

2000 - Present

Christopher J. Melhorn

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Summary of Qualifications

EPRI PEAC Corporation

Knoxville, Tennessee

Engineering Manager

January 2001 – Present

I currently manage EPRI's Program 1, Power Quality Tools and Testing program as well as EPRI PEAC's power quality and energy monitoring program. I am responsible for the coordination of proposals and projects for both U.S. and international clients. I oversee the work of six engineers and I am responsible for developing their work load and forecasting future projects.

Major research projects include:

- CLP Power – Performed research for CLP Power in Hong Kong. Research included the review of their current measurement system and the specification of a new measurement system.
- DPQ Phase II – Project involves the coordination of 13 utilities and their power measurement data. Data will be collected from the participating utilities, analyzed, and presented in a technical report.
- Power Quality Reliability Centered Maintenance (PQRCM) – Project involves the development of specialized algorithms for detecting and reporting anomalies in power measurement data. Data is used for predictive maintenance on power systems and end use facilities.

In addition, I am the lead developer and content provider for EPRI PEAC's Program 97 Web site, www.mypq.net.

Sr. Power Quality Engineer

June 2000 – January 2001

As a senior member of the EPRI PEAC staff I am responsible for the coordination and writing of proposals, providing technical support to engineers and lab technicians, providing consulting services for clients.

My major areas of research include power quality monitoring and monitoring and controlling distributed resources via the World Wide Web.

Major research projects include:

- Residential Power Quality – This project focuses on the methodology used to perform power quality monitoring at residential facilities. Information on monitor type, site selection, and data analysis are addressed.
- Transmission Power Quality – This project focuses on three methodologies that can be used to determine power quality levels on transmission systems. Through the use of system modeling, system monitoring, and state estimation, power quality levels are determined.
- TOM-PI – This project, for a major utility in the Southeast, focuses on data mining and data integration. Approximately 12 databases are brought together in one concise format to offer a plethora of information to system operators, engineers, and managers.

1990 - 2000

Electrotek Concepts, Inc.

Knoxville, Tennessee

Manager, Power Quality Products & Services

April 1998 – May 2000

I served as the manager of the Power Quality Products & Services department for Electrotek Concepts, Inc. In this role, I was responsible for developing new products and services for the Electrotek Systems group. Electrotek Systems, a new group formed as a result of the restructuring of Electrotek Concepts, Inc., focuses on supplying Utilities and Large Industrial & Commercial end-users with state-of-the-art monitoring systems and services.

In this new role, I was responsible for developing, marketing, and implementing systems and services for customers. The main focus of this business area was the use of the World Wide Web for gathering, transferring, and visualizing power quality monitoring data.

Major development projects included:

- WebPES – The Internet version of the Dranetz-BMI Power Evaluation Software (PES) used for controlling the Dranetz-BMI line of power quality analyzers.
- WebPASS – The Internet version of Electrotek’s PQNode Application and System Software (PASS). PASS is used in conjunction with the Dranetz-BMI 8010 & 8020 PQNodes.
- Monitoring Service – Electrotek System’s Monitoring Service was developed to offer customers power quality monitoring at a minimal cost. Electrotek downloads the data and makes it available on a secure server via the Internet for customer viewing and analyzing. The data is stored on a password-protected site located at <http://www.pqmonitoring.com>.

Manager, Industrial & Utility Studies

October 1996 – April 1998

As the manager for the industrial and utility power system study effort at Electrotek, I was responsible for developing marketing strategies, coordinating proposals and studies, coordinating personnel requirements, and developing and supporting seminars. I oversaw two engineers and coordinated their work efforts. I offered technical support to new engineers on site survey procedures, power quality monitoring, and data analysis.

I also had the responsibility of overseeing Electrotek’s marketing functions including Electrotek’s World Wide Web site. The majority of these tasks are performed by a marketing and communication specialist, which reported directly to me.

