ANALYSIS OF UTILITY BILLS AND SITE ENERGY COSTS

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Presented to:

American Society of Heating, Refrigerating and Air-Conditioning Engineers

Bi-State Chapter **Feb 2012**

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Learning Objectives

1. Understanding Industry Structural Issues, Energy Policy Act of 1992.

2. Understanding Concepts of Energy Billing (Production vs Demand, etc.) in today's energy marketplace.

3. Energy Bill Analysis
   A. Understanding Components of the Electricity bill.
   B. Review of energy consumption profiles.

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Analysis of Bills

The audit must begin with a detailed analysis of the energy bills for the previous twelve months. This is important because:

- **The bills show the proportionate use of each different energy source when compared to the total energy bill.**

An examination of where energy is used can point out previously unknown energy wastes. The total amount spent on energy puts an upper limit on the amount of money that can be saved.

Analysis of Bills, (Cont.)

A thorough analysis of a facility's energy bills requires a detailed knowledge of the rate structures in effect for the facility.

To determine accurate costs of operating individual pieces of equipment, separate energy bills into their components.

> **E.g. demand charge and energy charges for the electric bill.**

This allows more accurate savings calculations for Energy Management Opportunities (EMOs) such as high-efficiency equipment, rescheduling of some on-peak electrical uses, etc.

Energy Policy Act of 1992

As described by the US Energy Information Agency

The Energy Policy Act of 1992 (EPACT) created a framework for a competitive wholesale electricity generation market and established a new category of electricity producer, the exempt wholesale generator (EWG). These EWGs were not subject to the constraints on nonutility electricity generation specified in the Public Utility Holding Company Act.

EPAct 1992 removes obstacles to wholesale power competition in the Public Utilities Holding Company Act (PUHCA) (1935).

In most cases, electricity marketing restructuring required changes in state laws, in addition to the changes in federal law, for the implementation of competitive electrical markets.

Key Concepts

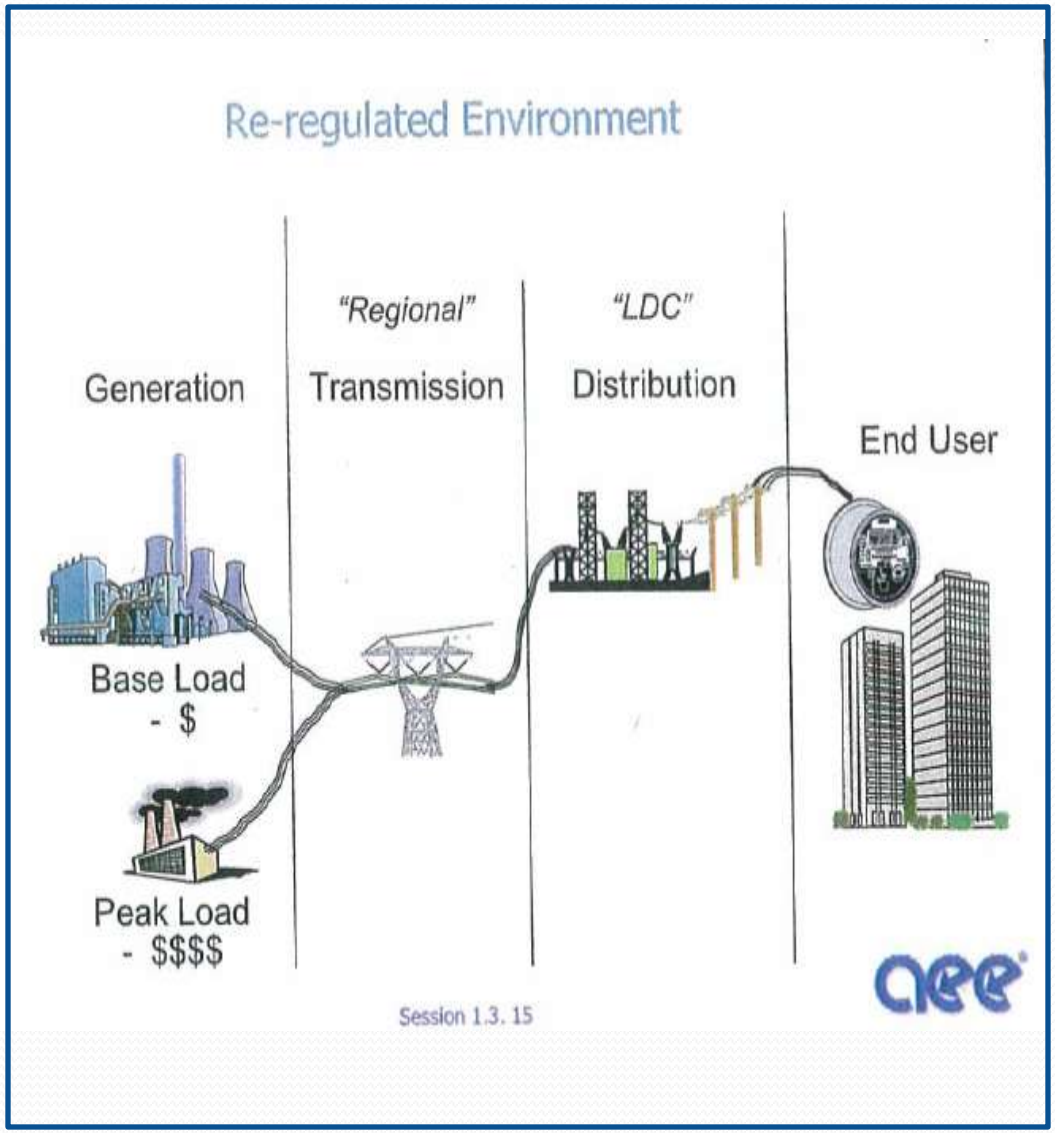
Knowing the difference between demand and energy consumption is essential to understanding your energy bill and when considering measures to reduce your energy costs.

