricidad (CFE) power grids. The purpose of the tie is to provide bi-directional energy transfers between completely independent power grids, exchange emergency power, provide immunity to propagation of disturbances from one grid to another, assist in maintaining AC voltages, share reserves, and ensure increased reliability of both the grids thereby supporting economic development of the associated regions.

In addition to the fast and precise active and reactive power control features of an HVDC, the tie is equipped with a unique "Black Start" capability. This is the world's world's first application, using a conventional Back-to-Back HVDC and an AC bypass arrangement. The Black Start capability is an important emergency assistance feature in which a safe flow of power will be provided to help quickly restore the blacked out AC network. The bypass arrangement facilitated extremely smooth conduction of commissioning tests in power circulation mode with only the ERCOT grid.



1a. **Incoming AC Line From The CFE Grid:** The line facilitates connection to the CFE grid, through which export or import of power to or from Texas takes place.

1b. **Connection To Railroad AC Substation:** A feeder is connected to the adjacent AC substation that provides connection to the ERCOT grid.

2a. **CFE Side AC Filter Area:** This comprises AC filters for the CFE side converter, which includes capacitors, reactors, resistor, breakers, disconnect and current transformers. The harmonic filters will suppress unwanted harmonics and hence limit audible noise and AC voltage distortion.

2b. **ERCOT Side AC Filter Area:** This area houses AC filters for the ERCOT side converter. They are identical to the CFE side filters and serve the same function for the ERCOT converter.

3. **Converter Transformers:** One 3-phase and 3-winding step-down transformer on each side rated for 183 MVA and equipped with on-load-tap-changers (OLTC), provides appropriate AC voltage connection to the converter valves.

4. **Valve Enclosures:** One enclosure on each side houses the 12-pulse water-cooled thyristor valves, considered as the heart of an HVDC station. They perform the actual conversion between AC and DC voltage. The design uses valves suspended from the ceiling. (A similar mechanical design is used for earth quake prone areas).

5. **Cooling Enclosure:** It houses the valve cooling equipment such as liquid pumps, expansion vessel, deionizer vessels, heaters, valves etc. An adequate level of redundancy is included in the system.

6. **Cooling Towers:** Air cooled liquid coolers that control the temperature of the water circulated through the thyristor valves. It includes fans and other items. Adequate redundancy is included in the system.

7. **Service Building:** It houses the brain of the HVDC tie, the MACH2.1 based control and protection system. It also houses the auxiliary supply system and the operator control desk and office. The entire control, protection and interface system comprises only 14 cubicles. The control system is duplicated to ensure very high reliability.

8. **DC Smoothing Reactors:** There are two air-core smoothing reactors connected in the neutral points on the CFE side. These control ripples in the DC current and help limit the fault current through valves, transformer and other equipment under certain fault cases. These reactors also serve as installed spares for each other.

9. **Bypass Arrangement:** As indicated above, the bypass arrangement is to facilitate black-start on either side of the grids. The arrangement is not included in this overview diagram. It consists of one circuit breaker, two disconnectors, two current transformers and a short flexible bus.

10. **Spare Converter Transformer:** A fully prepared spare converter transformer is provided, to quickly replace a faulty transformer and thereby minimising outage time for the tie.

The back-to-back tie was awarded to ABB in the last quarter of 2005 and had a tight schedule of 20 months. For more information, please visit:

www.abb.com/hvdc