



Synchrophasor Applications in Indian Power System

26 May 2021 1:30 pm – 2.45 pm (CET)

IEEE SGSMA 2021

Power System Operation Corporation Ltd. (POSOCO)

POSOCO

Synchrophasor Applications in Indian Power System

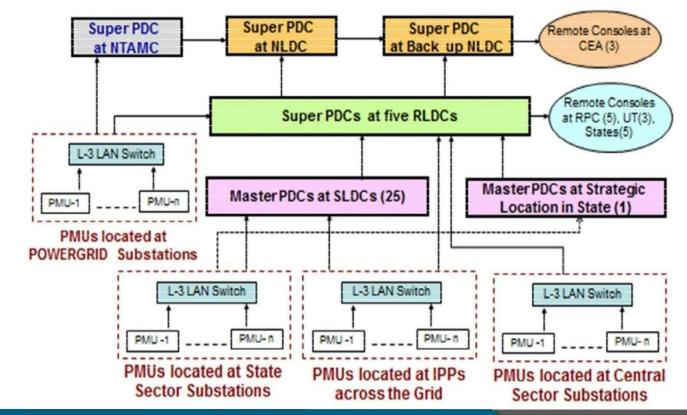


Unified Real Time Dynamic State Measurement System Hierarchy



SCOPE

- **3 Level Hierarchical System** – National, Regional, State
- 34 Control Centers, 351 Substations, 1186 PMUs, 30 K Phasor Measurement with sample rate of 25 samples per sec, 500 TB storage.
- Execution in 24 months & thereafter, 7 years of AMC.





Real Time Applications

Monitoring and Alarm



Wide Area Angular Separation

Event Detection

Low Frequency Oscillationsoc

Oscillation got subsided at 20:06 Hrs

1. Severe Local mode of oscillation observed in

absence of PSS in the Unit 1 and 2. 2. The oscillation has persisted for more than 5

3. Oscillation Frequency : 0.86 Hz 4. 564 MW peak to peak OScillation observed.

Power Plant Net Generation

1500

1400

1300

1200

1100

1000

900

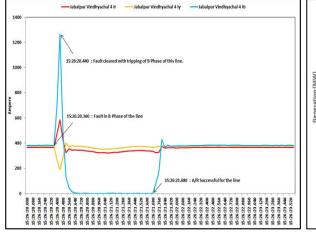
800

700

600

R Phase to Y Phase fault

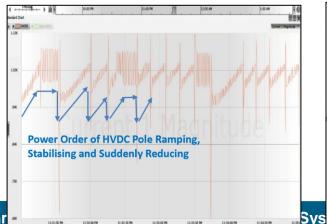
occurred on 400 kV evacuation line 1



Monitoring of Controlling Devices

Synchronisation and Islanding

minutes.





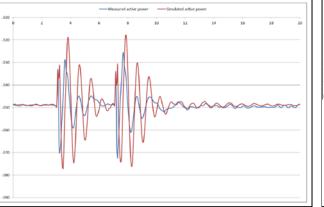
Frequency of the two system when in synchronization and when separated from each other.

Off-line Applications

SPS Improvement

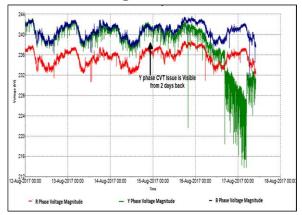


Model Validation

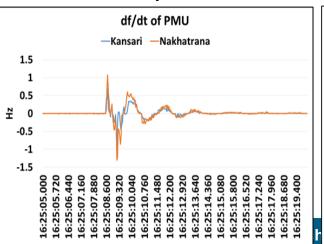


D/C Line Flow Monitoring 1600 1500 MW 2.5 sec > 1500 MW 2.5 sec 1500 in MV 1400 flow Ckt I P-Comparator 2.5 Sec SUM >1500 MW 2.5s Ckt II P---SPS Action Comparato 8:27.000 8:22.800 8:23.400 3:24.600 :25.200 :26.400 :28.800 :29.400 :30.000 :25.800 >2000 MW

Asset Management



Protection Operation



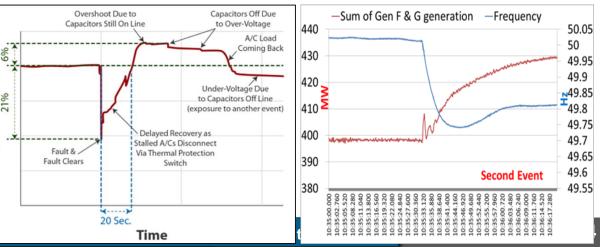
Delayed Voltage Recovery

6%

Deviation (%)

Voltage I

Governor Response of Generator





Oscillatory Stability Management System (OSM)

B - Replay - EPO_ETV_25.01.2019 - WAM H all 172.16.41.108 eff File View Help If all 172.16.41.108 eff File View Help If all 172.16.41.108 eff If all If all If all 172.16.41.108 eff		- • ×		
ETV WAM Context Panel Angle Chart Overview Status Indicators Mode Shapes - Modes 5 Alian Modes	Analysis Technique	Window Length	Update Rate	Useful applications
Websge Magninde P	PDX1-3	3 minutes	5 seconds	Operational use
PRQ OSM 40° 10° 10° 10° 10° 10° 10° 10° 1	PDX2-20	20 minutes	20 seconds	Planning & analysis use
• Alare	::ModeFrequency:WAM ::ModeFrequency:WAM ::ModeAmplitude:WAM	■ I N ■ 1/2000 # C/00 ■ 1/2000 # C/00 ■ E pp setic.urt.n €	Oscillations Extracts of Parameters	oscillatory stability

Inter – Area oscillation (12:04PM to 12:07PM on 22/06/2020)

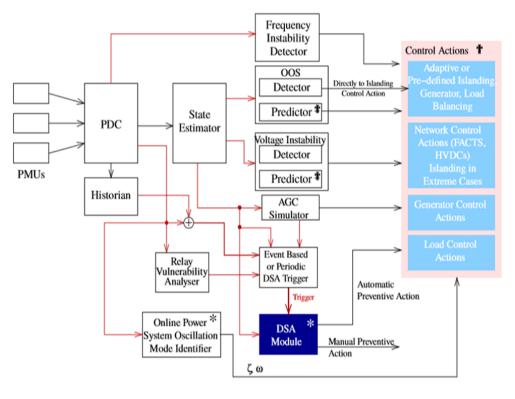
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Synchrophasor Applications in Indian Power System

Synchrophasor (Upcoming)



PMU SUPERVISED SCHEMES



Upcoming URTDSM Applications in Indian Power System

S.N o	Application Name		
1	Voltage Stability Monitoring		
2	Detection of disturbances		
3	Online monitoring of Inertia.		
4	Identification of source of Oscillation.		
5	Identification of stressed corridors		
6	ROCOF calculation over variable window		
7	Locating contributions to poorly damped or unstable oscillations		
8	Model Validation		
9	Higher frequency sub-synchronous oscillation analysis		
10	Big Data Analytics		

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Thank You

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page 7