Electrical Energy Management at MWRDGC
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Overview

• Electrical Energy Expenditures
• Supply Side Management
• Demand Side Management
• Review of Bills
• Impact of Deregulation
• Sources of Information
• Why Manage Electrical Energy?
Electrical Energy

• Page 7 of Budget 2006
• Mission Statement and Operational Goals
• To Keep Pollution out of Lake Michigan
• ...
• ...
• To Keep Energy Costs to a Minimum
Electrical Energy

• 2004 Actual Expenditure - $27 million
• About 16% of M&O Budget

• MWRDGC – one of top 10 large users in Chicago Area
• Usage – 560,000,000 kwh per year
• Enough to power 115,000 homes for a year
Electrical Energy

• Top 5 District Facilities
• Stickney WRP – 40%
• Calumet WRP – 15%
• Northside WRP – 12%
• Mainstream PS – 7%
• Kirie WRP – 6%
Electrical Energy

- Energy Expenditures held constant over last 10 years in spite of facility expansions

- Who manages electrical energy?

- How?
Electrical Energy

- Stickney Treatment Plant
- Service Period 10/31/05 to 11/30/05

Charges
- Monthly Customer Charge: $862.11
- Demand Charge: 10,000 x 12.85 = $128,500.00
- Second Step Demand Charge: 24862 x 5.03 = $125,057.87
- Redelivered Demand Credit: 1509 x -7.17 = $-10,821.82
- Peak Energy Charge: 7747290 x 0.05022 = $389,069.90
- Off Peak Energy Charge: 13445874 x 0.02123 = $285,455.91
- Redelivered Energy Credit: 1096663 x -0.03183 = $-34,906.78
- Rental Charges: 8,297.27
- Rider 11 Credit: -3,534.35
- Decommissioning Adjustment: 14,469.48

Total: $902,448.59
Electrical Energy

- Stickney WRP

- $21,193,164 \text{ kwh} \times \$0.04258 / \text{kwh} = \$902,448.59$

- Usage \times \text{Unit Cost} = \text{Total Cost}
Electrical Energy Management

Usage * Unit Cost = Total Cost

Goal is to lower the Total Cost.
Lower the unit cost (Supply Side Management)
Lower the usage (Demand Side Management aka Energy Conservation)
Adjust Operations to “exploit” the rate
Supply Side Management

• Evaluate different rates available

• Rider 32

• Rate 24

• Self Assessment of Taxes
Rider 32

- Curtailable Service Cooperative
- ComEd defers the need for new plants
- Customers receive $ based on load reductions
Rider 32

- Applied to 3 large plants in 1997
- Load committed 2,500 kw
- Actual load curtailed 6,800 kw (between Rider 32 and VRS)
- Compensation $178,000.00
Rider 32

- Expanded to total six facilities in 1998
- Raised the committed load to 6,500 kw in 1999
- Raised the committed load to 10,500 kw in 2001
Rider 32

• Total Compensation so far (1997 to 2005) is $2,800,500.00
• 2006 – we will continue to participate
• Future
Sources of Information

- Northern Illinois Energy Users (www.progressiveenergyllc.com/neu)
- Illinois Commerce Commission (www.icc.illinois.gov)
- www.peoplesenergy.net
- www.exeloncorp.com
Rate 24

• Rate 24 made available to District’s pumping facilities in 1995
• No demand charges
Rate 24

- Evaluated the rate
- Applied it to 34 facilities
- Annual savings - $95,000.00
- Future
Self Assessment - Taxes

• New state tax structure as a result of Deregulation
• Per kwh state tax instead of % of electric bill
Self Assessment - Taxes

- Reviewed the impact
- Would result in $80k more in annual state taxes for SWRP and MSPS
- Elected to self-assess state tax
- Avoided higher state tax
Demand Side Management