Kilowatt (kW) – A unit of electrical power equal to 1,000 watts.

Demand – The average rate at which electricity is consumed during a 15-minute interval. *Measured in kW.*

Kilowatt-hour (KWh) – 1 kW used for one hour. A measure of energy.

Energy –The amount of electricity consumed over a period of time, i.e., a billing period. *Measured in kWh.*


Re-regulated Environment
"Regional"
"LDC"
Generation
Transmission
Distribution
End User
Base Load
- $
Peak Load
- $$$$
Session 1.3. 15

Key Concepts

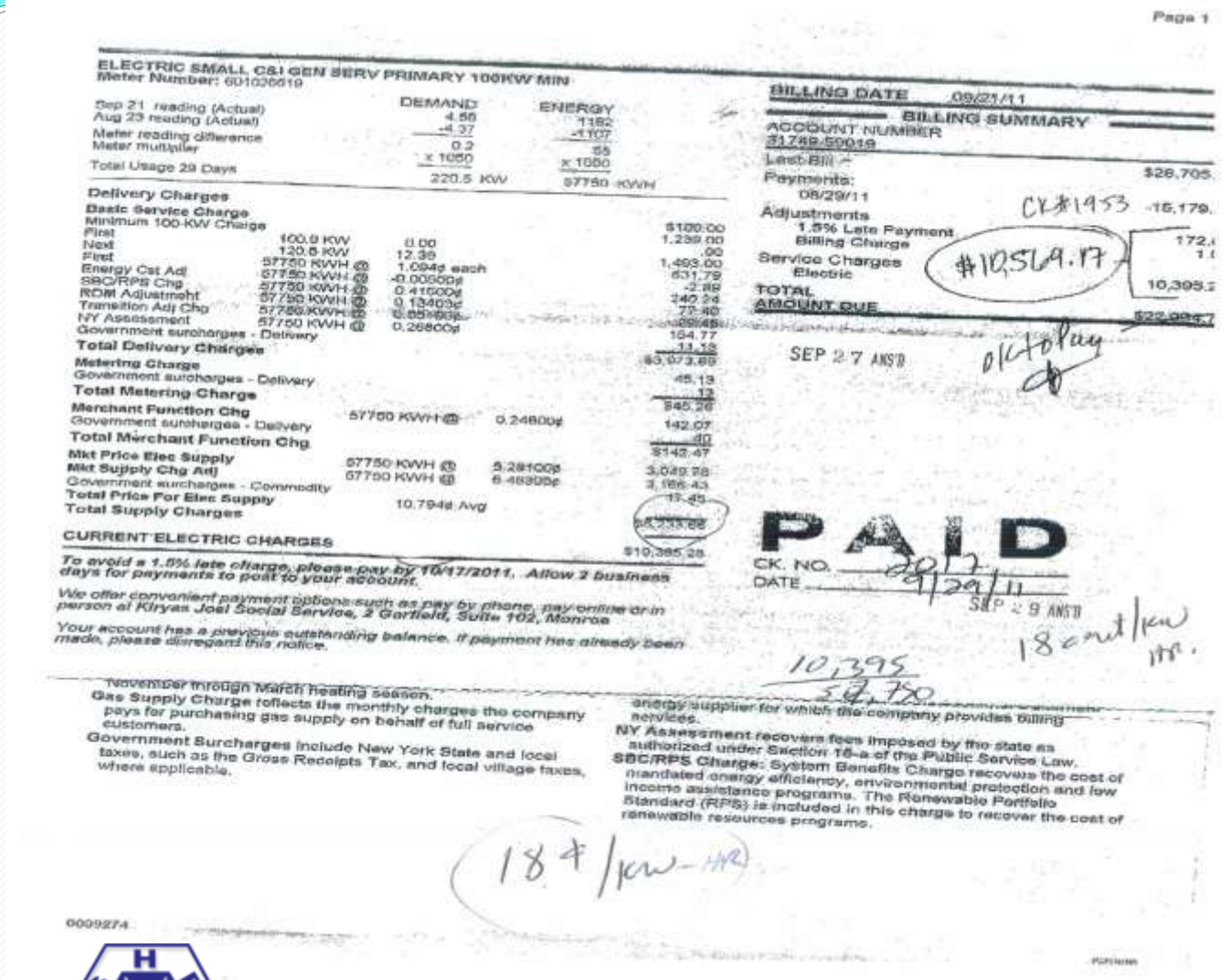
Energy Commodity Supplier -- Sells the KW-hrs produced at the power plant. ***(The dairy farmer),*** **AKA: Energy Consumption**

Delivery: The process of distributing electricity (also called transmission) to customers along a network of power lines (the transmission and local distribution systems). ***(The milkman)***

Incumbent Utility: The company that provides or provided your electricity in a regulated market. Also applies to natural gas.

