

ENERGY MANAGEMENT PLANNING

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NYSERDA

- New York State Energy Research & Development Authority
- Public benefit corporation created in 1975
- Mission:
 - Use innovation and technology to solve some of New York's most difficult energy and environmental problems in ways that improve the state's economy
- Municipal water and wastewater sectors are a target to strategically reduce energy consumption in New York



Water System Goals

- Primary Goal – meet regulatory requirements to protect human health and environment
- Secondary Goal – provide services for reasonable and fair user fees or rates



Energy Use and Water Utilities

- Energy represents the largest controllable cost of providing water services to the public
 - Over 52,000 Community Water Systems
 - Over 18,000 Non-Transient Non-Community Water Systems
 - Over 86,000 Transient Non-Community Water Systems
 - The total inventory is about 157,000 Public Water Systems
 - small systems (3,300 or less) make up about 94% of all systems



Energy Use at Water Systems

- Pumping water is the largest consumer of energy
- Energy use is expected to increase
 - increases in demand
 - new energy intensive technologies (ozone, membranes, UV)
- Water-stressed states are shifting to more energy-intensive technologies to address current and future water-scarcity concerns
 - desalination plants
 - interbasin water pipelines



Water Systems are Energy Users

- In 2010 water systems used 12.6% of the nation's total annual energy consumption

= annual consumption of
~40 million Americans



Energy Management Goals

- Improve Energy Efficiency & Manage Total Energy Consumption
- Control Peak Demand for Energy
- Manage Energy Cost Volatility
- Improve Energy Reliability



Improve Efficiency & Manage Total Consumption

- Cost of electricity is based on two main components
 - Quantity of electricity used (kWh)
 - Demand for electricity
- On-peak vs. off-peak consumption affects rates
- Understanding the electric utility's pricing policies (rate structures) is critically important



Control Peak Demand for Energy

- Electric utilities typically include a “demand charge” in their rate structure
 - 30-60% of the overall cost of electricity
- Lower variability in electric demand over time (flattened demand curve)
 - Minimize changes in peak demand throughout the course of a billing period
 - Shifting loads from peak periods, typically during daylight hours, to off-peak periods
- Potential for significant cost savings by minimizing demand charges



Manage Energy Cost Volatility

- Energy costs fluctuate (much more than water revenues)
- Dramatic changes stress budgets
- Protect against volatility as much as possible
 - Reducing need for energy
 - Long-term procurement of energy
 - Provisions for alternative energy sources
 - On-site generation of energy



Improve Energy Reliability

- Water utilities should be able to provide critical systems with adequate backup power
- Energy planning process should identify opportunities to improve energy reliability
 - Protection against complete loss
 - Identify changes in power quality that can damage equipment and/or
 - Institute operating procedures to address changes in overall power availability



ENERGY MANAGEMENT PROGRAM DEVELOPMENT



Energy Management Program - Basic Steps

- Step 1. Establish Organizational Commitment
- Step 2. Develop a Baseline of Energy Use
- Step 3. Evaluate the System and Collect Data
- Step 4. Identify Energy Efficiency Opportunities
- Step 5. Prioritize Opportunities for Implementation
- Step 6. Develop an Implementation Plan
- Step 7. Provide for Progress Tracking and Reporting

Source: NYSERDA



Step 1 – Establish Organizational Commitment

- Is your team defined? Is your team diverse?
- Does it represent various interests and responsibilities within the utility? (i.e. elected official, manager, operator, member of finance team, etc.)
- Team responsibilities include: develop the plan, establish goals, define the resources needed, provide information to others (i.e. CIP team)



Why bother?

- Without the commitment of several individuals at varying levels within your utility, successful implementation of an energy management plan will be difficult
- Think of The Avengers – no one individual could have saved the city; it took all of them working towards a common goal to be successful!



Step 2 - Developing An Energy Baseline – What Should You Do?

- Gather basic information
 - One year of data minimum
 - Examples: utility billing records, SCADA system records, O&M records, equipment or motor lists (horsepower & load)
- Organize treatment processes by functional area
- Evaluate energy bills and understand the energy rate structure



Developing An Energy Baseline

– What Else Should You Do?

- Review hydraulic data (flow) and compare it to energy use
 - Identify wet weather, seasonal patterns
- Build a basic ‘model’ to organize data, and capture energy use patterns
- Create basic graphics and reports to communicate initial findings



Why bother?



- Energy efficiency gains = \$\$ saved
 - The process of investigating energy use, and improving awareness among staff, can provide measurable energy efficiency gains on the order of 3-5%.
- Value shown before resources committed
 - Successfully developing a basic understanding of energy use can be a good ‘early victory’, allowing the team to demonstrate some value even before any significant resources are committed to the program.



Step 3- Evaluate the System and Collect Data

- Use the spreadsheet provided or any other format that is easy and acceptable to your team
- This step goes beyond the baseline development (historical records). It involves data collection in the field
 - System walk-through (note operational information, motor sizes, etc.)
 - Staff interviews (operational practices, maintenance practices/history, take suggestions)
 - Energy performance data (field data from direct measurements, average equipment run time, sub-metering, etc.)



Possible Areas of Evaluation

- Raw and Finished Water Pumping
- Chemical Mixing
- Backwashing
- Well Systems
- Ozonation
- Load Shifting
- Distribution
- Supervisory Control and Data Acquisition (SCADA)
- Energy Efficient Motors

And... System Water Loss



Step 4: Identify Energy Efficiency Opportunities

- Energy efficiency opportunities can be defined as any system change that helps to reach a stated energy management goal.
- At this stage the energy management team should identify a broad array of energy efficiency opportunities



Categories for Energy Efficiency Opportunities

- Capital program or equipment replacement
- Process change
- Operational change
- Automation or controls
- Maintenance improvements
- Business measures



Step 5: Prioritize Opportunities for Implementation

- The final product of this step is a short list of energy efficiency opportunities that have been selected and carefully evaluated out of the list of opportunities generated in the previous step
- Identify a consistent method to compare and rank opportunities (consider both the monetary and non-monetary)



Keys to Success

- Convert all energy efficiency opportunities characteristics to monetary terms whenever possible.
- Evaluate all energy management, including ancillary benefits when possible.
- Test the sensitivity of results to determine the impact of important assumptions (e.g. time horizons)
- Make sure that the final results make sense in terms of the utility's capabilities.



Step 6: Develop an Implementation Plan

- How to Do It – Business Plan
- Actions required in this step include the following:
 - List the projects chosen for implementation and describe the goals and objectives of the program
 - Explain the resources needed, including a budget and financing plan
 - Develop any specifications needed, including design criteria and procurement related documents
 - Provide any changes in standard operating procedures, and/or process control strategies
 - Set the schedule for implementation, including milestones and gaining the necessary regulatory approvals (if applicable)
 - Set realistic expectations for the project in terms of resources required, schedule, procurement time frame, and expected results



Step 7: Provide for Progress Tracking and Reporting

- The success of a project should be measured as it is being implemented
- The specific actions required in this step include the following:
 - Assign the responsibility for tracking the progress of a project and reporting on that progress. Allocate the resources necessary to fulfill the responsibilities.
 - Set the performance metrics that will be used.
 - Create a communication plan. Identify who needs to be included in progress reports (examples: elected officials, public, etc.), when reports should be made, and any actions that need to occur in response to reports.



Constraints on Implementing an Energy Program

- Organizational constraints
- Capital costs
- Process reliability
- Regulatory requirements and limits
- O&M capabilities, and non-energy O&M costs
- Engineering constraints
- Space availability

