

Ontario's Water and Wastewater Energy Management Best Practices

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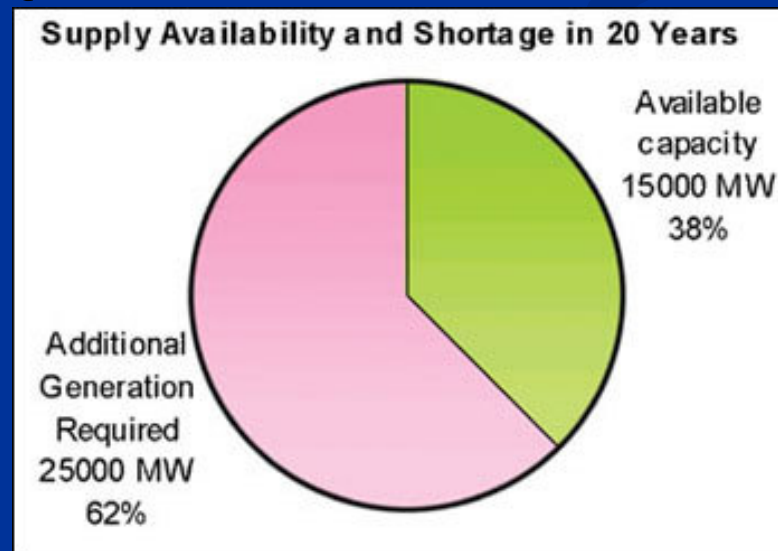
Introduction – What can I take back and apply?

- Energy in Ontario
- Setting the scene for energy management in the water and wastewater industry
- 2005-2006 OMBI Business Question – Electrical Energy Management
- Ontario's Water and Wastewater Energy Management Best Practices



Energy in Ontario

- May 1st, 2002 Ontario opened its electricity market to competition
- In the next 20 years many nuclear plants and some other sources are going to complete their active operational life and will need either refurbishing or replacement



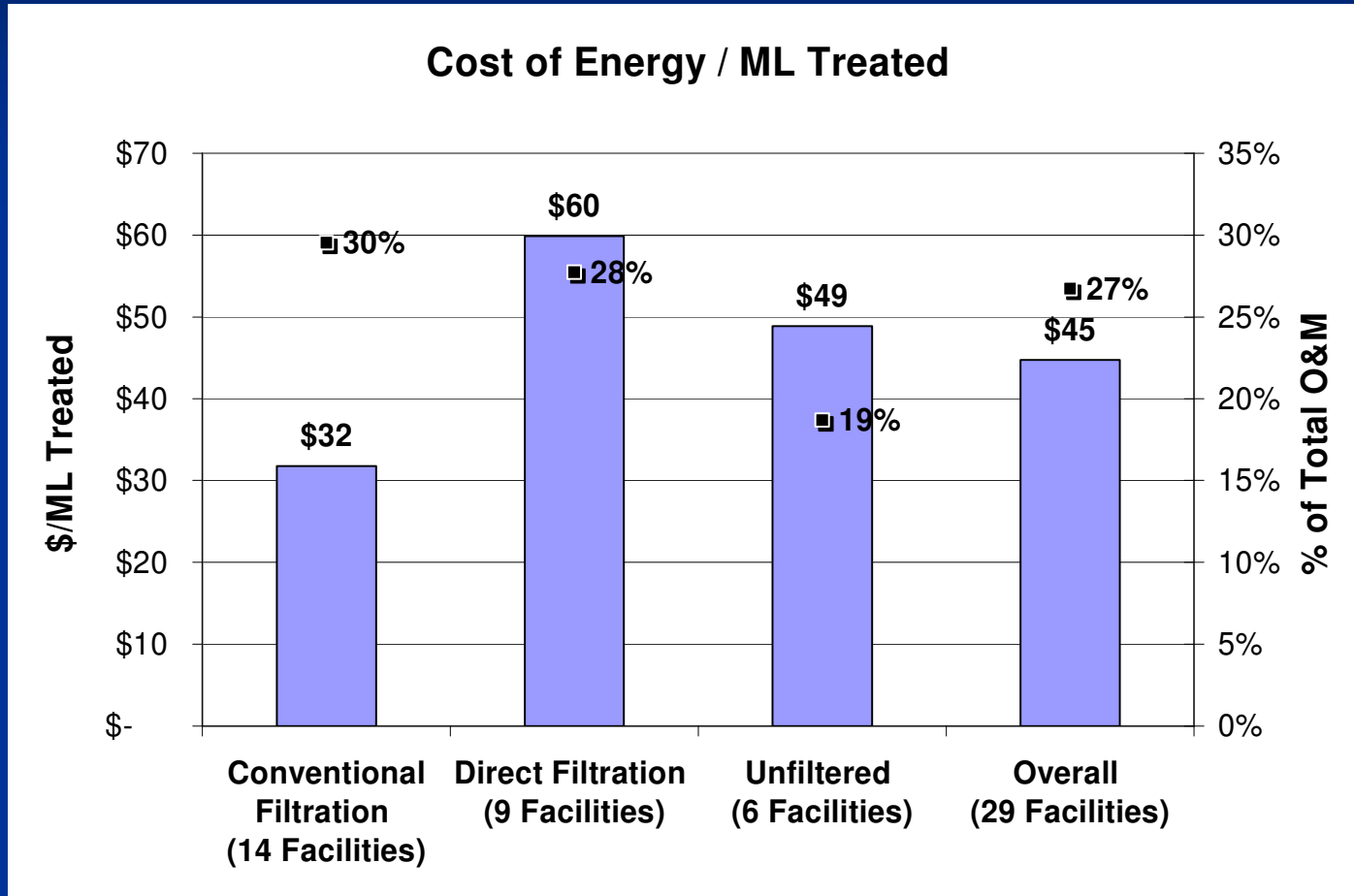
Source:
The Significance of Demand Side
Management By Satish Saini

