

Evaluating Utility Bills & Identifying Opportunities for



Energy
Efficiency

& Cost Savings

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UNIVERSITY OF
LOUISVILLE[®]
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KPPC's Energy Assistance Model

- **Phase 1: 12-month energy bill analysis:**
 - ✓ **Billing errors**
 - ✓ **Tariff comparison/evaluation**
 - ✓ **Interruptible power**
 - ✓ **Contract demand**
 - ✓ **Load shifting, load shedding**
 - ✓ **Power factor penalties/correction**
 - ✓ **Minimum billing provisions**

KPPC's Energy Assistance Model

- **Phase 2: on-site walkthrough to evaluate facility energy subsystems such as:**
 - ✓ **Lighting**
 - ✓ **Facility heating/cooling**
 - ✓ **Compressed air**
 - ✓ **Boilers**
 - ✓ **Ovens, driers, furnaces, other energy-intensive process equipment**

Includes energy use breakdown by process area and/or energy subsystems

Energy Bill Analysis

- ❑ **Essential component of any energy management program**
 - ✓ **Continuing account of energy use and cost**
 - ✓ **Keeping up-to-date records of monthly energy consumption and associated costs**
 - ✓ **A separate record will be required for each type of energy used, i.e., gas, electric, oil, etc.**
 - ✓ **A single energy unit should be used to express the heating values of the various fuel sources (MMBtu)**

If you can't measure it, you can't manage it!

Energy Units – Electric Service

- **kW = unit used to measure electrical demand (power)**
 - ✓ Usually calculated in 15 or 30-minute intervals
 - ✓ **Peak Demand = Greatest value in any 15 or 30-minute interval**
 - Ex. 1,000 kWh/0.50 Hr = 2,000 kW Demand

- **kWh = unit of measure for electrical energy**
 - ✓ 1 kWh = 1,000 Watts of power used for 1 hour
 - ✓ 1 kWh = 3,412 Btu = 0.003412 MMBtu

Energy Units – Electricity Analogy

□ Electrical Charges typically have two metered components:

1. Demand (Power)

2. Consumption (Energy)





Customer Service: 1-800-383-5582 Mon-Fri 7AM-6PM(EST)
 Walk-In Center Hours: Mon-Fri 8AM-5PM(EST)
 Telephone Payments: (800) 807-3596
 www.eon-us.com

DUE DATE	AMOUNT DUE
02/18/09	\$14,145.25

See the Important Information section for details about your new rates.

ACCOUNT INFORMATION

Account Number:
 Account Name:
 Service Address:

ELECTRIC CHARGES

Rate Type: PS-SECONDARY PF ADJ

Customer Charge	75.00
Energy Charge	5,885.54
Demand Charge (\$7.65 x 743.40 kw)	5,687.01
88.30% PF Adj to 90.00% (\$7.65 x 14.3 kw)	109.40

Other Charges For Above Rates

Fuel Adjustment (\$.00409 x 179328 kwh)	733.45
Program Cost Recovery (\$.00006 x 179328 kwh)	10.76
Environmental Surcharge (6.500% x \$12,501.16)	812.58
Merger Surcredit (1.013% CR x \$13,313.74)	-134.87

Total Electric Charges

\$13,178.87

Customer Service 1-800-383-5582

PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Account Number	Previous Balance	Payment Due Date	Total Amount Due	Winter Care Donation	Amount Enclosed
	\$68.95	02/18/09	\$14,145.25		\$



KPPC
 Kentucky's Resource Center for
 Environmental Sustainability



Power Factor

- ❑ **Low Power Factor (PF) Penalty**
 - ✓ Typically caused by using magnetic devices such as light ballasts, motors, transformers...
 - ✓ Assessed when below 80% or 90%

- ❑ **Three Effects of Low PF(<80%)**
 - ✓ Robs the Distribution System of Capacity
 - ✓ Higher Currents = High Voltage Drop & Electrical System Losses
 - ✓ Billing Penalty (\$)

