

# The IAC



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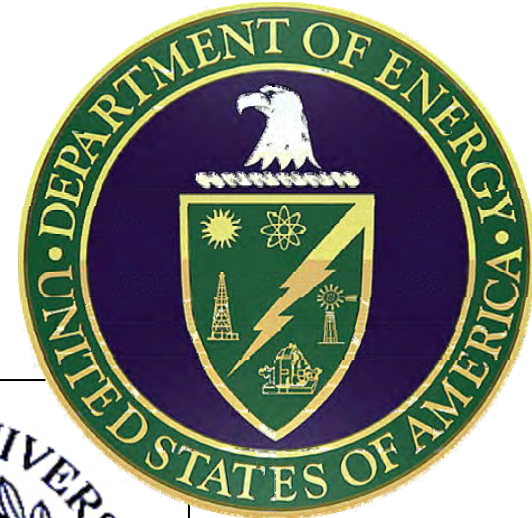
U.S. Department of Energy

**Office of Energy Efficiency and Renewable Energy**



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# Department of Energy Initiatives for Manufacturers through Syracuse University



[IAC](#)

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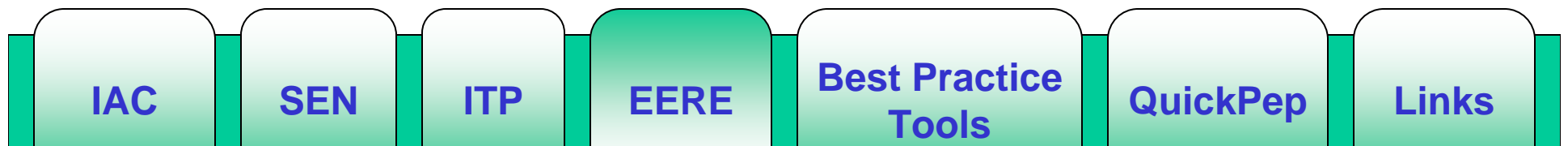
# Energy Efficiency & Renewable Energy

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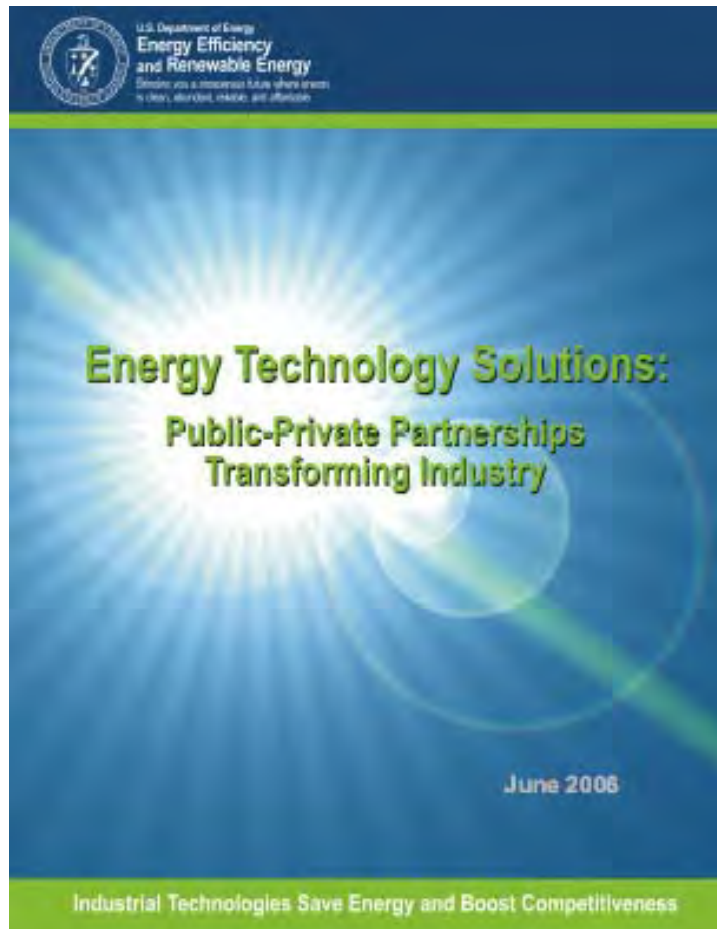


The DOE Energy Efficiency and Renewable Energy oversees many of the programs available from the Department of Energy including The Industrial Assessment Centers and Save Energy Now.

The Energy Efficiency and Renewable Energy website is a first stop in any search for energy saving programs, tools and information.

