

Mayfield Electric & Water Systems
Peak Reduction & Energy Management Program

9/16/2014

OBJECTIVE

To maintain as low of a monthly Demand charge on our TVA power bill as feasible. Forecasting the potential days and times MEWS' potential peak may occur each month and then enacting the Peak Reduction & Energy Management Program to remain below the forecasted peak can obtain this. MEWS will then capitalize on the forecasted opportunity to prevent an unnecessary and costly system peak. We believe we can potentially shave or reduce as much as 1MW of demand each month by implementation of a Peak Reduction & Energy Management Program. Each avoided MW of demand on MEWS' TVA power bill will result in \$8500.00 of savings realized by MEWS.

BACKGROUND

Mayfield Electric & Water Systems purchases all of its electricity from the Tennessee Valley Authority. Each month TVA sends MEWS a power bill for the usage as MEWS does our customers. A large portion of that bill is based upon the maximum, or peak, energy used by our customers during one hour of each month, known as a Demand charge. The rate we are charged from TVA are not only based on the total amount of energy used by the MEWS' distribution system, it also includes the Demand. The capacity required to supply energy for the short high peaks in usage are costly to TVA & MEWS, and the cost must be recovered. It is beneficial for our community to keep the peak demand as low as possible in order for MEWS to keep rates for our customers as low as feasible.

DESCRIPTION OF PROGRAM

MEWS will work proactively to forecast when that highest reading or peak demand could potentially take place. We will attempt to forecast these periods based on close examination of historical data, a review of the current month's trend, and the extended weather forecast. There are many variables that play a role in setting a new peak demand; however, weather is the main factor in driving the residential load up or down. Historically, during the months from May to October, MEWS has set the monthly demand peak 98% of the time between the hours of 1 PM and 4:59 PM. Narrowing the window MEWS demand peaks 92% of

the time the between 2 PM and 5 PM. In Cold weather months as in January and February MEWS' system peaks 92% of the time between the hours of 8am and 10:59am. Narrowing the window further records indicate that MEWS's system peaks 83% of the time between 8am and 9:59pm. In a mild month as we experienced in August, it may be less complicated to forecast the peak and see a narrow window of high temperatures and high humidity, creating high heat indices. This is when we normally see a spike in demand.

When MEWS recognizes the potential for a new peak demand to be set on the power system, we will ask our customers for assistance in trying to reduce energy consumption during those few hours a month to keep the demand charges down. We realize that asking too frequently will cause the customers to become immune to our request. We will attempt to budget ourselves to 4 or less requests to our customers per billing period. The cooperation of our customers, along with MEWS' own reductions should reduce energy consumption, helping our customers lowering their bill, while assisting MEWS in preventing a costly spike in demand charges.

STRATEGY TO ACQUIRE COMMUNITY COOPERATION IN PROGRAM

When we feel the city of Mayfield is reaching a potential new peak demand, we will send advanced notifications requesting customer participation in our "Peak Reduction/Energy Management Program" using Facebook, Twitter, and our website as follows:

Facebook & Twitter Post

"In an effort to prevent setting a new peak demand, MEWS is asking our electric customers to please take minor steps to reduce energy consumption between the hours of 1 PM and 5 PM today. Thank you for your cooperation in our NEW Peak Reduction/Energy Management Program. The graph below states that we are nearing the demand load we want to stay below. Please make minor steps to help the city of Mayfield stay below this anticipated peak demand."

KNOWN COMMUNITY PARTICIPATION

KY Kids Preschool

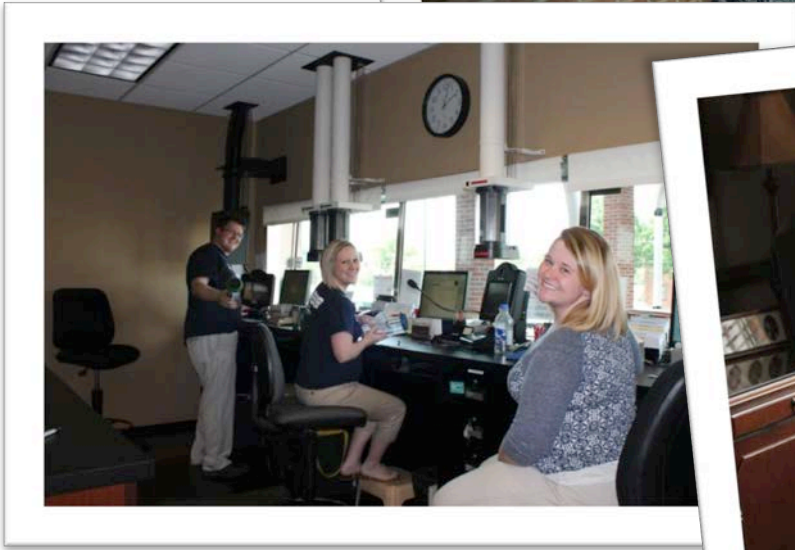
participated in our program by using natural light for afternoon classes and turning off excess lighting. They also used this opportunity to teach the children about energy conservation.