- ❑ **Improvements:**
 - ✓ Capacitors, High-PF Motors and Lighting Ballasts

Natural Gas Service

- ❑ **Natural Gas Charges typically have two components on the bill:**
 - ✓ **Supply – The purchase cost for the physical natural gas supplied by the utility (local distribution company).**
 - ✓ **Distribution/Transportation – The cost to deliver the physical natural gas through the utility’s distribution system to the customer.**



Customer Service: (800) 331-7370 Mon-Fri 7AM-6PM
 Walk-In Center Hours: Mon-Fri 8AM-5PM
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DATE DUE **AMOUNT DUE**
 05/24/07 \$488.49

Want to save time? Join the club! Sign up for our Automatic Bank Club! Check the Important Information section of your bill for more information.

ACCOUNT INFORMATION

Account Number:
Account Name:
Service Address:
Next Read Date: 06/06/07

BILLING SUMMARY

Previous Balance	0.00
Payments as of 05/08	0.00
Balance as of 05/08	0.00
Gas Charges	474.26

Averages for Billing Period	This Year	Last Year
Average Temperature	58°	63°

GAS CHARGES

Rate Type: COMMERCIAL

Customer Charge	117.00
Gas Distribution Charge	61.07
Gas Supply Component (\$.65666 x 319 ccf) Prev Rate 25 days	209.47

TAXES AND FEES

Rate Increase For School Tax (3.00% x \$474.26)	14.23
Total Taxes and Fees	\$14.23

Please see reverse side for additional charges.

Please bring entire bill when paying in person.

Customer Service (502) 627-3313

PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Account Number	Payment Due Date	Amount Due By Due Date	Amount Due After Due Date	Winter Help Donation	Amount Enclosed
	05/24/07	\$488.49	\$488.49	\$	\$



KPPC

Kentucky's Resource Center for Environmental Sustainability



Billing & Rate Structure

□ Rate Analysis (“Tabletop” Assessment)

✓ Utility companies classify electric and natural gas service according to Rate types

- Potential Rate Examples: Residential; General Service; Commercial; Industrial

✓ Riders modify the structure of a Rate and based upon specific qualifications of the customer

- Potential Rider Examples: Interruptible; HLF (High Load Factor); TOD (Time-of-Day); Green Energy

✓ Tariff Rates & Riders:

- State Public Service Commission Websites
- Utility Website

Billing & Rate Structure

□ Clauses:

- ✓ **Contract Demand – minimum monthly billing demand and excess demand charge**
- ✓ **Demand Ratchet – billing mechanism that selects the highest demand from the current month or previous month(s)**
 - **Sometimes a percentage of the highest demand recorded in the previous 11 months is used.**

Billing & Rate Structure

□ Clauses (continued):

- ✓ **Minimum Energy Charge – typically based upon a contract demand.**
 - **Ex. Contract Demand 500 kW x 400 Hours = 200,000 kWh**
 - **200,000 kWh x Energy Price (~\$0.06 kWh) = \$12,000**

- ✓ **Time of Day**
 - **Establishes a daily time period in which the peak demand is measured**
 - **Can also be used to establish peak and non-peak energy usage charge (Time of Use)**

Billing & Rate Structure

“As a result of your analysis, ICS did switch to a more economical electrical rate structure that will save us over \$11,000 per year. The Vice President of Operations was able to get a rebate in excess of \$13,000 ...”

“and to have our two companies metered together so that we can enjoy the optimal rate structure with an estimated savings of \$17,800 for both companies in the upcoming year.”