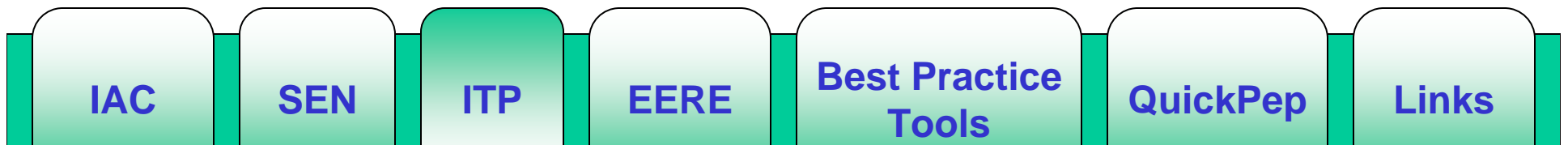


# Industrial Technologies Program

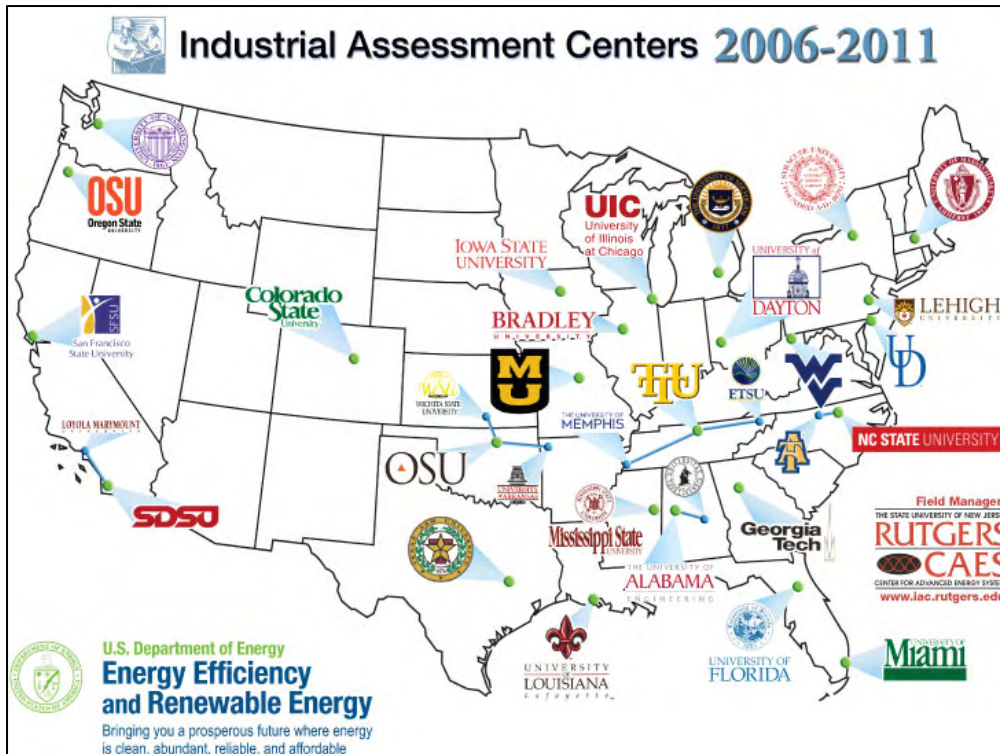


The Industrial Technologies Program works with U.S. industry to improve industrial energy efficiency and environmental performance.

The program invests in high-risk, high-value R&D to reduce industrial energy use while stimulating productivity and growth.



# Industrial Assessment Centers



IAC assessments involve a thorough examination of potential savings from:

- Energy Efficiency Improvements
- Waste Minimization and Pollution Prevention
- Productivity Improvement

26 Centers, based at universities across the United States, provide FREE in depth assessments of a plant's site.

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# Save Energy Now



Through Save Energy Now, DOE's Industrial Technologies Program (ITP) helps large industrial plants increase efficiency and profitably by identifying ways to reduce energy use in key industrial process systems.

Save Energy Now provides energy assessments to large size manufacturing facilities that qualify. Registration is done via the Save Energy Now website.

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# Best Practice Tools

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**AIRMaster+** provides comprehensive information on assessing compressed air systems, including modeling, existing and future system upgrades, and evaluating savings and effectiveness of energy efficiency measures.

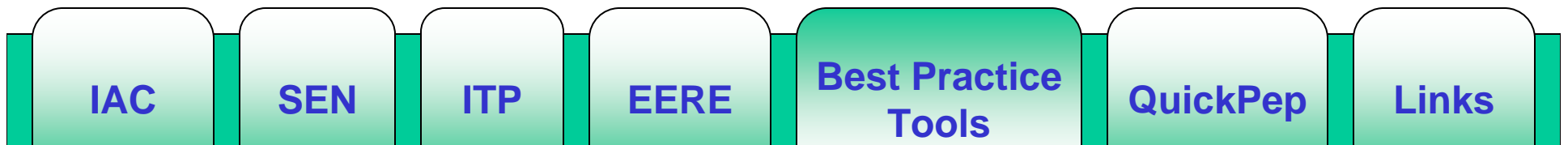
**The Pumping System Assessment Tool** helps industrial users assess the efficiency of pumping system operations.

**The Steam System Assessment Tool (SSAT)** allows steam analysts to develop approximate models of real steam systems.

**MotorMaster+** provides comprehensive information on assessing motors, including modeling, existing and future system upgrades, and evaluating savings and effectiveness of energy efficiency measures.

