

Electric Power Group Webinar

Welcome!

The meeting will begin at 11:00 AM. PT October 17, 2018

Today's Topic: PGDA New Features and Demonstrations

Registration URL: <https://electricpowergroup2.webex.com/>

Webinar Teleconference Number: 1 887 668 4493

Access code: 400 683 840

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Phasor Grid Dynamics Analyzer (PGDA) webinar

NEW FEATURES AND DEMO



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Today's Plan

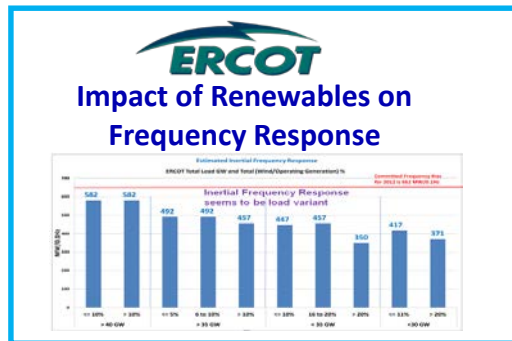
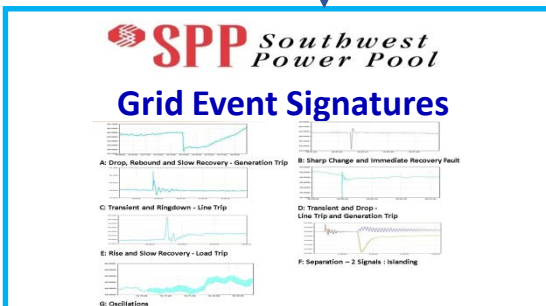
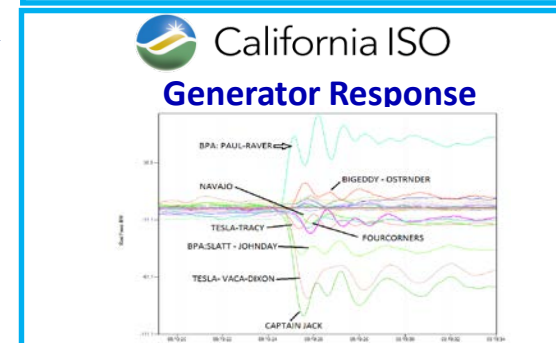
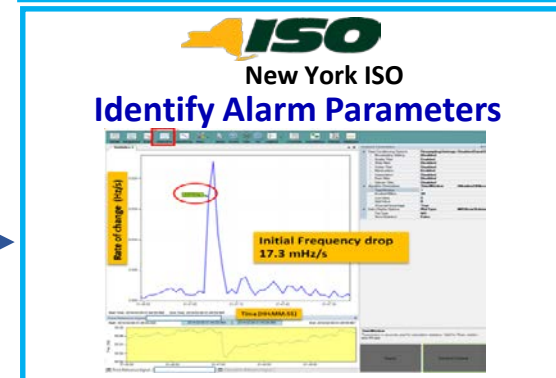
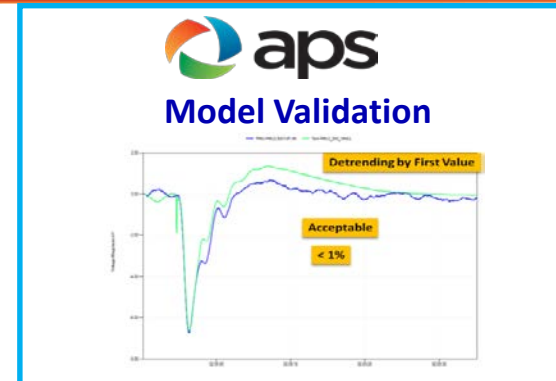
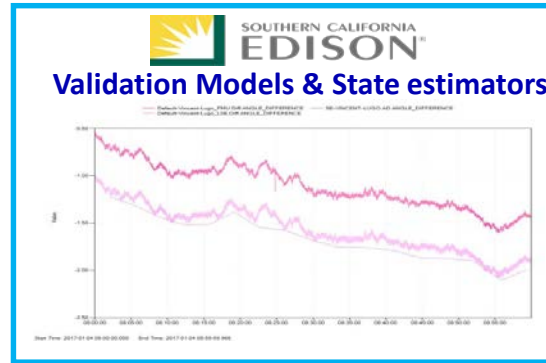
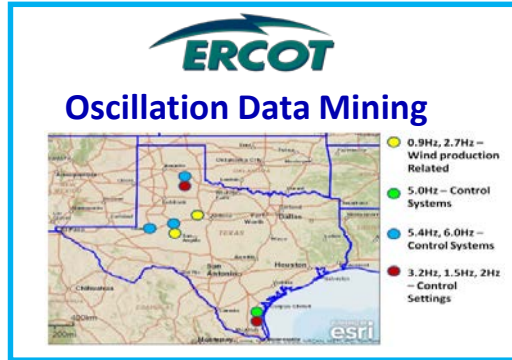
- PGDA – Tool and uses
- PGDA – Industry applications
- Overview existing features
- Overview new features
- Demonstration of new features
 - > Create System level Model validation report
 - > Searcher function
 - > Fault Analysis
- Q & A
- Summary