Energy In Ontario

- Energy prices will continue to rise – rate cap to be removed from the “MUSH” sectors (Municipalities, Universities, Schools & Hospitals)
- At peak times Ontario’s generation & transmission systems are at or near capacity
- The generation of electricity has not been adequate to meet demands – Ontario depends on costly imports from neighbours
- The demand in Ontario is increasing at average rate of 1.7% per year
- Power outages and brown-outs are expected

Setting the Scene

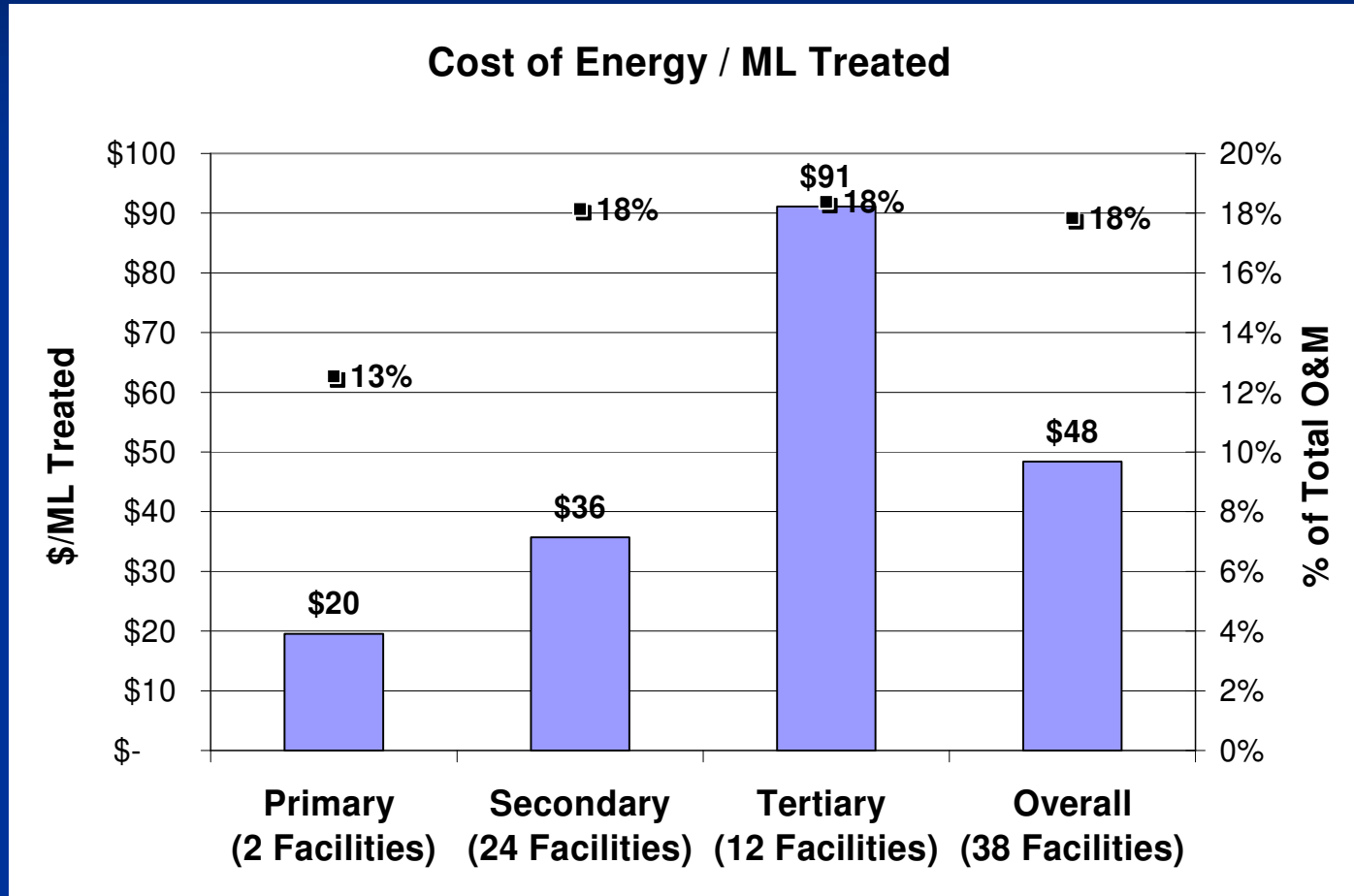
Water and Wastewater Industry



For a conventional filtration plant producing 100 ML/Day, this translates into an approximate annual cost of \$1,160,000!!!

Setting the Scene

Water and Wastewater Industry



For a secondary treatment plant producing 100 ML/Day, this translates into an approximate annual cost of \$1,300,000!!!

Compare, Communicate, Collaborate!!!

- Ontario Municipal CAO's Benchmarking Initiative (OMBI)
- Ontario Centre for Municipal Best Practices (OCMBP)
- National Water and Wastewater Benchmarking Initiative (NWWBI)



National Water and Wastewater
Benchmarking Initiative



Electrical Energy Management

- OMBI / OCMBP Energy Management Business

Question:

- Are opportunities achievable to monitor and manage the energy requirements for water and wastewater treatment more effectively which will decrease power consumption and limit the financial impact of forecasted price increases for electricity.



OMBI / OCMBP Business Question Project Approach

- OMBI survey data
- NWWBI data
- Potential best practitioner selection
- Potential best practitioner interviews
- Best practice case study report development
- Approval and publication




Proven Success!!!

Ontario Energy Management Best Practices

- Corporate Energy Management Strategy
 - Region of Peel
- Water Distribution Optimization Modeling