**3E Plus** The program calculates the most economical thickness of industrial insulation for user input operating conditions. You can make calculations using the built-in thermal performance relationships of generic insulation materials or supply conductivity data for other materials. .

With the right know-how, you can use these powerful tools to help identify and analyze energy system savings opportunities in your plant.



# QuickPep

1 2 3 4 5 6 7 8 9

**Step 1 - Case Information**

Enter a name for your case and select an industry. You may also optionally enter contact information. If you do not see your industry in the drop down list please select Other and enter your industry. Please note that if you select Other, then the energy and cost savings will be calculated using generic nationwide defaults. Click on the More Info link to view definitions for all industries.

Required fields are in **bold**

**Case Name**

**Industry**    
[More Info](#) Other:

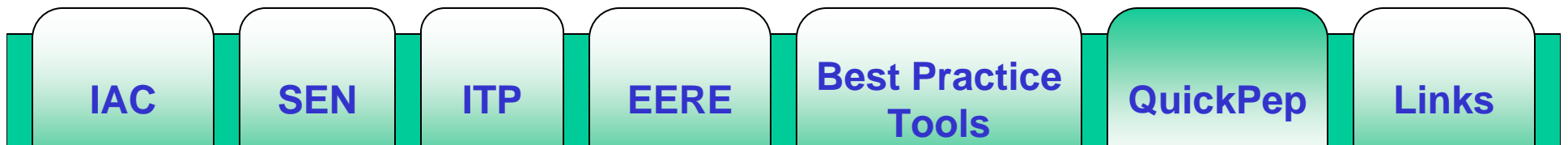
Contact Information (optional)

Name

Email

Address

The **Quick Plant Energy Profiler**, or Quick PEP, is an online software tool provided by the U.S. Department of Energy to help industrial plant managers in the United States identify how energy is being purchased and consumed at their plant and also identify potential energy and cost savings. Quick PEP is designed so that the user can complete a plant profile in about an hour





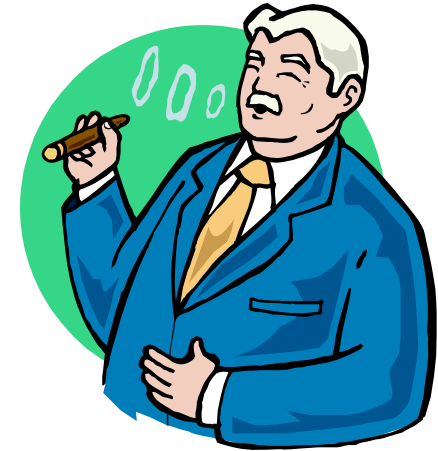
# Energy is Everywhere, and is usually in motion

- Energy can be stored and converted in different forms
- Heat (and Cold) and Work are Energy in Transit
- Heat is Low-Grade Energy (and, therefore, easy to misuse)
- Energy enters as Electricity, Air, Fuel, Water, Material, and People
- Energy exits as Product, Scrap, Waste Streams, Emissions, and Effluents



# A Waste-and-Energy Conscious CEO...

- Climbs Up on the Roof
- Dives in the Dumpsters
- Reads the Utility Bills
- Walks through the Darkened Plant
- Asks the FIVE-Why's
- Occasionally Burns his Hand
- Buys the most efficient equipment
- Gets Workers Involved
- Takes it (energy) personally





# “Boilerplate” Recommendations

These are the things we recommend in virtually every company:

- REDUCE AIR LINE PRESSURE
- BRING OUTSIDE AIR TO COMPRESSORS
- REPAIR AIR/STEAM/WATER LEAKS
- CHANGE V-BELTS TO COGS OR SEGMENTS
- INSTALL MOTION SENSORS FOR LIGHTS
- INSULATE PIPES, TANKS, AND PLENUMS
- USE CAPACITANCE FOR P/F CORRECTION
- RECOVER WASTE HEAT
- UPGRADE EXIT SIGNS



# Compressed Air

Do You Really Need  
***COMPRESSED*** Air?

- Do You Need it at **3:00AM**?
- Or on **Sunday Morning**?
- Do You Need it at **125 PSI**?
- Do You Need it **BONE DRY**?

(This is a classic Five-Why's application.)





# Insulation

If it's TOO HOT to TOUCH...

**INSULATE IT!**





# Stack Heat Opportunities

- Capture exhaust heat to pre-heat boiler feed water (economizers)
- Capture exhaust heat to pre-heat combustion air (recuperators)



- Shell and tube heat exchangers for hot water/steam needs



# Co-Generation

## **Reciprocating Engines:**

- Applications usually under 1 MW
- Heat recovery: supplemental heat and hot water

## **Gas Turbines:**

- Applications usually over 1 MW
- Heat recovery: process steam and heat

## **Micro-turbines:**

- Applications usually under 1 MW
- Each unit provides between 30-60 kW
- Can be linked for greater output

Turnkey Costs: \$800 - \$1,500 / kW



# FAT Manufacturing

## Fat Manufacturing...

- routes the product all over the plant
  - departmentalizes functions
  - processes in batches
  - runs machines when not needed
  - suffers from WIP-lash
  - works *for* the union, not *with* the union
  - tries to predict production need
  - wastes lots and lots of time
- (a commodity more valuable than energy!)



