TrenDAP

open-source trending-data analytics platform

Power Quality

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PQ Dashboard Suite of Products

Trend Data Analytics Tool

- **Area of Interest to Discuss**
  - Data Sources
  - Selecting and Filtering Data
  - Analysis
  - Charting / Visualizations
  - Data Management / Quality
  - Statistical Process Control (SPC) and Alarming

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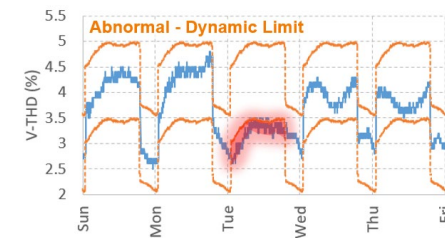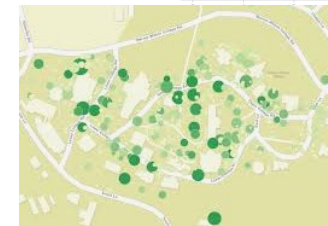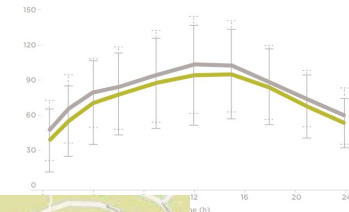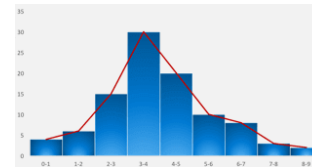
Trend Data Analytics Tool: **Data Sources**

1. Ability to chart interval data from PQMs, DFRs, meters; SCADA historian data, Synchrophasor historian data, and other historian data such as weather and asset-health simultaneously in the same tool.

2. Ability to connect to multiple databases / historians simultaneously.

Poll#1: What data sets would be useful to integrate with PQ waveform and trend data?

Chat#1: What manufacture and model of meter data would you want to bring in first?

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Trend Data Analytics Tool : **Selection and Filtering**

1. Ability to select/filter custom list of devices, channels, parameters, and other data for display
2. Ability to select any or all snapshots, interval max, interval avg, interval min for display
3. Ability to filter list of devices for easier selection of sites to display
4. Ability to filter list of channels for easier selection of channels to display
5. Ability to specify individual harmonics / interharmonics for display
6. Ability to filter data including user specified maximum and minimum valid values, standard deviation, valid hour(s), valid day(s), valid (months), valid date(s).
7. Ability to highlight and include or exclude invalid values in display.

Poll#2: At what interval do you gather trend data for most permanent site power quality monitors?

Trend Data Analytics Tool : **Analysis**

1. Ability to aggregate smaller intervals into larger intervals. Aggregation functions to include average, maximum, minimum, standard deviation, count, sum, and user specified cumulative probability percentiles.

2. Ability to select compliance parameters including ANSI, IEEE, IEC, NERC, NATF, EPRI and user specified. This includes compliance charting and reporting functionality.

3. Ability to perform mathematical calculations on trend data including summation, difference, multiplication, division, integration, derivation, absolute values, negative values, positive values, inverted values, natural log values, common log values, squared values, decibel values, scaled values, and offset values. Calculation between any given parameter of a channel and/or meter. Option post calculate and/or on-the-fly and store said calculation in database (Virtual channels)

4. Ability to perform statistical analysis of the displayed data including counts, minimum, average, maximum, range, standard deviations, and cumulative probabilities.

5. Ability to export trends (including derived) and histograms to csv, etc.

6. Ability for multi-site / channel statistics table.

7. Ability for static / absolute and dynamic /off-normal alarms.

8. Histogram and Daily Profile Plots

Poll #3: What software do you currently use to analyze metering data?

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Trend Data Analytics Tool : **Charting / Visualizations**

1. Display magnitude, angle, real and/or imaginary components (if provided by meter)
2. Display analog and digital channels.
3. Customize colors, line types, and orders of traces for display
4. Show or fill gaps in data in the display, and option to show data points. (more visual than data quality)
5. Auto fit horizontal and vertical axis of charts or set via user specifications.
6. Option of linear or logarithmic axis.
7. Display sites / channels on common chart: single-axis or multi-axis; or separate, aligned charts.
8. Customize units and format of display including absolute, kilo, mega, milli, percent, per unit, second, hour, day, etc.
9. Overlap display of data by hour, day, month or by hour of day, day of week, month of year.
   - Ability to apply transparency to lines/points for a "transparent density plot".
10. Both horizontal and vertical zooming of displays.
11. Horizontal panning of displays.
12. Customize chart titles, headers, footers, axis's, legends, etc.
13. Enable / disable display of grid lines on charts.
14. Integrating geospatial and trend data for wide-area view playback.

