

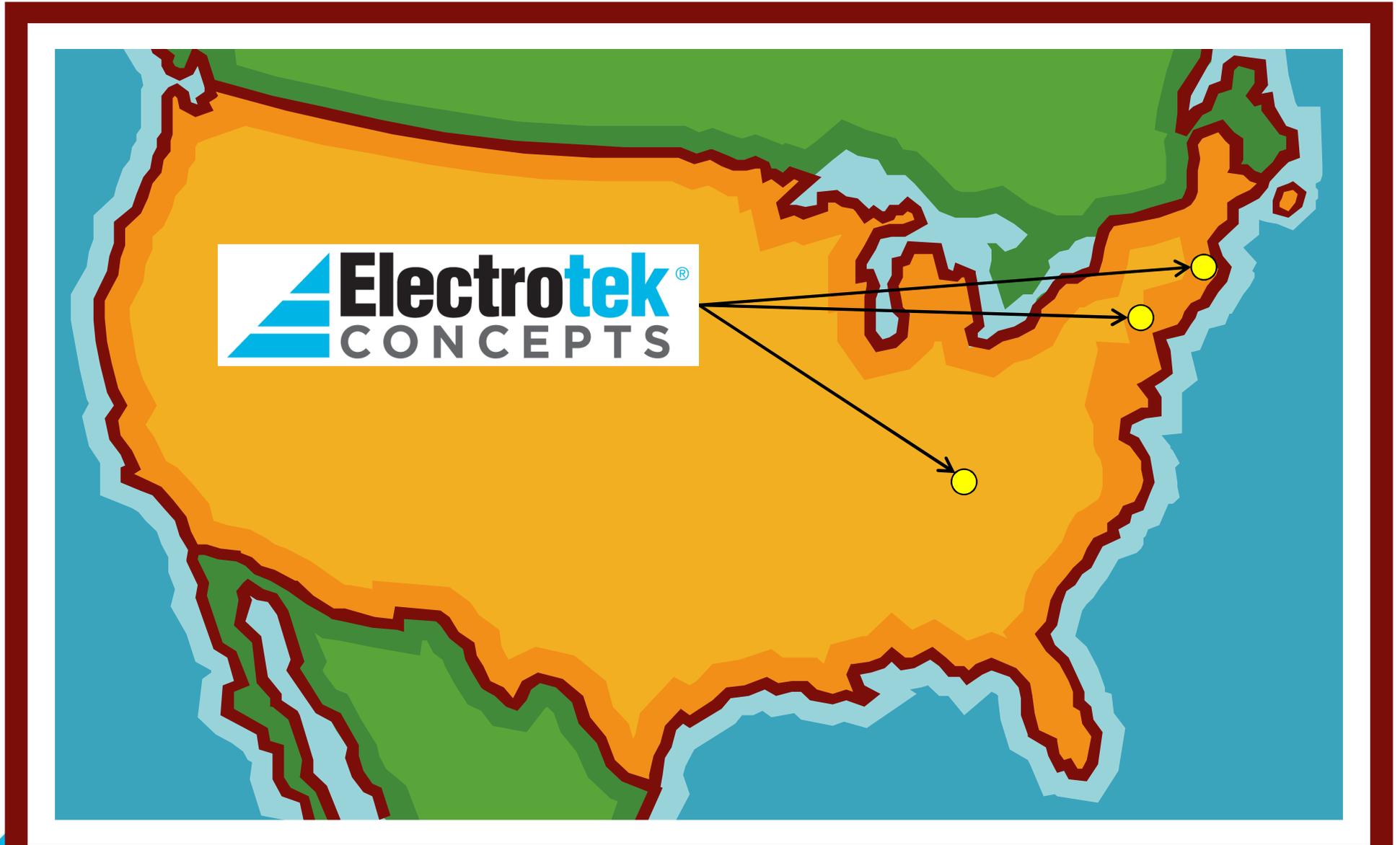
Advances in Software for PQ Monitoring Systems

Brian W Todd

Vice President, Dranetz Technology
General Manager, Electrotek Concepts.

Presented by Terry Chandler
General Manager Asia

Electrotek Office Locations



 **Global Power Technology**

 **DRANETZ™**

 **Electrotek®**
CONCEPTS

PQView 3 and PQWeb Software System



- PQView is a power quality database application
- Key Functions
 - Automatic data management
 - E-mail alarming
 - Analysis of single events or long-term trends
 - Report writing
 - Fault locating
 - Load growth estimation
 - Reports available via workstations and web browsers
 - Growing user base from around the world in collaboration to improve the system each year

Who Uses PQView Today?



United States/Canada

- American Electric Power
- Alabama Power Company
- Baltimore Gas and Electric
 - CMS Energy
 - CPS Energy San Antonio
- Consolidated Edison Company of New York
- Detroit Edison Company
- Dominion Virginia Power
- Duke Energy Corporation
- East Kentucky Power Cooperative
 - EnerNex Corporation
 - Entergy Services
 - EPRI
 - Federal Aviation Administration
 - FirstEnergy
 - Georgia Power Company
 - Hawaiian Electric Company

- Oklahoma Gas and Electric
 - Pepco Holdings, Inc.
- Public Service Electric and Gas Company
- Public Service of New Hampshire
 - Salt River Project
- San Diego Gas and Electric
 - Southern Company
- Tennessee Valley Authority
- United Illuminating Company
 - Wisconsin Public Service
 - Wireless from AT&T

Asia-Pacific

- Companhia de Electricidade de Macau (CEM)
 - Ergon Energy
- Guangdong Power
- Northern China EPRI
- Orion New Zealand Ltd.
- Provincial Electricity Authority
 - EGAT Thailand

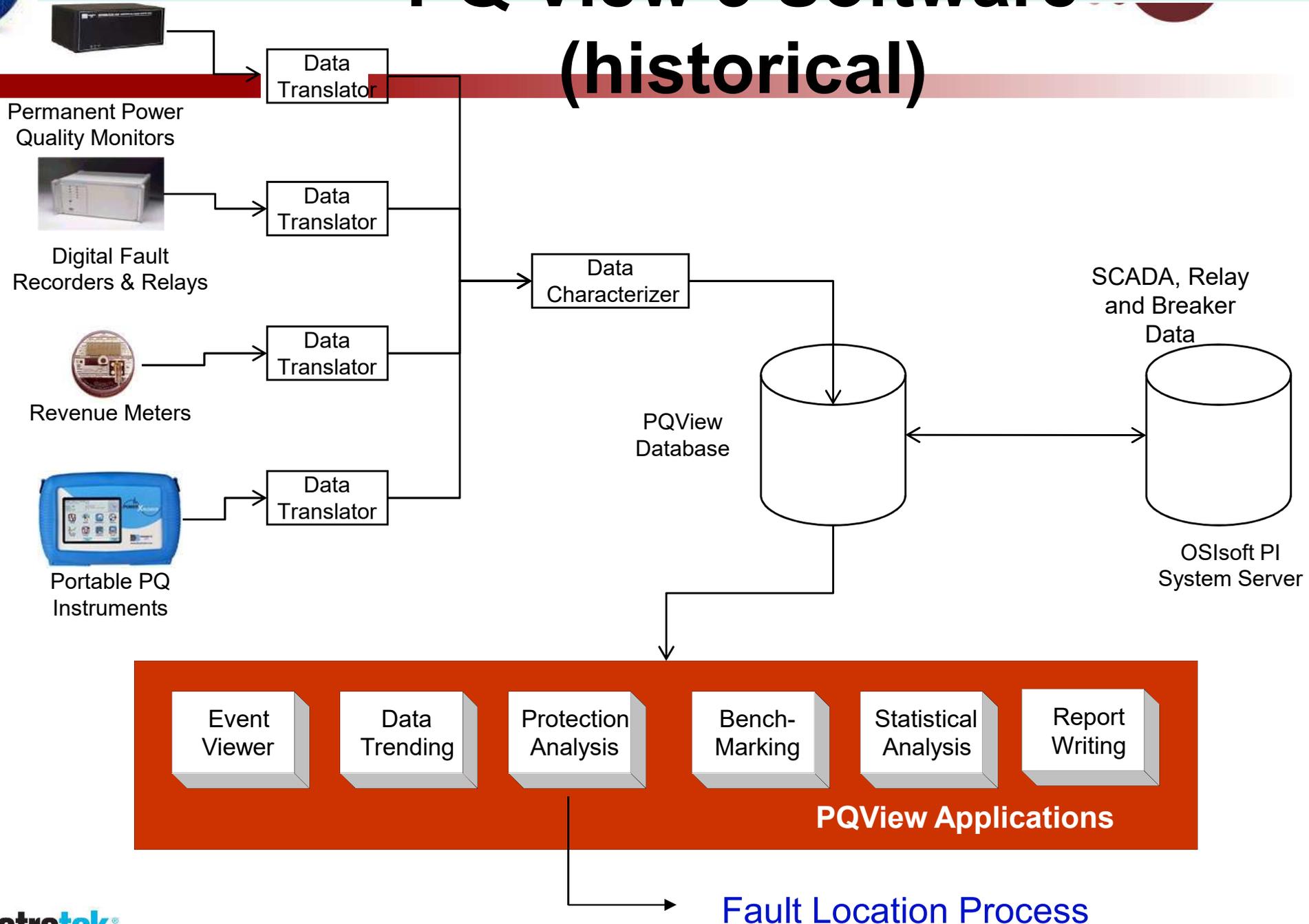
Europe

- Agder Energi Nett AS
- BKK Nett AS
- CEE Energiteknikk AS
- Central Networks (E.ON)
- Elektro Slovenia
- Elektrobistand
- Hålogaland Kraft AS
- Helgelandskraft AS
- Hydro Aluminium AS
- Hrvatska Elektroprivreda (HEP)
 - Istad Nett AS
 - Lyse Nett AS
- Nordmøre Energiverk AS
- Notodden Energi AS
 - PSE-Operator
- Rødøy-Lurøy Kraftverk AS
 - SFE Nett AS
- Skagerak Nett AS
 - SINTEF