PGDA - The Tool and Its Uses

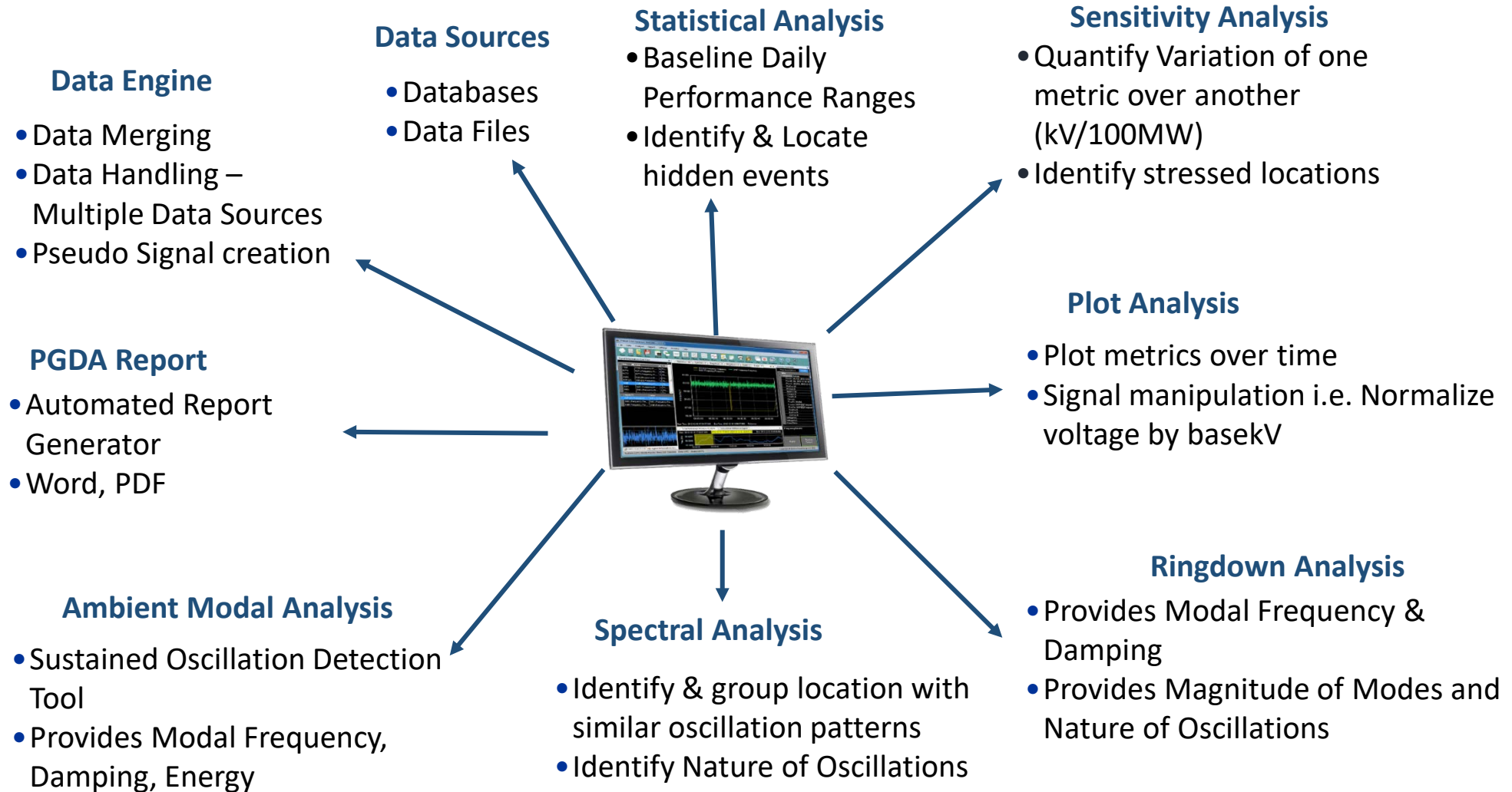
PGDA is a standalone application for offline analysis and is used for :

