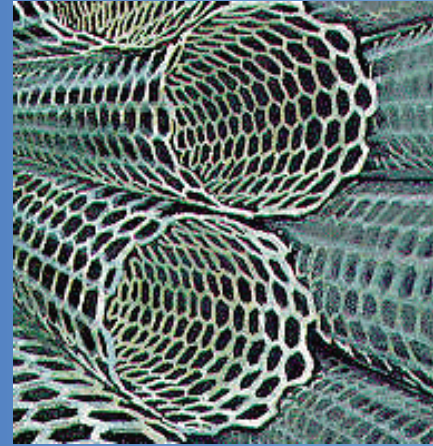




Save
ENERGY
Now



Industrial Buildings Tools and Resources

Webinar - June 11, 2009

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U.S. DEPARTMENT OF
ENERGY

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OAK RIDGE NATIONAL LABORATORY





Agenda

- Introduction to Industrial Buildings Opportunity and Tools
- EERE Funding, Opportunities, and Resources
- Next Steps



Facilities Energy



- ITP has been working for a couple years now to develop tools to address facilities energy use, present in most plants, and about 8% of total sector energy use
- First tool is a Score Card, implemented both as a stand-alone Excel file and for QuickPEP
 - Score Card has to be simple, so is approximate
 - But it can be a very important tool for scoping facilities energy use at a plant
- Second tool is an adaptation of the BCHP Screening Tool, originally developed by the Distributed Energy program but now used extensively by FEMP for CHP screenings
 - This tool runs DOE-2.1e simulations to calculate savings

Focus

- Small to medium size plants have a record from the IAC program, FY02-present, of:
 - 3,878 assessments, 31,833 recommendations (28,425 were “energy”), and 8,953 “buildings energy” recs
 - Of the 8,953 buildings recs, 518 were on envelope, 213 were on ventilation, 6,806 were on lighting, and 1,416 were HVAC
- Total energy savings for 8,953 recs of 14.7 Trillion Btu/yr
- Over 2 billion sq ft in 50 states + PR
- Average plant 500,000+ sq ft, median plant 120,000 sq ft



Generic Assessment Actions

- Obtain utility records / analyze costs
- Site/Building visit to collect data
- Energy accounting / Score Card
- Analyze potential measure savings
- Report



ITP BP Tools website

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



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BestPractices

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 - Qualified Specialists
 - Ways to Save Energy
 - EERE Information Center
- Opportunities**
 - For Corporate Executive**
 - For Plant Management**
 - For Technical**
 - For General Public**

Software Tools

BestPractices has a varied and expanding software collection. Much of the software can be accessed here. A few packages must be ordered from the EERE Information Center via [e-mail](#) or by calling 1-877-EERE-INF (877-337-3463).

With the right know-how, you can use these powerful tools to help identify and analyze energy system savings opportunities in your plant. While the tools are accessible here for download, you are also encouraged to attend a [training workshop](#) to enhance your knowledge and take full advantage of opportunities identified in the software programs. For some tools, advanced training is also available to help you further increase your expertise. Find out more about [training](#). You can get help on software installation and operation by calling the EERE Information Center at 1-877-EERE-INF (877-337-3463) or sending an e-mail to eereic@ee.doe.gov.

Please see the [notice](#) before downloading any of these tools.

Some of the following documents are available as Adobe Acrobat PDFs. [Download Adobe Reader](#).

The Quick Plant Energy Profiler, Version 2.0

Release Date: November 5, 2008

The Quick Plant Energy Profiler, or Quick PEP, is an online software tool that helps industrial plant personnel quickly diagnose how energy is being used at their plant an tool gives an overview of the energy that a plant purchases and the major energy-consuming systems. Quick PEP tool is your first step in identifying areas for potential improvements and provides a broad list of potential next steps to begin realizing energy and cost savings.

Version 2.0 includes the addition of Chinese language support for the whole software tool. New features also include an Energy Intensity Spreadsheet for expanded base improvements correct minor user errors to improve functionality.

- [Learn more about Quick PEP](#)
- [Launch the Quick PEP Software](#) Version 2.0
- [Quick Pep fact sheet \(PDF 502 KB\)](#)

Integrated Tool Suite, Version 1.1.2 Available for Testing

Release Date: January 12, 2009

ITP invites you to test the new Integrated Tool Suite that can be downloaded to a desktop as a stand-alone tool and does not require an Internet connection to input helps plants find the best opportunities to reduce energy use in major energy-consuming systems. In addition to the Energy Intensity Spreadsheet and a CO₂ Footprint for quickly estimating savings opportunities. Download the [Integrated Tool Suite](#) beta version and provide your [comments](#) by January 31, 2009.

DOE Industry Tools

- [AIRMaster+ LogTool](#)
- [AIRMaster+](#)
- [Chilled Water System Analysis Tool \(CWSAT\)](#)
- [Combined Heat and Power Application Tool \(CHP\)](#)
- [Fan System Assessment Tool \(FSAT\)](#)
- [Industrial Facilities Tool Suite](#)
- [MotorMaster+](#)
- [MotorMaster+ International](#)
- [NOx and Energy Assessment Tool \(Nx&EAT\)](#)
- [Plant Energy Profiler for the Chemical Industry \(ChemPEP Tool\)](#)
- [Process Heating Assessment and Survey Tool \(PHAST\) Version 2.0](#)



IFSAT Listing on same page

Industrial Facilities Tool Suite

Industrial facilities employ energy-intensive systems to heat, ventilate, air condition, light, and otherwise support plant processes and personnel. DOE offers a suite of software tools to help operators of buildings on industrial sites find ways to reduce energy use and costs, lower carbon emissions, boost productivity, and increase energy security. Download the software tools here.