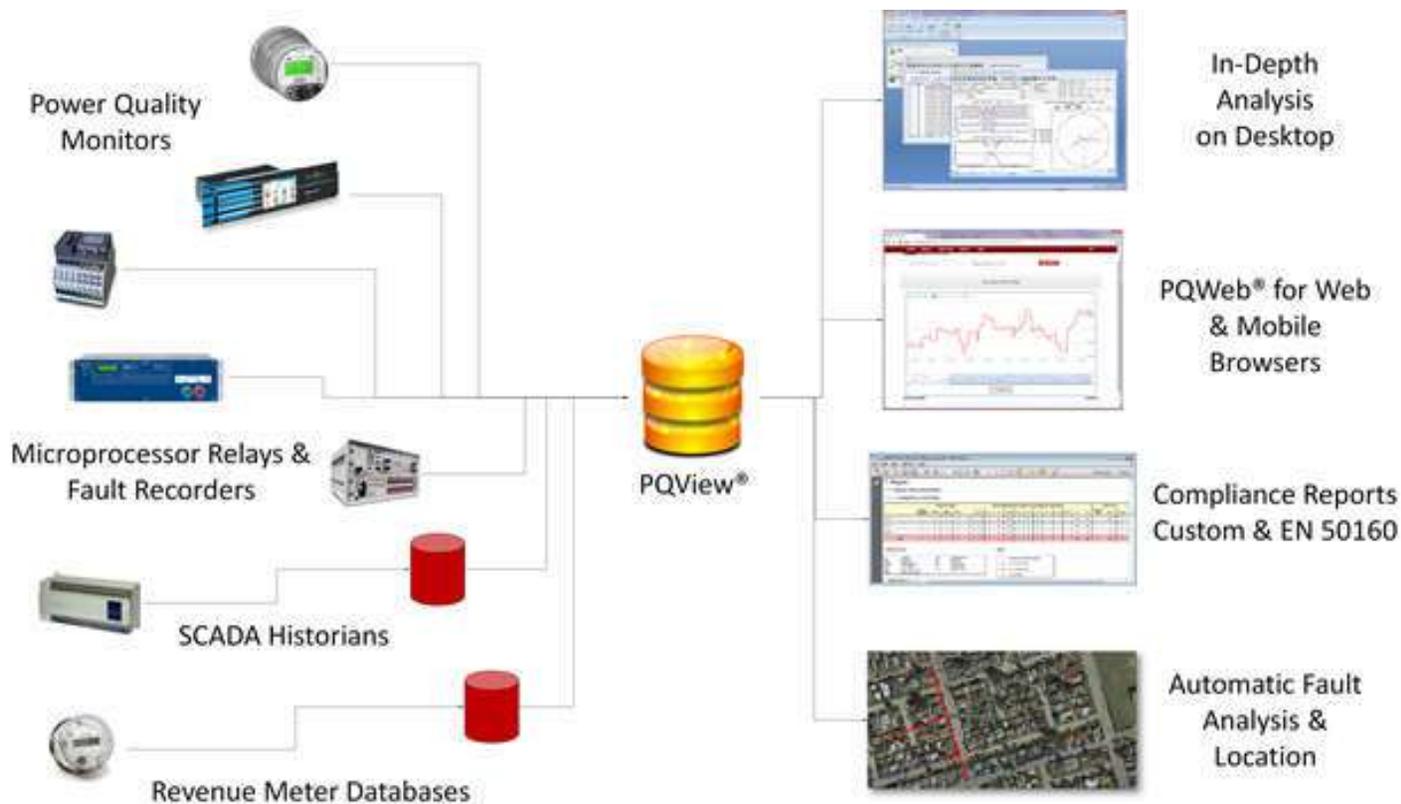
PQ View 3 Software (historical)



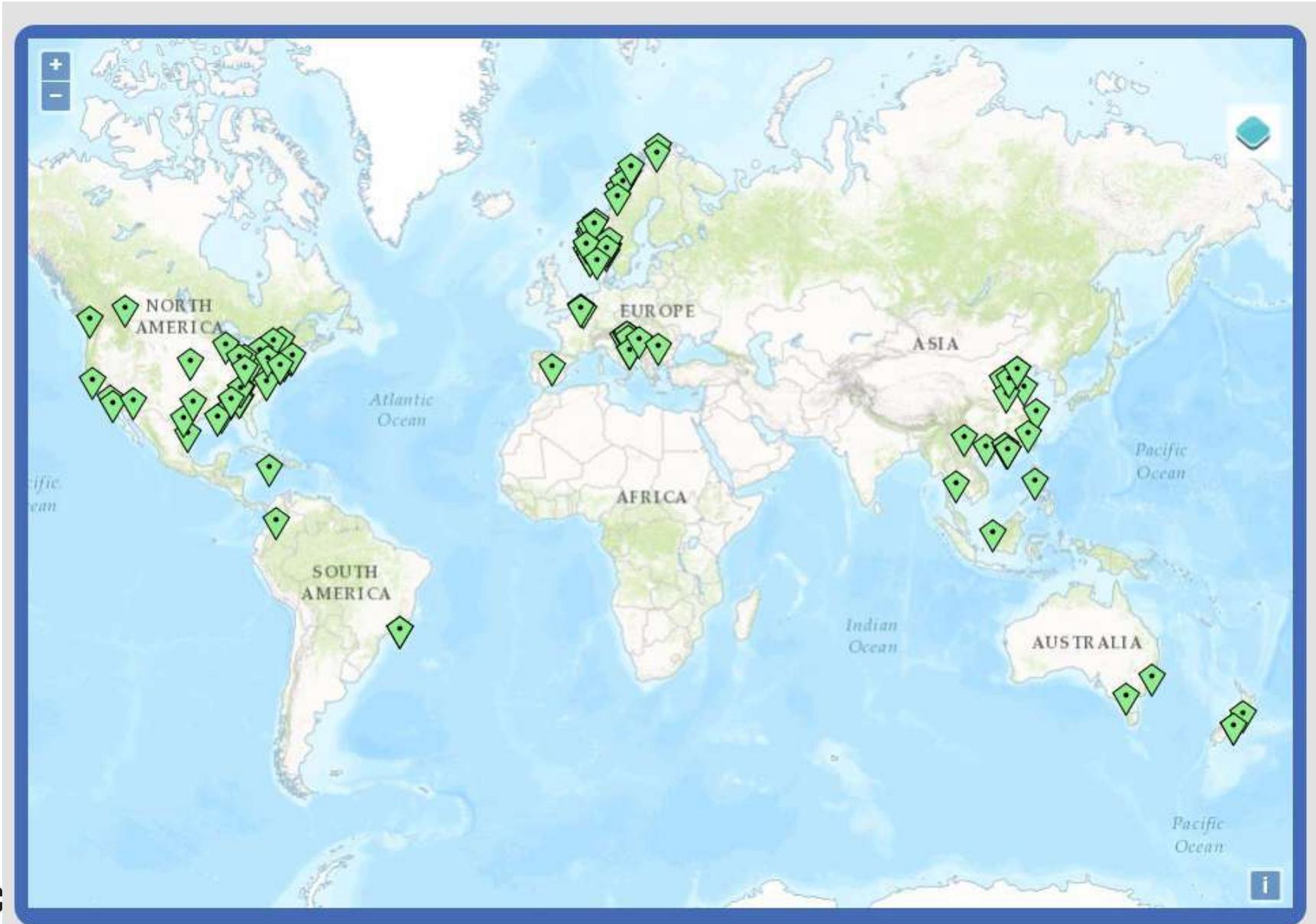
What is PQView?



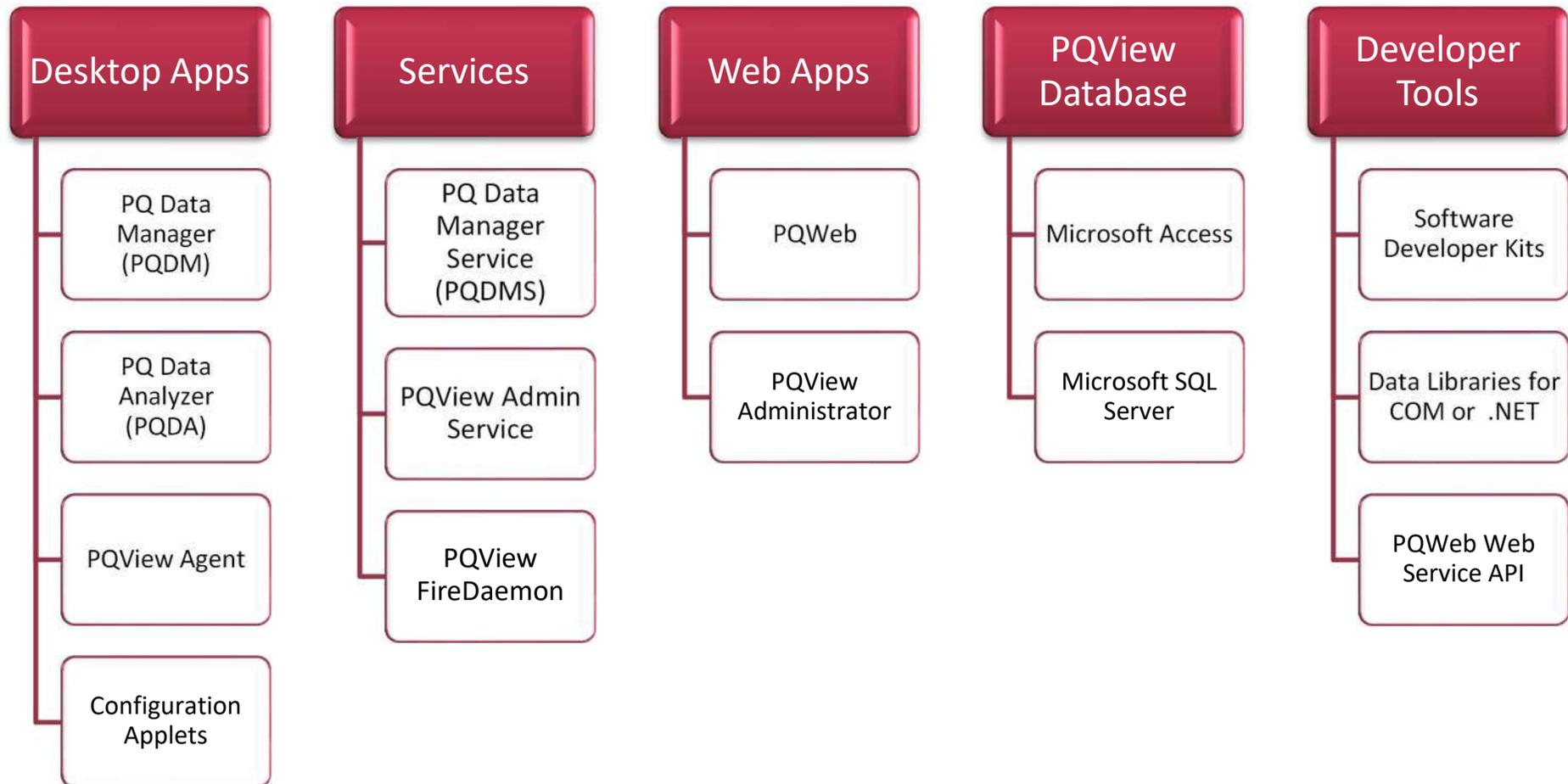
- PQView integrates waveforms and data logs from power quality monitors, digital relays, digital fault recorders, SCADA databases, and smart meters
- PQView provides desktop and web power quality & fault, analysis, reports, and fault location.