 - City of Thunder Bay
- Water Loss Control with Leak Detection
 - City of Thunder Bay & Halton Region
- Metering & Billing Control & Verification
 - Region of Durham, Region of Peel
- Energy Management with Alternative Sources of Energy
 - City of Ottawa
- General Energy Management Best Practices
 - OMBI Municipalities



Energy Management Strategy

- Peel Region established a Corporate Energy Management Division with a core mandate to:
 - Reduce energy consumption and cost of energy
 - Create a culture of conservation
 - Promote renewable and sustainable sources of energy and energy efficiency
 - Provide energy advisory services to Regional departments
 - Perform metering, monitoring, bill verification, energy profiling, reporting and analysis
 - Assist with development of energy efficiency standards

Energy Management Strategy

- The Corporate Energy Division has spent significant time and effort collaborating with the Water and Wastewater Treatment Division as it consumes over 60% of the total electricity in Peel
- Benefits:
 - Reduced energy consumption
 - Energy cost savings
 - Environmental benefits
 - Positive public relations
 - Over two years Peel Region has decreased its energy costs through procurement practices, bill validation, cost avoidance and conservation measures corporate wide valued at approximately \$ 8 Million

Water Distribution Optimization Modeling

- Thunder Bay utilizes a hydraulic water model to simulate fire flow conditions for the city's 3,368 fire hydrants.
 - The model estimates fire flow under various operating conditions versus manually flow testing each hydrant
 - Field tests are used to refine and improve the model and verify results
 - NOTE: Thunder Bay also operates and inspects their hydrants during their major fall maintenance program – conforming with the requirements of the Ontario Fire Code