Projects included:

- Serving as project manager for power quality monitoring project for Con Edison. This project involves the installation of 80 monitors on the Con Edison network in Manhattan, New York.
- Serving as project manager for the Precise Power motor-generator set for Con Edison. This project involves the installation of a written-pole motor-generator set for voltage sag ride through in customer facilities.
- Serving as project manager for the Electric Power Research Institutes (EPRI) Adjustable Speed Drive (ASD) effort. This project involves working with EPRI project manager to develop new projects that advance power systems by using power electronics.
- Serving as the principal engineer for Electrotek on the EPRI Power Quality Diagnostic System Event Recognition Module.
- Serving as principal engineer for Electrotek on the EPRI PQ ToolBox Wiring and Grounding Module.

Manager, Industrial & Commercial Studies

March 1996 - October 1996

Duties included developing marketing strategies, coordinating proposals and studies, coordinating personnel requirements, and developing and supporting seminars. Responsibility for overseeing one engineer and one engineering technician and coordinating their work efforts.

Supervisor, Industrial Applications

February 1993 - March 1996

Duties included developing marketing strategies, coordinating proposals and studies, coordinating personnel requirements, and developing and supporting seminars. Responsibility for overseeing one engineer and one engineering technician and coordinating their work efforts.

- Characterizing voltage sag concerns for two Pennsylvania Power and Light (PP&L) customers. This project involves monitoring on the PP&L distribution system and in the customer facility. Also, the project evaluates different energy storage techniques that allow critical loads to ride through voltage sags.
- Served as project manager for the development of a monitoring program for Zapadoslovenske energeticke zavody (ZSE) in the Slovak Republic. This project involves monitoring at transmission level substations and industrial customer service entrances.
- Writing training manuals and assisting in the design and implementation of a Power Quality program for East Midlands Electricity in Nottingham, England.

Power Systems Engineer

February 1991 - February 1993

Duties included performing power quality case studies for EPRI, utility, industrial, and commercial customers. These case studies involved site surveys, power quality measurements, and simulations using SuperHarm and the EMTP. Example case studies included work for Consolidated Edison Company of New York, Pennsylvania Power and Light, Pacific Gas and Electric, The New York *Times*, and CRS Sistine Engineers.

Other duties included developing and teaching power quality seminars, testing of newly developed software, continued support for network and telephone system, proposal writing, and project management.

Developed Electrotek's customer database and was responsible for coordinating all work performed on database.

Associate Power Systems Engineer

February 1990 - February 1991

Duties included the site selection process, installation of monitors, data collection, and data processing for the EPRI Distribution Power Quality (DPQ) project, RP-3098-1. Writing of manuals for various software packages like: TVPPA's SkyLine; Electrotek's Harmoni; Square D's PLSM; EPRI's EMTP and EMTPOUT. Other duties included system administrator for printing network and Merlin telephone system.

1989 - 1990

Bechtel Company

Pottstown, Pennsylvania

Electrical Engineer

Served as an electrical engineer in the Limerick Nuclear Power Plant. Duties involved updating drawings for the plant to agree with as-built conditions and to specify the correct design if the as-built condition was not acceptable. The work was performed during the start-up phase of the power plant.

1989

Pennsylvania Power & Light Company

Harrisburg, Pennsylvania

Engineer (co-op Student)

Undergraduate work at Penn State included a co-op with Pennsylvania Power and Light Co. (PP&L) in Harrisburg, PA. This work for PP&L included the design of a monitoring procedure to evaluate the harmonic levels on five of PP&L's radial distribution feeders. The project included design of a monitoring system, actual field measurements, computer simulations using both V-HARM and HARMFLO, and analysis of the results.

1983 - 1989

Industrial Electric Company of York Pennsylvania, Inc.

York, Pennsylvania

Supervisor

Responsibilities included the re-design of electrical apparatus such as induction motors and small transformers and management of the engineering office. Also, I oversaw the repair and rebuilding of electrical equipment and new construction work. This included scheduling the work for two other employees and inventory control.