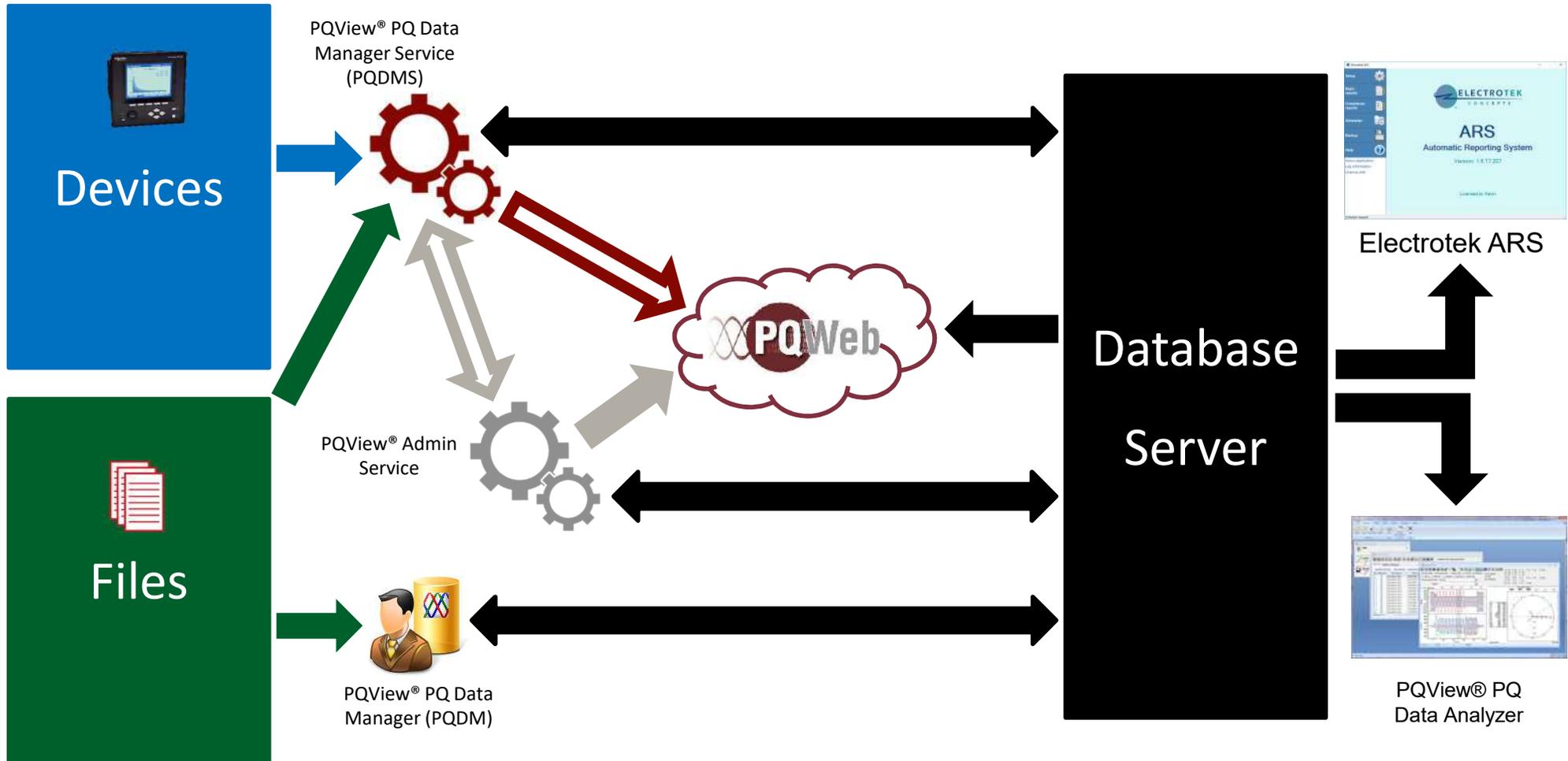


PQView Users Worldwide



Components of PQView



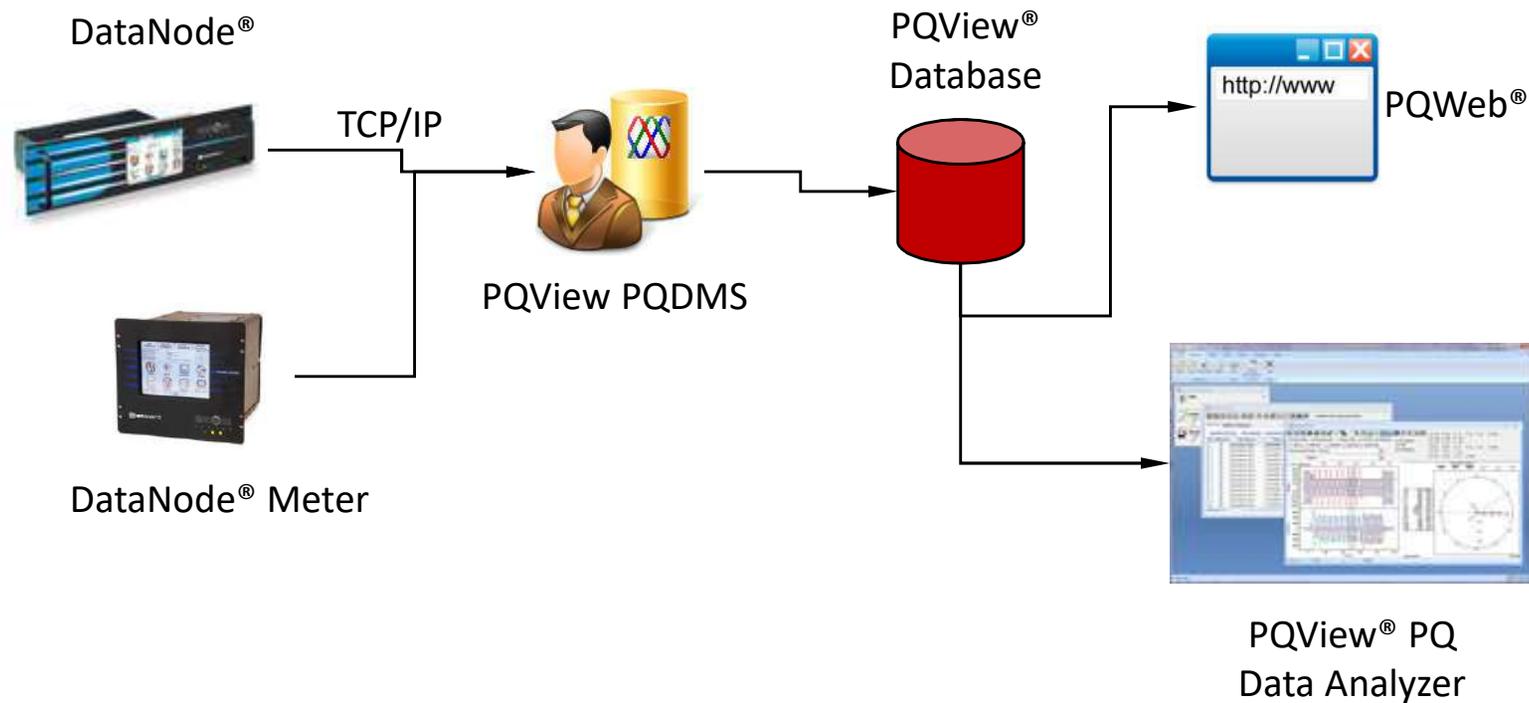


What are the Data Sources for PQView?



- IEEE® PQDIF
- IEEE® COMTRADE
- MODBUS®
- Advantech®
- Arbiter® Systems
- BTECH®
- Cooper CYMDIST
- Dranetz®
- Eaton®
- EDM I
- Electro Industries®
- ENTSO-E Loads
- Environment Canada
- Fluke®/RPM
- GE®
- Gossen Metrawatt
- I-Grid®
- GridSense
- HIOKI
- OSIsoft® PI System
- Power Monitors
- Progress Energy FMS Database
- PSL PQube®
- Qualitrol® /LEM
- SATEC
- Schneider Electric®
- Schweitzer Engineering Laboratories®
- Siemens®
- Synergi Electric
- TECTRA ALFA
- Unipower®

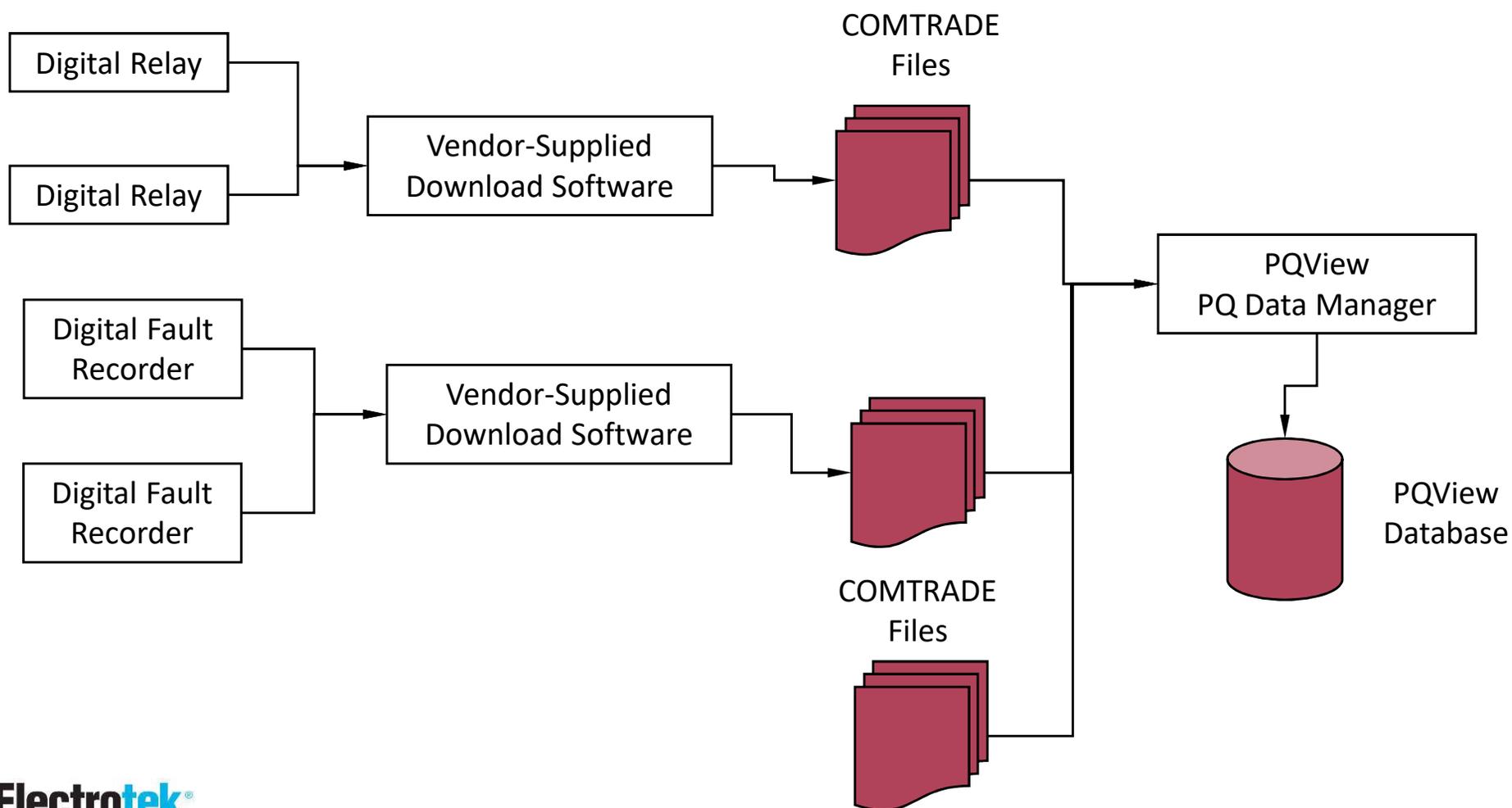
PQView Integration with Dranetz DataNodes