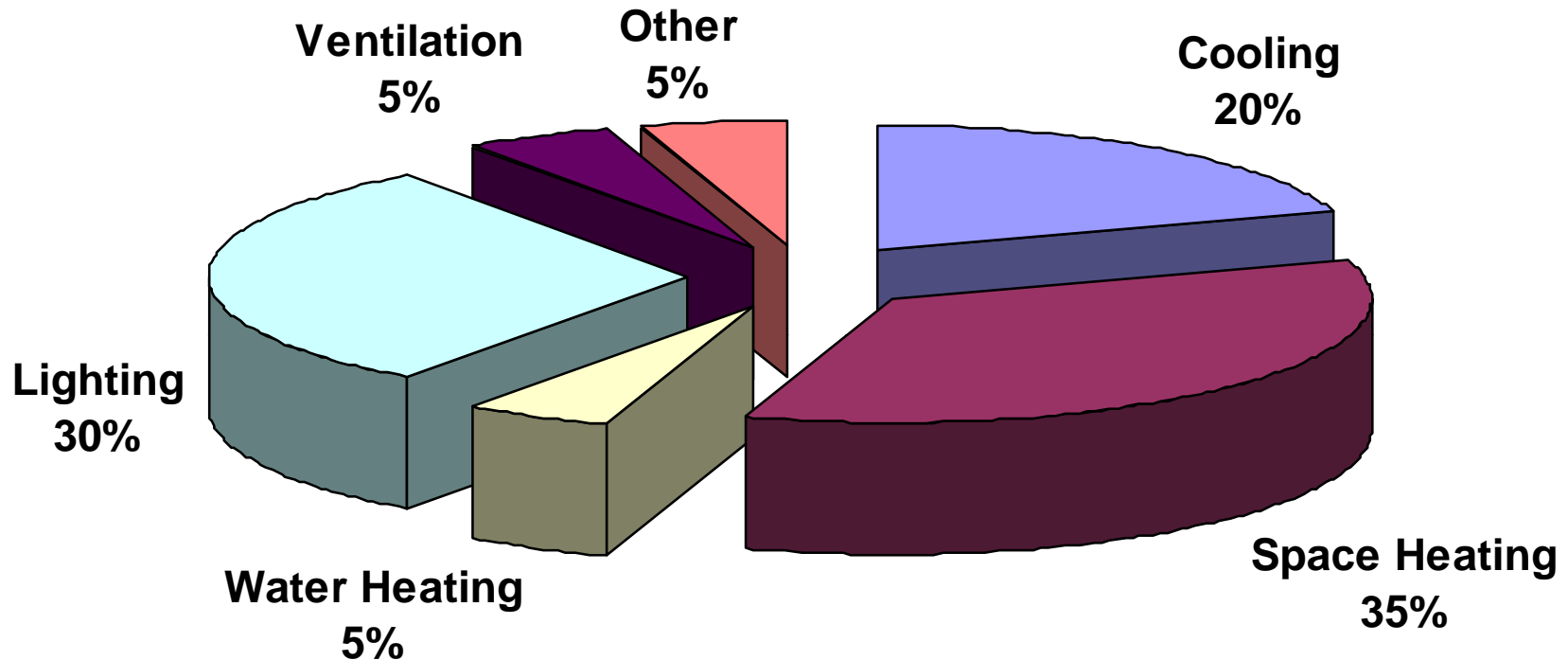
Energy Bill Analysis Leads Where?

- ❑ Trends and irregularities in energy usage and costs can be detected
- ❑ Track energy use, demand and cost
- ❑ Common tools:
 - ✓ Spreadsheets
 - ✓ Energy Star Portfolio Manager
 - ✓ Utility websites
 - ✓ Energy Service Provider/Energy Service Company (ESCO)(\$)
 - Web-based utility tracking & reporting services
 - Real-time energy tracking services

What is Baseline & Benchmarking?

- ❑ **Baseline** – Initial collection of data which serves as a basis for comparison with subsequently acquired data
- ❑ **Benchmarking** – Measurement and comparison of the facility's own energy use over time (internal) or a comparison to similar facilities outside the organization (external)

Typical School Energy Use Breakdown



Typical Savings Potential: 10-15%
Can Be As High As 30%

Basic Energy Accounting

- ❑ **Normalizing - process of removing the factors impacting on energy use to fairly compare the energy performance of facilities and operations**

- ❑ **A facility's energy usage/ cost can be normalized using:**
 - ✓ **Building Size (ft² of heated/cooled space)**
 - ✓ **Operation Hours**
 - ✓ **Production Numbers**