Education

1987 - 1989

Pennsylvania State University *Middletown, Pennsylvania*

Bachelor of Science Degree

Major - Electrical Engineering Technology

1984 - 1986

York College of Pennsylvania *York, Pennsylvania*

Associate of Science Degree

Major - Engineering

Computer Skills

Operating Systems

MS-DOS, OS/2, Windows 95 / NT.

Software

Microsoft ® Windows. MS Word, MS Excel, MS PowerPoint, MS Access, Word Perfect, CAD programs for Windows, HTML, JAVA.

Languages

Visual Basic, Visual Basic for Windows, Visual Interdev, Quick Basic, Access Basic.

Internet Languages

HTML, ASP, Cold Fusion, Java, and Java Script.

Software Development

TVPPA SkyLine Software for Windows. Part of development team at Electrotek Concepts, Inc. Validated algorithms and functionality of software. Wrote the User's Manual and the Help system for the software.

PowerLogic System Manager Software for Square D Circuit Monitor. Part of development team at Electrotek Concepts, Inc. Tested beta and final versions of software and wrote initial version of User's Manual.

The EMTP Workstation (Windows Version). Developed workstation to facilitate batch mode processing of the electromagnetic transient program (EMTP) data files. Wrote the User's Manual and the Help system for the software.

The EMTPOUT Software for OS/2. Part of development team at Electrotek Concepts, Inc. Software was developed for visualization of output and PL4 files from the EMTP. Tested beta and final versions of software and wrote the User's manual for the software.

FlukeView™ Software for Fluke 97 and Fluke 41 Meters. Developed original version of FlukeView™ for the Fluke 97 Scopemeter®. Received contract with Fluke to add enhancements to FlukeView™ for the Fluke 97 and develop new software for the Fluke 41.

EPRI Power Quality ToolBox - Wiring and Grounding Tool. Designed and developed application. Developed miscellaneous applets for use by Electrotek engineers. Applets included: simple harmonic resonance calculation software, Square D's "Motor Data Calculator", K-Factor Calculation and transformer derating.

Developed customized reports for Electrotek's PQView™ software package. PQView™ is used to analyze power quality data from various monitoring instruments. PQView™ is Microsoft® Access database program.

Web Pages

I developed and maintain several web pages for EPRI PEAC, Electrotek, other organizations, and personal use.

Professional Web Sites

- RemotePQ.com – <http://www.remotepq.com>. This web site is used to provide a monitoring service for clients of EPRI PEAC Corporation.
- Distribution Harmonics – <http://www.distributionharmonics.com>. This web site is used to disseminate information about a particular project. The site also contains several analysis tools written in Java Script.
- PQMonitorin.Com – <http://www.pqmonitoring.com>. I developed and maintained this web site. I supplied all content for this site as well as designed and wrote all HTML and Cold Fusion for the site.
- Electrotek Systems – <http://www.electroteksystems.com>. This site contains information about the Electrotek Systems Group at Electrotek Concepts, Inc. I developed and maintained this site.
- IEEE P1100 Emerald Book Site – <http://grouper.ieee.org/groups/ias/1100/>. This site is currently under development. I am the secretary for the P1100 Working Group in the IEEE. One of my functions is to develop and maintain a web site that allows the dissemination of information to working group member.

Personal Web Sites

- Executive Accessories – <http://www.executiveaccessories.com>. This is a web page where I sell handcrafted items that I make.
- Custom Tampers – <http://www.customtampers.com>. This is a web page where I sell handcrafted pipe tampers and pipes that I make.
- Melhorns.Com – <http://www.melhorns.com>. This is a personal web page that houses information about my family, professional career, and hobbies.
- Troop125.net – <http://www.troop125.net>. This web page is used to disseminate information to scouts, parents and leaders of Boy Scout Troop 125 in Knoxville, Tennessee.