Mayfield/Graves County Chamber of Commerce

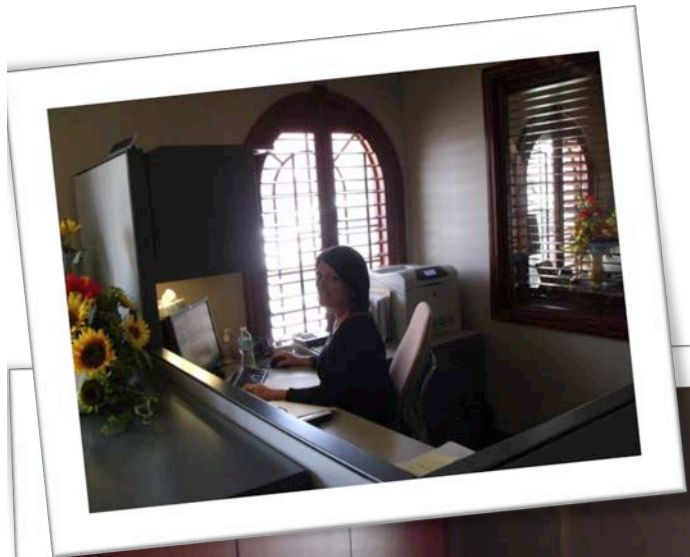
participated in the program by turning off excess lighting, such as lamps, and over head lighting during the hours of anticipated peak times.



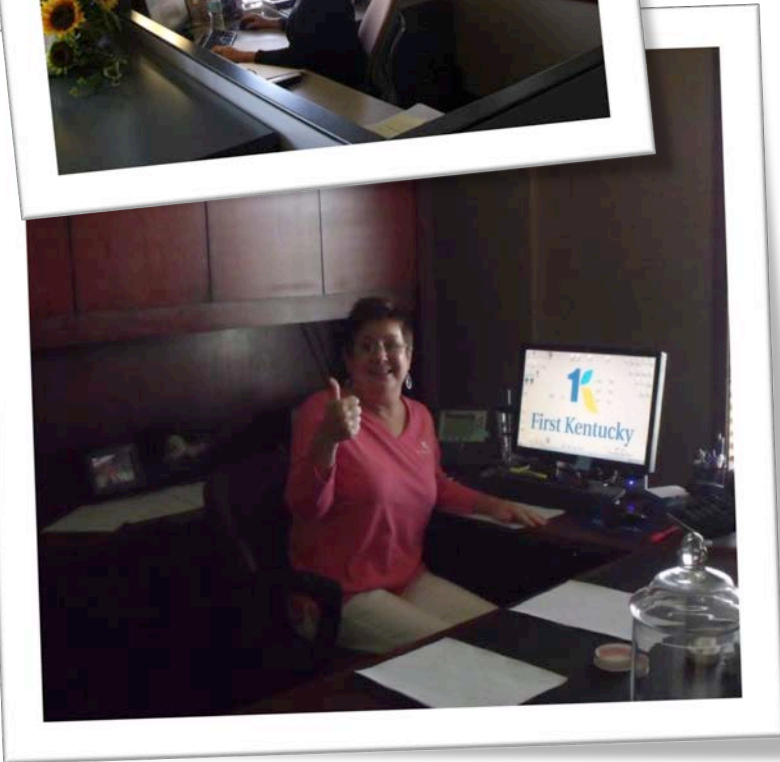
Mayfield City Hall participated all three days by eliminating excess lighting and turning up the thermostat between the hours of 1 PM and 5 PM.



FNB participated in the program by reducing their lighting during the requested times.



First Kentucky Bank turned off lights in unoccupied areas and in areas with natural light. Some employees stated they enjoyed working in natural light more than florescent light.



STRATEGY FOR PEAK REDUCTION & ENERGY MANAGEMENT PROGRAM

MEWS plans to lead by example and reduce energy consumption and Coincidental Peak at all MEWS facilities.