# The LEAN Revolution

## LEAN Manufacturing...

- Employs Cellular Manufacturing
- Aggressively Kills Waste
- Brings the Process to the Part
- Reduces Scrap and Defects
- Reduces Standard Costs
- Reduces Lead Times
- Creates a continuous improvement consciousness



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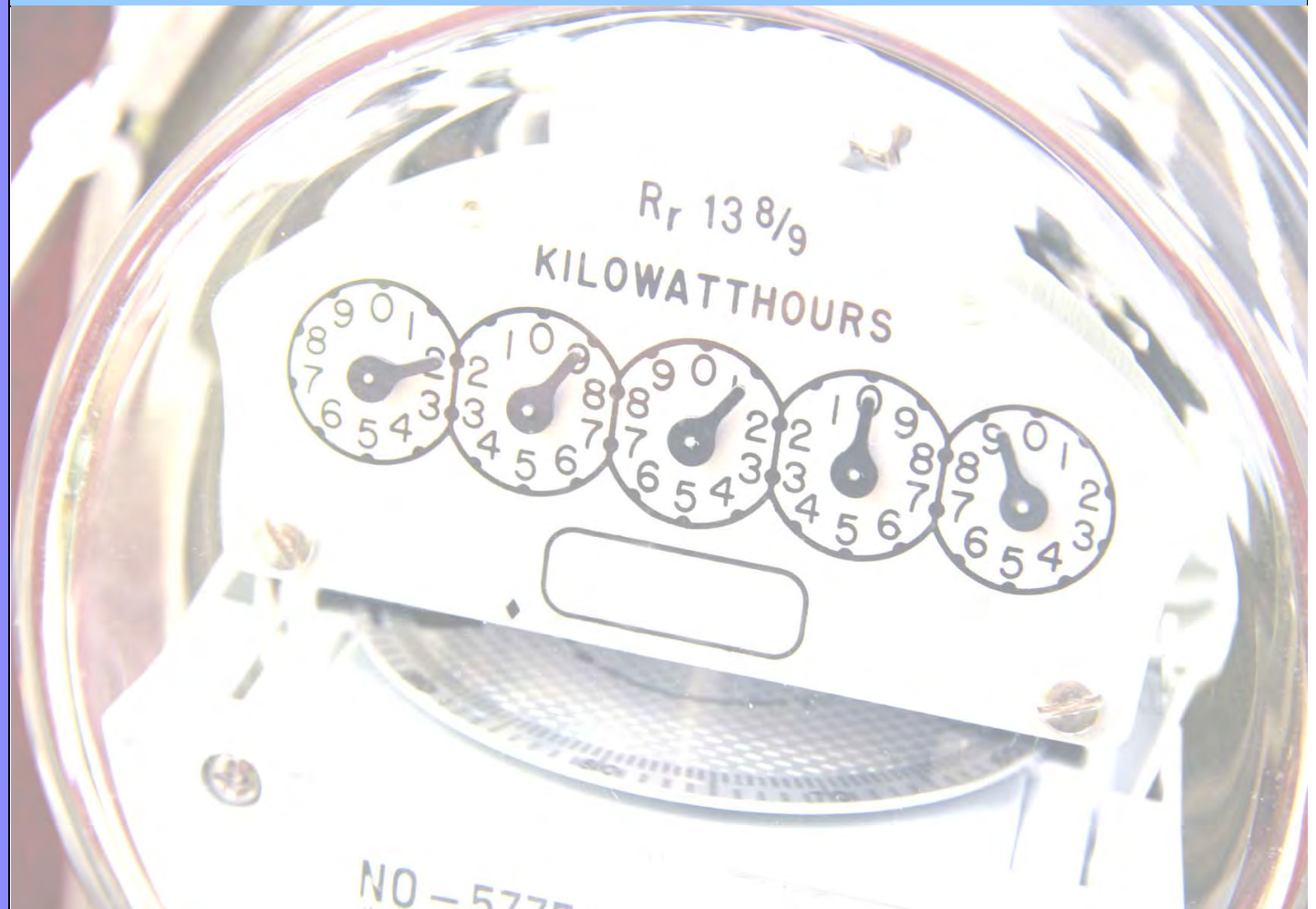
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# Understanding Your Electric Bill

## “Utilities 101”



U.S. Department of Energy

**Office of Energy Efficiency and Renewable Energy**



# Electrical Usage (kWh)

Electrical usage is the **accumulated** measure of the amount of electricity being drawn. Multiplying demand by time (h) gives usage (kWh).

