TreMonti

Customer Assisted Power Quality Monitor

Design of an intelligent power management system for use on the consumer's side of the Power Grid.

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Inventor
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Field
Energy Systems and Control

Technology
Customer Assisted Power Quality Monitoring

Key Features
- Residential-based services
- First of its kind
- Monitors and saves energy, contributes to its quality

Stage of Development
Prototype has been developed.

Status
Seeking development & licensing partner.

Patent Status
Patent pending

Technology
Howard University (HU), Center for Energy Systems and Control (CESAC)'s proposed technology describes an innovative scheme that uses simple but advanced computational intelligence techniques coupled with systems modeled to achieve the monitoring and control of power quality within the house. This system provides the residential customer with the opportunity to choose appropriate options to meet given goals subject to technical, economic, and regulatory constraints of power delivery, quality, and efficiency. The system uses wired or wireless data agents and computer-based processing of the system behavior and performs analysis of system states based on performance indices of power quality, harmonics, and other measures. The system allows the customer to make utility decision such as turning off non-critical appliances or critical loads or introducing additional capacity when necessary. In addition the system provides protection to electronic equipment and home appliances that are sensitive to power quality problems.

Coupled with the Customer Aided Power Quality Management System (HCAPQ), the system is designed to:
- Promote consumers involvement in the maintenance of the Power System environment.
- Provide consumers with more opportunity to contribute to their power quality with the utilization of distributed generation.
- Research promotes the design of an intelligent power management system for use on the consumers' side of the Grid.

Benefits of the Technology
In today's environment, efficient power management options are left, typically, in the hands of the utility companies. Little is done by the consumer at the demand side to improve the quality, cost and reliability of Power delivery. An innovative scheme that involves the customer in the loop for reducing the impact of system disturbance in time and duration is proposed. The HU CESAC research team has developed a customer based assisted power quality monitoring scheme for real-time system viability. It utilizes appropriate customer or utility decisions to:

a) Turn off non-critical appliances or critical loads
b) Introduce additional capacity (such as Distributed Generation) and improve availability of power to meet critical needs
c) Switch on corrective devices to minimize distortion or humming
d) Accept or reject opportunity to improve given supply quality.

Potential Application for Technology
There is not a customer based assisted power quality monitoring scheme for real-time system viability in the residential market, schemes currently exist only for corporate, electric utility, and government agency customers. The proposed technology would be the first to be introduced in the residential market. A significant benefit is the flexibility of the device design to be put on electronic circuit chips that can be installed in a central location in a house or on appliances. Additional flexibility will allow the customer the ability to choose appropriate options of the power quality monitoring scheme to meet given goals subject to technical, economic, and regulatory constraints of power delivery, quality, and efficiency. In addition, the monitoring scheme will also take into consideration issues of safety, security and reliability.

Stage of development
The described technology is currently in the advanced development stage yet not reduced to practice. Research results and evidence support its feasibility and its pursuit addresses the market need for energy efficiency and effectiveness.

The described technology is well suited for adoption by a company that is already established in the commercial, industrial, and utility segments of the power quality market.

Pathway to technology being ready for licensing and/or product
The researcher states several areas of current and future work, to include:
1. Developing a pilot project with implementation schemes, testing and validation of the integrated parts of the system proposed to fulfill the claims of the patent.
2. Finalized development of the prototype system.

Opportunity
Howard University is looking for a commercial partner to further develop this system.

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EDUCATION
Ph.D., Electrical Engineering, Howard University, 1983
M.S.S.E., Systems Engineering, University of Pennsylvania, 1980
M.S.E.E., Electrical Engineering, Carnegie Mellon, 1976

SPECIALTY
Systems Engineering, Power Systems and Controls, Expert Systems, Neural Networks

Recent Publications:

- Engineering Systems Conference on Power Engineering (LESCOPE), Nova Scotia, Canada , July 2001, pp. 206-212.
- J.A. Momoh and S.S. Kaddah, "A Comparative Study of Load Shedding Techniques: Everett Method and Genetic Algorithm," Intelligent Systems Application for Power Conference (ISAP), Budapest, Hungary , June 17-21, 2001.
- J.A. Momoh and A.R. Ofoli, "Load Management and Control of the Photovoltaic (PV) System Using Fuzzy Logic," Proceeding of Large Engineering Systems Conference on Power Engineering (LESCOPE), Nova Scotia, Canada , July 2001.
- J.A. Momoh and A.R. Ofoli, "Distribution System Reliability with Control of an Integrated Photovoltaic (PV)," published and presented at North American Power Symposium Conference (NAPS) , October 2001.
- J.A. Momoh, Qi Zhang, and Robert Button, "Evalution of Feature Extraction Technique for DC Arcing Fault at Aerospace Power Management and Distribution (PMAD) System," published for the AAE Conference , April 2002.
- J.A. Momoh, Qi Zhang, Nagy Y. Abed, and Robert Button, "Aerospace DC Arcing Fault Decision Using Neural Network Techniques," published for the AAE Conference , April 2002.
- J.A. Momoh and S.S. Kaddah, "Comparative Study between Two Voltage Stability Methods for Integrated Shipboard Power System with DC Zonal," Published in North American Power Symposium Conference 2002 .
- J.A. Momoh and J.Z. Zhu, "Optimal Generation Scheduling Based on AHP/ANP," Published In IEEE Systems, Man, and Cybernetics 2002.
- Momoh, J., Sun, and Stott. "Challenges to Optimal Power Flow," IEEE Transactions on Power Systems , Vol. 12, No. 1, February 1997, pp. 444-455.
- Momoh, J., Chattopadhyay, and Dolce. "A Mixed Integer Programming-based Power Schedule for the Space Station," Journal of Propulsion and Power, AIAA , Vol. 13, No. 1, pp. 150-156, Jan-Feb 1997.
- Momoh, J., Wang, and Dolce. "Fault Analysis of Space Station DC Power Systems - Using Neural Network Adaptive Wavelets to Detect Faults," Proceedings of STAIF, American Institute of Physics, Jan. '97, pp. 277-284.