



An Energy Efficiency Workshop & Exposition  
Palm Springs, California

*Please be courteous to our speakers*



**Turn off all cell phones  
and  
Set pagers to vibrate**



An Energy Efficiency Workshop & Exposition  
Palm Springs, California

*Playing by the Numbers*

Presented By:  
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## *The Value of Energy Information*

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- Identify billing and metering errors
- Helps track utilities to cost centers
- Identify building and system inefficiencies
- Allows for measurement and verification of energy retrofit cost avoidance
- Identify more economic rate schedules
- Prepares you for deregulation opportunities

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## *Utility Bill Analysis*

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***“You can’t manage what you can’t measure”***

- Collecting and Organizing Utility Data
- Calculating the Energy Use Index
- Creating Charts & Graphs
- Analyzing Consumption

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## Recording Energy Information

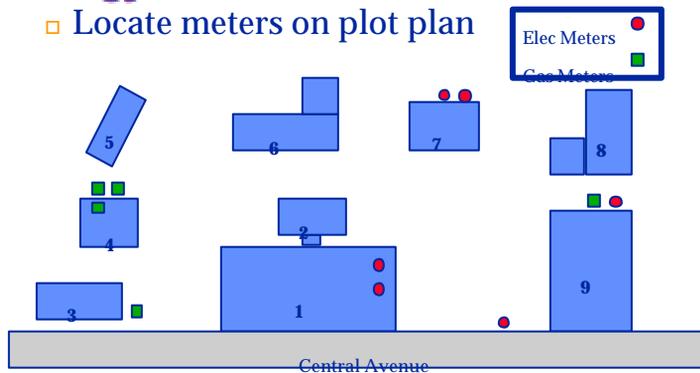
- Start with 12 to 24 Months of Utility Data
- Establish Energy Accounting Year
- Establish Baseline Year
- Read Dates
- Days in Billing Period
- Fuel Consumption - kWh, Therms, Oil
- Electric Demand kW
- Fuel Costs & Rate Schedules

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## Meter Locations

- Locate meters on plot plan



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## Spreadsheet Setup

Energy Accounting Form																
Facility Name:																
Facility Type:																
Electric Utility:						Electric Meter #				Electric Rate Schedule:						
Gas Utility:						Gas Meter #				Gas Rate Schedule:						
Street Name & Address:																
MONTH	1	ELECTRICITY						NATURAL GAS				TOTALS		ENERGY USE INDEX		
		12/1/00	1/1/01	2/1/01	3/1/01	4/1/01	5/1/01	1000	1000	1000	1000	1000	1000	1000	1000	1000
Jan	1															
Feb	2															
Mar	3															
Apr	4															
May	5															
Jun	6															
Jul	7															
Aug	8															
Sep	9															
Oct	10															
Nov	11															
Dec	12															
TOTAL																

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## EUI Calculations

- Convert Fuel to Common Units - BTUs
- Add Annual Totals for Each Fuel
- Divide by Gross Conditioned Area

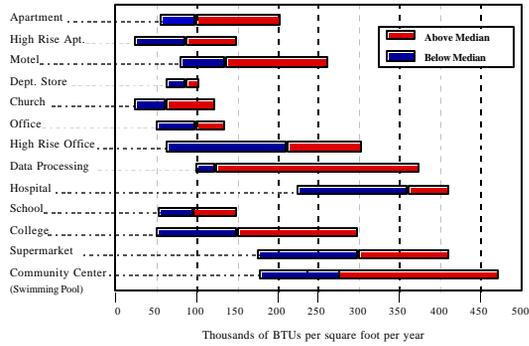
*Example: 25,000 Sq.Ft. Grocery Store*

- 2,000,000 kWh x .003413 = 6,826 mmbtu
- 17,000 Therms x .100000 = 1,700 mmbtu
- Total Annual Energy Use = 8,526 mmbtu
- EUI = 8,526 / 25,000 Sq.Ft. x 1,000,000
- EUI = 341,040 BTU / Square Foot / Year

