Project Profile Information Form

PROJECT TITLE: Implementation Prototype Energy and Water Quality Management System

PROJECT NUMBER: 2624

PRINCIPAL INVESTIGATOR: Lawrence A. Jentgen

OBJECTIVES:

The project objectives included:

- Quantify the projected benefits of an Energy and Water Quality Management System (EWQMS) using the methodology defined in previous AwwaRF/EPRI reports.
- Design, model, implement, measure results, and document the Operations Planning and Scheduling (OPS) function.
- Evaluate EWQMS specifications, procure and implement methodologies and software systems that can improve performance, be operational quickly, and achieve significant cost savings.
- Achieve significant operating cost savings and improved performance, and implement methodologies that yield a positive return on investment.
- Document the process of EWQMS development and release specifications used for the project.

BACKGROUND:

The American Water Works Association Research Foundation (AwwaRF) and Electric Power Research Institute (EPRI) introduced the concept of an EWQMS in a February 1997 report which defined an EWQMS as a collection of application software programs that provide information used to develop plans that solve water quality, supply and energy management problems. Users receive information and prepare plans for daily decision-making. These plans are developed using optimization and simulation techniques embedded in the software programs.

HIGHLIGHTS:

- Utilities that implement an EWQMS can expect lower energy costs, reduced operations and maintenance budgets, enhanced water quality, higher availability of the water system, and a heightened reputation for customer responsiveness.

- A utility has much to gain by proactively optimizing operational processes and scheduling component operations from a systems perspective.

- Organizational implications of changing the operational culture of a water utility to support integrated system operations optimization are even more significant and time consuming.

- A water system simulator and optimizer are required to minimize operating costs. The simulator and optimizer depend on a reduced network representation and calibrated SCADA data for accuracy and ease of use in an operations environment.

- Work on water system components, which will affect system operations, must be identified for approval or “clearance” by the OPS prior to scheduling and commencing the work.

- Initial implementation of an EWQMS should focus on organization and processes associated with the OPS function.

APPROACH:

The project team analyzed data from SCADA, energy bills, hydroelectric generation records, and water quality to quantify benefits and costs of an EWQMS.

The team modeled EWQMS operational processes to identify organization, process, and technology requirements.

Modeling also enabled development of functional specifications for these software applications:

- Consumption Forecaster
- Economic Pump/Valve Controller
- Water System Simulator
- Optimum Pump Scheduler
- Water Quality Analyzer
- Water Source Analyzer
- Daily Operating Plan
- Daily Operating Plan Net Conference
- Construction/Maintenance Clearance Process

RESULTS/FINDINGS:

Implementing an EWQMS at Colorado Springs Utilities is a large undertaking involving many players coordinating efforts, justified by the following:

- The tangible benefits of EWQMS are significant. The annual opportunity for optimization of hydroelectric generation, pumping, and treatment plant operations ranges from $250,000 to $850,000per year.
- The return on investment for software is less than three years.
- Implementation of a Water Supply Analyzer will substantially improve the daily management (cost, water rights, quality) of the multiple surface water sources supplying the CSU water system.
- Better management of water sources will result in lower treatment costs.
- Implementation of a formal clearance procedure associated with operations planning and scheduling will improve system reliability, enhance the safety of maintenance crews, and facilitate a "systems" perspective for program driven maintenance.
- The single point of operational coordination provided by the OPS function consolidates water system security processes.
- Moving the CSU organization from independent to coordinated interdependent operations management is a significant cultural change requiring patience, understanding, and time.
- The operating environment of the future is projected to be more dynamic and complex requiring more coordinated, better planned, and agile operations to minimize cost and provide high quality service to water customers.

IMPACT:

The operating environment for water utilities is changing. New information and control systems and operating procedures are required to manage water utility operations. Operations and maintenance managers must pursue improved planning and scheduling methods to reduce costs. Electric deregulation presents an opportunity and a challenge for energy cost reduction. Water quality and supply issues must be managed to maximize system performance and minimize costs.

Energy and Water Quality Management Systems enable water utilities to better utilize limited resources to provide optimal service to their customers. By planning and scheduling operations processes and integrating the use of data from automated systems, an EWQMS enables utilities to do more with less – just what is needed in the changing business climate.

PARTICIPATING UTILITIES: Colorado Springs Utilities