Modeling Advanced VSC HVDC Control Modes in PSS®E for a European TSO

Strategy / Results / Value
• Custom PSS®E Development
• Python™ powered powerflow solution user customizations
• Enabling fast powerflow model development and advanced control mode prototyping

Challenges and Drivers:
• New VSC HVDC technology for which sufficiently accurate powerflow models do not exist in PSS®E
• Model behavior and control modes must be simulated to determine wide-area grid interaction
• Control modes and parameters must be tunable and testable in a flexible prototyping environment
• Planning engineers must be trained in Python™ programming and the customization methods

Service Territory: Europe
Scope of Services: Custom PSS®E Extensions
Voltage Level: 400 kV AC, +/- 320 DC
Project Duration: 12 Months
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Technical solution

• Custom development implemented with PSS®E powerflow simulator to allow powerful, low-level customizations to the powerflow solution algorithm.
• Programming “hooks” designed and implemented allowing various points in the PSS®E powerflow solution to be arbitrarily extended at runtime with custom Python™ code.
• The initial VSC HVDC project powerflow model was developed using the new method
• Customized on-the-job training provided for PSS®E, Python™ and VSC HVDC control modeling
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Wide-Area Transmission System Modeling of a VSC HVDC Project

- Advanced control modes can be tested against the wide-area system
- The wide-area transient stability assessment can be performed using an accurate powerflow operating point
- Changes to the existing control scheme can be quickly modeled, simulated and validated.