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## Energy Use Index



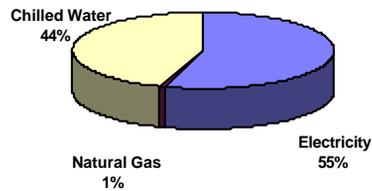
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## Annual Energy Cost Breakdown

### Year Ending 12/2001

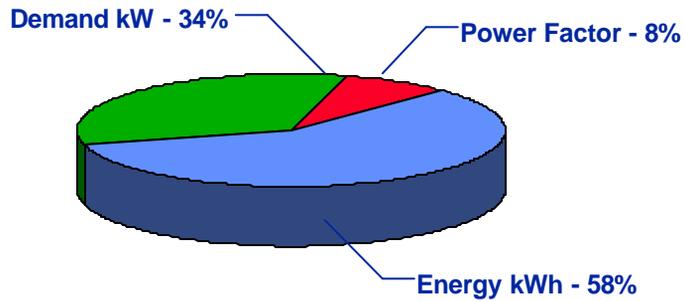
Electricity	\$ 1,325,923
Natural Gas	\$ 16,922
Chilled Water	\$ 1,074,929
<b>TOTAL</b>	<b>\$ 2,417,774</b>



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## Electricity Charges



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## Load Factor

- Relationship Between Consumption and Demand
- Indicator of Frequency of Peak Loads
- Average Demand/Peak Demand

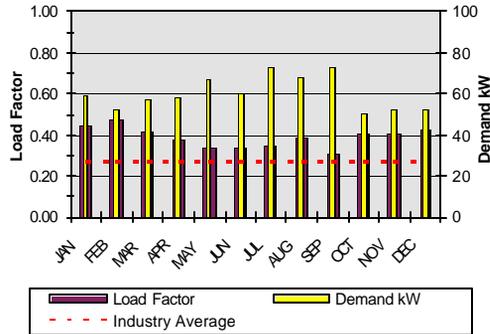
**kWh**

**kW x # Hours in billing period**

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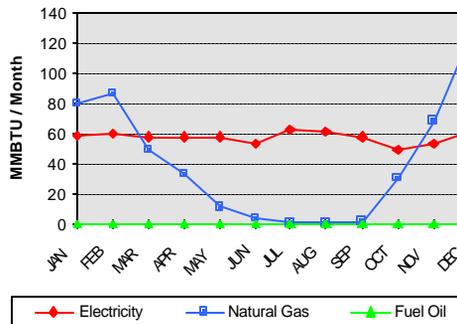
## Demand & Load Factor



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## Energy Use Profile

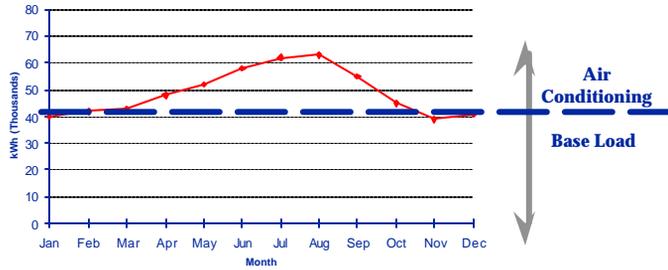


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## Base & Seasonal Loads

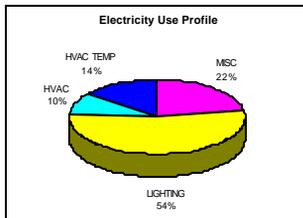
### Electricity Consumption



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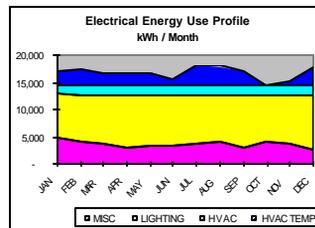
## Office Building End Use



- HVAC Temp.** - Above Min. Line
- HVAC Vent.** - 1 kWh/Sq.Ft./Year
- Lighting** - Watts/1,000 x Hours
- Miscellaneous** - Remaining kWh

