PQView®

The Industry Standard Power Quality Database Management and Analysis Software

What is PQView?

PQView is a multi-component software system for building and analyzing databases of power quality and energy measurements. It is used by power providers and consulting companies throughout the world and is widely recognized for its capabilities and flexibility. It consists of components for building measurement databases, writing summary reports, computing power quality indices, viewing waveforms and rms samples, and trending steady-state quantities via workstations and web browsers.

With PQView, you can build databases with billions of measurements from thousands of monitoring points taken by many different types of meters, including power quality monitors, voltage recorders, in-plant monitors, and digital fault recorders. You can store and analyze information with the measurements about cause and source of triggered events, as well as evaluate the financial impact of events to both a power provider and a power user. You can quickly extract meaningful information from a database as small as one megabyte to as large as one terabyte.

Developed by Electrotek Concepts® under EPRI® sponsorship, PQView combines powerful features in a user-friendly interface. A complete PQView system consists of three main applications: the Power Quality Data Manager (PQDM), the Power Quality Data Analyzer (PQDA), and PQWeb®. Measurements can be stored in either Microsoft® Access or Microsoft® SQL Server.

PQView Power Quality Data Manager (PQDM)

PQDM's primary function is to automatically build power quality databases from data sources. It also automatically sends e-mail notifications using SMTP servers or Microsoft® Outlook® clients when data sources have finished importing, rms voltage variations (voltage sags, swells, and interruptions) are imported from data sources, or measurements are not collected from a monitoring instrument for a specified number of days. PQDM also automatically correlates measurements by time stamp and location.

PQDM Data Sources

For its source data, the basic PQDM installation can import information from the following file and database formats:

- IEEE Std 1159.3-2003 (PQDIF) files from power quality monitors
- Dranetz-BMI Signature System™ DataNode® PQDIF files downloaded by NodeLink® or NodeCenter®
- Dranetz-BMI data files downloaded by PES from the 3100 PQPager® and the 7100 PQNode®
- Dranetz-BMI data files downloaded by PASS® from the 8010 PQNode and 8020 PQNode
- Omega (*.OMG) files downloaded from RPM/Fluke Power Quality Power Recorder meters
- Cooper Power Systems PST files exported from V-Flicker™
- LER DL8000 voltage dip database
- Landis+Gyr or Siemens Quad4® meters downloaded by MAXtrac
- Text files

Importers for these file and database formats are available as options

- IEEE C37.111-1191 (COMTRADE) files from digital fault recorders and relays
- PML PEGASYS® databases
- PML ION® Enterprise® databases
- PML M-SCADA® databases
- DCI Sentry databases

Typically, PQDM automatically updates measurement databases once each day after all of the meters have been polled by their proprietary download software. However, it may be configured to update manually, or as fast as once every minute.

Other functions provided by PQDM include deleting old measurements, manually adding missed rms voltage

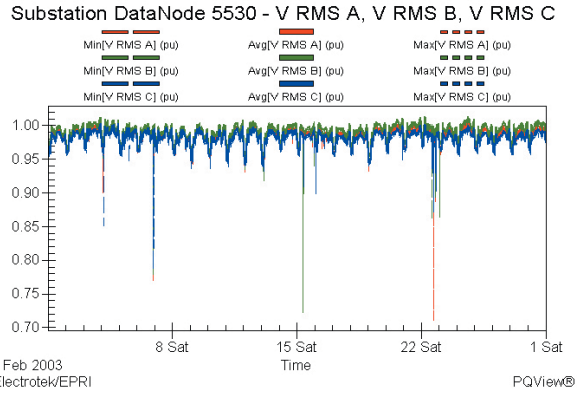

Figure 1: One Month Trend of Minimum, Average, and Maximum Voltage for Three Phases

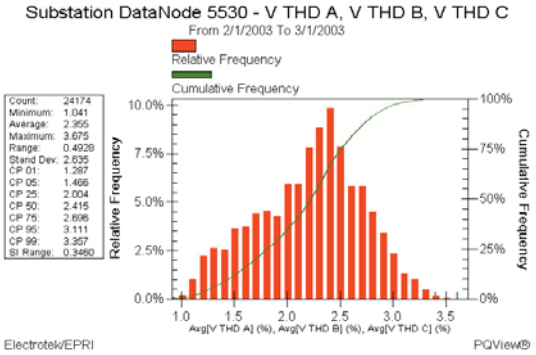

Figure 2: Histogram of Voltage THD for Three Phases

variations, and creating voltage sag and voltage swell records from voltage minimum/maximum strip chart data.