The Federal Energy Regulatory Commission, or FERC, is an independent agency that regulates the interstate transmission of natural gas, oil, and electricity.

NARUC (National Association of Regulatory Utility Commissions), represents the State Public Service Commissioners who regulate essential utility services, including energy, telecommunications, and water.



ELECTRIC SMALL C&I GEN SERV PRIMARY 100KW MIN
Meter Number: 601026619

	DEMAND	ENERGY
Sep 21 reading (Actual)	4.56	1182
Aug 23 reading (Actual)	-4.37	-1107
Meter reading difference	0.2	75
Meter multiplier	x 1050	x 1050
Total Usage 29 Days	220.5 KW	97750 KWH

Delivery Charges
Basic Service Charge $100.00
Minimum 100-KW Charge 1,259.00
First 100.0 KW 0.00 .00
Next 120.5 KW 12.38 1,493.00
First 97750 KWH @ 1.094¢ each 631.79
Energy Cst Adj 97750 KWH @ -0.00000¢ -2.88
SBC/RPS Chg 97750 KWH @ 0.41500¢ 240.24
RDM Adjustment 97750 KWH @ 0.13403¢ 77.40
Transition Adj Chg 97750 KWH @ 0.05160¢ 29.80
NY Assessment 97750 KWH @ 0.26800¢ 154.77
Government surcharges - Delivery 11.13
Total Delivery Charges $3,973.89
Metering Charge 45.13
Government surcharges - Delivery .13
Total Metering Charge $45.26
Merchant Function Chg 97750 KWH @ 0.24800¢ 142.07
Government surcharges - Delivery .40
Total Merchant Function Chg $142.47
Mkt Price Elec Supply 97750 KWH @ 3.28100¢ 3,049.78
Mkt Supply Chg Adj 97750 KWH @ 6.48300¢ 3,166.43
Government surcharges - Commodity 13.45
Total Price For Elec Supply 10.794¢ Avg
Total Supply Charges $6,233.66
CURRENT ELECTRIC CHARGES $10,385.28

To avoid a 1.5% late charge, please pay by 10/17/2011. Allow 2 business days for payments to post to your account.

We offer convenient payment options such as pay by phone, pay online or in person at Kiryas Joel Social Service, 2 Garfield, Suite 102, Monroe

Your account has a previous outstanding balance. If payment has already been made, please disregard this notice.

BILLING DATE 09/21/11
BILLING SUMMARY
ACCOUNT NUMBER
31749-50019
Last Bill $28,705.
Payments: 08/29/11 CK#1953 -15,179.
Adjustments
1.5% Late Payment Billing Charge 172.
Service Charges Electric #10569.17 10,395.
TOTAL AMOUNT DUE $22,994.

SEP 27 ANS'D

PAID
CK. NO. 2917
DATE 9/29/11
SEP 29 ANS'D

10,395
34,720

18¢ kwhr

November through March heating season.
Gas Supply Charge reflects the monthly charges the company pays for purchasing gas supply on behalf of full service customers.
Government Surcharges include New York State and local taxes, such as the Gross Receipts Tax, and local village taxes, where applicable.
energy supplier for which the company provides billing services.
NY Assessment recovers fees imposed by the state as authorized under Section 18-a of the Public Service Law.
SBC/RPS Charge: System Benefits Charge recovers the cost of mandated energy efficiency, environmental protection and low income assistance programs. The Renewable Portfolio Standard (RPS) is included in this charge to recover the cost of renewable resources programs.