- Oscillation Detection**
- Comparative Analysis**
- Disturbance Analysis and Root Cause Assessment**
- Baseline Daily Performance & Establish Safe Operating Ranges**
- Generator Frequency Response Analysis**
- Model Validation**
- Stability Assessment**

PGDA – Industry applications



PGDA Existing Features and Capabilities



PGDA – 12 new major capabilities

New Features - 8

Demo 1

1. Automatic System level model validation report according to NERC MOD 033-1
2. Harmonic evaluation for IEEE 519 Standard
3. Intelligent searcher function
4. Phasor converter
5. Enhanced Pseudo signal calculator
6. Peak to Peak magnitude for Spectral, Modal
7. Supports Open historian database
8. Align multiple COMTRADE files according to trigger time

Demo 2

Enhancements - 3

1. Simplified parameters for Oscillation (Spectral, Ringdown, Modal) and Event analysis
2. Color schemes
3. Global bad data filter will be auto applied to all signals

New Analysis - 1

Demo 3

1. Fault analysis
 - Fault Location
 - Mho characteristics
 - Fault ride throughs – Voltage and Frequency

System Model Validation Report

■ *Demo*

6 Steps for creating System Model Validation Report

1. Load PMU data file
2. Load simulated data file
3. Shift time stamp to align simulated and PMU data
4. Using Time Series Plots:
 - > Plot simulated and PMU data for different metrics
 - > Determine the steady state and dynamic state
5. Set the thresholds to determine acceptability
6. Generate the report

System Model Validation Report

Differences table

Steady State Analysis

Frequency Results

Substation/Bus	Max Difference (mHz)	Min Difference (mHz)	Average Difference (mHz)
TimeSeries-1	31.01	16.39	22.66

Bus Voltage Results

Substation/Bus	Max Difference (KV)	Min Difference (KV)	Average Difference (KV)
TimeSeries-2	0.21	0	0.09

Line Flows Results

Substation/Bus	Max Difference (MW)	Min Difference (MW)	Average Difference (MW)
TimeSeries-3	2.77	0	0.93

Reactive Power Results

Substation/Bus	Max Difference (MVAR)	Min Difference (MVAR)	Average Difference (MVAR)

Voltage Angles Results

Substation/Bus	Max Difference (Degree)	Min Difference (Degree)	Average Difference (Degree)

Dynamic State Analysis

Frequency Results

Substation/Bus	Max Difference (mHz)	Min Difference (mHz)	Average Difference (mHz)
TimeSeries-1	17.19	0	7.48

Bus Voltage Results

Substation/Bus	Max Difference (KV)	Min Difference (KV)	Average Difference (KV)
TimeSeries-2	2.81	0	0.43

Line Flows Results

Substation/Bus	Max Difference (MW)	Min Difference (MW)	Average Difference (MW)
TimeSeries-3	63.45	0	35.8

Reactive Power Results

Substation/Bus	Max Difference (MVAR)	Min Difference (MVAR)	Average Difference (MVAR)