PQView Power Quality Data Analyzer (PQDA)

PQDA creates trends, histograms, and statistical summary tables of more than 125 steady-state characteristics defined within the IEEE PQDIF standard. It offers scores of charts, event lists, tables, and indices to analyze voltage sags/dips, swells, and interruptions. PQDA interfaces with Microsoft® Word to automatically create summary documents, and allows the user to filter invalid measurements from final analysis.

Trends and Histograms

PQDA allows you to create trends, histograms, and statistics for any steady-state voltage, current, power, and energy quantity (Figure 1 and Figure 2). You can also view trends and histograms for the minimum, average, maximum, standard deviation, count, and any percentile for steady-state data in intervals of minutes, hours, days, weeks, months, and years (Figure 3).

The data for trend and histogram charts can be filtered to not include invalid measurements. All trends are interactive so you can zoom in with your mouse cursor to an area of interest. Also, each trend can become an event timeline by plotting any associated waveform or rms variation measurements as tick marks along the x-axis. When you click on a tick mark, the waveforms and rms samples

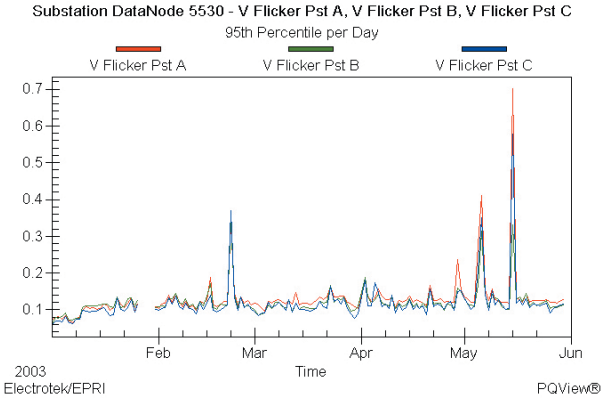

Figure 3: 95th Percentile of Flicker Pst per Day

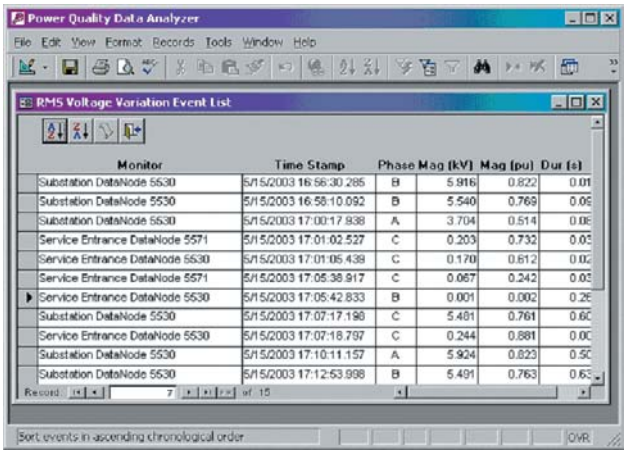

Figure 4: Event lists of voltage sags, swells, and interruptions can be aggregated by time and by location

recorded with the event will open in a new window. This feature is especially useful when evaluating faults and switching transients.

Each trend and histogram can be copied automatically into Microsoft Word documents, exported to HTML documents with related graphics files, or sent to a printer. For example, you could create a report showing the trend and/or histogram of rms voltage or voltage THD for all phases for every meter in your database for a year by specifying only the file name of a Microsoft Word document. Each chart is automatically created and exported to the specified file.