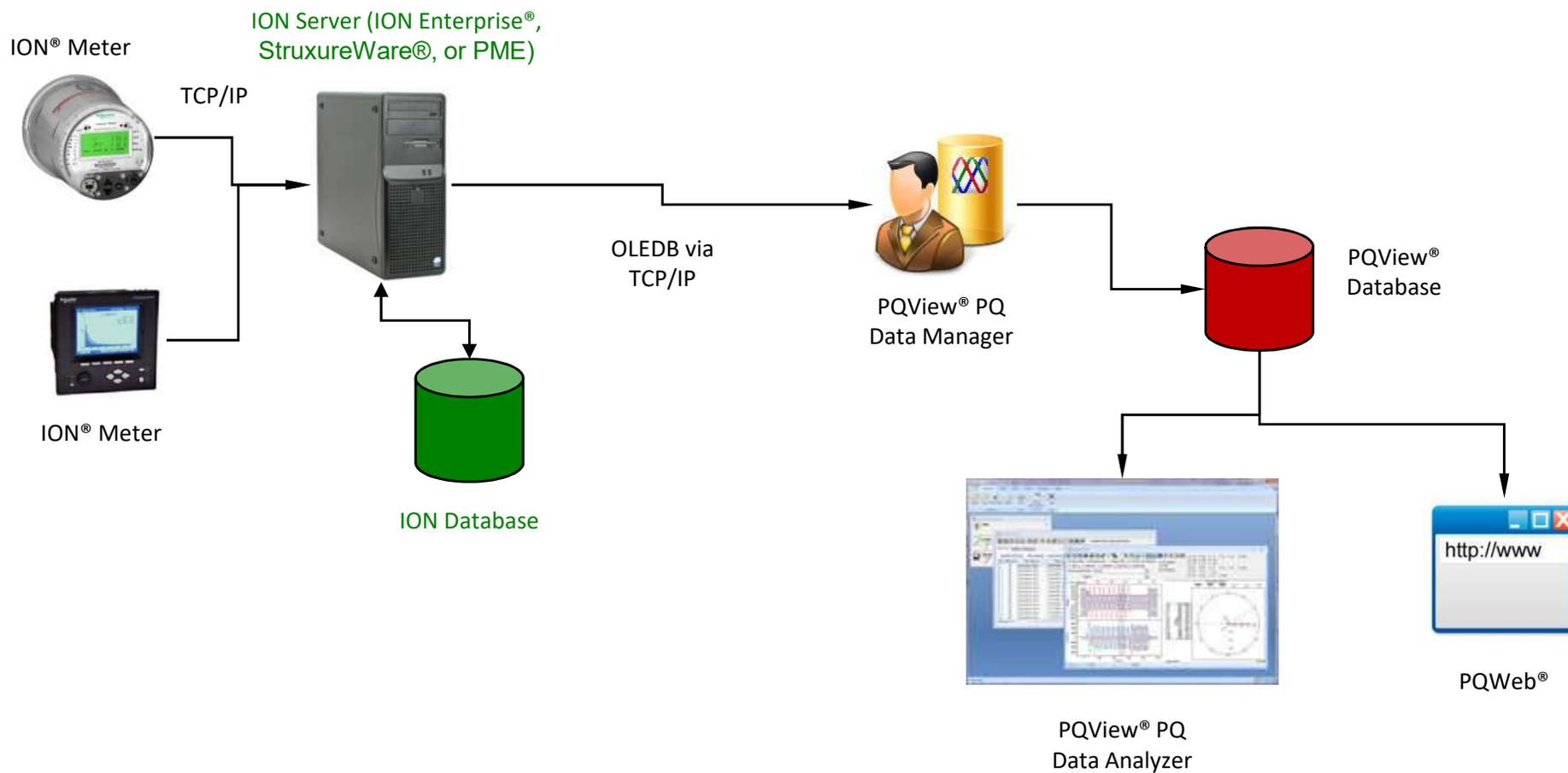
Data Handler for IEEE® Std C37.111-1991/1999 Data Files for PQView



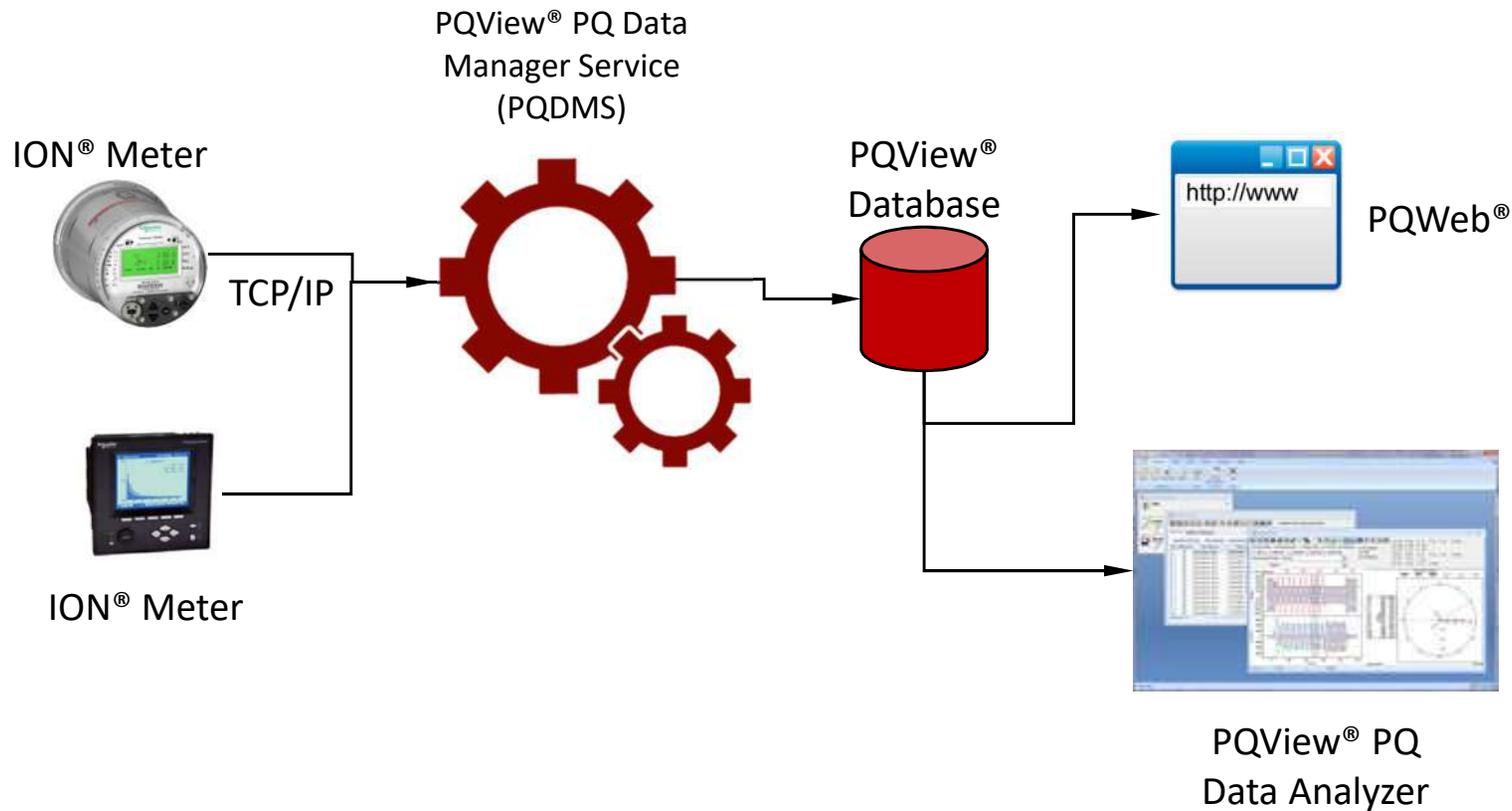
COMTRADE Files Contain One Waveform or RMS Event



