

# O&M Improvement Opportunities Using Enterprise Energy Management

## Power Measurement

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# Overview

- Why do you need to monitor utility consumption?  
WAGES.....
- Do you know how you use energy?  
KW, DEMAND, KVA, POWER FACTOR
- What is power quality and how does it affect your facilities?
- What should you look for in an Enterprise Energy Management System?
- How do you benefit?

# Power Measurement Customers

- Energy Suppliers
  - ◆ Generation Companies
    - ❖ Power Producers – Utilities, DG, Cogeneration
  - ◆ Transmission and Distribution Companies
    - ❖ System Operators, Utilities, Co-ops...
- Energy Consumers
  - ◆ Manufacturing & Production
    - ❖ Automotive, Paper, Chemical, Food
  - ◆ Critical Operations
    - ❖ Banks, Telecom, Hospitals, Data centers
  - ◆ Energy Conservation & Efficiency
    - ❖ Office Buildings, Universities, Government

# Why do you need to monitor WAGES?

Who said this phrase?

When you can measure what you are speaking about and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind: it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science.

# William Thompson, Lord Kelvin

Popular Lectures and Addresses [1891-1894]

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You cannot control what you cannot see.

# “Energy Policy Act 2003”

## House committee on Energy and Commerce

- Title I – Energy Conservation
- Section 1001-1002
- ⑩ Mandates energy conservation and management plan for all facilities administered by the Congress. .
- Must submit to congress a schedule of “energy surveys” for all buildings every 5 years
- Submit results of cost and benefits of installing submetering
- \$2B in funds for congressional buildings / year?
- Mandates energy reduction on yearly basis. Includes schedule of required reduction on yearly basis against 2001 levels. Max of 20% by 2013.

# “Energy Policy Act 2003”

## House committee on Energy and Commerce

- Section 1003
- Mandates energy use measurement and accountability
- By Oct 1, 2010 all federal buildings shall be metered or submetered.
- Each agency to use advanced meters or advanced metering devices that provide data at least daily and measure at least hourly consumption. Data to be incorporate into existing federal energy tracking systems and made available to the federal facility managers.
- GSA will drive program with input from industry.

# **“Energy Policy Act 2003”**

## **House committee on Energy and Commerce**

- Section 1007
- Goal is for voluntary agreements with industries that consume significant amounts of energy per unit of physical output to reduce energy intensity of their production activities.
- Voluntary agreements to reduce energy intensity by at least 2.5% per year each year from 2004-2014.
- Federal grants