MEWS FACILITES PARTICIPATION

Water Plant

- Shift Water Plant coincident peak kW by operating diesel generator during MEWS peak
- Utilizing our storage by shutting off the service pumps at the million-gallon water tank. Reducing horsepower is will reduce kW at facility, 1HP=. 75kW.
- Eliminating excess lighting in unoccupied areas
- Raising thermostat to 78 degrees during specified times

Wastewater Plant

- Monitor the plant and only run blowers, digesters and motors that are necessary to keep plant in compliance during peak time.
- Reducing the amount on motors running, pumps and blowers during the peak time. Reducing horsepower is will reduce kW at facility, 1HP=. 75kW.
- Bringing up the plant slowly
- Eliminating excess lighting in unoccupied areas
- Raising thermostat to 78 degrees during specified times

Electric Warehouse

- Eliminating excess lighting in unoccupied areas

Main Office

- Eliminating excess lighting in unoccupied areas
- Raising thermostat to 78 degrees during specified times
- Lowering the solar shades in the main lobby

Residential/Commercial Customers

- MEWS will ask our customers for assistance, if they are at home, just refraining from using or preventing from cycling high-energy consuming appliances such as electric hot water heaters, pool pumps, washers, dryers, or electric ranges can have a valuable impact. The greatest impact will be to raise their thermostat just a few degrees so that their air conditioning does not operate during the specified time.
- MEWS will ask our commercial facilities to adjust the thermostat up to 78 degrees, and turn off lights in unoccupied areas during the specified times to make a difference. Minor changes by an entire community can make a major impact on the MEWS power bill while saving the customer money along the way.

RESULTS

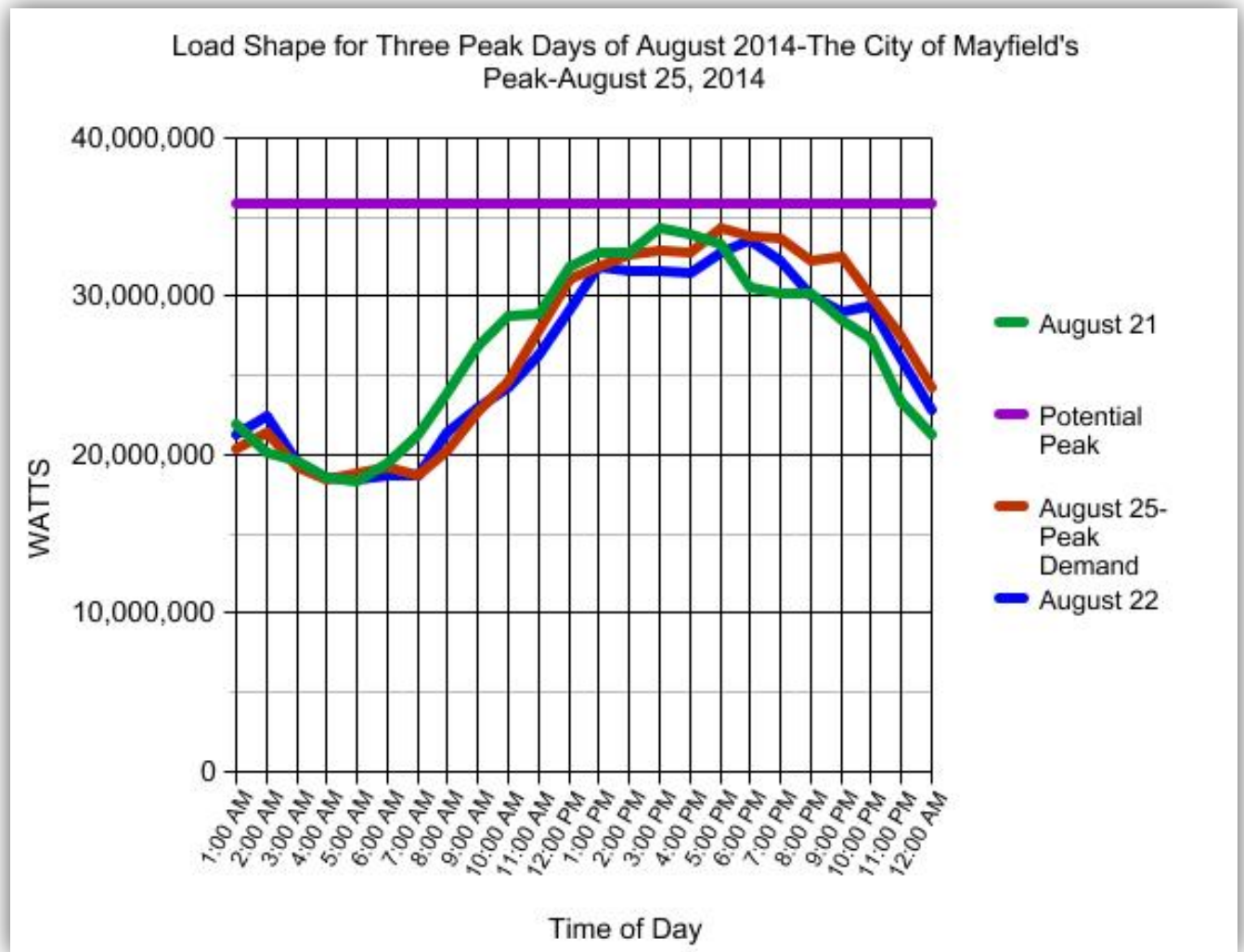
MEWS forecasted that the potential peak would occur on August 21, 22 or 25th and based on historical data should peak at approximately 36MW. Keeping the peak demand below 36,000 kW or 36 MW became our goal for this period. The peak for the month of August was set on Monday, August 25, 2014 at 3:59 PM. The MEWS' distribution system reached its peak demand at 34,048 Megawatts at that time. By utilizing the aforementioned components of our Peak Reduction & Energy Management Program MEW can project an approximate reduction in peak demand on our TVA power bill of 1.952 MW. This translates into an approximate projected savings of \$16,592.00 for MEWS.