Energy Tracking Systems Comparison

Tool	Data Entry	Custom Functions	User Friendly	Software Cost	Overall Rating
Spreadsheet	Manual	Yes	No	Usually Free	Good for DIY's
Energy Star Portfolio Manager	Manual /Auto	Some	Yes	Free	Good for overview and basic tracking
Energy Service Provider/Company	Auto	Yes	Yes	Initial Set Up and Annual Service Fee	Good for clients with multiple meters

Rate Spreadsheet

Rate:
Customer / Facility:
Account Number:

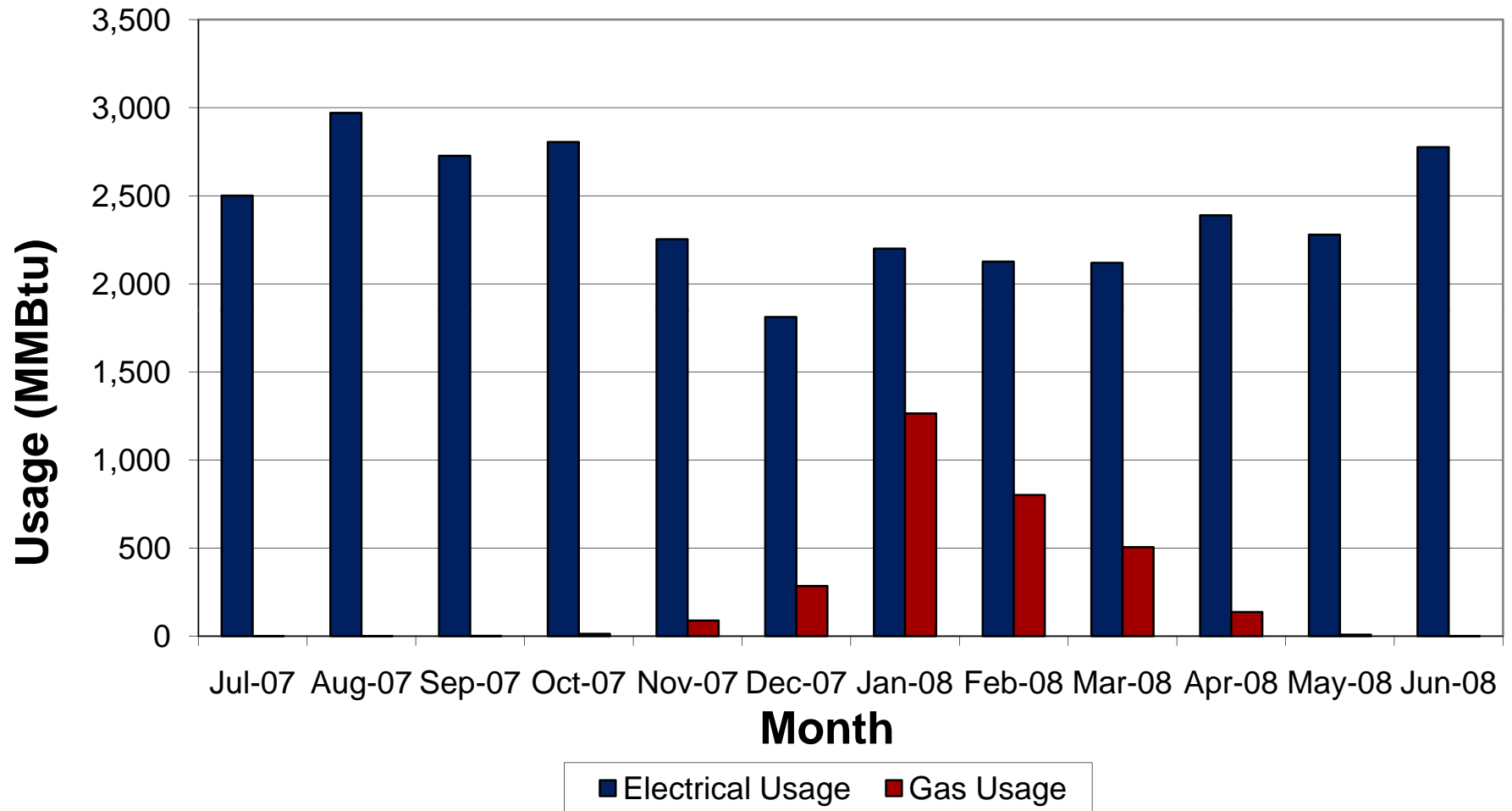
	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08
Demand (kW)							
Peak Demand (kW)							
Usage (kWh)							
Power Factor (%)							