Analysis plots



Simplified parameters and Searcher function

- *Demo*

Simplified parameters

Modal analysis

Analysis Parameters	
▼ Data Conditioning Options	ResamplingSettings: EnabledDataQualityFil
> Re-sampling Setting	Enabled
> Quality Filter	Enabled
> Stale Filter	Disabled
> Outlier Filter	Disabled
> Manipulation	Enabled
> Interpolation	Disabled
> Pass Filter	Disabled
> Kalman Filter	Disabled
▼ Algorithm Parameters	Algorithm :Yule_Walker_Spectral
Algorithm	Yule_Walker_Spectral
ProcessTimeWindow	60
StepInterval	5
AROrder	25
MAOrder	10
NPointsARCoef	10
DampMax	30
▼ Frange	0.1,1
Min	0.1
Max	1
EnergyMin	0.001
Nfft	30
EstimatedMaxModesNumber	10
ModeTolerance	0.1
▼ Data Display Options	AmplitudeScaling_Mode :Absolute
AmplitudeScaling_Mode	Absolute

PGDA v3.14
14 Parameters

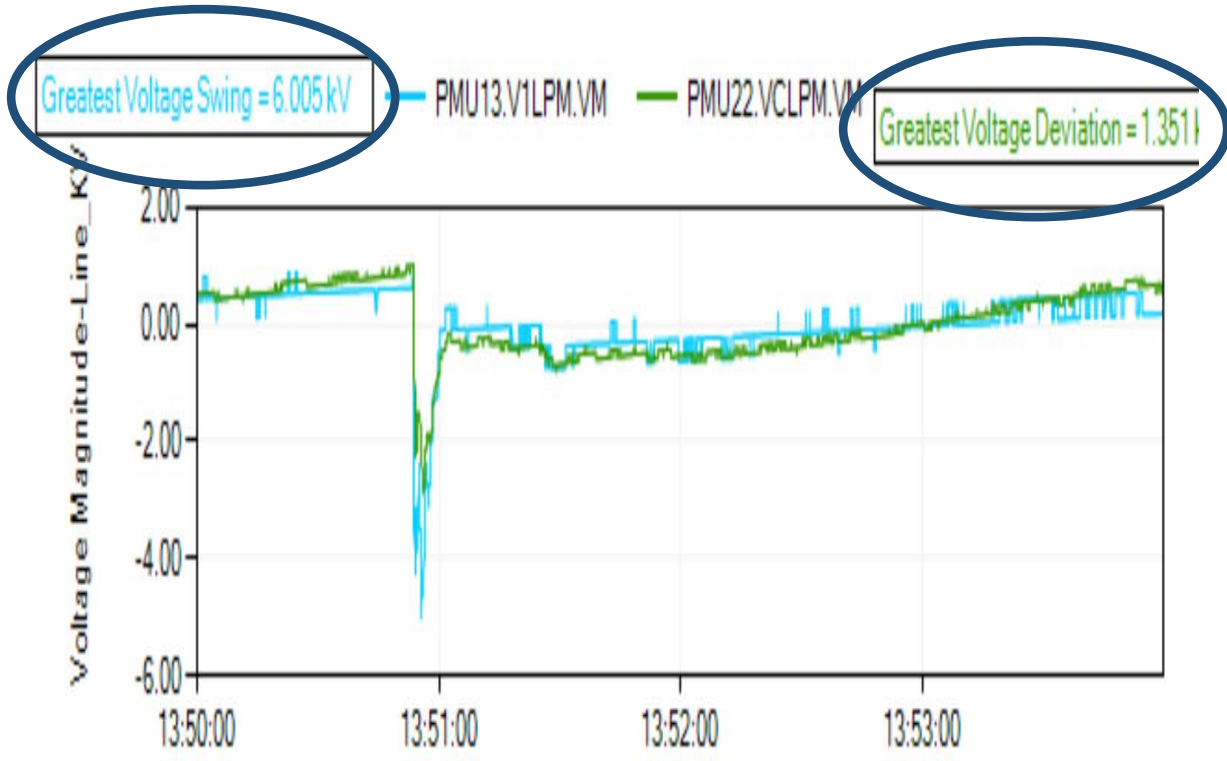
Analysis Parameters	
▼ Data Conditioning Options	ResamplingSettings: Disabled
> Re-sampling Setting	Disabled
> Quality Filter	Enabled
> Stale Filter	Disabled
> Outlier Filter	Disabled
> Manipulation	Disabled
> Interpolation	Disabled
> Pass Filter	Disabled
▼ Algorithm Parameters	
DampMax	30
▼ Frange	0.1,1
Min	0.1
Max	1
EnergyMin	0.001