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- HVAC Temp.** - Varies by Outdoor Temp.
- HVAC** - Ventilation/Varies by # Occupants
- Lighting** - Interior/Exterior Lighting
- Misc.** - Plug Loads/Non-HVAC Loads





## Energy Using Systems

### ☐ Heating System

- Combustion Efficiency
- Distribution System
- Controls
- Hours of Operation
- Envelope

### ☐ Ventilation

- Amount of Outside Air
- Night & Warm-up Operation
- Exhaust System Interaction

### ☐ Lighting

- Operation Time
- Lamp Efficiency
- Light Levels

### ☐ Service Hot Water

- Temperatures
- Distribution System

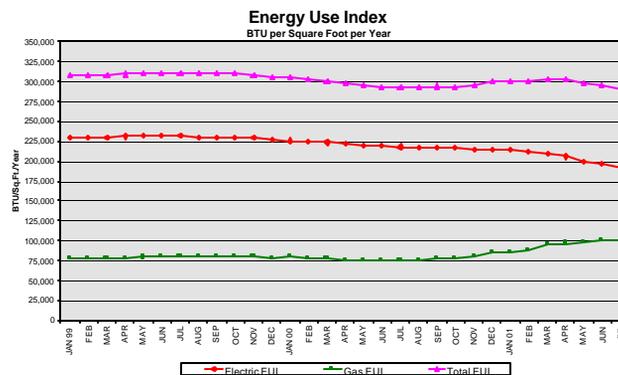
### ☐ Pumps & Motors

- Sizing
- Energy Efficient
- Maintenance

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## Consumption Trends



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## *Measurement & Verification*

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- A. Partially Measured Retrofit Isolation
  - Measurement & Stipulations
- B. Retrofit Isolation
  - Field Measurement at System Level
- C. Whole Facility
  - Monitor at Utility Meter Level
  - Simple Comparison or Regression Analysis
- D. Calibrated Simulation
  - Computer Simulation of Energy Performance
  - Calibrated with Utility Meter Data if Possible

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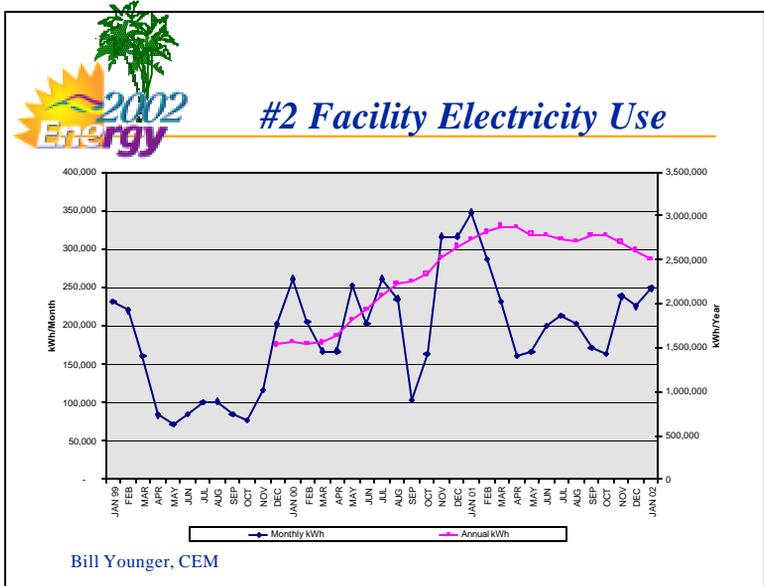
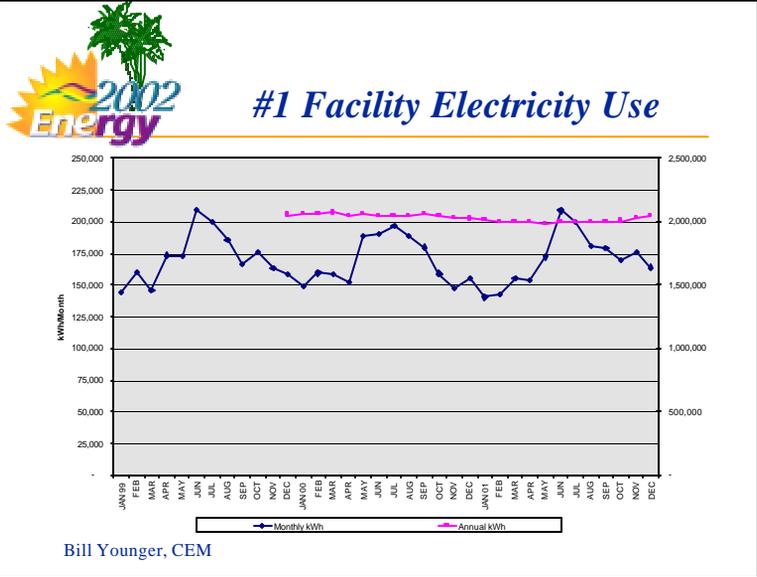