Event Lists

PQDA can quickly build event lists (Figure 4) from the millions of events recorded in a measurement database. PQView "measurement events" consist of the waveform and rms samples recorded during voltage sags and swells due to faults and motor starting, and voltage transients due to fuse operations, lightning strikes, load switching, and capacitor and cable energizing. The event lists can be built based on simple queries that only select certain meters for a specific date range. Or, they can be more sophisticated. For

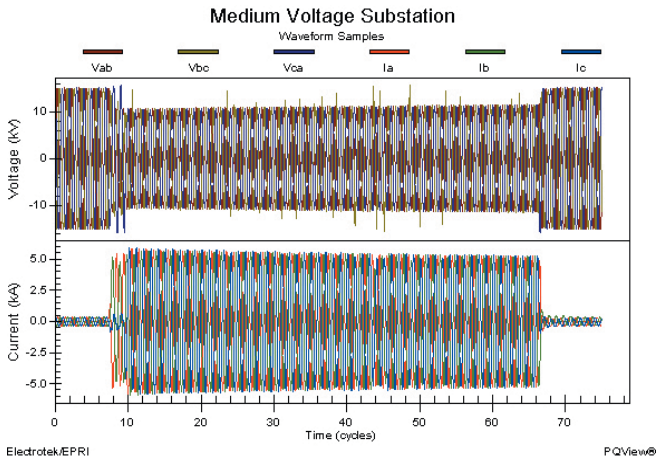

Figure 5: Three-Phase Voltage and Current Waveforms during a Three-Phase Fault

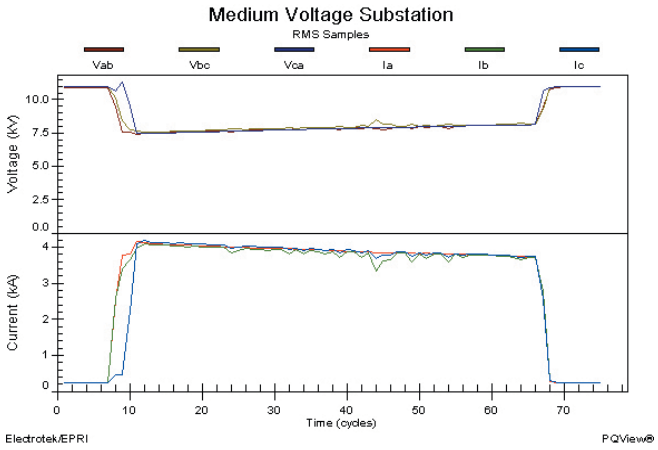

Figure 6: Three-Phase Voltage and Current RMS Samples during a Three-Phase Fault

example, you could request a list of all events in which the rms voltage dropped below 0.7 per unit. Even more sophisticated queries can be run allowing you to search for single-phase sags, three-phase sags, single-phase faults, and three-phase faults.

Measurements can be triggered to one of two nominal base voltages: the base voltage set when the event was triggered, or a base voltage set for the monitoring site. This means that although you might use 115V as the base voltage for a meter during triggering, you could normalize its voltage to 120V at the time of display.

RMS Voltage Variation Analysis

A key strength of PQDA lies in its analytical capabilities of rms voltage variations (voltage sags, swells, and interruptions). In addition to being able to build lists of events showing the voltage magnitude and duration of each event, you can build ITIC Charts, CBEMA Charts, and SEMI F47 Charts. Custom charts that overlay multiple curves (Figure 7) can be built as well. The measurements from each meter can be plotted optionally in a different

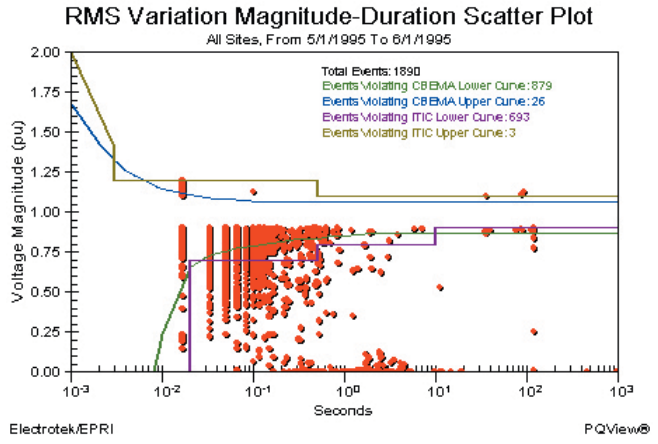

Figure 7: An rms variation magnitude-duration scatter plot overlaid with the sensitivity curves specified by CBEMA in 1987 and by ITIC in 1997