<u>Bill Calculation</u>	
Customer Charge	
Energy Charge	
Demand Charge	
Peak Demand Charge	
Unmetered	
<u>Other Charges</u>	
Power Factor Charge	
DSM Charge	
Fuel Adjustment	
Program Cost Recovery	
Environmental Surcharge	
Merger Surcredit	
Value Delivery Surcredit	
<u>Taxes</u>	
School Fee	
Franchise Fee	
Sales Tax	
Total Taxes	
Total Electric Charges (Before Tax)	
Amount Due	
<u>Unmetered Charges</u>	
(charge 1)	
(charge 2)	
Unmetered Total (before tax)	

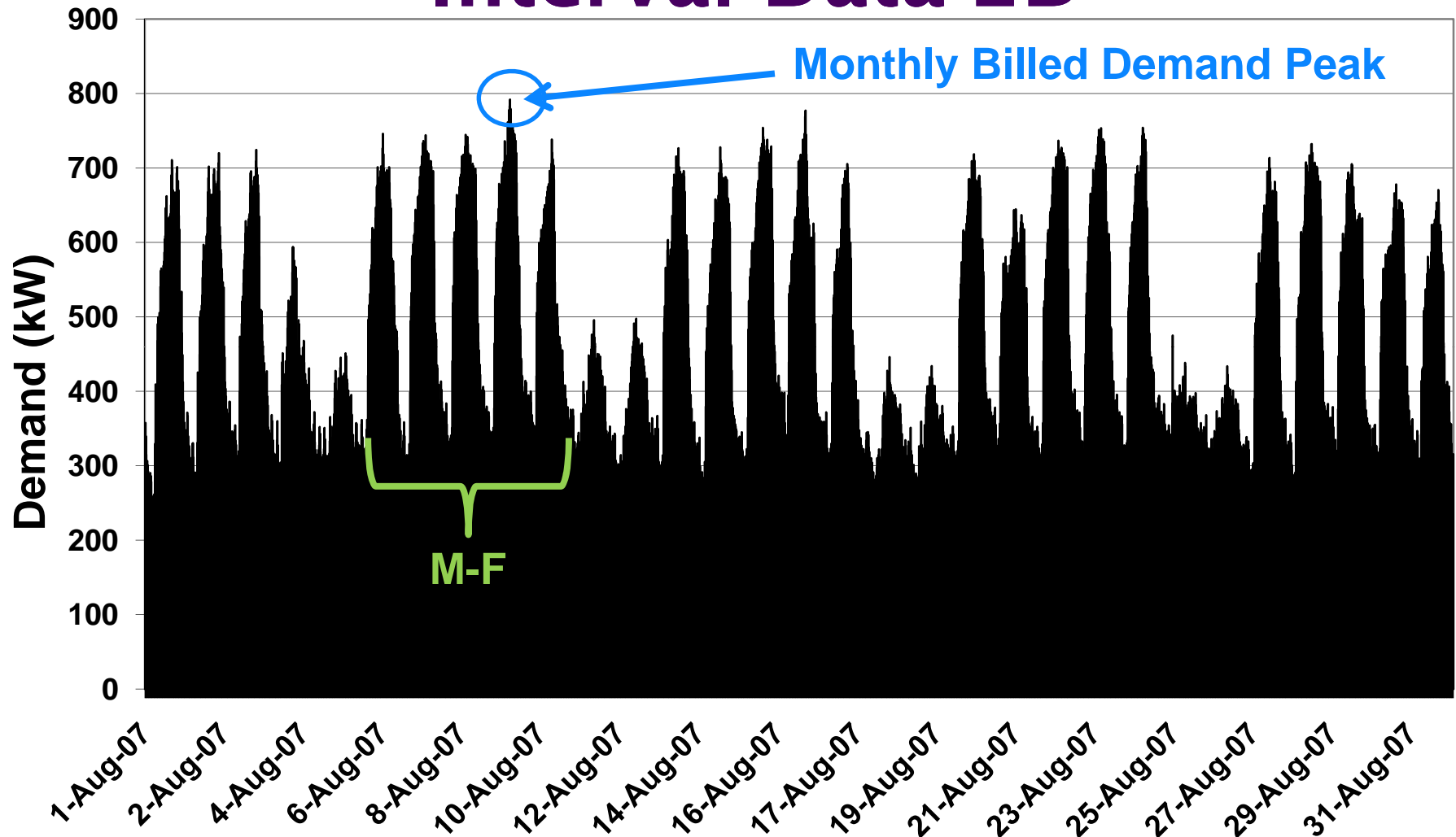
	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total/Avg
Demand (kW)													#DIV/0!
Peak Demand (kW)													#DIV/0!
Usage (kWh)													0
Power Factor (%)													#DIV/0!
Rate:													
Customer / Facility:													
Account Number:													
<u>Bill Calculation</u>													
Customer Charge	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Energy Charge	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Demand Charge	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Peak Demand Charge	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Unmetered	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<u>Other Charges</u>													
Power Factor Charge	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
DSM Charge	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fuel Adjustment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Program Cost Recovery	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Environmental Surcharge	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Merger Surcredit	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Value Delivery Surcredit	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<u>Taxes</u>													
School Fee	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Franchise Fee	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Sales Tax	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Taxes	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Electric Charges (Before Tax)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Amount Due	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<u>Unmetered Charges</u>													