Water Distribution Optimization Modeling

- Benefits:
 - Energy savings in reduced water treatment and pumping
 - Annual savings in water production in the range of 33,340 cubic meters to 75,780 cubic meters per year (7.3 to 16.7 million imperial gallons per year)
 - Annual savings in manpower requirements, equipment and fuel
 - Disruptions to the public caused during fire flow testing related to traffic and flooding are minimized

Water Loss Control – Leak Detection

- The City of Thunder Bay and Halton Region utilize leak detection technology to locate and repair leaks in the water distribution system
 - Thunder Bay has dedicated staff, vehicle, and equipment to conduct day-to-day leak detection
 - High tech equipment quickly locates and pinpoints leak locations
 - The Region of Halton retained a consultant to undertake flow monitoring through modeling and District Metering to isolate leakage in portions of the distribution system that are supplied by ground water

Water Loss Control – Leak Detection

■ Benefits

- Allows planned versus reactive repairs
- Reduces energy requirements, chemicals, materials, supplies and maintenance for water treatment and distribution
- Reduces unaccounted for water
- Maximizes use of existing infrastructure, delaying expansions
- Halton Region's program discovered water leakage over a three year period equivalent to approximately 2,160 cubic meters per day (475,000 IGPD)
- Savings in water treatment operating and maintenance costs amount to approximately \$100,000 per year
- Volume of recovered water is equivalent to support demand from approximately 2,370 single family housing units

Metering & Billing Control

- Peel Region and Durham Region reduce energy costs through the use of interval metering, power monitoring, billing control and verification
- Interval meters installed at large water and wastewater facilities to monitor power consumption in real time. The meters and related software provide information on:
 - Energy load profiles
 - Power quality and power factor monitoring / analysis
 - Real time energy demand and demand forecasting
 - Comparison of energy use with variable market prices
 - Data logging and historical trending
 - Report generation
 - Bill verification statistics

Metering & Billing Control

■ Benefits

- Allows quick response to maintain power demand below “Peak Consumption Thresholds” at each facility
- Effective decision making on Energy Management
- Facilitates Energy Bill Verification (consumption vs. utility billing)
- Facilitates optimization of water & wastewater treatment processes, pumping and Storage
- Corporate wide, Peel Region has saved approximately \$8 million through procurement practices, bill validation, cost avoidance and conservation measures
- Durham Region has realized savings of \$250,000 over the past five years and estimated a savings of \$60,000 in 2006 with bill verification

Alternative Sources of Energy

- The City of Ottawa lowers peak power demand from the electricity grid using alternative forms of power generation at its water and wastewater treatment facilities
- Wastewater:
 - Use of digester gas for cogeneration for WWTP processes (5.3 MW)
Estimated annual electricity cost savings of \$1,000,000 per year
 - Use of digester gas to fuel WWTP boilers (four dual fuel 3000 KW input boilers) with an estimated cost savings of \$400,000 per year over using natural gas to fuel boilers
- Benefits:
 - Decreased electrical and natural gas consumption
 - Efficient use of digester gas
 - Reduced peak demand on electricity grid
 - Lower overall energy costs

Alternative Sources of Energy

- Water Supply:
 - Utilizing the natural head of the Ottawa River for generation of power for pumping at the Lemieux Island Water Treatment Plant, saving \$100,000 per month in energy costs
 - Cogeneration using natural gas at the Britannia Water Treatment Plant when the cost of electrical energy exceeds a certain threshold. The 3.5 MW generator provides 2.5 MW to the treatment plant and exports 1.0 MW to the hydro grid. Savings during 2005 amounted to approximately \$180,000
- Benefits:
 - Decreased electrical energy consumption
 - Reduced peak demand on electricity grid
 - Lower overall energy costs
 - Supply back to hydro grid

General Energy Management Best Practices

- General energy management practices and operation procedures including:
 - Capital projects
 - Operational strategies
 - Maintenance procedures
- Energy Management Best Practices in development
 - Water Distribution Optimization (Region of Durham & City of Toronto)

Ontario Energy Management Best Practices

- Published on both the Ontario Municipal Benchmarking Initiative Website www.ombi.ca and the Ontario Centre for Municipal Best Practices Website www.ocmbp.ca
- Project Approach Document
- Six Energy Management Best Practice Reports including Municipal Profiles, Municipality Contacts, and Contact Information



Questions???

For a copy of this presentation, please
visit www.nationalbenchmarking.ca