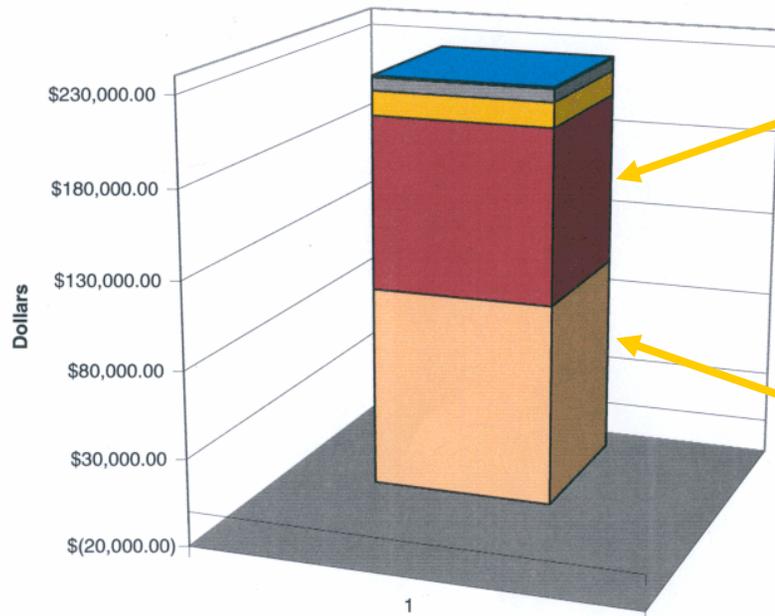
# Electric Bills

## Energy & Demand

Primary Contributing Factors

Controllable

### Typical Electric Bill



**Energy**

What you  
consume

**Demand or  
Capacity**

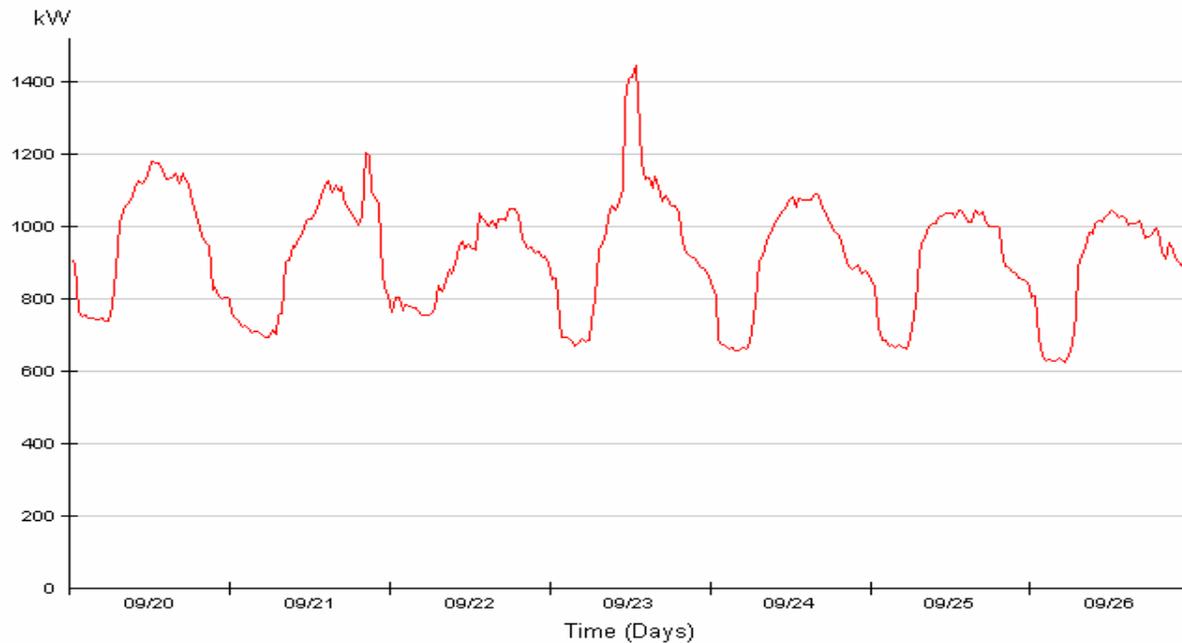
Maximum rate  
at which you  
consume

# What does peak demand mean?



## Load Profiles

Profile for Selected Accounts on 09/20/2002



■ Totalized (kW)

Selected Date Range: Thursday, August 01, 2002 through Friday, October 18, 2002

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# Money Saving Information

## *Demand Control and Peak Shaving*

- Load profiles detail your consumption patterns by month, day or hour and allow cost saving measures to be implemented
  - ◆ Adjust usage based on business hours, temperature, square footage, occupancy, etc.
  - ◆ Automatically shed non-critical loads or start up generators to avoid setting new demand peaks



# Money Saving Information

## *Detailed Cost Analysis from Many Locations*

- Measures that reduce energy costs
  - ◆ Eliminate errors in your energy bills
  - ◆ Negotiate with energy suppliers for lower cost electricity
  - ◆ Do "what-if" analysis of different rate structures
- Allocate cost appropriately
  - ◆ Discover how much energy was consumed... by department, tenant, or process
  - ◆ Compare efficiencies between departments and buildings
  - ◆ Identify opportunities to better balance consumption



# Example Bottom Line

	Before	After	Charge
Energy (MWh)	16000	15500	\$4/MWh
Monthly Hours	720	720	
Avg MW	22.2	21.5	
Demand (MW)	74	63	\$14,000/MW
Load Factor	30.0%	34.2% (avg/peak KW)	
Energy Charge	\$64,000	\$62,000	
Demand Charge	\$1,036,000	\$882,000	
Demand Reduction		15%	
Monthly Reduction		\$148,148	
Annual Reduction		\$1,777,776	
Incremental Cost of Generation		\$1,000,000	
Total Annual Savings		<b>\$777,776</b>	

# What is Power Quality and how Does it Affect Your Business?

- Terms
  - ◆ Surges, Sags, Transients, Harmonics, Power Factor
- How does this affect your facility
  - ◆ Computers Shut Down, Loss of Lighting, Short Life to Motors on HVAC and Pumps, Damaged Equipment

If you know what the problems are you can implement solutions to make you systems more efficient. Reducing your facility downtime and increasing productivity.