PQView Integration with Schneider Electric ION Databases



PQView Integration with Schneider Electric ION Meters

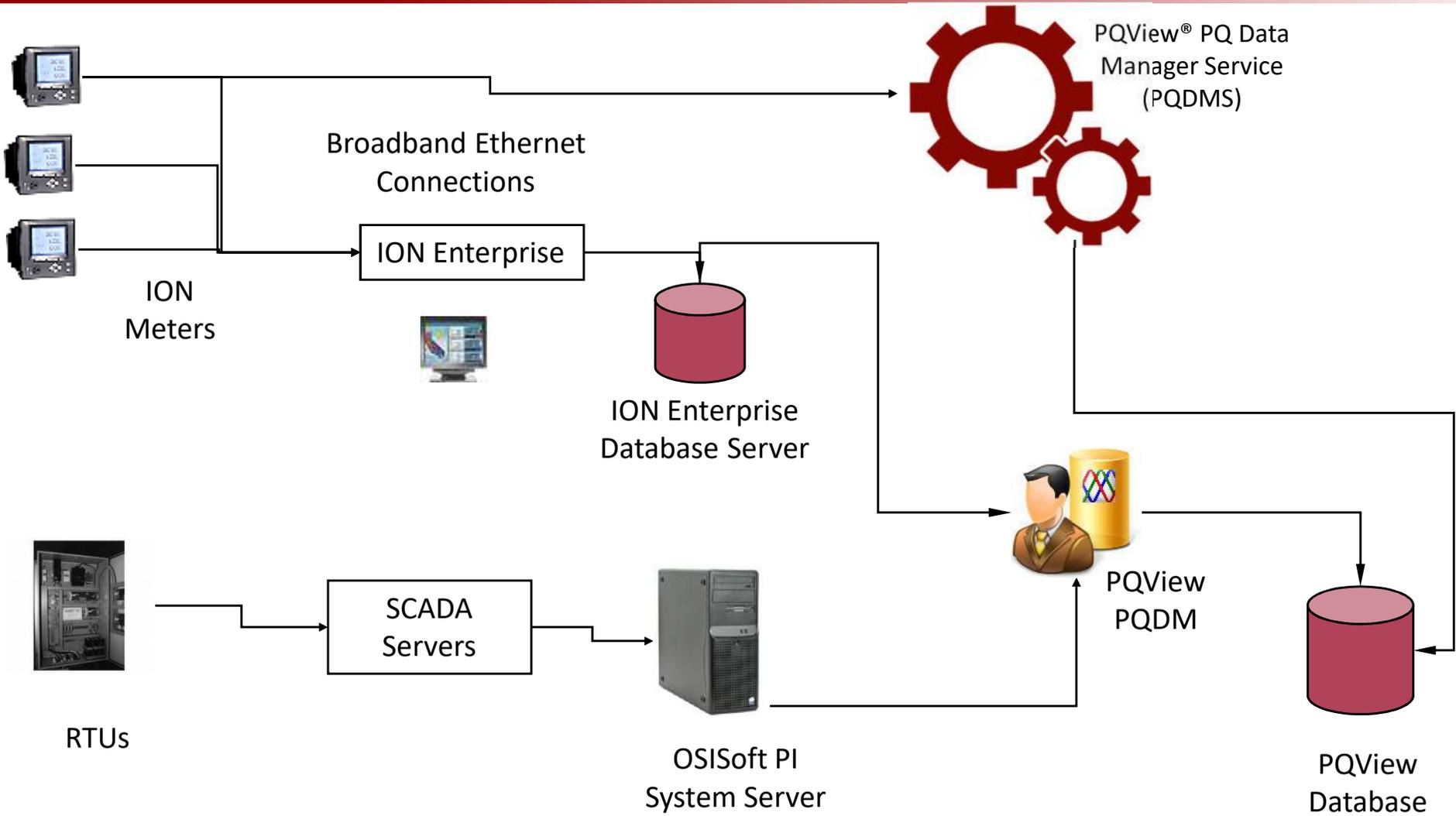


PQView PQDMS Download Capability

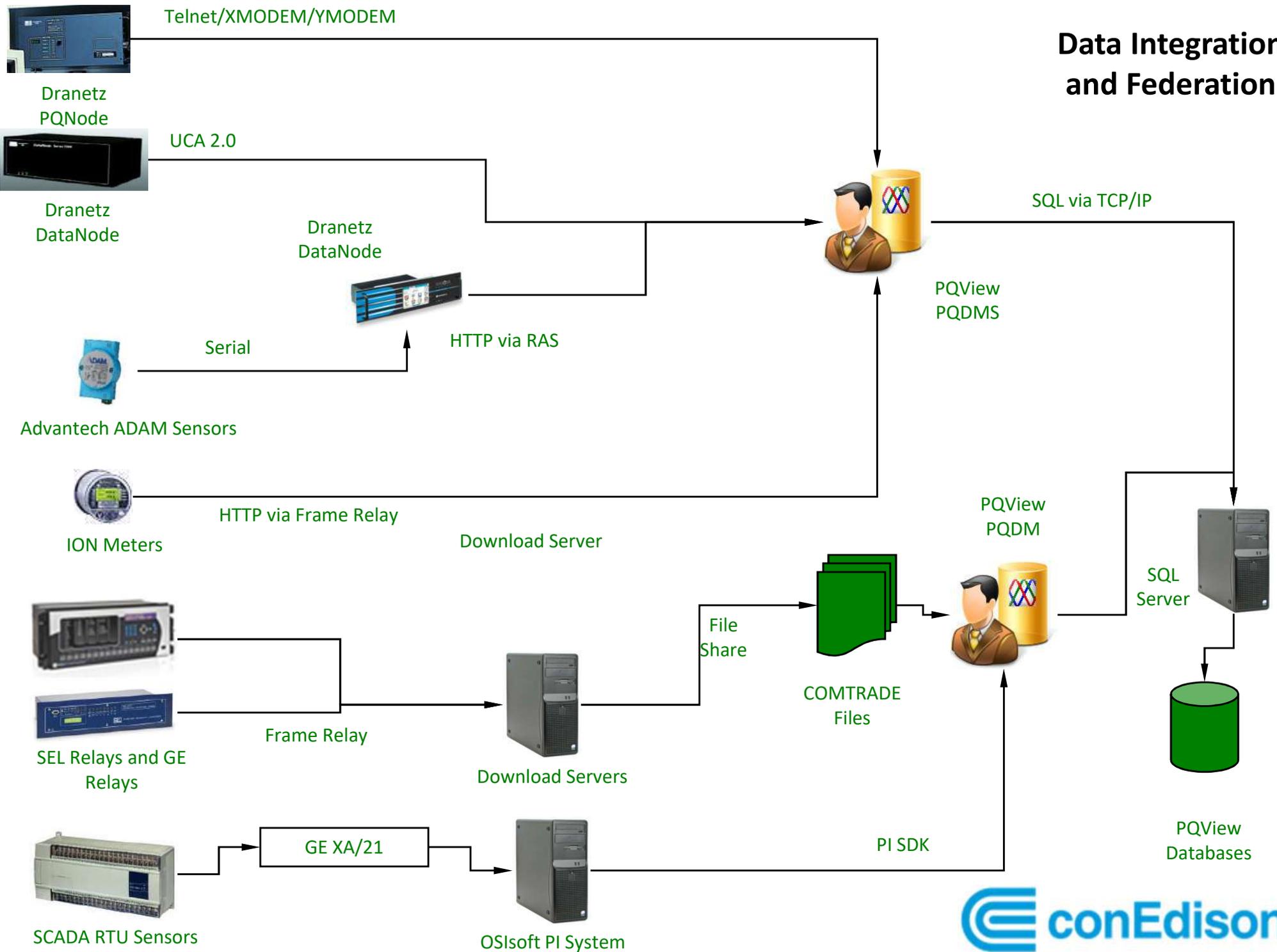


Company	Monitor	Real-Time Values			Data Download	Meter Setup
		Metering	Waveforms	Phasors		
Advantech® Corporation	ADAM Analog and Digital Modules	✓			✓	✓
Arbiter® Systems	Power Sentinel 1133A	✓		✓	✓	✓
GE®	KV Meter	✓			✓	✓
Dranetz®	DataNode® 5520, 5530, 5560, 5571, 61000, HDPQ, HDPQ SD	✓	✓	✓	✓	✓
Dranetz®	ES210, ES220, ES230, 5540	✓			✓	
Dranetz®	PQNode® 7100, PQNode® 8010, DataNode® 5571				✓	
MODBUS® Devices		✓			✓	✓
Power Standards Lab®	PQube® Classic, PQube® 3	2Q 2017			✓	
Rockwell Automation	I-Grid Website				✓	
Schneider Electric	ION and PME using ION Protocol	✓			✓	
Schweitzer Engineering Laboratories® (SEL)	Relays, Reclosers, Concentrators, and PQ Monitors				✓	

Data Integration at Large Utility



Data Integration and Federation



Current PQView Data Sources



- IEEE® Std 1159.3 PQDIF Files
- IEEE® Std 37.111 COMTRADE Files
- PQView® Database
- PQView® Text Files
- BTECH® Battery Validation Manager Database
- Cooper/CYME CYMDIST Network and Equipment Database
- Dranetz® ESS/InfoNode® Server
- Dranetz® PASS® Database or PASS Archive
- Dranetz® PES PQPager® 3100 Database
- Dranetz® PES PQNode® Database
- Dranetz® DDB File from Power Xplorer, PowerGuide, PowerVisa, or Energy Platform
- Eaton Power Xpert
- EDMI Multidrive Database
- Electro Industries/General Electric® Communicator Log
- Environment Canada
- Fluke®/RPM PAS Omega Database
- Fluke®/RPM Scenario Database
- Gossen Metrawatt MAVOSYS
- Gossen Metrawatt MAVOWATT
- GridSense PowerView CSV Folder
- HIOKI Hi-View Pro Text Files
- Landis+Gyr® MAXsys PRN Text File Folder
- NOAA Daily Geomagnetic Data
- OSIsoft® PI System
- Qualitrol® LEM Instruments QIS Database
- SATEC PAS Database
- Schweitzer Engineering Laboratories® (SEL) EVE Folder
- Schneider Electric® PEGASYS Database
- Schneider Electric® ION Enterprise® Database
- Schneider Electric® StruxureWare® Database
- Siemens® SIMEAS® Text File Folder
- Silver Spring Networks Export Folder
- SoftSwitching® I-Grid® Web Site
- Unipower PQ Secure Database
- ENTSO-E System Loads
- ERCOT System Loads
- IESO System Loads
- ISO-NE System Loads
- NYISO System Loads
- PJM System Loads
- Custom Databases

www.pqview.com/data-sources/

Login



Login



PQWeb Dashboard and Fault Location



Browser: PQWeb 4 | URL: pqweb4.electrotek.com

Navigation: Home | Views - | Real-Time - | Admin - | Help - | admin -

Start Pinging | 1 Database Selected

Events

Site Name	Date and Time	Type
Knowlville 61000 Delta	2017-01-26 10:40:03	Transient
Knowlville 61000 WYE	2017-01-26 09:54:41	Transient
Knowlville 61000 Delta	2017-01-26 09:54:41	Transient
Knowlville 61000 Delta	2017-01-26 07:57:38	Transient
Knowlville 61000 WYE	2017-01-25 16:00:08	Transient
Knowlville 61000 WYE	2017-01-24 18:04:21	Transient
Knowlville 61000 WYE	2017-01-23 11:36:23	Transient
Knowlville 61000 Delta	2017-01-23 11:36:23	Transient

Knowlville 61000 WYE - 1/26/2017 09:54:41.5630

Bechtel/EPRI | PQView® DEMO

Monitors

Name	Status	Health
AmbletDemo1	Inactive	Unknown
Beverly 61000	Idle	Normal
Knowlville 61000 Delta	Idle	Normal
Knowlville 61000 Wye	Idle	Normal
Knowlville ES210	Idle	Normal
Knowlville ES230	Idle	Normal

Electrotek CONCEPTS | EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Browser: KML Map | URL: pqweb4.electrotek.com/Views/KMLMap

Navigation: Home | Views - | Real-Time - | Admin - | Help - | admin -

KML Map

Demo Substation - 20051126T062532-1 | Submit

Electrotek CONCEPTS | EPRI | ELECTRIC POWER RESEARCH INSTITUTE

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Portions © 1993-2011 EPRI. All Rights Reserved. User Agreement.

Event List



Event Report List

1 Database Selected

Event List Options

Select Sites

Sites

Select Date Range

Last Seven Days with Data

Date Range

11/27/2016 2:01 PM

12/04/2016 2:01 PM

Select Report

Default Options

Submit

Charts

Select A

Show 25 entries

Search:

Site Name		Date and Time	Type	Minimum	Maximum	
Knoxville 61000 Delta		2016-12-04 09:00:44	Transient	-99.716%	98.949%	<input type="checkbox"/>
Knoxville 61000 Delta		2016-12-02 19:21:46	Transient	-90.221%	89.951%	<input type="checkbox"/>
Knoxville 61000 Delta		2016-12-02 19:21:46	Transient	-93.656%	97.327%	<input type="checkbox"/>
Knoxville 61000 Delta		2016-12-02 19:21:29	RMS Variation	64.251%	99.735%	<input type="checkbox"/>
Knoxville 61000 Delta		2016-12-02 19:21:29	Transient	-91.239%	95.067%	<input type="checkbox"/>
Knoxville 61000 Delta		2016-12-02 17:27:42	Transient	-103.495%	98.564%	<input type="checkbox"/>

Event List – Site Filtering



Event Report List 1 Database Selected

Event List Options

Select Sites: Select All Deselect All

Select Date Range:

Date Range:

