

Synchronized Measurement Platforms for Control Center WAMS and Analytics

Frank Carrera and Neeraj Nayak

Electric Power Group, LLC
USA



The 2nd IEEE International Conference on Smart Grid Synchronized
Measurements and Analytics (SGMA) *Virtual Event* | May 24-27, 2021

- EPG Introduction
- Synchronized Measurement Platform Solutions
- EPG's WAMS Deployments



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About Electric Power Group (EPG)

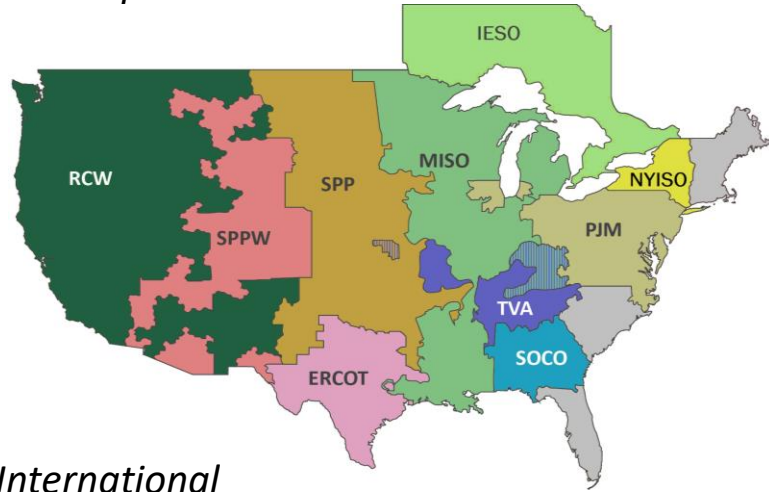
- Established in 2000 by an **experienced team** of electric utility executives
- EPG's team includes internationally acknowledged industry **experts in phasor technology**
- EPG portfolio of **Synchrophasor Platforms** are designed to deliver value to Transmission Companies and System Operators for Asset Monitoring, Event Notification, and Situational Awareness
- EPG solutions **integrate** with existing customer infrastructure
- EPG provides **synchrophasor solutions** to over 30 Grid Operators and Transmission Utilities in North America, Middle East and India



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The majority of grid operators and transmission companies across North America are EPG customers

Grid Operators



Transmission Companies



International



GETCO
in Gujarat



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OMAN ELECTRICITY TRANSMISSION COMPANY S.A.O.C.
احدى شركات مجموعة ناما
Member of Nama Group

OETC in
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NEPCO in
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Comprehensive Portfolio of Real-time and Offline Synchrophasor Platforms

	Phasor Data Concentrator	Wide Area Monitoring System Platform	Linear State Estimator Platform	Substation Asset Health Monitoring Platform	Grid Resiliency Platform	Offline Analytics Platform
						
Data Collection	✓	✓			✓	
Data Dissemination and Storage	✓	✓			✓	
Data Validation		✓	✓	✓	✓	✓
Data Conditioning			✓		✓	
Data Extraction		✓	✓		✓	✓
Real-Time Monitoring		✓	✓	✓	✓	
Real-Time Alarms		✓		✓	✓	
Real-Time Reports		✓		✓	✓	
Real-Time Notifications		✓		✓	✓	
Real-Time Analytics		✓			✓	
Situational Awareness		✓			✓	
Expanded Observability			✓		✓	
Real-time Contingency Analysis					✓	
Predictive Analytics				✓		
Offline Analytics		✓		✓	✓	✓
Big Data Mining						✓
Generator Model Validation						✓