PGDA v4.0
4 Parameters

Intelligent Searcher Function

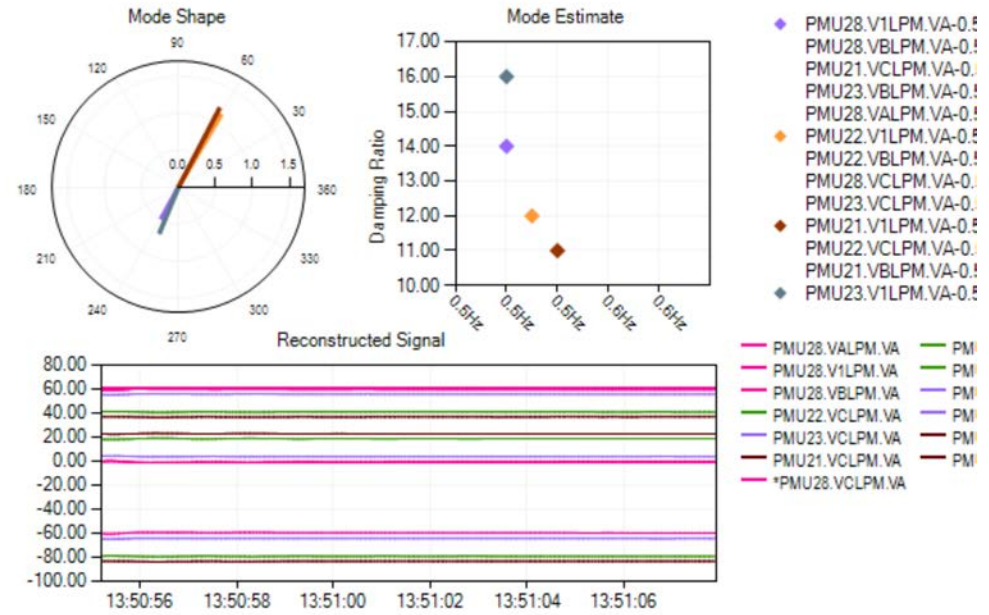
- Manual scanning of hundreds of signals for an event is not effective
- Searcher automatically scans signals for Oscillation and Event analysis
- Oscillation analysis:
 - > Detects the locations of two ends of Oscillation
 - > In Spectral analysis, signals are identified based on Coherency, Frequency and CSD
 - > In Ringdown analysis, signals are identified based on Frequency range and MSA
- Event analysis
 - > Signals are identified based on greatest swing and deviation
 - > Detects the locations which have greatest transients and deviations