**Example:** a 100 watt light bulb consumes 0.1 kW when it is on. If it is left on for 20 hours, it will consume:

$$0.1 \text{ kW} \times 20 \text{ h} = 2 \text{ kWh}$$

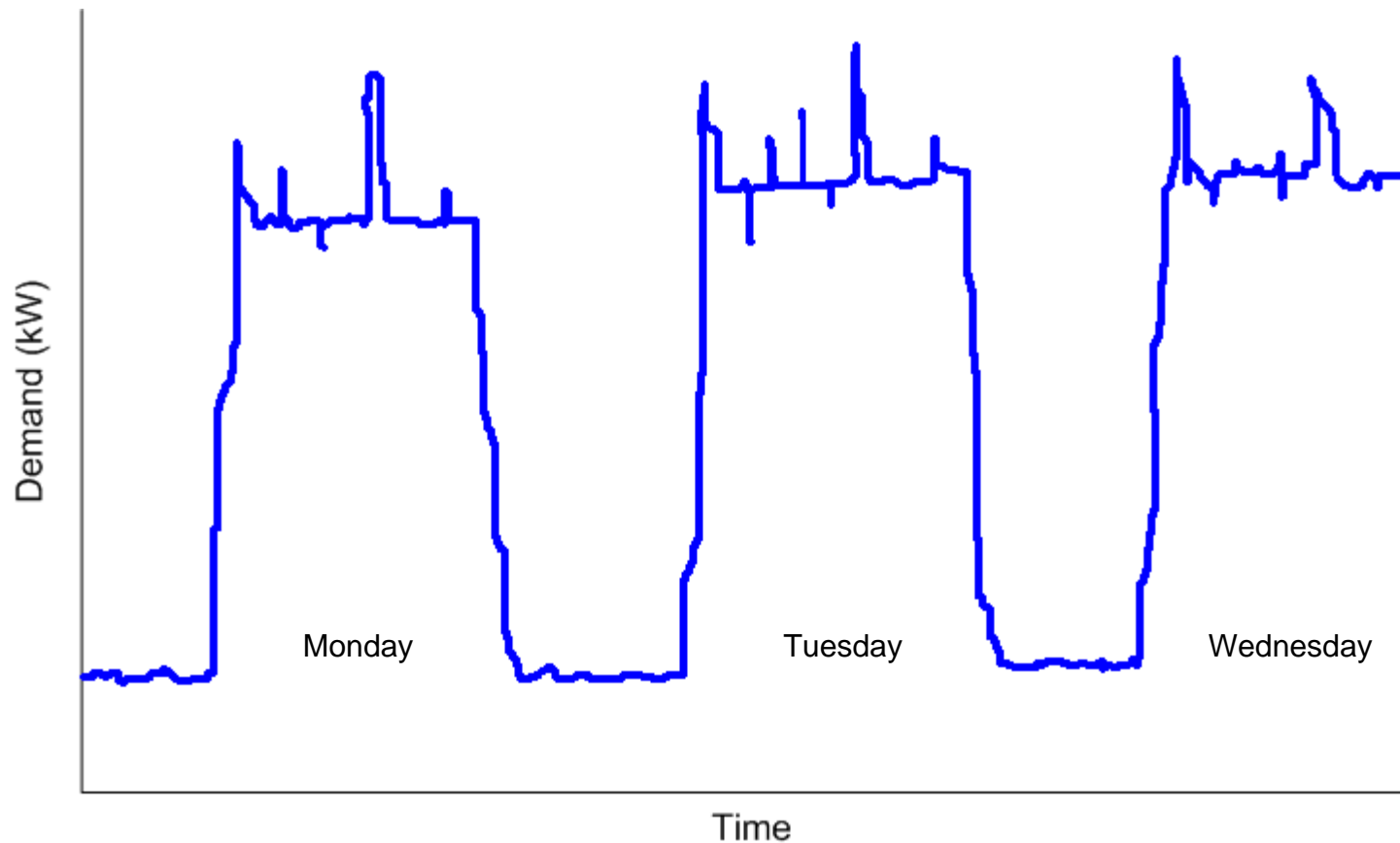
If your usage charge is 10 cents per kWh, the light bulb costs you:

$$2 \text{ kWh} \times 0.1 \frac{\$}{\text{kWh}} = \$0.20$$



# Electrical Demand (kW)

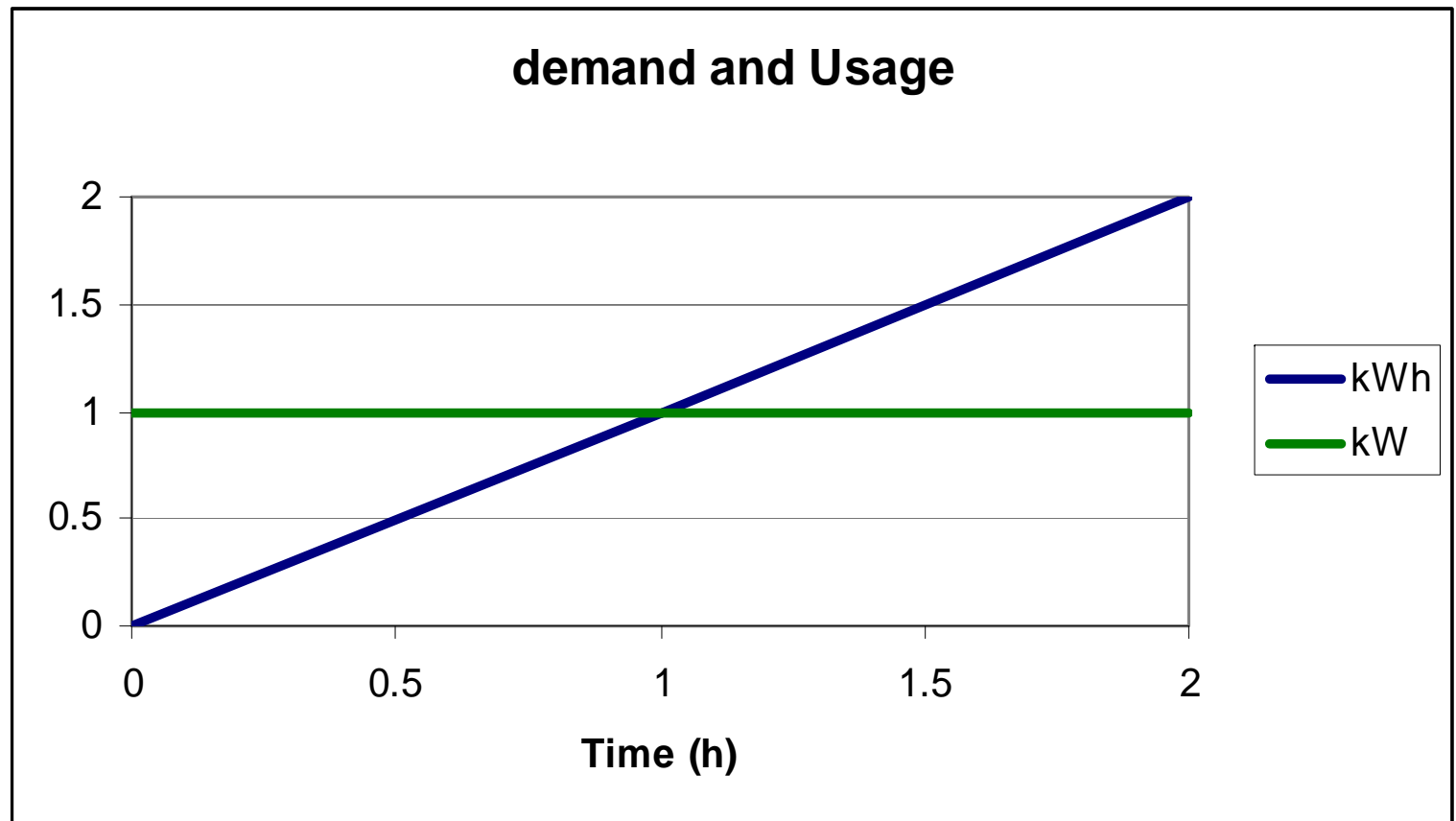
Electrical Demand is the instantaneous measure of the amount of electricity being drawn. This “snapshot” is typically averaged for 15 minutes segments.





# The difference between kW and kWh

A one kW space heater running for 2 hours:

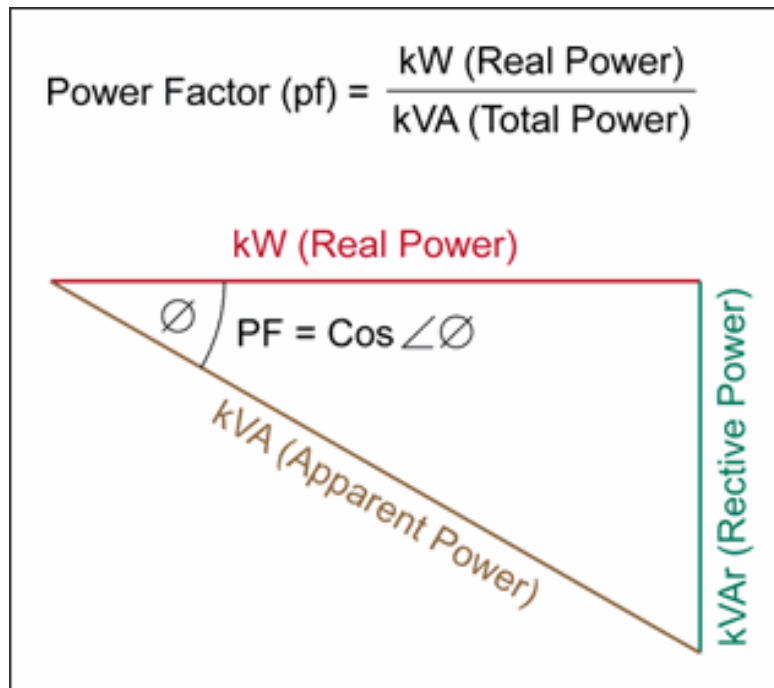


**An Analogy:** If demand (kW) were the speedometer in your car, usage (kWh) would be the odometer.



# Reactive Power (kVar)

There is no such thing as a 100% efficient machine. The amount of electricity consumed that isn't turned into work is called reactive power. The Utility company meters this reactive power and calculates a power factor (%).