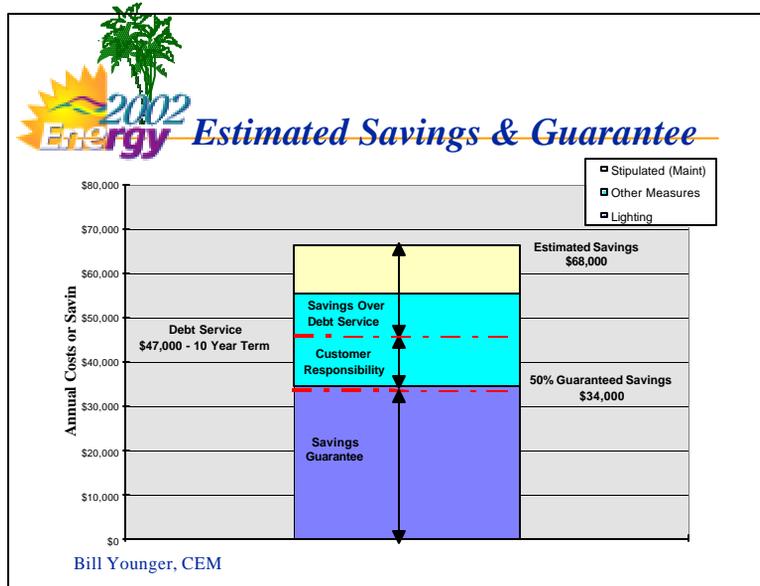
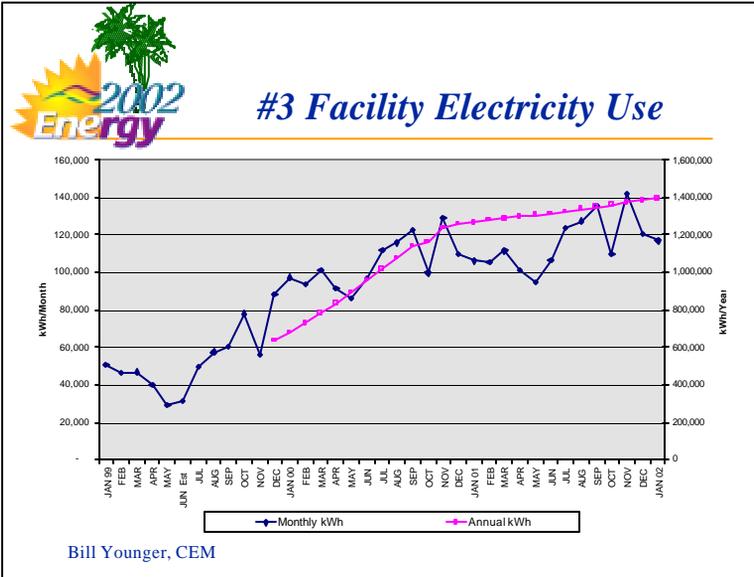
## *Option C – Whole Facility*

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- Calculate Avoided Cost
- Compare to Base Year Consumption
- Determine Energy Savings
- Convert Energy Savings to Dollars
- Weather Correct if Necessary

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## *Successful Energy Management*

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