Professional Memberships

Senior Member, Institute of Electrical and Electronics Engineers (IEEE)
Chairman, IEEE IAS Power Quality Sub-Committee
Secretary, IEEE IAS Emerald Book, IEEE Std. 1100-1999
Chapter 3 Chairman, IEEE IAS Emerald Book, IEEE Std. 1100-1999
IEEE Power System Engineering Committee
IEEE Power System Engineering Design Sub-Committee
IEEE Standards Coordinating Committee 22 Power Quality
IEEE Project 1346 Working Group
IEEE IAS Power Quality Sub-Committee
IEEE 519 Application Guide Task Force

Additional Professional Activities

Currently involved in setting up the “Smoky Mountain Power Quality Interest Group”.

Actively attend IEEE PES and IAS annual meetings.

Publications

Melhorn, Christopher J., Thomas Levitsky, "Does Your Watt-hour Meter Play the Harmonic(a)?", IEEE Student Paper Contest, third place Region 2, 1989.

Markel, L.C., C.J. Melhorn, S.R. Williams, H. Mehta, Design of a Measurement Program to Characterize Distribution Power Quality. Proceedings: 12th International Conference on Electricity Distribution (CIRED'93), Birmingham, England, May 1993.

Beam, G.E., E.G. Dolack, C.J. Melhorn, V. Misiewicz, M. Samotyj, "Power Quality Case Studies Voltage Sags; The Impact on the Utility and Industrial Customers", PQA93 Conference, San Diego, California, November 1993.

Schwabe, R.J., C.J. Melhorn, M. Samotyj, "Effect of High Efficiency Lighting on Power Quality in Public Buildings", PQA93 Conference, San Diego, California, November 1993.

Schwabe, R.J., C.J. Melhorn, "Commercial Building Harmonics - Impact of Electronic Ballasts", 1994 IEEE PES Winter Power Meeting, Panel Session on Harmonics, New York, New York, January 1994.

Tang, Le, Christopher J. Melhorn, "Operational and Harmonic Concerns Associated with a Semiconverter", 1994 IEEE IAS Rubber and Plastics Conference Record, Akron, Ohio, April 1994.

Melhorn, Christopher J., Peter Hofmann, Aubrey Braz, Marek Samotyj, "Characterization of Power Quality Problems Associated with Large Commercial Customers Served from Large Underground Distribution Network Systems", 1994 IEEE IAS Industrial and Commercial Power Systems Conference Record, Irvine, California, May 1994.

Melhorn, Christopher J., Le Tang, "Effects of PWM ASDs on Standard Squirrel Cage Induction Motors", 1994 Power Quality/PCIM Conference, Dallas, Texas, September 1994.

Schwabe, R.J., Z. Zelingher, T. Key, K. Phipps, C.J. Melhorn, S. Williams, "Electromagnetic Susceptibility of Electronic Devices to High Efficiency Electronic Lighting", PQA94 Conference, Amsterdam, Netherlands, October 1994.

Melhorn, Christopher J., Mark McGranaghan, "Interpretation and Analysis of Power Quality Measurements", 1995 IEEE/IAS Textile, Fiber and Film Conference, Charlotte, NC, May 3-4, 1995.

Braz, Aubrey, Peter Hofmann, Ralph Mauro, Christopher J. Melhorn, "An Evaluation of Energy Storage Techniques for Improving Ride-Through Capability for Sensitive Customer on Underground Networks", PQA 95 Conference, New York, New York, May 8 - 11, 1995.

Davis, Tim, George Beam, Christopher J. Melhorn, "Voltage Sags: Their Impact on the Utility and Industrial Customers", PQA 95 Conference, New York, New York, May 8 - 11, 1995.

Melhorn, Christopher J., Le Tang, "Transient Effects of PWM Drives on Induction Motors", 1995 IEEE/IAS Industrial and Commercial Power Systems Conference Records, San Antonio, Texas, May 7 - 11, 1995.

Melhorn, Christopher J., Mark McGranaghan, "Interpretation and Analysis of Power Quality Measurements", 1995 PCIM/PQ Conference, Long Beach, CA, September 10-15, 1995.