Poll# 4: What other organizations within your company outside of PQ could or do benefit from the PQ data? A) Operations, B) Reliability, C) System Protection, D) Metering, E) Other

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Trend Data Analytics Tool : **Data Management / Quality**

1. Ability to delete / edit invalid or missing data points.

2. Ability to detect data quality / availability issues: missing, latched, invalid, etc.

3. Ability to show event data tick-marks on the trend displays with links to the events in OpenSEE.

4. Ability to filter display of event data tick-marks on trend displays based upon event type: fault, sag, swell, transient, interruption, breaker open, etc.

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EPRI Component:
Statistical Process Control for Trend Data

Trend Data Analytics Tool : Statistical Process Control and Alarming

- Objective: A tool that will generate, evaluate, and publish various methods of upper and/or lower control limit for each parameter of power quality trend data in an enterprise monitoring system.

- Generate: Creates the limits based on historical sampling of data and user input.

- Evaluate: While creating limits, feedback will be given on how current settings will influence alarming

- Publish: Generated limits of each parameter will be pushed out to each individual monitors configuration

- Methods: Types of limits will consist of regulatory, abnormal-static, abnormal-dynamic.

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Trend Data Analytics Tool : Limit Types

- **Regulatory:** Limits based on establish regulatory or undesirable values

- **Abnormal-Static:** Limits based on a historical sampling of normal variances from unknown causes. These limits are <u>one static value that do not change</u> with periodic variances from known causes.

- **Abnormal-Dynamic:** Limits based on a historical sampling of normal variances from unknown causes. These limits <u>change over time</u> to adjust for periodic variances from known causes.
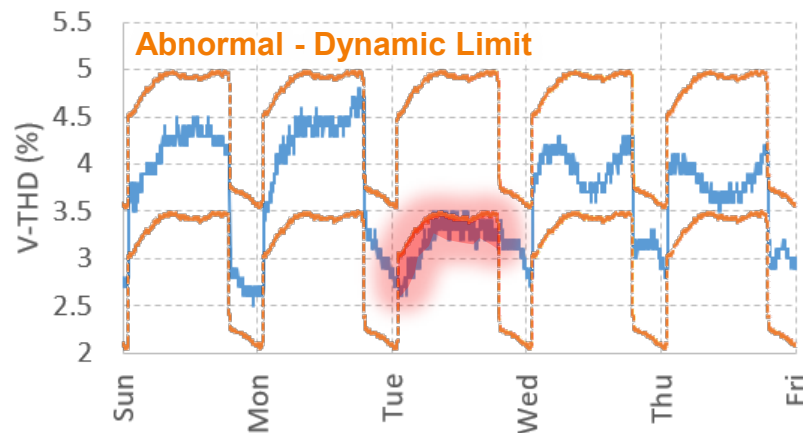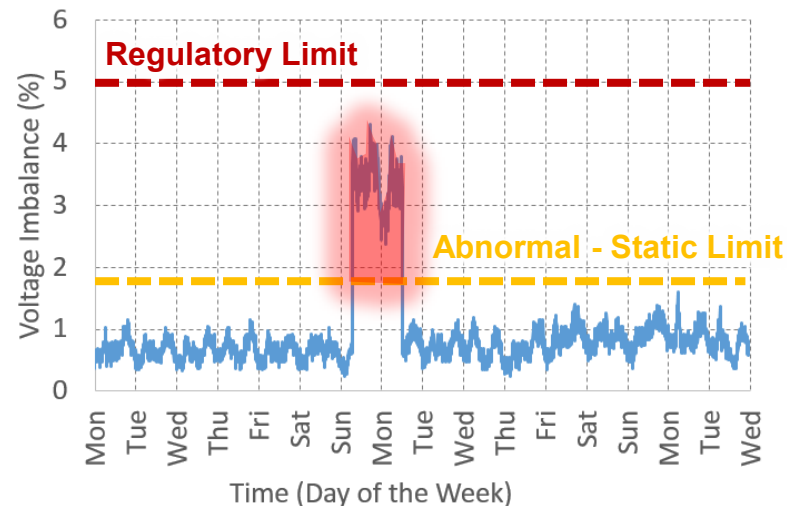
Poll#5: How do you currently detect trend levels beyond a regulatory limit?

Trend Data Analytics Tool : **Alarming**

- Alarm reporting will be separate for each enabled limit type. (Helps with the option to give regulatory alarming higher priority)

- Option to suppress alarms that exceed a certain amount for a given monitor.

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