18¢/kw-hr

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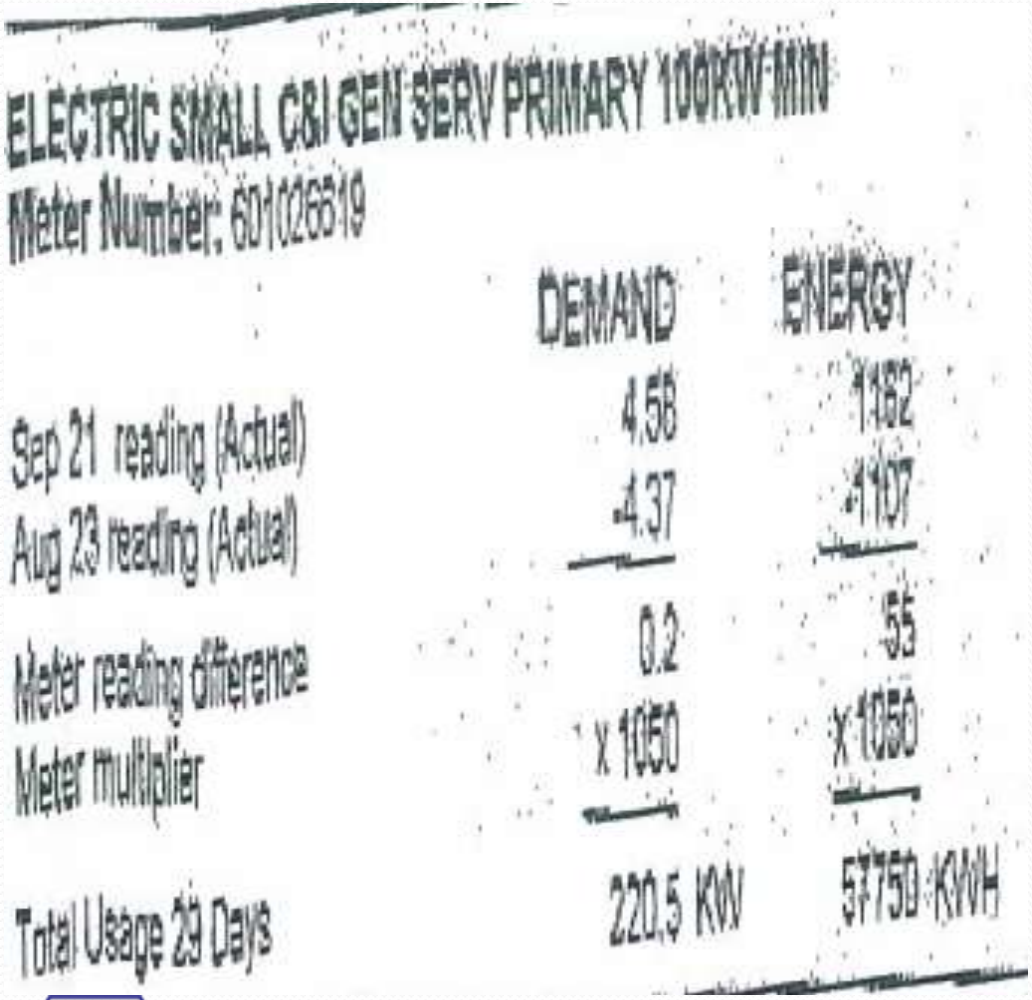
Actual bill for a small manufacturer located in Orange County, New York, served by Orange and Rockland Electric.

This Account will ultimately have an energy spend > $200K per year.



ELECTRIC SMALL C&I GEN SERV PRIMARY 100KW MIN

Meter Number: 60102665 19

	DEMAND	ENERGY
Sep 21 reading (Actual)	4.56	1152
Aug 23 reading (Actual)	4.37	1107
Meter reading difference	0.2	55
Meter multiplier	x 1050	x 1050
Total Usage 29 Days	220.5 KW	57750 KWH

- Summary of Demand vs Energy.
- Total Days of Usage
- Meter constant (multiplier).
- Tariff

Illustrative Electric Bill (cont.)

Distribution Charge

	Peak	Usage	Rate	Amount
Winter	On	10348 @	.00973	$ 100.69
Energy	Semi	37798 @	.00781	$ 295.20
Usage	Off	51405 @	.00691	$ 355.21

Off-Peak Demand:	**190.8 kW x $3.59**	**$ 684.97**
On-Peak Demand:	**192.6 kW x $11.18**	**$ 2,153.27**
TOU Customer Charge		**$ 58.22**

Total Charge for Distribution $ 4,247.56

Average Cost Per Kw-hr, distribution: **4.27 Cents**

Illustrative Electric Bill

Electric Energy Charge

Generation Demand: 190.8 kW x $.21	**$ 40.07**
On Peak 10,348 kWh x $.07684	**$ 795.14**
Semi Peak 37,798 kWh x $.05336	**$ 2,016.90**
Off Peak 51,405 kWh x $.03866	**$ 1,987.32**
Total Electric Charges	**$ 8,961.85**

Total Average Cost Per Kw-hr: **9.00 Cents**

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Economic Impact of Energy Management Opportunities and Energy Conservation Measures

- The facility above has an average energy cost of $0.1167 per kWh.

- An ECM's that reduces peak demand would save the company $ 7.02 per kW per month.

- ECMs that save both energy and demand on the first shift would save about $0.116 per kWh.

- ECMs that save electrical energy during the off-peak shift would only save $0.092 per kWh because they are already using off-peak energy and there would be no additional demand cost savings.

