



Dissecting your Electric Bill:

Energy Efficient Wastewater Operations

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Background



Obvious Components of Bill

- Start Date
- End Date
- Days (25-35)
- Rate #
- Usage (kwh)
- KW Demand (Time Set) (Highest 30-minute Interval)
- KVAR – (Very minimal charge of entire bill) (Do not worry about)
- \$ Amount (Broken Down)
 - Customer Charge
 - Distribution Charge
 - Transmission Charge
 - Generation Charge
 - Generation Rider

Hidden Components of Bill

- **ON and OFF Peak Differences**
 - If you have ON/OFF Peak Meter
 - 25% Reduction in OFF Peak Demand
 - No Reduction in Usage
- **Seasonal Demand**
 - December/January/February (WWTP High Flows)
 - June/July/August (WTP High Production)
 - First Energy does not use this
- **12 Month Highest Demand**
 - Will hold your Seasonal Demand Peaks
 - Will see Peak Demand of 75% Seasonal Demand
 - Even if you are below 75% of it in you current month

MOST IMPORTANT SLIDE

- **IF YOUR PLANT IS OVER 0.3 MGD DESIGN FLOW or YOUR BILL IS OVER \$2,000 A MONTH YOU MUST GET AN ON/OFF PEAK METER**
- **\$240 per YEAR FOR THE CHANCE TO SAVE THOUSANDS!!!!**
- **DO THIS NOW!!!!!!!!!!!!!!!!!!!!**

ON/OFF PEAK HOURS

- **168 HOURS PER WEEK**
- **60 ON PEAK HOURS (M-F 8AM-8PM)**
- **108 OFF PEAK HOURS**
- **64.3% OF THE WEEK AND YEAR IS OFF PEAK**
- Your wet weather peak plant flows can come whenever, unlike daily peak flows that are steady.
- **VEGAS WILL NEVER GIVE YOU THESE ODDS**

Rate Calculator

- Find your Rate Code on Bill
- Contact your Supplier
 - DP & L will distribute if you ask
 - First Energy you might need to know someone
- Obtain bill components (Numerous Tariff's)
- Set up an excel spreadsheet that will calculate your bill
- Use an old bill's data to check
- Plug and chug different usage and demand values that your plant might or could see with operational changes
- These can change 1-2 times per year, so it gets confusing to follow, just the way they like it.

ON / OFF Peak Operations

- Where the real money savings is found!!!
- Usage (kwh) will stay the same, just change when you are using your power.
- HOW do we know what we can move to OFF PEAK?????

Major Equipment Classification

- **Category I**
 - Runs 24/7/365.25 (Minimal Control)
- **Category II**
 - Flow Related (Minimal Control Unless you have a Large EQ Basin)
- **Category III**
 - **Equipment you have control over**

Category I (24/7/365.25) Examples

- Influent Screw Pumps
- Activated Sludge Aeration
- Minimal RAS Pumping
- Post-Aeration
- Chemical Feed Pumps
- Non-Potable Water
- Mixers
- Heating and AC

Category II (Flow Related) Examples

- Influent Pumping
- Lift Station Pumping
- RAS Pumps +/-
- Continuous WAS Pumps
- Activated Sludge Aeration
- Change from season to season

Category III (You Control) Examples

- Aerobic Digester Aeration
- Tertiary Filter Backwashing
- Sludge Transfer
- Know your Location (Wind Patterns)
 - Isolated- You can really push things
 - Land Locked? Be cautious in approach
- Sludge Dewatering
 - Centrifuge (Very Demanding)
 - Filter Press/Rotary Fan (Less Demanding)

Wet Weather Ready (WWR)

- Have a plan to take Category III equipment offline during wet weather events
 - Turn off/down Aerobic Digestion Blowers
 - Do not dewater sludge
 - Especially Centrifuge
 - Puts loading back on plant + non potable pumps
 - Lower aeration basin blower speeds
- This will all help offset dramatic increase seen Category II (Flow related pumping of water)