# So What?

- Cost of an hour of downtime:

Energy supply company	\$ open ended
Broker Operations	\$6,500,000
Banking Center	\$2,500,000
Retail	\$140,000
Manufacturing	\$28,000
Other industries	\$82,500

Source: Eagle Rock Alliance, Ltd

# ION EEM System Overview

## ION EEM

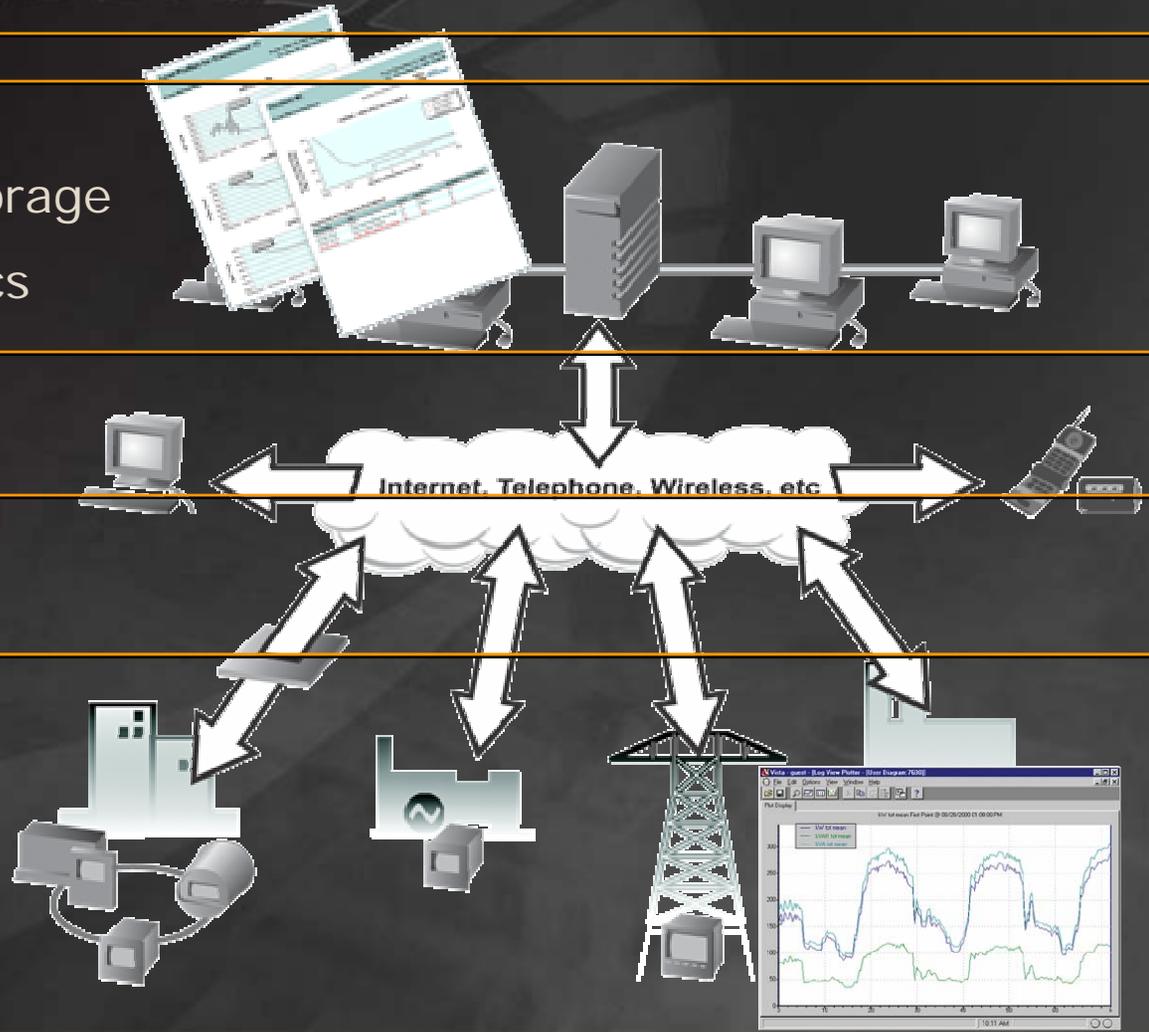
- ▶ Servers for data storage
- ▶ Decisions and Control
- ◆ Web-enabled Analytics

- ◆ Purchase Reporting
- ◆ Demand Transfer
- ◆ What-if?

- ◆ Aggregate Facilities
- ◆ Negotiate Purchase Agreements

- ▶ Data Acquisition
- ▶ Resources
- ◆ ION TEDs

- ◆ Existing DCS, PLC, for WAGES



# How Can You Benefit From an Energy Management System

- Negotiate WAGES contracts with data acquired from system
  - ◆ Pool the load of all facilities and negotiate bulk energy purchases
- Shed Peak Demand at Facilities:
  - ◆ Flatten the overall load profile by staggering demand peaks
  - ◆ Cycle loads at different times for different sites
  - ◆ Define best energy usage practices, learning from the most efficient locations

# Summary

- When you know how your facility uses power, you can control it and implement solutions to make it more efficient.
- Jeff Byron, Oracle Corporation:
  - ◆ “What’s the self-sufficiency worth to us? Millions of dollars per hour. It is so important, you almost can’t calculate the value to us and our customers...The digital economy depends on uninterrupted supplies of the highest quality electricity.”

# Questions?



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