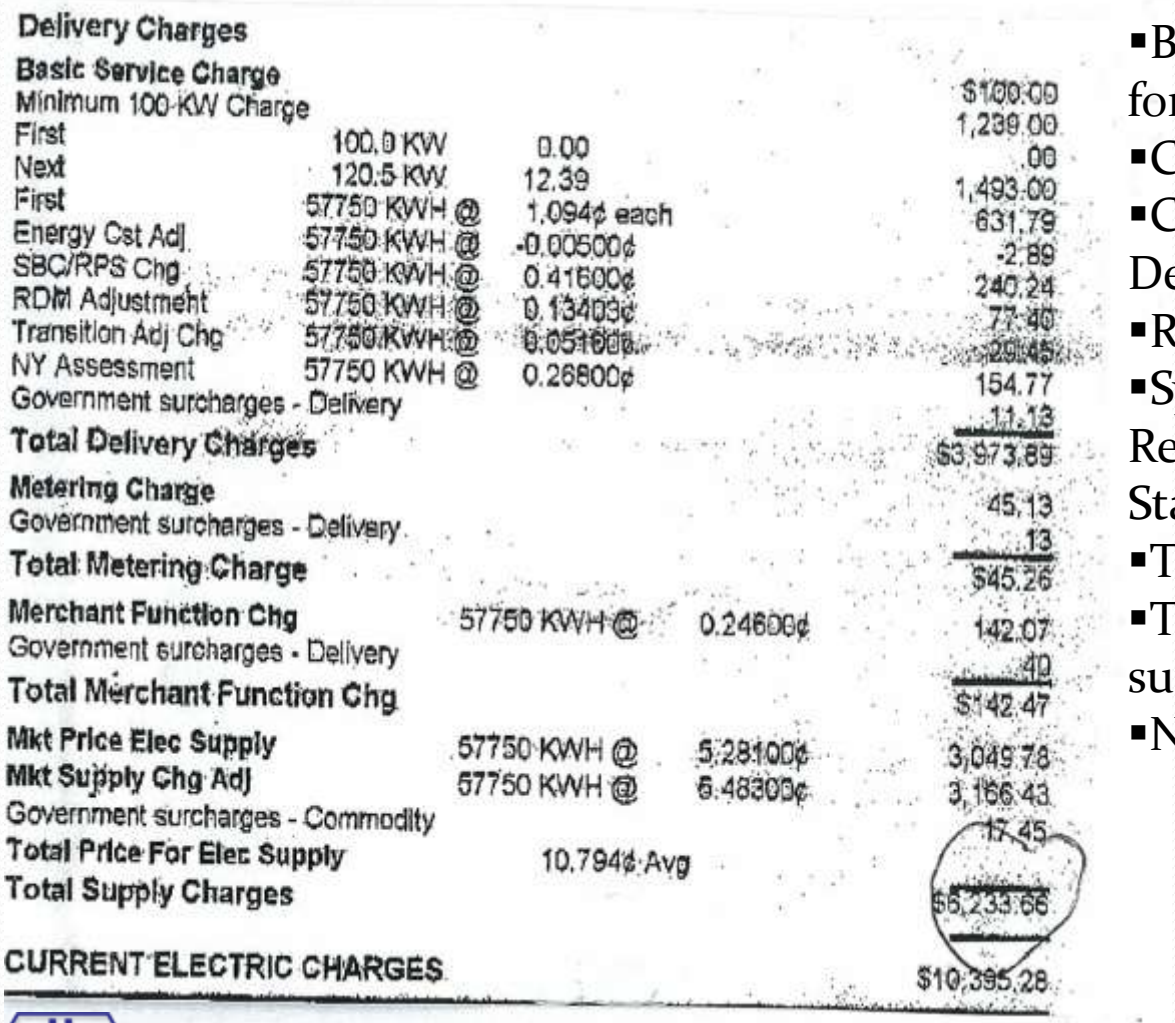
More Key Concepts
Types of Energy Pricing

- Flat rates

- Block rates
  - declining
  - inverted

- Demand rates
  - demand charge
  - demand ratchet

- Time of use rates
  - on-peak
  - off-peak
  - partial-peak



Delivery Charges			
Basic Service Charge			$100.00
Minimum 100 KW Charge			1,239.00
First	100.0 KW	0.00	.00
Next	120.5 KW	12.39	1,493.00
First	57750 KWH @	1.094¢ each	631.79
Energy Cst Adj	57750 KWH @	-0.00500¢	-2.89
SBC/RPS Chg	57750 KWH @	0.41600¢	240.24
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Mkt Price Elec Supply	57750 KWH @	5.28100¢	3,049.78
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Government surcharges - Commodity			17.45
Total Price For Elec Supply		10.794¢ Avg	
Total Supply Charges			$6,233.66
CURRENT ELECTRIC CHARGES			$10,395.28

- Block Rate Structure (both for demand and energy)
- Cost Per Block
- Commodity Supply and Delivery
- Rates Per block
- Systems Benefit Charge - Renewable Portfolio Standard
- Taxes
- Total **average** electrical supply is noted on bill.
- Not present:
  - Reactive charge
  - Ratchet Clause

BILLING DATE 09/21/11

BILLING SUMMARY

ACCOUNT NUMBER
31749-59019

Last Bill	$26,705.12
Payments:	
08/29/11 CK#1953	-15,179.53
Adjustments	
1.5% Late Payment	172.87
Billing Charge	1.02
Service Charges	
Electric	10,395.28
TOTAL AMOUNT DUE	$22,094.75

$10,569.17

Billing Summary

Real Time Pricing

• Concept: Charge for the "real" cost at that point in time. Price will change due to weather, season, power supply problems, power demand problems, etc. Since there is a strong seasonal and time of day component, it is a more sensitive time of use rate.