**An Analogy:** Reactive power is like the foam in your beer glass. It isn't beer but you still pay for it.



# Reactive Power continued

The utility doesn't expect you to have 100% power factor. However, the utility still has to provide the electricity that your machines aren't "using." Therefore, the utility charges a reactive charge when your power factor is below 95%.



By installing capacitor banks at the service (shown above), the power factor can be corrected to 95% and the reactive charge will go away.



# Some New (for us) Technologies

The Department of Energy encourages the Industrial Assessment Centers around the country to explore and adopt DOE-developed or funded technologies, processes, hardware, and software tools.

We, at the SU-IAC, have tried to pursue those that we anticipate will be of highest interest to our clients.



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# Demand Controlled Ventilation

Opportunity and Method  
for ventilation energy  
conservation.





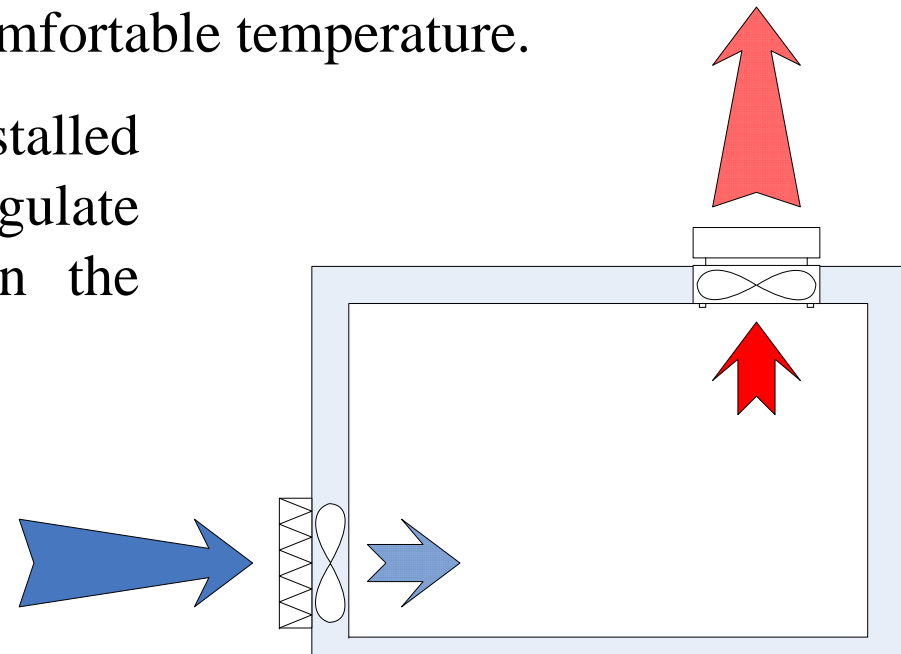
## Theory/Background

ASTM Standard 6245-98 gives optimal ventilation rates for safe and comfortable work and commercial environments. However, companies will often over-ventilate. This can result in energy losses because conditioned air is exhausted and the makeup air must be adjusted to a comfortable temperature.

Equipment can be installed to measure CO<sub>2</sub> and regulate ventilation to maintain the standard.

This is called:

**Demand Controlled Ventilation**





## Demand Control Ventilation

Once installed, dedicated CO<sub>2</sub> sensors are mounted in offices and ductwork and tied to a control system that automatically cycles exhaust fans to maintain the benchmark CO<sub>2</sub> level, and, therefore, CFM-per-person requirements.

By controlling the ventilation, energy savings are obtained by conserving conditioned air and by reducing fan usage.





## Measurement

On site, a handheld device is used that measures parts-per-million (ppm) of CO<sub>2</sub> and relates this to the measurement of ambient outdoor ppm CO<sub>2</sub>, also measured.

The handheld sensor does an internal calculation that determines the appropriate flow rate per person.