- DO Control
- VFDs
- Energy Efficient Motors
- Lighting
Demand Side Management

• SWRP Annual Bill - $11,000,000.00

• Top 5
  • Aeration Blowers – 50%
  • Main Sewage Pumps – 25%
  • Pre Dig Centrifuges – 5%
  • Digesters – 5%
  • Post Dig Centrifuges – 3%
Aeration Blowers

• System is made up of
  – Motors
  – Blowers
  – Piping
  – Diffuser Plates
Aeration Blowers

• Motors
  – VFDs (for 480v or less)
  – Energy Efficient Motors
  – PM of Motors
  – PM of Cooling Coils
Aeration Blowers

- Blowers
- DO Control (using Inlet Vanes)
- High Wire Balancing Act
- Less Aeration – Violate NPDES Permit and/or Upset Plant Operations
- Too Much Aeration – Higher Electricity Expenditures
Aeration Blowers

- Blowers
  - PM of Blowers
  - Oil Analysis / Replacement
Aeration Blowers

• Piping
  – Leak Detection and Repairs
Aeration Blowers

• Diffuser Plates
  – Inspection / Repairs
  – Coarse / Fine Bubble Diffusers
  – Placement of Diffusers
Main Sewage Pumps

- System is made up of
  - Motors
  - Pumps
  - Piping
Main Sewage Pumps

- Pumps
  - Maintenance of Impeller
  - Alignment
  - Bearings
Centrifuges

- PM of Bowl
- PM of Motors
VFD

• Variable Frequency Drives

• Uses
• Energy Conservation
• Process Control
• Start up of Large Inertia Load
• Minimize Water Hammer Problems
• Relationship between Power and Speed

• HP proportional to Cube of RPM

• When speed is cut in half, power requirement is cut to \( \frac{1}{8} \)th.
Low Voltage VFD – Proven Technology

- Small Main Sewage Pumps
- Biosolid Pumps
- Centrifuge Main Drives
- Centrifuge Back Drives
- Air Handling Units
- Polymer Pumps
VFD

- Medium Voltage VFD

- Carefully Evaluate Applications for Design, Installation and Maintenance Issues
Sources of Information

• www.drivesmag.com
• www.energy.gov
Motors – Energy Efficient

- Higher the efficiency – lower the kw
- 10 HP, 1800 RPM, 3 PHASE, TEFC
- Motor 1 – Lazy Lilly - 89.5 %
- Motor 2 – Efficient Emily - 92.4 %
Motors – Energy Efficient

- Cost to run Lazy Lilly, 6000 Hours a Year, Unit Cost of Electricity 5.4 Cents/kwh

\[
\frac{(10 \text{ HP} \times 0.746)}{0.895} \times 6000 \text{ Hrs} \times 0.054/\text{kwh}
\]

- $2,700
Motors – Energy Efficient

- Cost to run Efficient Emily, 6000 Hours a Year, Unit Cost of Electricity 5.4 Cents/kwh
  - \(((10 \text{ HP} \times 0.746)/0.924) \times 6000 \text{ Hrs} \times $0.054/\text{kwh}\)
  - $2,615
  - A Savings of $85 / year
Motors – Energy Efficient

• Lazy Lilly List Price - $930
• Efficient Emily List Price - $1060

• Simple Payback = (1060-930) / 85
• 1.5 Years

• Motor Master Software from DOE
Motors – Energy Efficient

- Standard Efficiency
- Premium Efficiency
- NEMA Premium Efficiency
- EPACT Efficiency
- Jan 2003
- SWRP’ Stock of 165 Motors
- Inserted nominal efficiency ratings in the specs
Sources of Information

- www.motorsmatter.gov
- www.eebestpractices.com
- www.nema.org
• Replaced Incandescent Lamps with HPS / Fluorescent Lamps