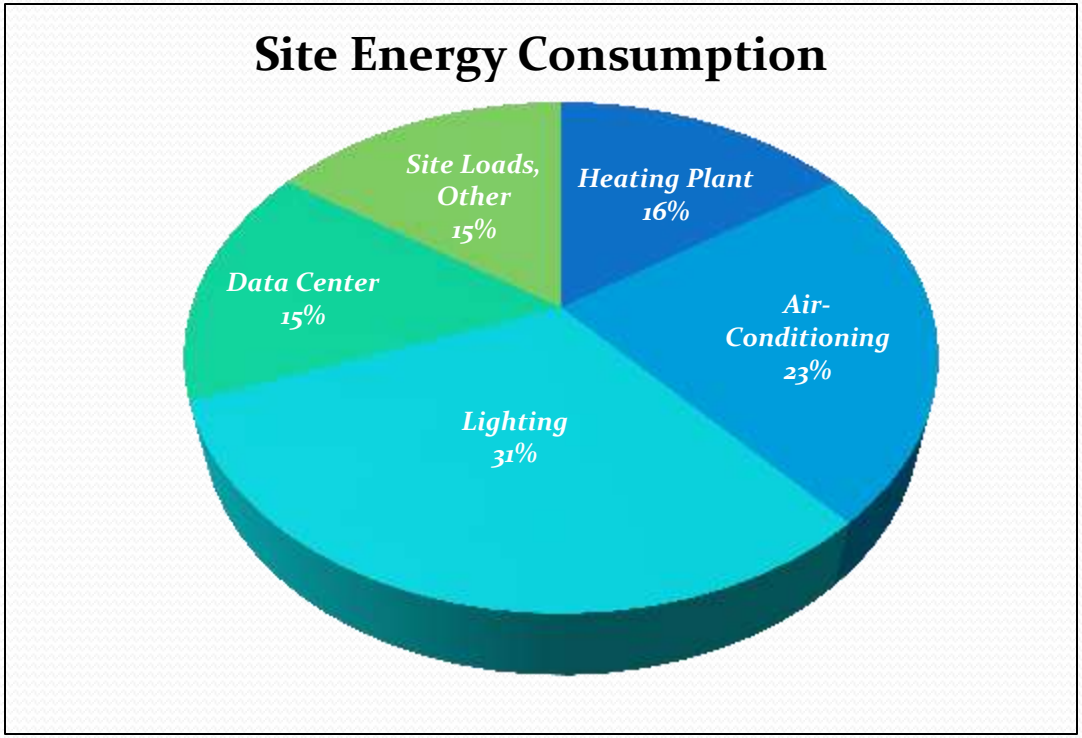
•Facilities can move energy use from periods when the marginal costs are high to periods when they are low, and save considerable amounts of money.

•This is a natural for computer (automated) control of select processes (reschedule electric furnace operation, turn off select equipment, or even alter production schedules to meet tomorrow's marginal costs).

Characteristics of Facilities That Have Flexibility to Benefit from TOU or Real Time Pricing

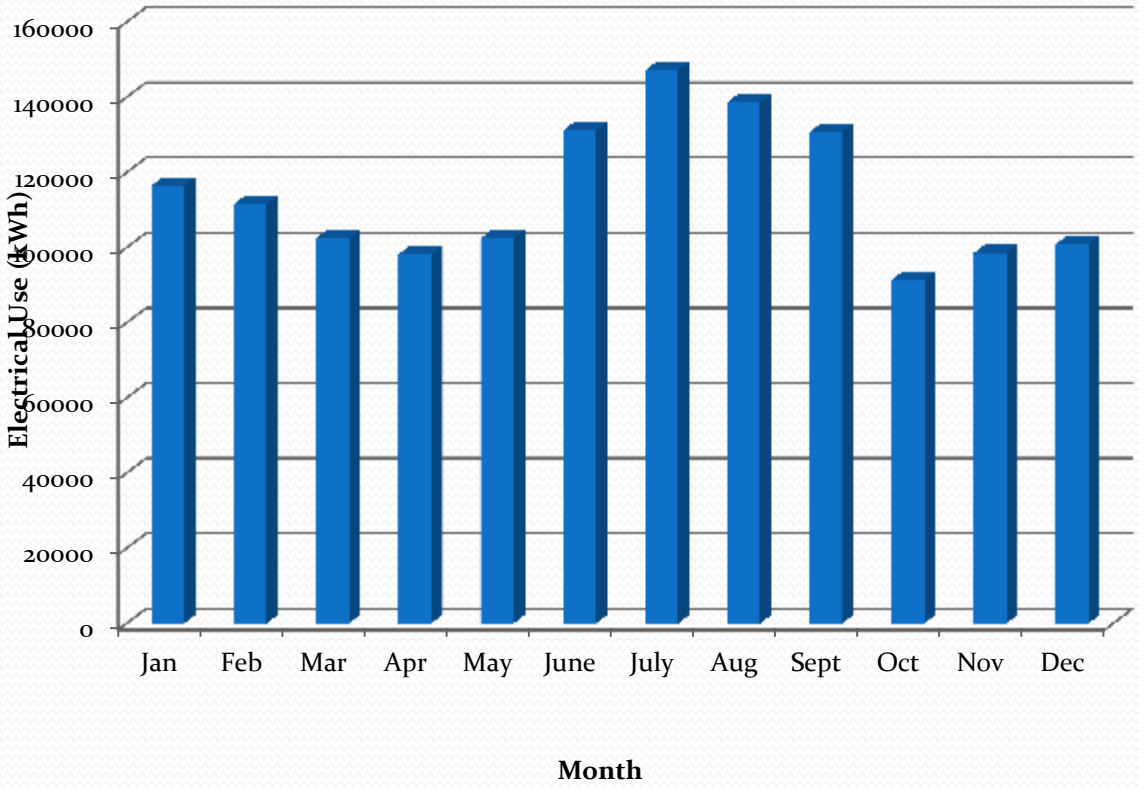
- The production process has:
  - Discrete elements that can be interrupted or modulated.
  - Excess production capacity.
  - Intermediate storage capacity.
- The customer can generatee electricity on-site.
- The customer can delay some production orders.
- The cost of electricity is important compared to the cost of other inputs.