- Beverly 61000
- Dabbs 61000
- Knoxville 61000 Delta
- Knoxville 61000 WYE

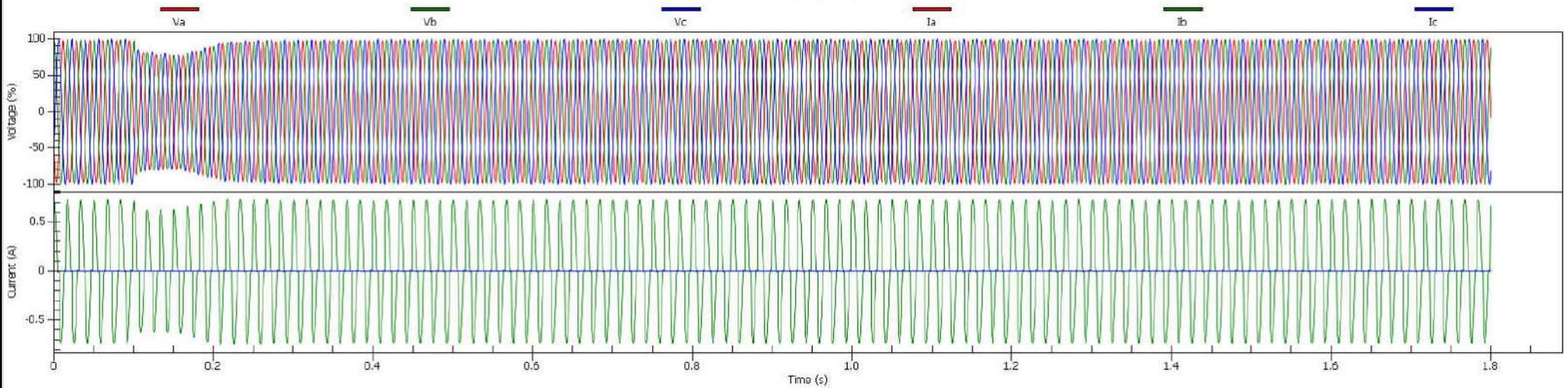
Show entries Search:

Site Name		Date and Time	Type	Minimum	Maximum	
Knoxville 61000 Delta		2016-12-04 09:00:44	Transient	-99.716%	98.949%	
Knoxville 61000 Delta		2016-12-02 19:21:46	Transient	-90.221%	89.951%	
Knoxville 61000 Delta		2016-12-02 19:21:46	Transient	-93.656%	97.327%	
Knoxville 61000 Delta		2016-12-02 19:21:29	RMS Variation	64.251%	99.735%	
Knoxville 61000 Delta		2016-12-02 19:21:29	Transient	-91.239%	95.067%	
Knoxville 61000 Delta		2016-12-02 17:27:42	Transient	-103.495%	98.564%	

Static Event Charts



Knoxville ION 8650 - 5/11/2016 07:06:16.8340

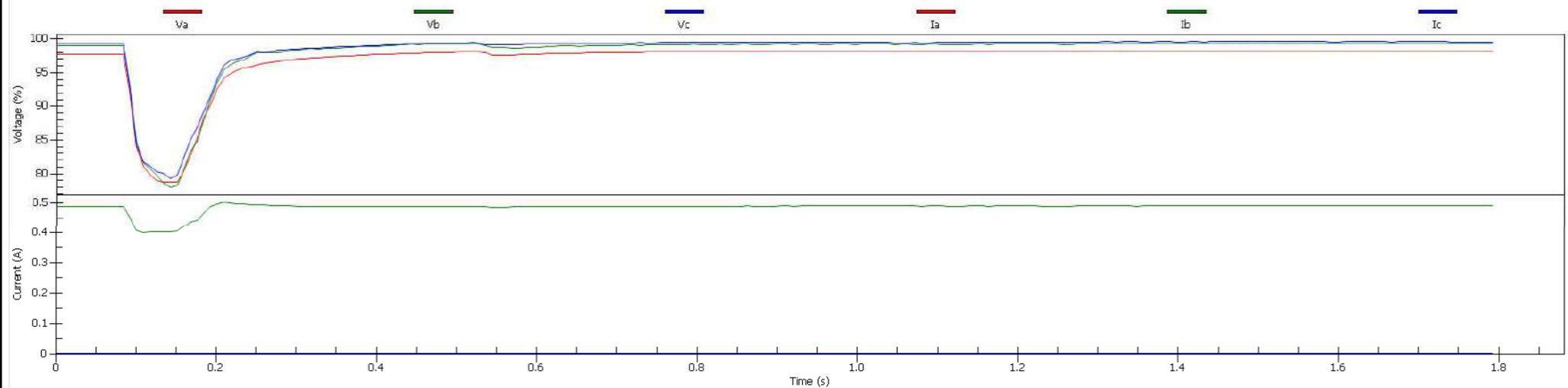


Electrotek/EPRI

PQView®

[Interactive Chart](#)