• Replaced Magnetic Ballasts with Electronic Ballasts

• Replaced T12 Lamps with T8s
Lighting

- Timers
- Photo Sensors
- Motion Sensors
Adjust Usage

• Adjust Operations to “exploit” the rate

• Lower Off Peak Rate
  – Increase Off Peak Usage
Adjust Usage

- High Demand Charges
  - Demand Control
Review of Bills

- Energy (kwh) Usage
- Demand (kw)
- Credits
- Taxes
Review of Bills

- Mainstream PS – March 06 Bill

- Noticed higher demand charges

- Billing Demand (kw) – 6,200
  - Total Bill - $240,000

- Actual Demand (kw) – 3,100
  - New Bill - $180,000

- Error - $60,000
- Salary of an Associate EE
Deregulation in Illinois

• Timeline
  – Dec 1997 - The Deregulation Act enacted
  – Oct 1999 - Open Access to customers > 4 MW
  – Dec 31, 2000 - Open Access to all customers
  – Dec 31, 2006 - Transition period ends
Deregulation in Illinois

- No fixed price rate for large customers from ComEd
- Rate 6L going away
- Options Post 2006
  - ARES
  - ComEd Rates are being replaced based on current proceedings to ICC
Deregulation in Illinois

• List of ICC Certified ARES
  – Ameren Energy Marketing Co.
  – Bluestar Energy Services, Inc.
  – Cinergy Retail Sales, LLC
  – Constellation NewEnergy
  – Direct Energy Services, LLC
  – EnerStar Power Corp.
Deregulation in Illinois

• List of ICC Certified ARES (cont.)
  – Exelon Energy Co.
  – Lower Electric, LLC
  – MidAmerican Energy
  – Nordic Marketing of Illinois, LLC
  – Peoples Energy Services Corp.
Deregulation in Illinois

- List of ICC Certified ARES (cont.)
  - Pepco Energy Services, Inc.
  - Reliant Energy Solutions East, LLC
  - Sempra Energy Solutions
  - Sempra Energy Trading Corp.
  - Strategic Energy, LLC
  - SUEZ Energy Resources NA, Inc.
  - WPS Energy Services, Inc.
MWRD Procurement Process

- Defined goals with input from Technical, Law and Purchasing Dept
- Defined load profiles
- Prepared RFP
- RFP Advertised
MWRD Procurement Process

• RFP Highlights
  – Vendor Qualifications
  – Contractual Language
  – Financial Requirements
  – Legal Requirements
  – Technical Requirements
MWRD Procurement Process

• RFP Highlights
  – Pricing Structure
    • Generation (ARES)
    • Transmission and Distribution (ComEd)
MWRD Procurement Process

- RFP Highlights
  - Account Numbers, Meter Numbers
  - Historical Usage on CD
  - Contract Quantity & Deviations
  - Billing Options
  - Transition Strategy
MWRD Procurement Process

- RFP Highlights
  - Prebid Meeting
  - Evaluation and Selection Process
  - BAFO Turnaround Time
  - Draft Contract
  - “Marketable” RFP
MWRD Procurement Process

- Selected a Supplier on April 5, 2006
- Peoples Energy Service
- Electric Energy for 25 Facilities
- Beginning Dec 2006
- Contract – Three Years
- Rates are 31% higher than Current Rates
ComEd Filings

• Two Filings with ICC
• Competitive Procurement Process
• Tariff Revisions
ComEd Filings

- Competitive Procurement Process
- Filing Date – February 25, 2005
- ICC Ruled in Jan 2006
- Reverse Auction Process
- Higher Generation Charges
ComEd Filings

- Tariff Revisions
- Filing Date – August 31, 2005
- ICC to rule by July 2006
- Higher Distribution Charges
- Intervention
Sources of Information

- Illinois Commerce Commission (www.icc.illinois.gov)
- Northern Illinois Energy Users (www.progressiveenergyllc.com/neu)
- ComEd (www.comedpowerpath.com)
- Exelon (www.exeloncorp.com)
Sources of Information

- Price Newsletters from ARES
- www.pjm.com
- www.enerfaxdaily.com
Sources of Information

- US Department of Energy (www.energy.gov)
- Association of Energy Engineers (www.aeecenter.org)
- www.energyandpowermanagement.com
Sources of Information

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Questions?

Thank You!