Searcher function summary



Event analysis

Two ends of oscillation



Oscillation analysis

Fault Analysis

- *Demo*

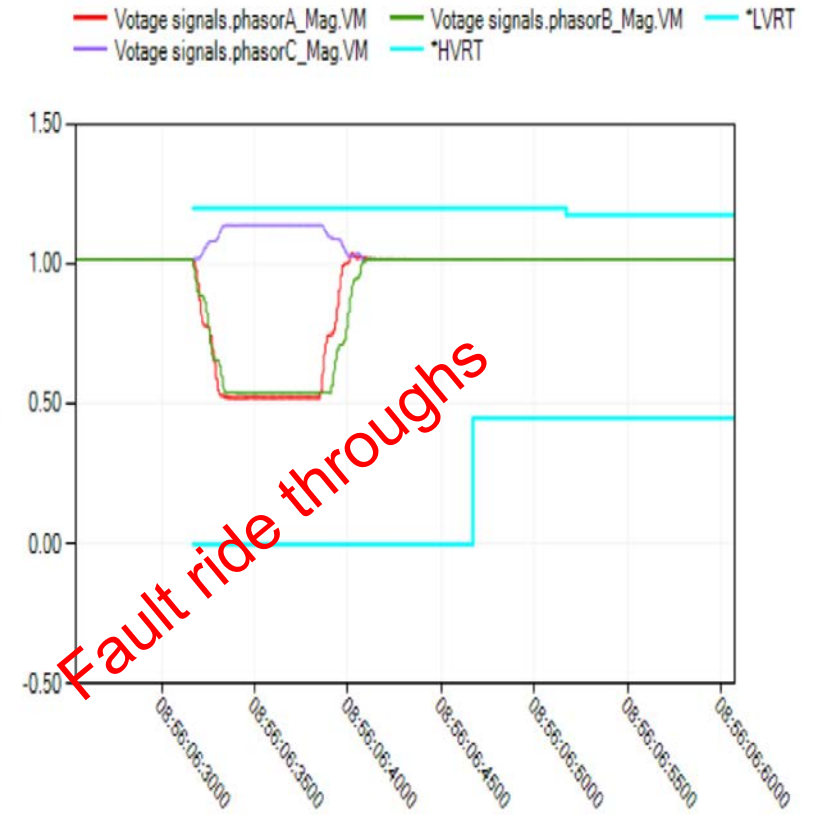
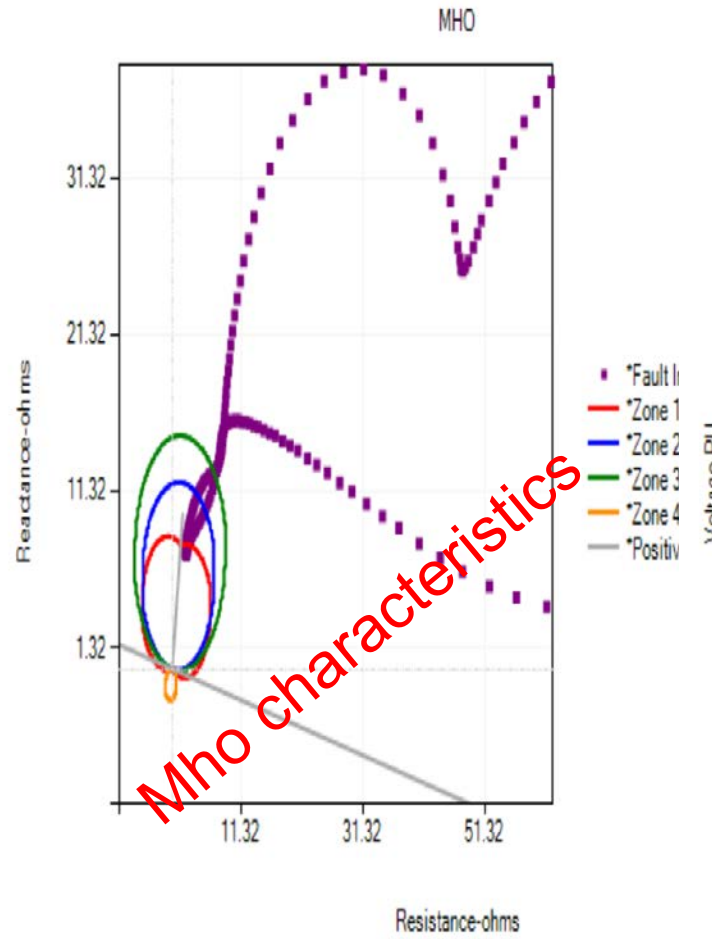
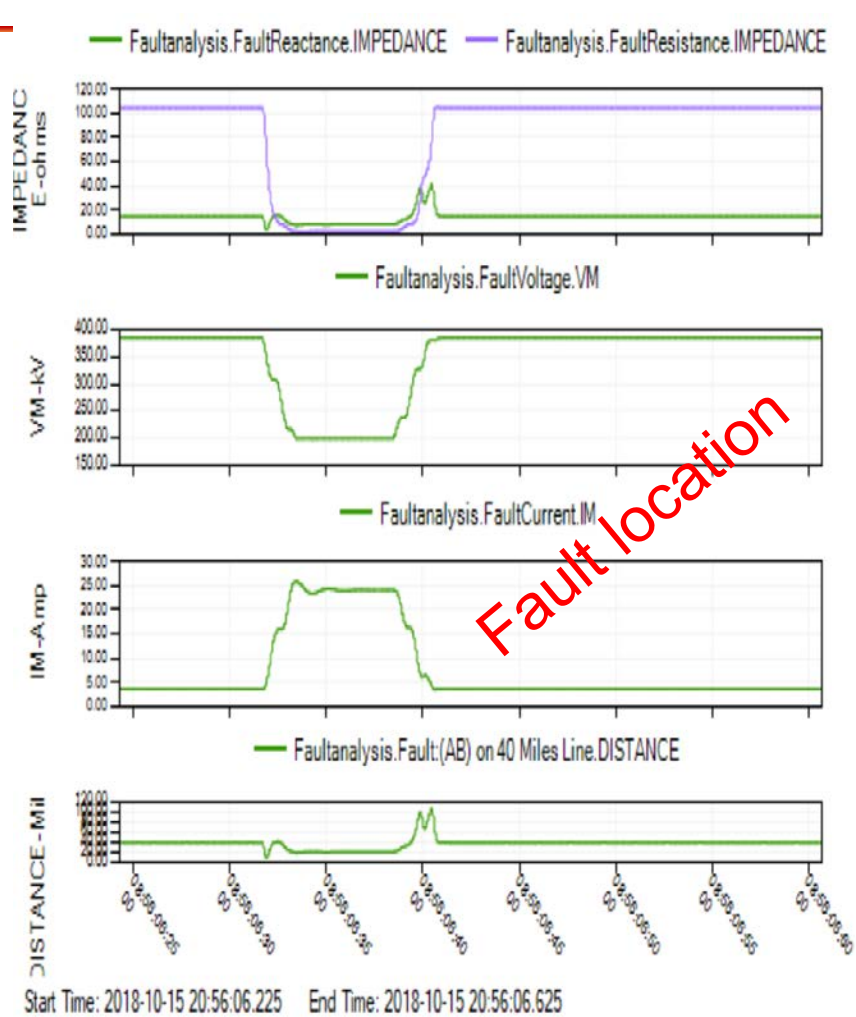
Why PGDA for Fault Analysis?