Knoxville ION 8650 - 5/11/2016 07:06:16.8340



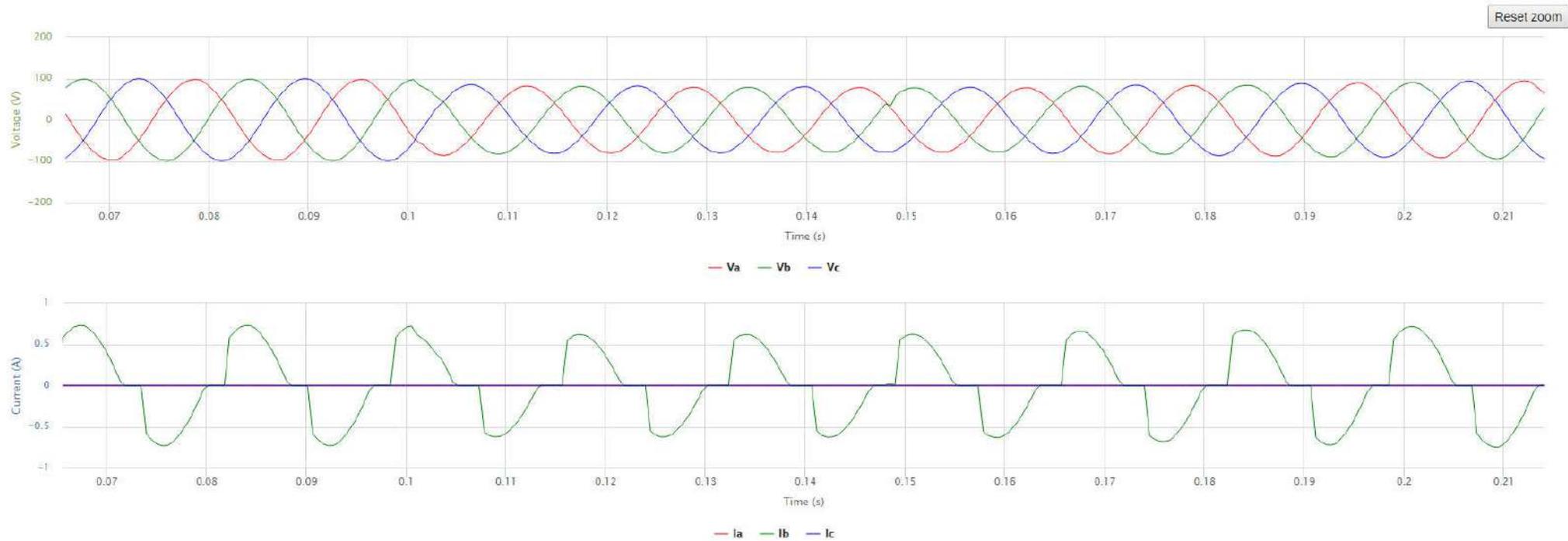
Electrotek/EPRI

PQView®

Interactive Event Charts – Waveforms



Knoxville ION 8650 - 5/11/2016 07:06:16.0000



Electrotek/EPRI

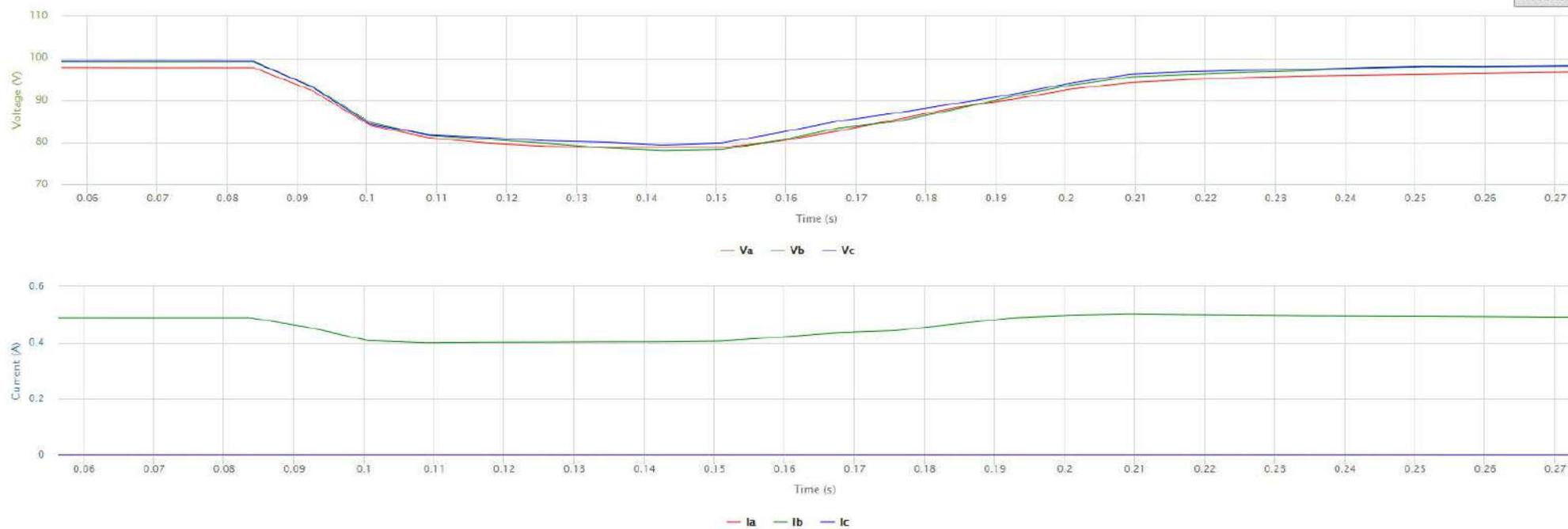
PQWeb®

Interactive Event Charts – RMS



Knoxville ION 8650 - 5/11/2016 07:06:16,0000

Reset zoom



Electrotek/EPRI

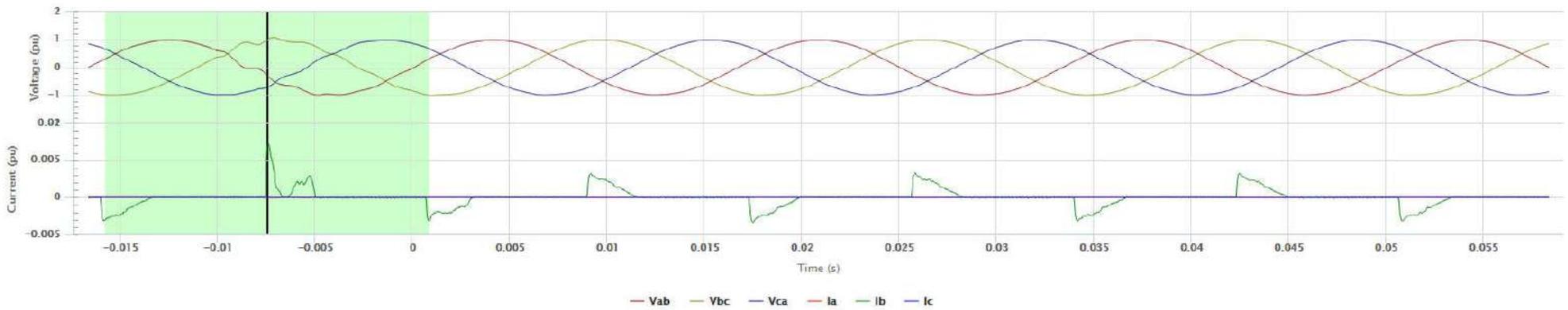
PQWeb®

Derived Charts



Event Chart

Knoxville 61000 Delta - 12/4/2016 09:00:44.8090



Electrotek/EPRI

PQWeb®

Derived Chart

Derived Chart Types

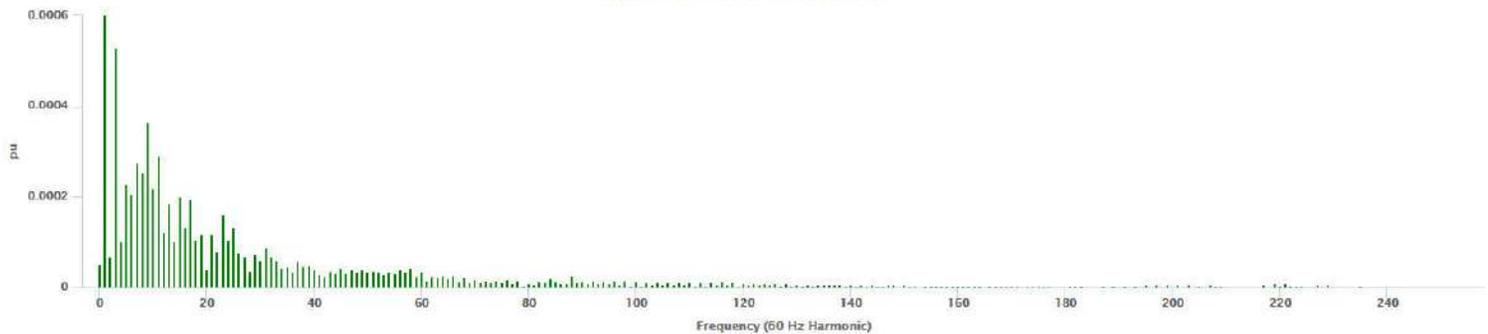
Spectrum from: 1-Cycle Window

Show Derived Chart

Knoxville 61000 Delta - 12/4/2016 09:00:44.8090

1-Cycle FFT Ib From -0.01578 To 0.0008677 s

RMS:	0.0013
Fund:	0.0008
DC:	0.0001
Max:	0.0073
Min:	-0.0032
CF:	5.4810
FF:	2.2010
THD Fund:	136.4%
THD RMS:	80.53%
HRMS:	0.0011
Phase Jump:	-0.236°



PQWeb® served.

Voltage Sag/Dip Map



Home Views Real-Time Admin Help



Sag Map

1 Database Selected

Select Sites

Select Interval

Date Range

Sites

24 hours

09/23/2008 12:00 AM

09/25/2008 12:00 AM

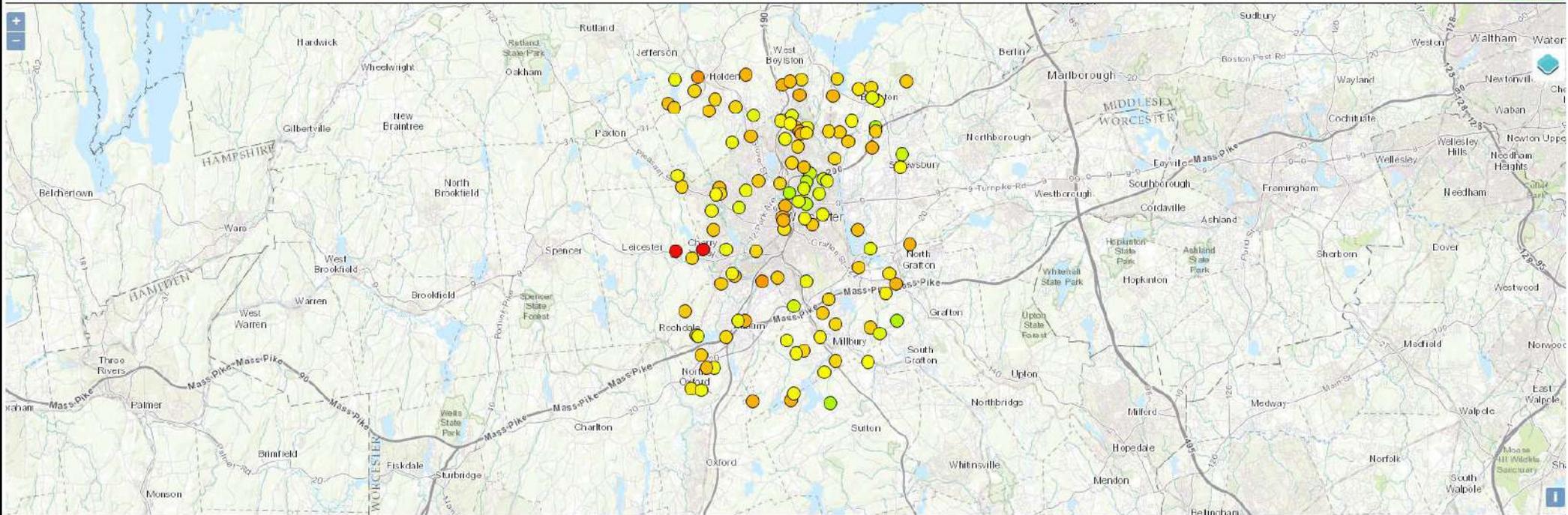
Start

Reset

2008/09/23 12:00:00 to 2008/09/24 12:00:00

Auto Zoom

Charts



Site Map



Home Views Real-Time Admin Help



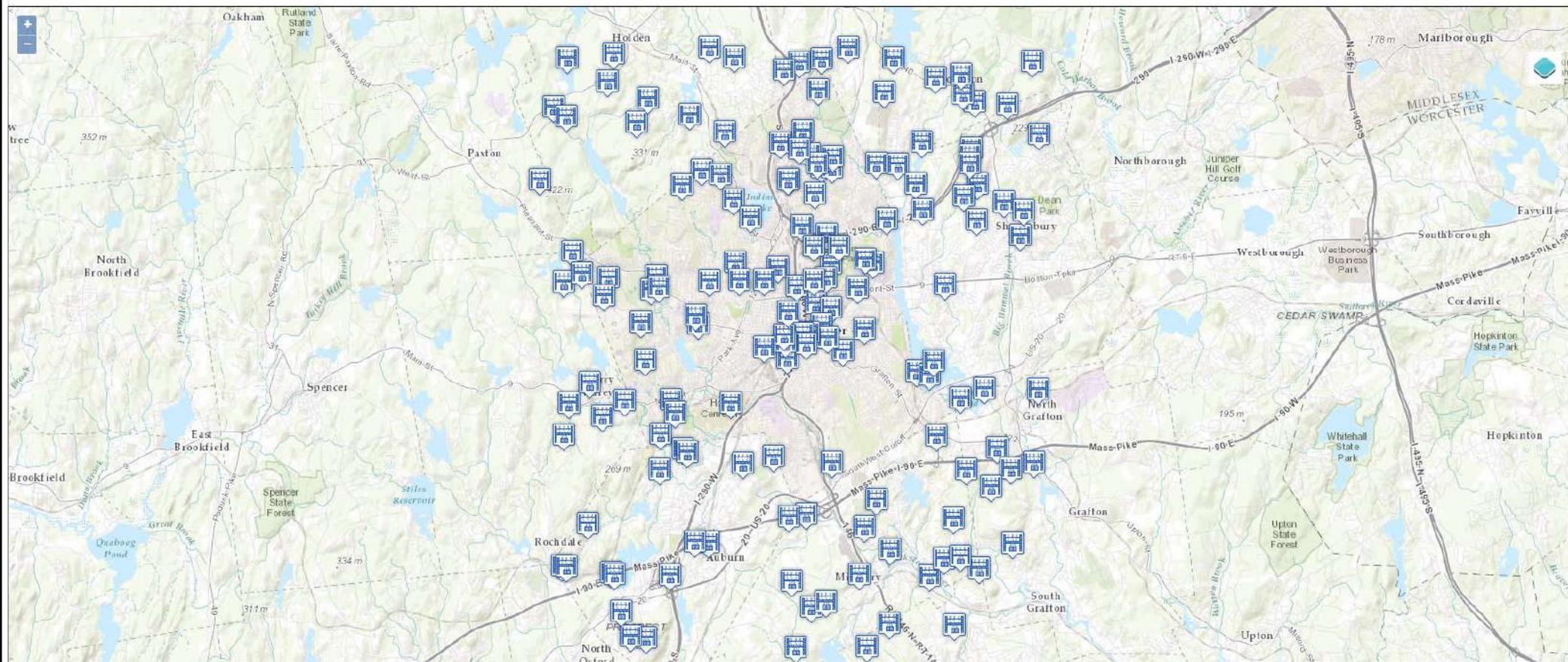
Sites Map

1 Database Selected



Sites

Submit



Data Logs – Site and Channel Selection



Home Views Real-Time Admin Help 1 Database Selected

Logs

Select Sites: 2 Sites Selected

Select Date Range: Last Seven Days with Data

Date Range: 09/21/2008 12:00 AM, 09/28/2008 12:00 AM

Channels: Deselect All Max 32 Sites

- Beverly 61000 ✓
- Dabbs 5530
- Dabbs 61000
- DabbsHDPQ
- Knoxville 61000 Delta ✓
- Knoxville 61000 WYE
- Knoxville ES210
- Knoxville ES230
- Knoxville ION 8650
- Monitor3
- SSHUB L61 ZHAM