Site Overall Energy Consumption Pie Chart Example



- Normal Office Building with a data center.
- Units normalized to $'s.
- Loads not defined, are called the site "process" loads.

Electrical Profile for a "Regular Office Building" in the Northeast



- Electrical Base Load
- Summer Peak
- Normal Profile for our local climate
- This facility was a "stacked" mid-rise.

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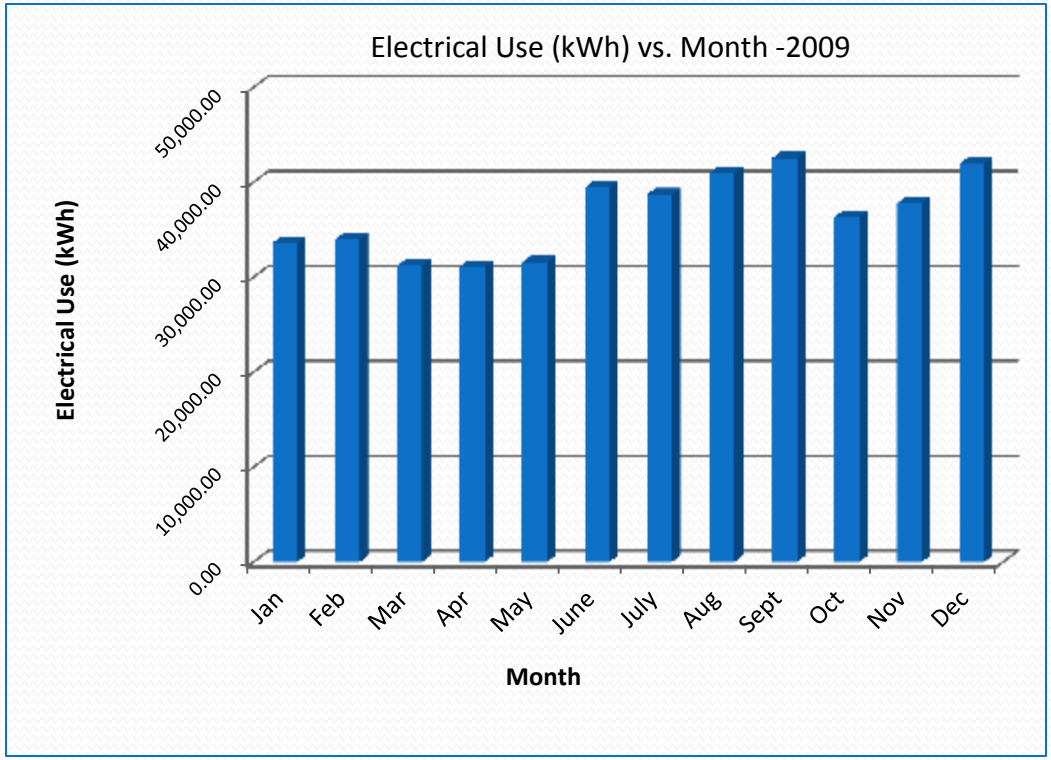
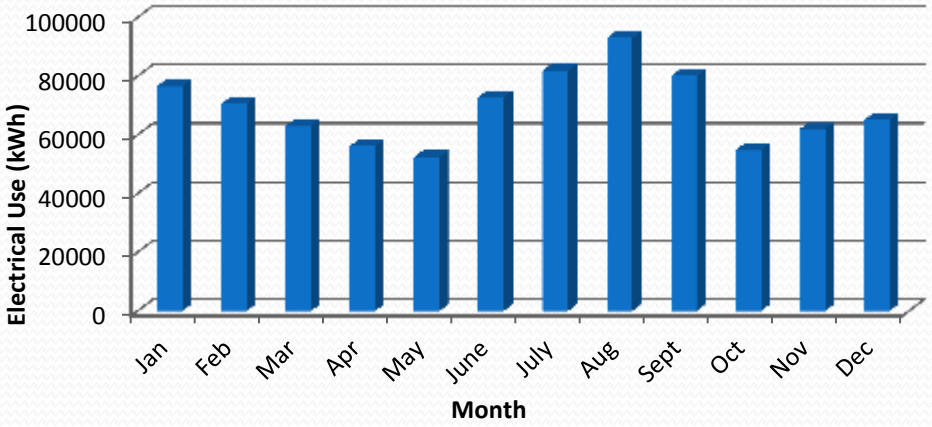
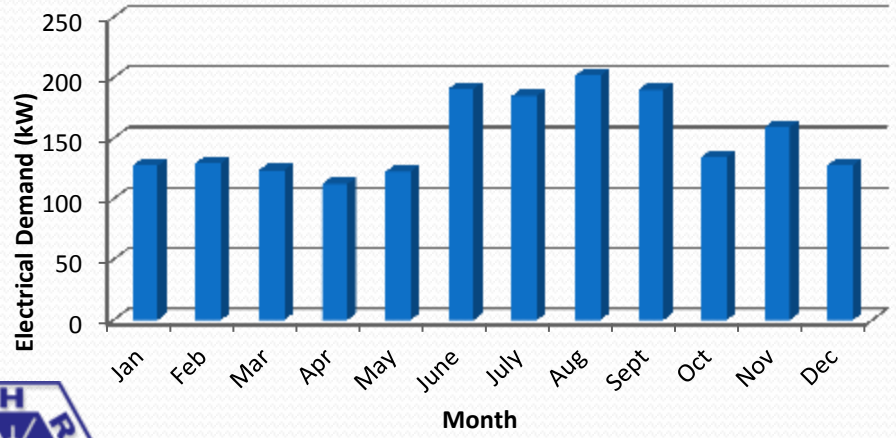
Electrical Profile for a Transportation Facility