Melhorn, Christopher J., Le Tang, "Transient Effects of PWM ASDs on Standard Squirrel Cage Induction Motors", 1995 IEEE IAS Annual Technical Conference, Orlando, FL, October 8-12, 1995.

Melhorn, Christopher J., R.J. Schwabe, M. Samotyj, "Effect of High Efficiency Lighting on Power Quality in Public Buildings", 1995 IEEE IAS Annual Technical Conference, Orlando, FL, October 8-12, 1995.

Sabin, D.D., T.E. Grebe, C.J. Melhorn, A. Sundaram, "Distribution Power Quality Measurement Program." 48th Power Distribution Conference, Austin, Texas, October 1995.

Melhorn, Christopher J., "Coping With Non-Linear Computer Loads in Commercial Buildings - Part I", *emf-emi control* Volume 2, Number 5, September/October, 1995.

Melhorn, Christopher J., Mark F. McGranaghan, "Interpretation and Analysis of Power Quality Measurements", IEEE Transactions in Industry Applications, Volume 31, Number 6, November/December 1996, Pages 1363 - 1370.

Melhorn, Christopher J., "Coping With Non-Linear Computer Loads in Commercial Building - Part II", *emf-emi control* Volume 2, Number 6, January/February, 1996.

Melhorn, Chris, Aubrey Braz, Peter Hofmann, Ralph Mauro, "An Evaluation of Energy Storage Techniques for Improving Ride-Through Capability for Sensitive Customers on Underground Networks", IEEE IAS I&CPS Technical Conference, New Orleans, LA, May 1996.

Davis, Tim, George Beam, Christopher J. Melhorn, "Voltage Sags: Their Impact on the Utility and Industrial Customers", IEEE IAS I&CPS Technical Conference, New Orleans, LA, May 1996.

Melhorn, Chris, Pete Hofmann, Kelley Flatford, Sid Bhatt, "Accessing Power Quality Information and Monitoring Results Using the World Wide Web or a Private Corporate Web", EPRI PQA March 1997, Columbus Ohio.

Melhorn, Christopher J., Le Tang, "Transient Effects of PWM Drives on induction Motors," IEEE Transactions on Industry Applications, Volume 33, Number 4, July/August 1997, Pages 1065 - 1072.

Melhorn, Christopher J., Aubrey Braz, Peter Hofmann, Ralph Mauro, "An Evaluation of Energy Storage Techniques for Improving Ride-Through Capability for Sensitive Customers on Underground Networks", IEEE Transactions on Industry Applications, Volume 33, Number 4, July/August 1997, Pages 1083 - 1095.

Melhorn, Chris, "Flickering Lights — A Case of Faulty Wiring," PQToday, Volume 3, Number 1, Page 4, August 1997.

Melhorn, Christopher J., Peter Hofmann, Frank Sinicola, Ben Banerjee, "Evaluating Written-Pole Motor Generator Technology for Providing Voltage Sag Ride Through," 1998 EPRI PQA Conference, Phoenix, Arizona, June 1998.

Hofmann, Peter, Frank Sinicola, & Christopher J. Melhorn, "Power Quality: Opportunity or Obstacle?" 1998 EPRI PQA Conference, Phoenix, Arizona, June 1998.

Melhorn, Christopher J., Sandy Smith, Peter Muccio, Frank Sinicola, "Utilization of Web-based Power Quality Monitoring to Access Customer Power System Performance," DistribuTech 1999, San Diego, California, February 1999.

Bell, Sandra C., Mike Ingram, Daniel Rubia, Ramon Saenz, Harry Simpson, Christopher J. Melhorn, John Harding, "Application of Power Quality Monitoring Data for Predictive Maintenance," PQA 2001, Pittsburgh, Pennsylvania, June 2001.

Melhorn, Christopher J., Mark Stephens, "Remote Monitoring and Control of Distributed Resources," PQA 2001, Pittsburgh, Pennsylvania, June 2001.