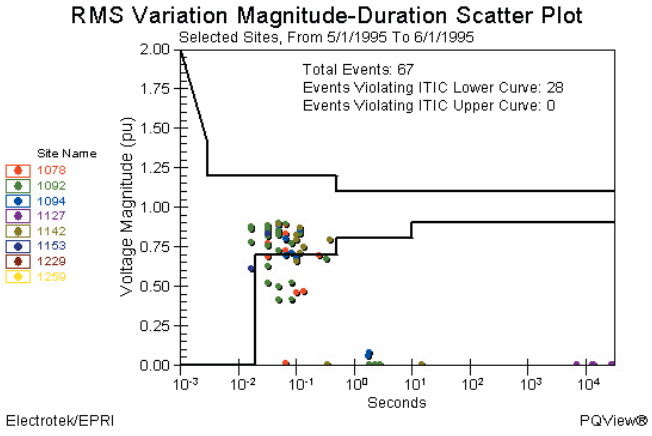

Figure 8: Voltage Sag Magnitude versus Duration Scatter Plot with ITIC Curves

color (Figure 8). If you identify the cause code or source code of each event by adding additional information to your database, then the plots can use a different color for these supplemental codes as well.

Another scatter plot will plot the voltage magnitude of each voltage sag, swell, or interruption versus time (Figure 9.) When plotting any of these magnitude-duration or magnitude-time scatter plots, you may click on the point representing each event to see the waveforms and rms samples associated with that event. Because PQDA's rms variation analysis algorithm involves temporal aggregation of multiple events occurring in close in time, you see not only the event that resulted in a particular voltage magnitude and duration, but also any other events that occurred around the same time at that location.

In Figure 10, PQDA temporally aggregated voltage sag measurements by determining the lowest voltage during a 60-second period of time at each meter. Rates of occurrence were calculated by determining the number of days each meter was available during the 31-day analysis period. If a meter had unavailable days, then PQView took them into account when computing the occurrence rates.

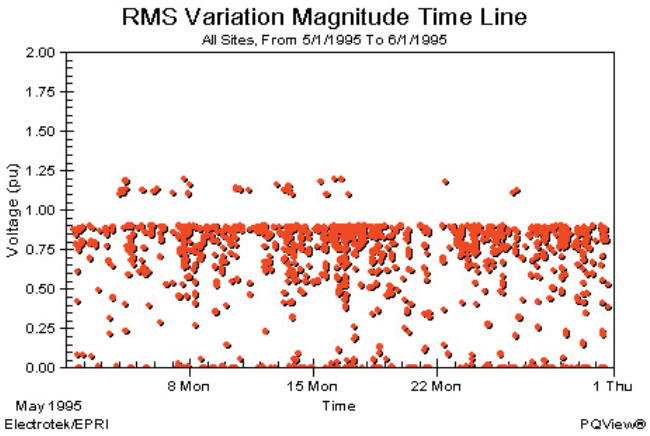

Figure 9: A voltage sag scatter plot of rms voltage magnitude on a one-month timeline

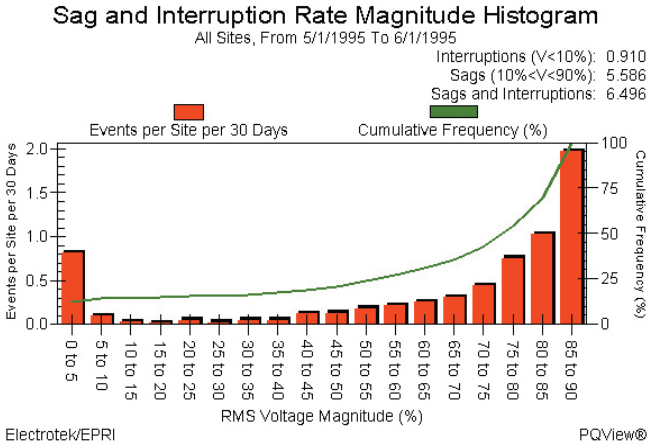

Figure 10: Statistical histogram showing the voltage magnitude distribution for voltage sags measured at 241 power quality meters

