Successful Utilization: Phasor Data in Closed Loop Control



Areas of Success

- Rector SVC Control
- EMS Data Integration
- 2009 Rate Case Submission
- Real Time Stability Measurement
- SMART: Synchronized Measurement and Analysis in Real Time
- Event Analysis



Planned Corridor Upgrades





Rector SVC One-Line





Rector SVC Operating Characteristics



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Coordinated Voltage/Var Control Scheme





EMS Operation Screen (Color Inversion for Clarity)

(3.525 SCA) @RECT(OR RECTOR SVC	[1 of 1]	<u>_ ×</u>	
le <u>E</u> dit <u>V</u> iew Options	Summary Special	rtdb Freeze	Ack Bata Bel	
	RECTOR SVC 1-	LINE		
		EMERGENCY TRIP:		
SVC REACTIVE POWER -	7.7 R-C C-D	SVC ON/OFF:	∎ on →	
WC HV VOLTACE 231 7	233 3 231 9	SVC STAND BY:	ON	
VC LV VOLTAGE 9.48	9.56 9.57	EMER GEN ON/OFF:		
A	B C	SVC COORDINATED CNTR:	Enable (+)	
VC TRANS BK AMPS 0	18 17	RECTOR CAP CNTRLABLE:	Disable	
20KV N.BUS KV 231.1 20KV S BUS KV 230 9	232.9 232.7	BIG CREEK AVR CONT:		
		AUTO RECONFIG:	U Disable	
H1 233.1 VL1 228.9	VRECT 232.2	SCHDA CONTROL: BIFTO CBIN RESET-		
H2 242.0 T VL2 237.9 T H3 234.0 T VL3 224.0 T	VBC3 239.0 6 CAP OPEN	CB 4112:	Enable	
C)@X 50 T		CB 6112:	Enable	
REF -0 T	7SVC BANK	COOLING SYS STATUS:	■ ON	
LMAX -100 T LOPE X 1.0 T	220/9.5KV	COOLING SYS ALARM:	NORMAL	
TANUAL Q -0 T	Ϋ́	COOLING SYS TRIP:	NORMAL	
NLET H20 TEMP 33.0		SVC SEL COMM FAIL:	NORMAL	
UTLET HZU TEMP 32.0	9.5 KV	BUS	12KV	
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FILTER 2 FILTER 1	TSC3 TSC2 TSC1	TCR3 TCR2 TCR1	'=B AMPS	
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Rector SVC Coordinated Control # 1 Priority

 Maintain Big Creek #3 230 kV bus voltage below its upper (VH2) limit (BC-AVR) and maintain SVC steadystate output below QCmax (SVC-AQR)





Rector SVC Coordinated Control Priorities 2 & 3

- Maintain Rector 230 kV bus voltage within its upper (VH1) and lower (VL1) limits with Priority #1 maintained (REC-AVR)
- If Big Creek #3 230 kV bus voltage is below VL2, the SVC should control it within VL2 with Priorities 1 and 2 maintained



V-Q Characteristics of Rector SVC Coordinated Control



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Effect of SVC Operation on Big Creek





SOUTHERN CALIFORNIA

Effect of SVC Operation on Big Creek



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Voltage Calibration Need





EMS Data Integration

- State Estimation
- Data Historian



2009 Rate Case Submission

- Transition to "Commercial" Applications
- Wide Area Monitoring
 - View of entire WECC
- Wide Area Control
 - Voltage/Var resource optimization



Real Time Stability

- Stability Measurement due to synchronized sampling
- System configuration independent
- Project proposed for fall 2008/spring 2009



System





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RAS: No Action Taken





RAS: Action Taken





SMART: Synchronized Measurement and Analysis in Real Time

- Real Time Visualization
- Placed in Grid Control Center
- Has identified "issues" to grid operations
- Co-Winner of Automation Project of the Year Award at Distributech 2008



Event Analysis

• Years of experience analyzing events