WWR Example

- Cedarville WRRF (0.56 MGD)
 - Turned off Aerobic Digester during high flow events
 - Implemented in March 2011
 - Monthly KW Demand (Day of highest Flow) / Highest Daily Flow
 - **March 2008 (202) / 2.84 MG**
 - **April 2008 (204) / 1.71 MG**
 - **March 2010 (183) / 1.81 MG**
 - **March 2011 (117) / 1.55MG**
 - **April 2011 (132) / 2.54 MG**
 - **May 2011 (111) / 2.11 MG**

What this means in \$\$\$

- Previous Wet Weather Events
 - Average Bill (At current Rate and Same Usage)
 - Before Average Bill \$7,058
 - After Average Bill \$5,665
 - Difference \$1,393 per month or almost 20% less by this one simple WWR Measure for a (0.56 MGD Plant)
 - Also do not run dewatering equipment during WWE
- Larger plants will see a proportionally larger \$avings

Wasting Electricity – Where?

- If your Effluent Ammonia is AA 0.05 mg/l, too much aeration of activated sludge
- If Aerobic Digester DO >3.0 mg/l, turn a blower down or off
- Effluent DO >9.0 mg/l, turn your Post Aeration down or off (especially during winter)
- Excess RAS 50% or greater of Influent
- Only offices need to be room temperature when you are there, not buildings with equipment in them
- Centrifuge dewatering OFF peak (preliminary look at GC ops could cut demand by 15% and \$1700 per month per plant)

Another Example

- *Clark County Utilities Aerobic Digester Over Aeration*
 - Left 200 HP on 24/7/365 unless decanting
 - (DO Greater than 5.0 mg/l)
 - Began to run Blower OFF Peak-Decant ON Peak
 - 144,000 kwh per month before cycling blower
 - 92,000 kwh per month after cycling aeration
 - \$2,000 a month savings (20%) on one piece of equipment running OFF Peak and Less
 - **In 2 years, saved enough energy for a family of 4 to use for 145 years or Al Gore's House's to use for 5 years**

Ways to Track you Usage

- Online software through your Energy Provider **\$75 a month and a phone line to meter (phone line 25-35\$ a month)**
 - See instantly what your changes do to meter
 - Can download and print trends
 - First Energy is 450\$ a year, but not real time
- Data retrieval – Excel SS emailed to you with 30 minute increments for previous month **\$25 a month+ phone line**
 - Data can be manipulated easily – track vs. flow and operational data of plant
- Document what the meter reads every day – Usage and Demand and Time **\$FREE and no phone line needed**
 - You will see differences when equipment comes on and when flows increase and when meter is reset
 - Chart Daily usage and identify major changes
 - Back calculate demand changes to see what your equipment uses

New Construction Thoughts

- Require Engineering Firm to consider long term electrical usage and demand in design
 - Will the new equipment use more or less energy?
 - Do they need VFD's or not?
 - Do you need the control or will it be on 24/7/365.25?
 - Or will a soft start work better or not help you either
 - Payback on (Super) Premium Efficient Motors
 - Pump Efficiencies and paybacks
 - Watch for over sizing of equipment to meet IO State Std
 - Keep operational control of more smaller units instead of less larger units.
(Four 75 HP blowers instead of Two 150 HP) Might need 225 HP not 300 HP
 - Give them your rate calculator to make their projections accurate, ***not just using their boiler plate \$0.09 per kwh***

Use your Generator to Help

- Look into using Generator at High Flow Events
 - May only need a couple of times a year
 - Know the last day of your billing cycle (February rains)
 - Can keep the seasonal peak out of play
 - Watch for air permit requirements
- Check/Bump seldom used equipment why you are off the grid or OFF Peak
 - Testing equipment while ON PEAK can jump your monthly demand and you may hold this mistake for up to a year

More Ideas

- Do not leave seldom used equipment in remote on your SCADA
 - Operators can turn on/off/on without physically moving – this will jump your demand
 - Turning things on and off (numerous times) in 30 minute interval is not good for demand
 - Put them in local control or actually lock them out
 - Think about what turning on a piece of equipment will do
 - Operators will over react and turn on all of their available pumps or blowers at once (little advantage seen because of dead heading, hydraulic limitations and diffusion limitations)

QUESTIONS

- Now or in the future
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