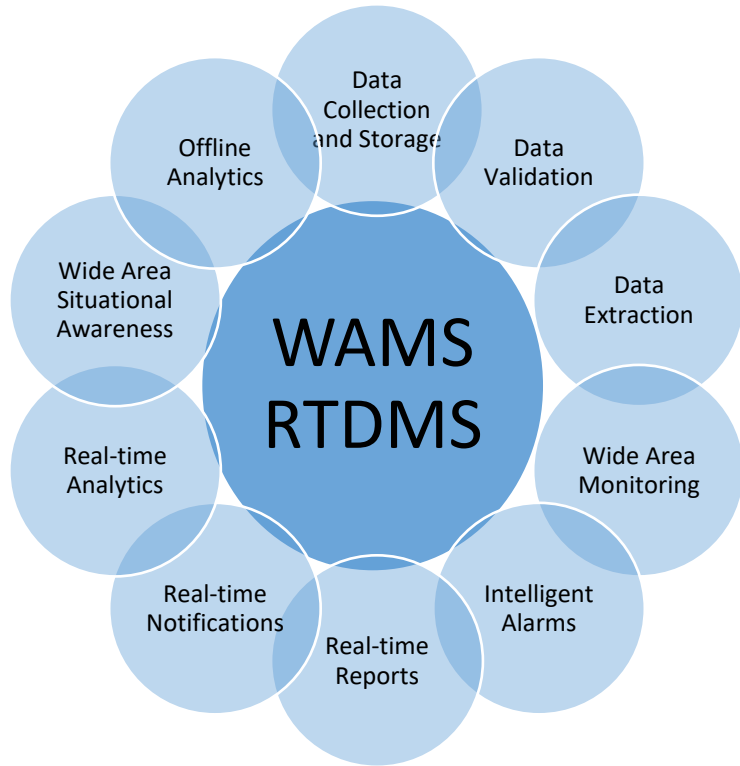
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Examples of Platform Customers and Solutions

Solutions Customer	Data Collection	Data Storage	Real-Time Analytics	Advanced Data Validation	Linear State Estimation	Offline Analytics	Operator Training Services	PMU Vendor	SCADA and EMS Integration	In Operations for
PJM	✓	✓	✓	✓	✓	✓	✓	SEL/GE	Monarch/Siemens	10 Years
ERCOT	✓	✓	✓	✓	✓	✓	✓	SEL/GE	GE/Alstom	13 Years
NYISO	✓	✓	✓	✓		✓	✓	SEL/GE	ABB	10 Years
CAISO	✓	✓	✓				✓	USI/SEL/GE/Alstom	ABB/Siemens	18 Years
OETC	✓	✓	✓			✓	✓	Qualitrol/Siemens	GE/Alstom	3 Years
GETCO	✓	✓	✓			✓	✓	ABB	GE	In Progress
AEP	✓	✓	✓	✓	✓		✓	SEL/GE	GE/Monarch	9 Years
Duke Energy		✓	✓	✓	✓	✓	✓	SEL	GE/Alstom	8 Years
SPP	✓	✓	✓			✓	✓	Ametek/SEL	GE	5 Years
Southern Co.	✓	✓	✓	✓	✓		✓	USI	Siemens	7 Years



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Real-time Analytics of Synchronized Measurements

- Oscillations Monitoring and Detection
- Islanding, Resynchronization and Blackstart Analytics
- User Defined Calculation
- Composite Alarms
- Event Detection
- Grid Stress Monitoring
- Voltage Sensitivity and Stability

- GETCO operates the electric transmission grid of the State of Gujarat in India
 - System provides electricity to ~64 million people and has over 2,000 substations and 65,000 circuit kilometers of transmission
- EPG partnered with Hitachi-ABB Power Grid (HAPG)
 - EPG selected as sole supplier of WAMS
 - HAPG will deliver PMUs and associated infrastructure

