Convertible Static Compensator (CSC) and Other FACTS Refurbishments

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New Generation of FACTS

• Second generation of FACTS is in trouble!
• UPFC, SSSC, IPFC configurations never reached their full potential in power system applications.

• What to do with the existing devices?
  ➢ Upgrade of control boards.
  ➢ Replacement of the existing electronic switches.
Project Overview

- Refurbishment of the CSC control boards and/or GTO valves;
- The new control and protection system to control two 100 MVA three-level voltage-sourced converters, a 200 MVA shunt transformer, and two 100 MVA series transformers.
- Improved functional performance and reliability of the CSC.
About NYPA

- New York State’s supplier of electricity and the largest state-owned power organization in the US;
- Operates 18 generating facilities and more than 1,400 circuit-miles of transmission lines;
- Marcy 765/345 kV substation: major transmission bottleneck.
Convertible Static Compensator (CSC)

- Installed in 2004 at Marcy 345 kV substation;
- Uses high-speed solid-state electronic switches, GTOs, to:
  - increase flow of electricity on existing transmission lines;
  - dynamically control voltage at Marcy 345 busbar;
  - improve reliability of power delivery without the need of building new transmission lines.
CSC Major Configurations

- STATCOM (±100 Mvar or ±200 Mvar)
- SSSC (±100 Mvar on one or both lines)
- Independent STATCOM and SSSC (100 MVA each)
- UPFC (200 MVA; switch between DC capacitors closed)
- IPFC (200 MVA; switch between DC capacitors closed)
Current Status

The original control boards were:
- tested by Siemens on their 3-bus TNA
- currently maintained at NCSU
- independently tested at IREQ on larger TNA in 2000;

New control boards:
- In 2008 NYPA issued a RFP for new control boards,
- There is a currently RFP for control boards.

Existing Human Machine Interface platform upgraded back in 2008 from Genesis 3.54 to Genesis 32 V. 9
Issues

• CSC is a custom made device, capable of five configurations and 11 control modes;
• IPFC configuration is the world’s single installation;
• New control boards shall be custom made;
• Only handful of companies capable of undertaking this task;
• EXPENSIVE!
Summary

• CSC is not the only one!

• Establish a sound commercial basis for the refurbishment – **Otherwise they will disappear**

  – STATCOM: Westinghouse, Mitsubishi, ABB, Alstom TVA, AEP, PG&E, NYPA, SDG&E, VELCO, NU, Austin
  – UPFC: Westinghouse (Siemens) AEP, NYPA, Korea
  – SSSC: Westinghouse (Siemens) AEP, NYPA
  – IPFC: Westinghouse (Siemens) NYPA