# **Adopt-a-Technology program:**

## **Imaging of High Temperature Furnaces**

### **Motivation:**

**We are pursuing thermal imaging research due to:**

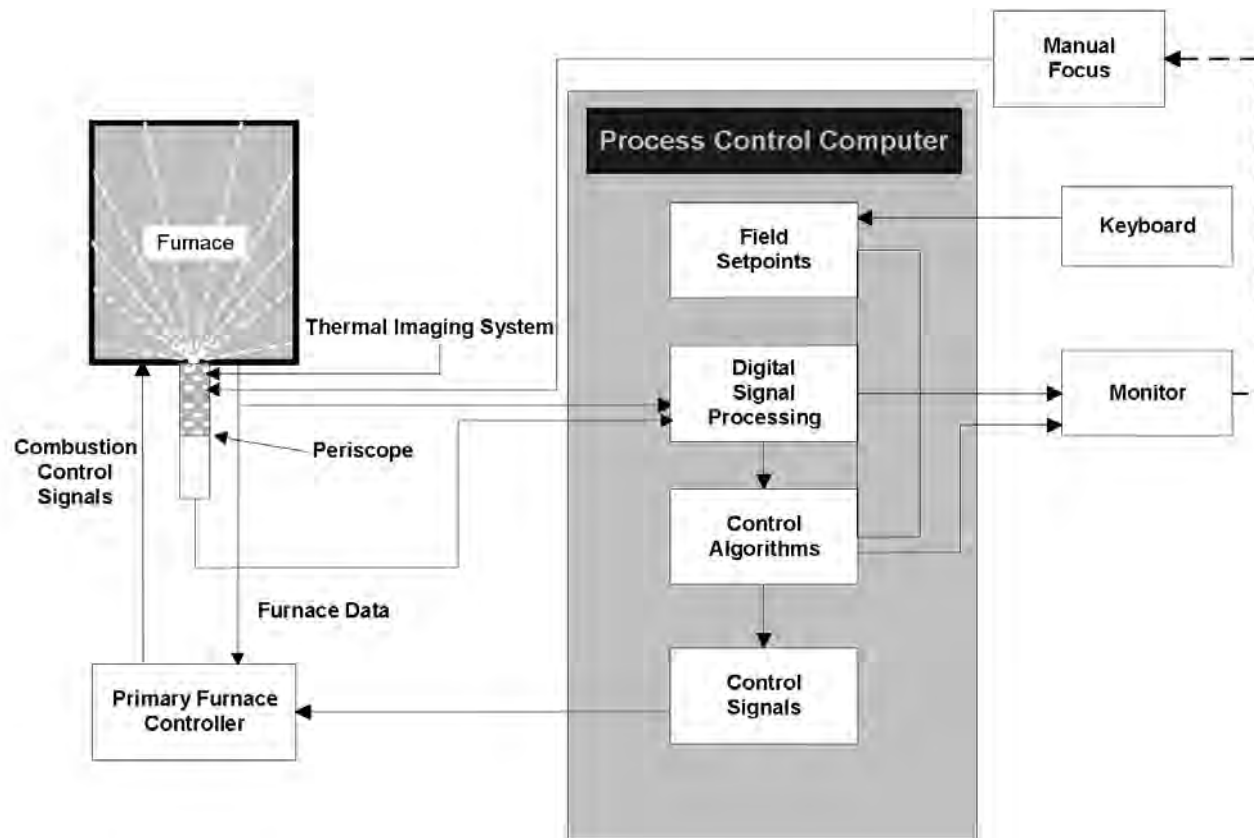
- A professional relationship with Corning Glass facilities in New York state**
- Our work for and with the Syracuse Center of Excellence in Environmental and Energy Systems**

# **Adopt-a-Technology program:**

## **Near Infrared Thermal Imaging Control of High Temperature Furnaces**

- A near infrared digital image is sent through a signal analyzer (one million pixels) and then sent to a computer.**
- The computer sends feedback control to the existing furnace controller to optimize combustion and decrease hotspots.**
- This may result in fuel savings and decreased emissions.**

# System Overview



Taken from EERE Sensors & Controls Project Fact Sheet: Thermal Imaging Control of High Temperature Furnaces, David Rue, Gas Technology Institute

# Some Helpful Links

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## **Industrial Assessment Centers:**

<http://www.iac.rutgers.edu/>

## **Save Energy Now:**

<http://www1.eere.energy.gov/industry/saveenergynow/>

## **Industrial Technologies Program:**

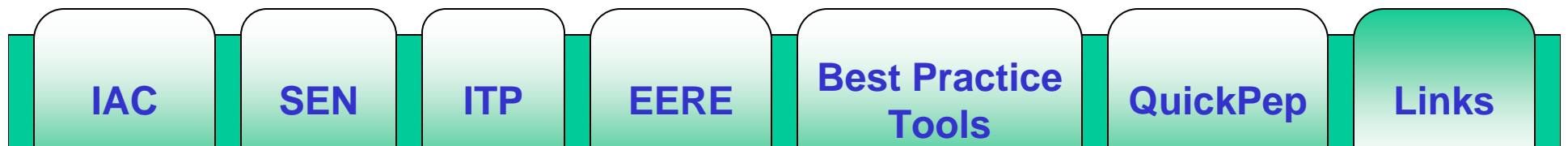
<http://www1.eere.energy.gov/industry/index.html>

## **Best Practice Tools:**

<http://www1.eere.energy.gov/industry/bestpractices/software.html>

## **QuickPep:**

[http://72.32.189.26/industry/quickpep/\(gz3knvf5lodtd1ijb2zwhc45\)/default.aspx](http://72.32.189.26/industry/quickpep/(gz3knvf5lodtd1ijb2zwhc45)/default.aspx)





## Contact

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