



Great Lakes Protection Fund

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Funded Project

# Real-Time System Optimization for Sustainable Water Transmission and Distribution

Project No.	881
Timeline	2008 – 2013
Award Amount	\$1,480,000
Team Leader	Carol Miller, Wayne State University, <a href="mailto:cmiller@eng.wayne.edu">cmiller@eng.wayne.edu</a>
Project Website	<a href="http://engineering.wayne.edu/wsuwater/index.php">http://engineering.wayne.edu/wsuwater/index.php</a>



Municipal water systems will reduce air pollution and other water use impacts thanks to the software and training programs this team developed. This team created a first-of-its-kind hydraulic optimization software that directs water pumps to operate at times when the electric power grid is supplied by the cleanest available sources of energy, and avoid times when it is supplied by more polluting sources. The team piloted this software (called PEPSCO, Polluting Emissions Pump Station Optimization) in Michigan at the Detroit Water and Sewerage Department (DWSD) and the Monroe Water Filtration Plant (Monroe).

The pilot applications of PEPSCO at DSWD and Monroe showed that use of the software could reduce emissions between 20-35 percent for five evaluated pollutants: carbon dioxide, mercury, sulfur dioxide, nitrogen oxides and lead. Most importantly, emissions are reduced while at the same time the software satisfies all the hydraulic system requirements necessary for water transport; that is emissions are reduced while the utility continues to provide the same level of service to its customers. PEPSCO is the only software that can do this.

“It’s important to monitor water... We need to know we have a very high quality of water, and it helps us figure out where the greatest stresses are and how to remedy them.”

The concept of marginal emissions was a critical aspect of the project, and the team’s discovery of marginal emissions as a function of location and time led to the development of LEEM, Locational Emissions Estimation Methodology. LEEM is a groundbreaking technology that can predict with accuracy, and in real-time, the type of marginal electricity generator (coal, natural gas, nuclear, etc.) that is supplying electricity to users at a specific point location, and the emissions from those sources. LEEM allows, for the first time, the opportunity to manage electricity demand for air quality considerations on a real-time, real-generator basis.

The team developed a fully functional alpha version of LEEM and deployed it in PEPSCO. The team also deployed LEEM in a second, offshoot product called HERO, or Home Emissions Read-Out, which is a phone and web application for individual consumers (<http://herowayne.com/>).

Unanticipated pathways emerged from this work which led to the development of a technology and products that were unforeseen at the time of the award. In 2013, the Board [made an award](#) for the team to take the technology developed in the project into the marketplace.