(charge 1)													
(charge 2)													
Unmetered Total (before tax)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<u>Degree Days (based on billing Per.)</u>													
Heating	754	899	927	561	197	55	0	0	0	23	222	691	
Cooling	2	2	0	0	47	178	452	538	475	259	57	0	
<u>Number of Days in Billing Period</u>													
Load Factor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
<u>Unit Costs</u>													
Customer Charge	\$0.02008	\$0.02008	\$0.02362	\$0.02362	\$0.02362	\$0.02362	\$0.02362	\$0.02362	\$0.02362	\$0.02362	\$0.02362	\$0.02362	\$0.02362
Energy Charge (\$/kWh)	\$4.88	\$4.88	\$4.88	\$4.88	\$4.88	\$4.88	\$4.88	\$4.85	\$4.85	\$4.85	\$4.85	\$4.85	\$4.85
Demand Charge (\$/kW)	\$7.43	\$7.43	\$7.43	\$7.43	\$7.43	\$7.43	\$7.43	\$9.99	\$9.99	\$9.99	\$9.99	\$9.99	\$9.99
Peak Demand Charge (\$/kW)	\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32	-\$0.32
PF charge													
<u>Other Charges</u>													
Electric Fuel Adjustment (\$/kWh)	\$0.00586	\$0.00479	\$0.00271	\$0.00575	\$0.00603	-\$0.00019	\$0.00207	\$0.00151	\$0.00134	\$0.00175	\$0.00355	\$0.00364	
Prog. Cost Recovery (\$/kWh)													
Environmental Surcharge (%)	0.590%	0.900%	1.370%	2.080%	1.580%	0.080%	0.780%	0.370%	1.490%	1.480%	1.020%	0.150%	
Merger Surcredit (%)	-2.431%	-2.431%	-2.431%	-2.431%	-2.431%	-2.431%	-2.431%	-2.431%	-2.431%	-1.369%	-1.499%	-1.499%	
Value Delivery Surcredit (%)	-0.940%	-0.940%	-0.940%	-1.000%	-0.897%	-0.897%	-0.897%	-0.897%	-0.897%	-0.897%	0.000%	0.267%	
<u>Taxes/Fees</u>													
Franchise Fee													
School Fee	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Sales Tax	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
<u>Amount Billed</u>													
Error	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00