This transportation facility has a non-summer peak load associated with higher facility usage at the holiday season.

Electrical Profile for a Multi-Family (About 100 units)





Summer peaks in both demand and consumption, attributable to many smaller inefficient units coming on at the same time.

Also secondary winter peak, lighting contributes to this and possibly electric heating.

A multi-family will show more year on year variability than An equivalently sized office building

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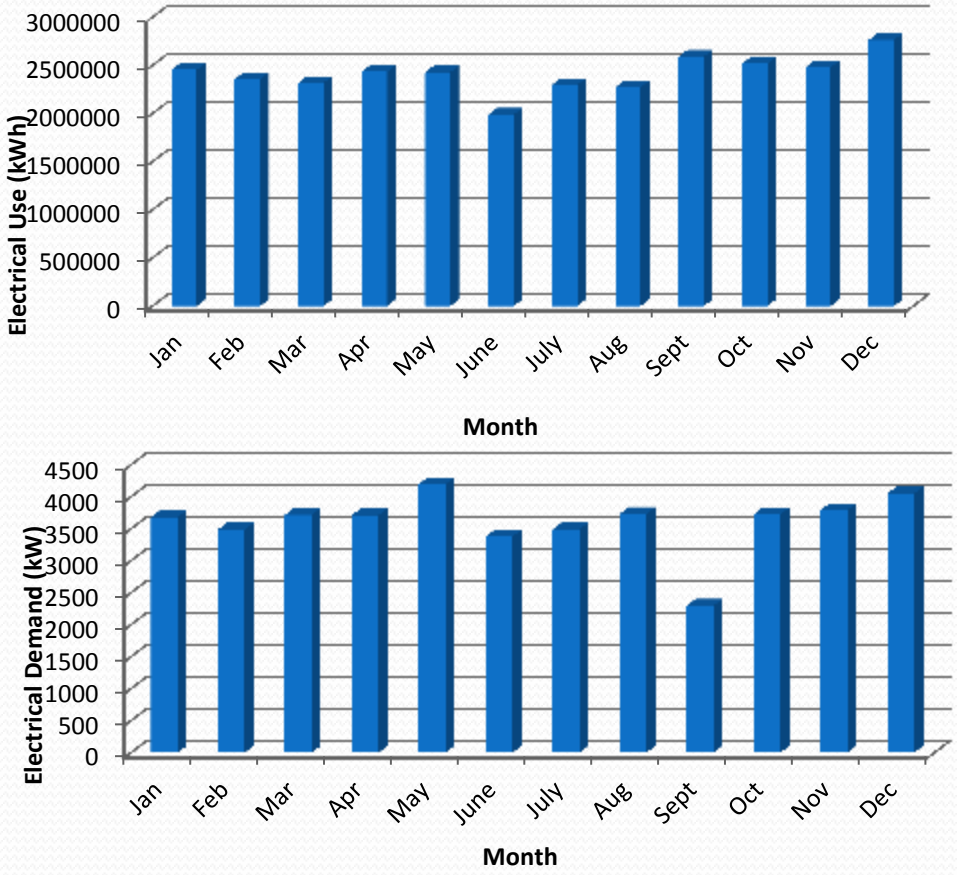
What Type of Facility is this??



Waste water Treatment Plant

- Peaks appear to be somewhat random
- Note September, high consumption but low demand
- Minor Peak in the spring correlating with the rainy periods.

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