- DFR data (Point on wave) from different substations can be compared by time synchronization
- Comparing the DFR and PMU data from different locations give sequence of events over wide area
- Phasor Converter can convert “Point on wave “ signals to Phasor signals
- Symmetrical components can be used to analyze the unbalance in the system
- Smart report generation capability

7 step process for Fault Analysis in PGDA

1. Load the Data
2. If the data is of Point on wave, then convert to Phasors by using Phasor converter
3. Verify the Fault by plotting the Voltage Magnitude signals
4. Determine the Fault Location
5. Determine the Fault trajectory by Mho Characteristics
6. Check for Voltage or frequency violation
7. Generate the report

Fault analysis summary



FAQ

- **Q:** How accurate are the PGDA fault location algorithms?

Ans: All the fault location algorithms are according to IEEE_C37.114-2004.

- **Q:** Can PGDA store relay settings for Mho characteristics?

Ans: PGDA V4 does not store the relay settings. It is in the roadmap.

- **Q:** What is the installation process?

Ans: One installer for PGDA. No pre-requisites required.

Q&A, Discussion



Summary

1. PGDA tool can be used for offline analysis of PMU data
2. 12 New major features have been implemented in PGDA
3. PGDA can create System Model validation report according to NERC MOD 033
4. Demonstration on Model validation, Searcher function, Fault analysis

PGDA next steps

- Release date: November 1, 2018.
 - > Website: www.electricpowergroup.net
- For one on one demo, Please contact: chiluka@electricpowergroup.com

Thank you for participating!

*If you have any questions regarding any part of the webinar, please contact us at
Contact@electricpowergroup.com*

Thank you!



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