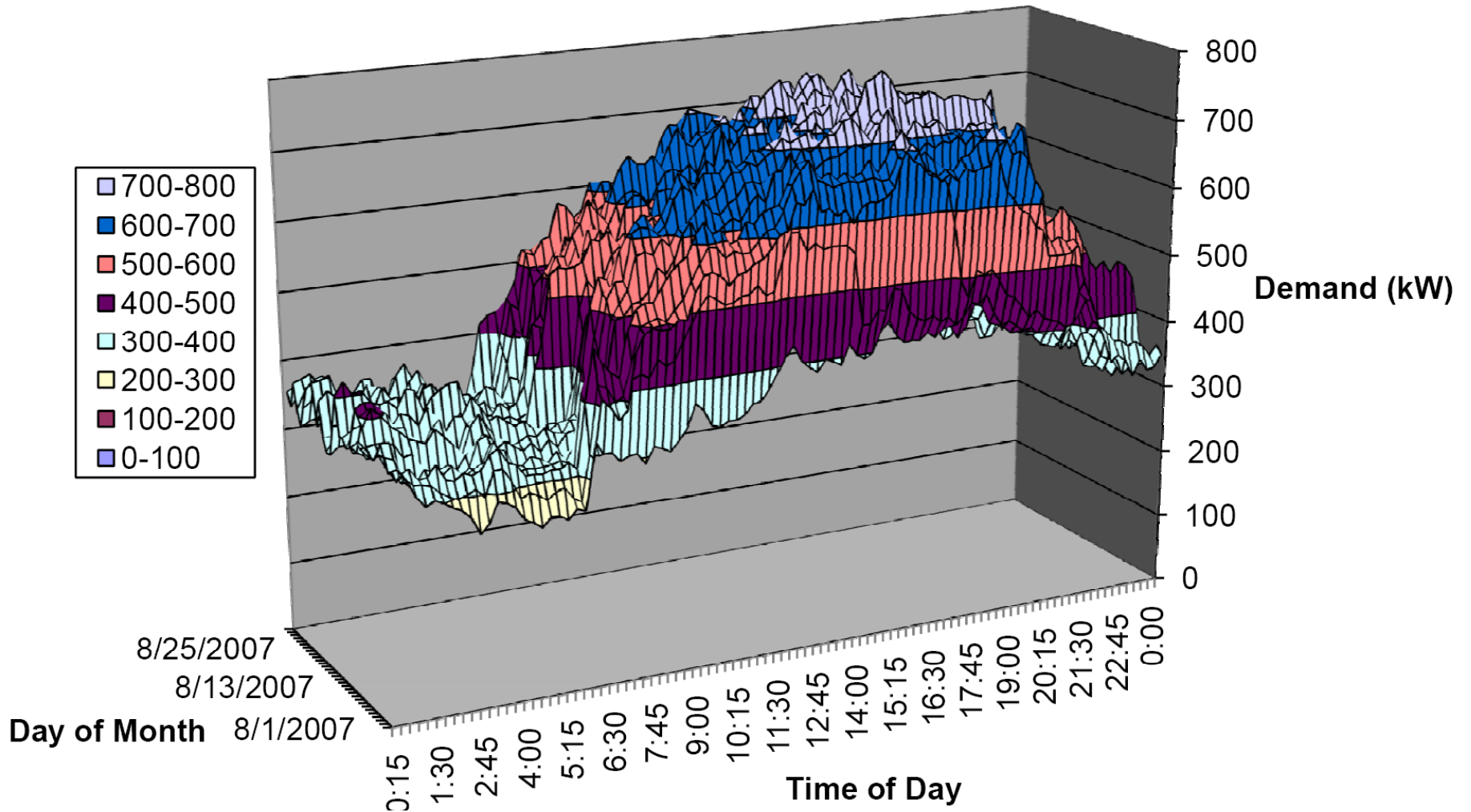
Spreadsheet – Energy Usage



Spreadsheet - Monthly Demand Interval Data 2D



Spreadsheet – Monthly Demand Interval Data 3D



Questions & Comments



Cam Metcalf



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KPPC Contact Info

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