Melhorn, Christopher J., et al, "Distribution System Power Quality Assessment Phase II: Voltage Sags and Interruption Analysis," PQA 2004, Long Island, New York, May 2004.

Sunderman, Wes, Christopher J. Melhorn, Fred Elmendorf, Dan Sabin, "Automated Detection of Voltage Unbalance Conditions," PQA 2004, Long Island, New York, May 2004.

Santoso, Surya, Christopher J. Melhorn, "Automatic Evaluation of Capacitor Bank Concerns Using a PQ Monitoring System," PQA 2004, Long Island, New York, May 2004.

Books

I was a contributing author, Electrical Power Systems Quality, Dugan, R. C., Mark F. McGranaghan, H. Wayne Beaty, McGraw-Hill: Chapter 8 – Monitoring Power Quality.

I was a contributing author, Encyclopedia of Electrical & Electronics Engineering, John Wiley & Sons: Chapter on Multimeters.

I was a contributing author, The Electrical Power Engineering Handbook, CRC Press, 2000, Chapter on Wiring and Grounding.

Presentations and Seminars – Developed & Presented**Introduction to Power Quality**

2/18/92	Con Edison / CRSS	10/23/92	Con Edison
11/14/92	Puget Power	11/17/94	Gulf States
11/18/92	Gulf States	1/27/94	Montana Power
7/13/94	PS&G	5/12/94	United Illuminating
5/13/94	United Illuminating	6/22/94	Con Edison
11/14/94	Con Edison	12/6/94	Snohomish
12/12/94	Con Edison	4/25/95	Snohomish
01/30/96	TTN Czech Republic	4/21/96	Con Edison
06/02/98	USPS PdM Conference	02/14/00	Ford - EcoStar

Advanced Power Quality

10/25/94	GPU York	10/28/94	GPU Easton
11/15/94	Con Edison	11/16/95	Con Edison
4/23/96	Con Edison (Harmonics)	4/22/97	Con Edison
4/27/98	Con Edison	4/27/99	Con Edison
02/14/00	Ford – EcoStar	05/02/00	Con Edison
04/18/01	BENCO	10/25/01	Advanced PQ Monitoring Workshop
03/26/02	Alabama Electric Cooperative	9/20/2004	Advanced PQ Seminar

Training (EMTP, PQView, PASS, and Monitoring)

11/12/92	Puget Power	10/13/94	Con Edison
2/28/95	Con Edison	10/5/95	Duke Power Trade Show
10/20/95	In House	4/16/96	In House
4/22/96	Con Edison	5/28/96	Georgia Power
12/10/96	ZSE Slovakia Monitoring	4/23/98	Con Edison
4/28/99	Con Edison	04/18/00	Allegheny Power
10/01/00	PQ Interest Group		

Special Talks

12/05/94	Music City Power Quality Group	12/05/95	Delaware Valley Power Quality Group
05/06/96	IEEE IAS Panel Inter-harmonics	05/24/95	CIA PQ Conference
05/26/95	Power Quality Square D	10/06/96	IEEE IAS Harmonics Tutorial
01/30/97	IEEE PES Talk Princeton, NJ	03/03/97	EPRI PQA Wiring & Grounding Tutorial
03/10/98	AEP PQ Workshop	08/04/98	Music City Power Quality Interest Group
08/18/98	OG&E Power Monitoring Mtg.	10/01/98	South Dakota Rural Electric Association
10/05/98	OPAC Fall Conference	10/16/98	U.S. Fuel Cell Council PQ Conference

10/21/00 EPRI PQIG

9/14/2004 PQIG Japan

10/05/04 PQIG Nashville

Community Activities

Advancement Chairman of Cub Scout Pack Troop 125, Knoxville, Tennessee

Treasurer, Volunteer Investment Club

Treasurer, Misty Harbor Homeowners Association

Hobbies

Weight training

Woodworking

Gardening