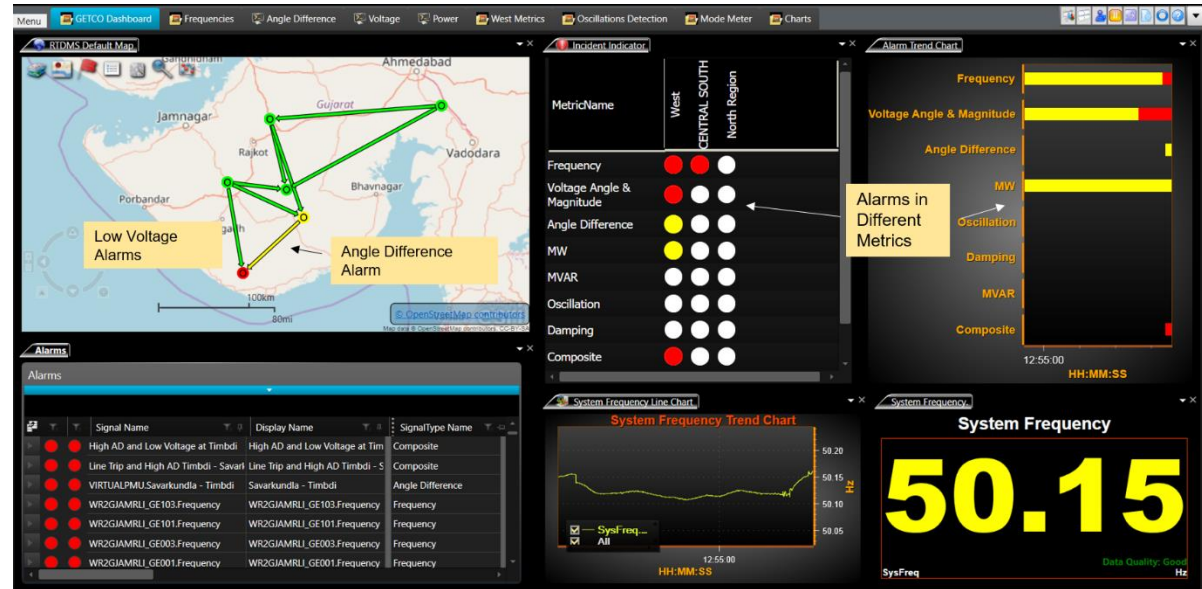
Largest WAMS deployment in the world once completed in 2022

System capable of receiving data from 1,650 PMUs at 50 samples per second



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- High availability deployment
- Comprehensive technical and IT infrastructure support from EPG
- EPG's WAMS will integrate with GETCO's existing EMS/SCADA system to provide operators with intelligence in one system for monitoring and operator action



Examples of WAMS Integration



GETCO

GE/Alstom EMS

- Deployment in 2021
- WAMS will receive breaker status and redundant voltages and currents from SCADA
- WAMS will send PMU data to EMS
- WAMS will integrate one-line diagrams from EMS
- Integration planned using IEC-104



OSI/Siemens EMS

- Deployed WAMS in 2011
- WAMS gets breaker info from SCADA
- WAMS sends PMU data to EMS and OSISOFT PI Historian



GE/Alstom EMS

- Deployed WAMS in 2013
- WAMS receives breaker status from SCADA; sends PMU data to EMS
- WAMS imported one-line diagrams from EMS



New York ISO
Independent System Operator

ABB EMS

- Deployed WAMS in 2011
- WAMS sends PMU data to EMS
- EMS displays measurements from SCADA, State Estimator, PMUs
- Integration via ICCP



California ISO

ABB / Siemens EMS

- Deployed WAMS in 2003
- WAMS sends PMU data to EMS
- EMS forwards PMU data to other Transmission Companies



OETC

GE/Alstom EMS

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OETC Association / OETC
الجمعية العامة لعمال الكهرباء في مصر
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- Deployed WAMS in 2018
- WAMS sends PMU data to EMS



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- 20+ years of experience in the area of synchrophasor technology
- Deep history rooted in synchrophasor technology initiatives and innovation
- 6 Synchrophasor platforms supporting System Operations, Engineering, Asset Maintenance, and Technology groups
- Production grade platforms in use in control rooms to meet high-availability requirements
- Integrated with third party vendors including EMS, Historians, and Simulators
- 30+ utilities and ISOs worldwide using EPG's WAMS synchrophasor solutions



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