ANALYSIS OF UTILITY BILLS AND SITE ENERGY COSTS

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Learning Objectives


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.
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.
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.
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.


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.
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.
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.
<table>
<thead>
<tr>
<th></th>
<th>Demand</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 21 reading (Actual)</td>
<td>4.58</td>
<td>1182</td>
</tr>
<tr>
<td>Aug 23 reading (Actual)</td>
<td>-4.37</td>
<td>-1107</td>
</tr>
<tr>
<td>Meter reading difference</td>
<td>0.2</td>
<td>55</td>
</tr>
<tr>
<td>Meter multiplier</td>
<td>x 1050</td>
<td>x 1050</td>
</tr>
<tr>
<td>Total Usage 29 Days</td>
<td>220.5</td>
<td>57750</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Peak</th>
<th>Usage</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter On</td>
<td>10348 @ .00973</td>
<td>$ 100.69</td>
<td></td>
</tr>
<tr>
<td>Energy Semi</td>
<td>37798 @ .00781</td>
<td>$ 295.20</td>
<td></td>
</tr>
<tr>
<td>Usage Off</td>
<td>51405 @ .00691</td>
<td>$ 355.21</td>
<td></td>
</tr>
</tbody>
</table>

- **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
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
- 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 SUMMARY

ACCOUNT NUMBER
31749-59019

BILLED TO

BILLING DATE 09/21/11

LAST BILL $26,705.12

PAYMENTS:
08/29/11

ADJUSTMENTS
1.5% Late Payment

BILLING CHARGE

SERVICE CHARGES

$10,514.17

TOTAL AMOUNT DUE

$21,089.76

10,395.28

$21,089.76
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 generate 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.**

Month

Electrical Use (kWh)
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.
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.