Home Views Real-Time Admin Help 1 Database Selected

Logs

Select Sites: 2 Sites Selected

Select Date Range: Last Seven Days with Data

Date Range: 09/21/2008 12:00 AM, 09/28/2008 12:00 AM

Channels: Deselect All

- V RMS
- V RMS A ✓
- V RMS B ✓
- V RMS C ✓
- V RMS AB
- V RMS BC
- V RMS CA
- V RMS N

Data Log – Static Chart



Logs

1 Database Selected

Select Sites

2 Sites Selected

3 Channels Selected

Submit

Select Date Range

Last Seven Calendar Days

Date Range

05/16/2016 3:40 AM

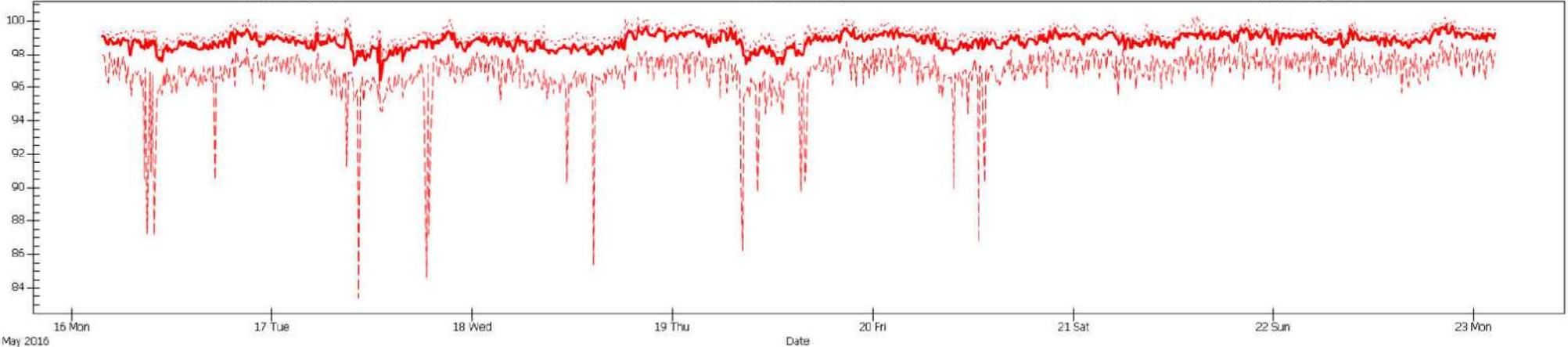
05/23/2016 3:40 AM

Beverly 61000 - V RMS A
From 5/16/2016 to 5/23/2016

Avg[V RMS A] (%)

Max[V RMS A] (%)

Min[V RMS A] (%)



Electrotek/EPRI

PQView®

Interactive Chart

Data Log – Interactive Chart



Data Log

Warning: Data has been automatically aggregated due to the Max Data Points preference (set under the Chart sub-tab).

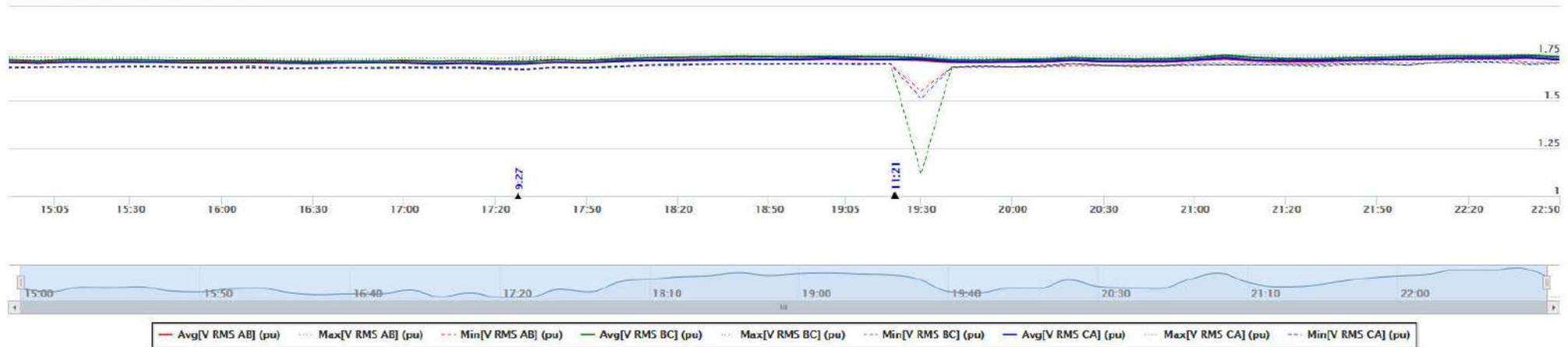
Event Tick Marks

All Events

Knoxville 61000 Delta – V RMS AB, V RMS BC, V RMS CA

From 12/2/2016 to 12/2/2016

Zoom 1m 5m 10m 20m 30m 1h All



Electrotek/EPRI

PQWeb®

Real-time Meter Data



Real-Time

Meter Panel Phasor Plot Scope Mode Trend Chart

Select All

Show 25 entries

Search:

Name	Description	Device Type	Status	Health	Last Poll	Next Poll	
Beverly 61000		61000 PQ	Idle	Normal	2016-12-06 13:00:00.017	2016-12-06 13:05:00.000	<input type="checkbox"/>
Knoxville 61000 Delta		61000 PQ	Downloading data	Normal	2016-12-06 13:00:00.046	2016-12-06 13:01:00.000	<input type="checkbox"/>
Knoxville 61000 Wye		61000 PQ	Idle	Normal	2016-12-06 13:00:00.003	2016-12-06 13:02:00.000	<input type="checkbox"/>
Knoxville ES210		ES210/ES220	Idle	Normal	2016-12-06 13:01:00.004	2016-12-06 13:02:00.000	<input type="checkbox"/>
Knoxville ES230		ES230	Idle	Normal	2016-12-06 13:01:00.023	2016-12-06 13:02:00.000	<input type="checkbox"/>
Knoxville ION 8650	Test ION Meter	ION	Idle	Normal	2016-12-06 13:00:00.045	2016-12-06 14:00:00.000	Not Supported
Monitor1		Modbus	Inactive	Unknown			Not Supported
Station 1 SEL-735	Bus 1	SEL Relay	Inactive	Unknown			Not Supported
Todds 61000	Just another test.....	61000 PQ	Inactive	Unknown	2015-10-29 15:24:00.109		Not Supported

Showing 1 to 9 of 9 rows

Previous 1 Next

Meter Panel Phasor Plot Scope Mode Trend Chart

Select All

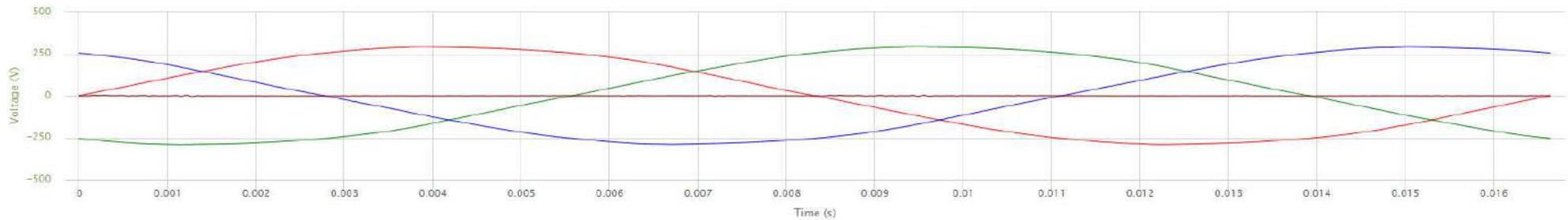
Real-time Meter Data – Scope Mode



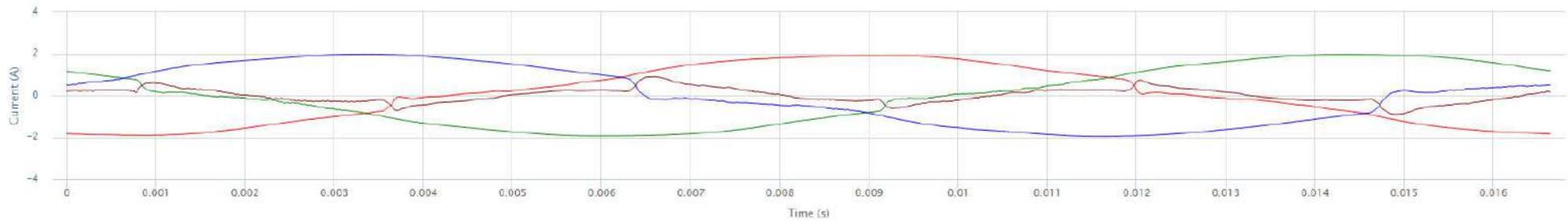
Scope

Polling Interval

Knoxville 61000 Delta - 2016-05-23 08:05:13.614000



— Voltage AB — Voltage BC — Voltage CA — Voltage N



— Current A — Current B — Current C — Current N

Real-time Meter Data – Phasor Plot



Home Views Real-Time Admin Help



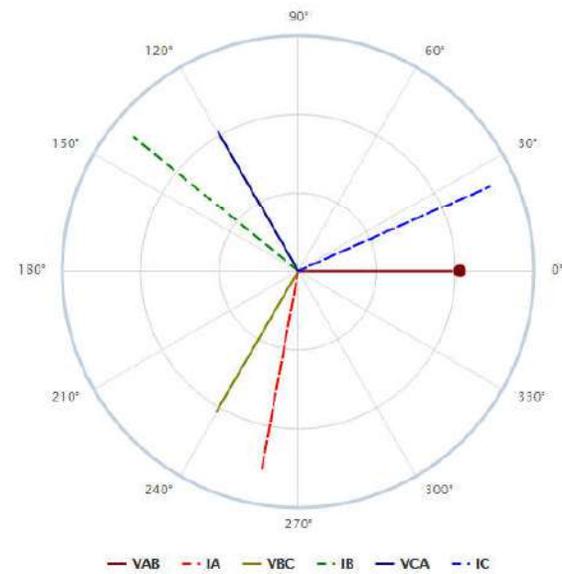
Phasor Plot Refresh

Polling Interval 30

Start Polling

Knoxville 61000 Delta

VAB	206.398	0.003229°
IA	1.28469	-100.442°
VBC	207.44	-120.28°
IB	1.35429	140.655°
VCA	205.741	119.79°
IC	1.3385	23.9331°
Zero Sequence Voltage		0.22342
Zero Sequence Current		0.05143
Positive Sequence Voltage		206.483
Positive Sequence Current		1.31465
Negative Sequence Voltage		0.807832
Negative Sequence Current		0.0099
V Unbalance (S2/S1)		0.391225
I Unbalance (S2/S1)		0.753205
V Unbalance (S0/S1)		0.108203
I Unbalance (S0/S1)		3.91203



Real-time Meter Data – Trend Chart



Home Views Real-Time Admin Help

3 Channels Selected Max 16 Channels

Polling Interval 5 Start Polling

Knoxville 61000 Delta

- Rms Voltage AB ✓
- Rms Voltage BC ✓
- Rms Voltage CA ✓
- Rms Current A
- Rms Current B
- Rms Current C
- Active Power Total
- Fundamental Reactive Power Total
- Apparent Power Total
- Frequency AB
- VA (Arithmetic) Total
- VA (Vector) Total
- Fundamental VA (Arithmetic) Total
- Fundamental VA (Vector) Total
- True PF (Arithmetic) Total
- True PF (Vector) Total
- DPF (Arithmetic) Total
- DPF (Vector) Total
- Rms Current Residual
- Rms Current Net
- Positive Sequence Voltage Total
- Negative Sequence Voltage Total
- Zero Sequence Voltage Total

PQWeb®

Real-time Meter Data – Trend Chart



Home Views Real-Time Admin Help



3 Channels Selected

Polling Interval 5

Start Polling

Knoxville 61000 Delta



Electrotek/EPRI

PQWeb®

Export Table Data

Try it yourself!



<http://pqweb4.electrotek.com>

Login: pqtester

Password: pq4test