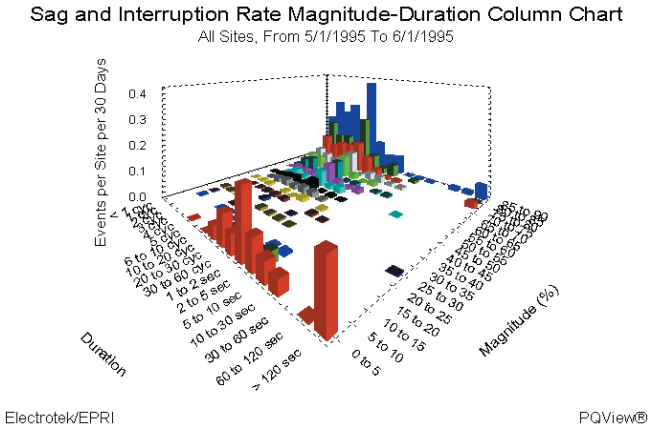

Figure 11: Column chart showing the voltage magnitude and duration for voltage sags measured at 241 power quality meters

A chart showing a magnitude-duration distribution (Figure 11) and a distribution of SARFI-80 rates recorded at 241 sites (Figure 12). The height of each column in the SARFI-80 chart is a count of sites that had a similar rate of voltage sags to below 0.80 per unit. For example, 44 sites had no events resulting in a drop in rms voltage to a level below 0.8 per unit, while 27 sites experienced an event below 0.8 per unit three times during the month. Only one site experienced 20 events resulting in a voltage sag below 0.8 per unit during the 31-day period.

You can automatically create summary reports using Microsoft Word or by exporting to HTML files with associated graphics files. You need only to specify the sites for the report, specify the desired date range, and which options you want for the report. The rms variation report writer can include monitoring site lists; event lists; SARFI summaries that compute the count or rate of voltage sags; IEC 61000-2-8 DISDIP tables; CBEMA, ITIC, SEMI F47, and timeline scatter plots; and magnitude, duration, magnitude-duration column charts.

Internet Accessibility via PQWeb®

PQView can provide data and reports via the Internet or company intranet. Through PQWeb, also available from Electrotek, a server runs PQView data analysis tasks and allows you to access and view the results using any web browser. With this software, PQView becomes a multi-platform application, able to work across otherwise incompatible operating systems.

Support

Support for PQView is provided through an Electrotek-operated users group. Members receive upgrades, technical support, and enjoy access to online resources. Additional support, such as specialty instrument interfaces or report customization, is provided on a time and materials basis.

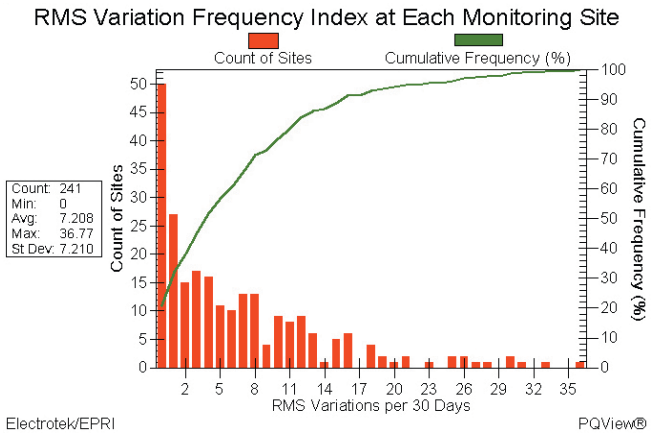

Figure 12: Column chart showing the distribution of rates for voltage sags below 0.9 per unit measured at 241 power quality meters

Learn more on the web at www.pqview.com

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