Comparison of Potential kW Consumed Under Normal Operations vs. kW Consumed Under Peak Reduction/Energy Management Program

MEWS Facilities

LOCATION	No Event 3 PM – 4 PM	Event Notification 3 PM - 4 PM
Wastewater Plant	338 Potential kW	93 kW
Water Plant	372 Potential kW	0 kW
Main Office	51 Potential kW	27.12 kW

MEWS' Distribution System Operating Under the Peak Reduction/Energy Management Program



MEWS' PROPOSAL FOR FUTURE CONTRIBUTION TO THE PEAK REDUCTION & ENERGY MANAGEMENT PROGRAM

1) MEWS Substation & Distribution System

- Conservation Voltage Reduction (CVR)
 - The technique for improving the efficiency of the electrical grid by optimizing voltage on the feeder lines that run from substations to homes and businesses.
 - CVR lowers the voltage at which electrical power is delivered and yields on average, a 1% energy savings for each 1% in voltage reduction down to 114V
 - In the US, regulations require that voltage be made available to consumers at 120V +/- 5% – which yields a range of 126V to 114V

2) Install Ecobee Wi-Fi Enabled Thermostats at MEWS Facilities

- MEWS will install Wi-Fi enabled thermostats at the Main Office, Office w/ Board Room (separate thermostat), Water Plant, and Sewer Plant.
- We will deliver a message via the Internet stopping the HVAC from cycling during the specified times.

3) Design a Program to Offer MEWS Customers Programmable Thermostats

- MEWS will develop a program offering a programmable thermostat controlled by MEWS to the customers.
- MEWS will deliver a message via the internet allowing MEWS the ability to have control over their thermostat during the specified times, preventing their home from contributing to the peak demand, and providing a return on our investment.

4) Design a Program to Offer MEWS Customers Programmable Water Heaters

- MEWS will develop an Electric Water Heater Program offering a smart water electric water heater controlled by MEWS to the customer.
- MEWS will deliver a message via the internet allowing MEWS the ability to have control over their water heater during the specified times, preventing their home from contributing to the peak demand, and providing a return on our investment.

5) Potential Upgrades to Waste Water Plant to Improve Efficiency of Operation and Further Reduce Demand During Peak Times

- Install O2 Monitoring System on Oxidation Ditch and Post Aeration
- Reduce aerator brush operation based on O2 readings
- Reduce aeration fan speeds based on O2 readings using VFD's
- Upgrade UV disinfection in post aeration to more efficient system
- Obtain TVA Comprehensive Services Program to perform sub-metering on plant components and compare to O2 data.
- Determine which plant components are largest energy users
- Upgrade lighting from Metal Halide and T-12 fluorescents to T-8/T-5 fluorescents
- Install energy efficient influent pump(s) with VFD's that modulate based on influent levels replacing the original worn screw pumps

6) Potential Upgrades to Water Plant to Improve Efficiency of Operation and Further Reduce Demand During Peak Times

- Use Variable Frequency Drive (VFD) to slow high-service pumps so they can be "paired" with well pumps
- Use staging/VFD controls to operate "paired" pumps such that one (1) pair runs as trim system and others are used as base load.
- Controls can rotate which set is used as trim system to balance run hours.