- **Industrial Facilities Score Card Version 1.1**

Release Date: March 31, 2009

The industrial facilities score card provides a snapshot of energy used by all the buildings at a plant. Identify potential energy savings measures based on annual energy use, as well as costs that can be considered for further investigation.

Download Score Card ([Excel 170 KB](#))

- **BCHP Screening Tool Version 2**

Release Date: March 31, 2009

Use the Buildings Cooling, Heating, and Power Systems (BCHP) Screening Tool to assess the economic potential of these systems in commercial buildings. The tool features databases for HVAC equipment, electric generators, thermal storage systems, prototypical commercial buildings, and climate data. It also includes DOE2.1e to calculate heating, cooling, and electrical loads.

Release Notes: *You will need administrative privileges to install this software on your computer. Upon installation of this tool, three OCX files will be placed in the \windows\system32\ directory, creating the temporary directory c:\temp\drm to allow function of the program. This program does not work on a MAC.*

[Download Software](#)

- **Industrial Facilities Systems Assessment Tool (IFSAT) Beta Version**

Release Date: March 31, 2009

ITP invites you to test the beta version of a tool for analyzing energy use scenarios in industrial facilities where building energy is being consumed, such as enclosed and conditioned process buildings. This tool is similar to the BCHP tool above but includes building and equipment types that are applicable to manufacturing. Provide [comments](#) on this tool.

Release Notes: *You must install the BCHP Screening Tool prior to installing and running the IFSAT tool. See release notes above.*

[Download Beta Version of Software](#)

Download Information on Interim Default Building Types and Zones ([Excel 54 KB](#))



Example

- You have completed the generic steps of:
 - Obtained utility data
 - Conducted site visit

- Now starting to analyze data:
 - Use Score Card to scope buildings energy
 - Use Score Card to scope building energy measure total savings
 - Use other tools, like IFSAT, for further calculations



Notes

- We generally like to analyze utility data before site visit, but keeping flow simpler here for presentation
- “Typical” plant of 150,000 sq ft, about 4 million kWh/yr, about 40,000 MMBtu/yr gas
- There is an Excel file available that shows site data needed for an IFSAT analysis
- Site location here is Allentown, PA



IFSAT Field Data Forms, partial Form 1, Forms 1-4 in actual

Industrial Facilities Systems Assessment Tool (IFSAT)

BUILDING DESCRIPTION DATA FORM

Building ID: _____

Building Type: _____

Date: _____

Prepared by: _____

Building Use: _____

e.g., metal fabrication

Building location (e.g., city state zip): _____

1. General Data and Building Envelope

NAICS circle Y or N SIC circle Y or N

Applicable NAICS or SIC codes, as desired to record: _____

Simple length and width to equal total floor area, ft: Length: _____ Width: _____

Number of floors: _____

Floor-to-floor height(s), ft: _____

Total Floor area, sq ft: Heated Cooled Unconditioned

Above ground

Below ground

Exposed roof area, sq ft: _____

Average roof estimated R-value: _____ Roof components, out to in: _____

Average estimated opaque wall R-value: _____ Wall components, out to in: _____



Back to Score Card, we estimate that 50% of total energy is “Buildings” energy, which is not atypical for light industrial with some conditioned space and a lot of exhaust air

BUILDINGS

Part 2

Energy Estimate and Buildings Energy

Buildings Energy Measures Score Card version 1.1

This tool needs an estimate of annual buildings electricity use and fuel/steam use. So this sheet indicates what the estimate will be and allows changes.

Enter for:

TOTAL SITE, all energy, including process for total site applicable to buildings being surveyed

ACTUAL or ESTIMATE

Electricity kWh/yr

Fuel/Steam Million Btu/yr

Use a fuel calculator, if available, to derive these values

4,384,525

42,565

Electricity \$/yr

Fuel/Steam \$/yr

\$306,917

\$510,780

CALCULATED BUILDINGS ENERGY based on item 'c' on PctFac sheet

Electricity kWh/yr

Fuel/Steam Million Btu/yr

2,192,263

21,283

Electricity \$/yr

Fuel/Steam \$/yr

\$153,458

\$255,390

ADJUST BUILDINGS ENERGY if needed

Energy Use Adjustment

Percent of calculated:

Electricity

Fuel/Steam

100%

100%

values here will be used:

kWh/yr

Million Btu/yr

2,192,263

21,283

Percent of calculated:

Electricity

Fuel/Steam

100%

100%

values here will be used:

\$/yr

\$/yr

\$153,458

\$255,390



Score Card File

- Score Card Excel file, version 1.1, has How-to instructions, and some documentation
- Score Card, Parts 1 – 5, are:
 1. Percent Buildings Energy based on default Facilities Energy
 2. Energy Estimate and Buildings Energy
 3. Energy End-Use and Maximum Savings Percent Breakouts
 4. Scorecard Questions, higher means more savings potential
 5. RESULTS

Part 3 of Score Card

Facility End-Use	Buildings energy breakout percents by system type (miscellaneous is everything else)		Maximum composite percent savings considered achievable if all measures from a range of buildings could be installed (do not change unless you are sure)		Max percent Result for Buildings Energy	
	Column 'B'	Column 'C'	Column 'D'	Column 'E'	Column 'F'	Column 'G'
	Electricity (%)	Fuel/Steam (%)	Electricity (%)	Fuel/Steam (%)	Electricity (%)	Fuel/Steam (%)
Envelopes	5%	17%	30%	30%	2%	5%
Lighting	35%	0%	60%	0%	21%	0%
Space Conditioning	15%	50%	50%	50%	8%	25%
Ventilation	40%	30%	30%	30%	12%	9%
Miscellaneous	5%	3%	0%	100%	0%	3%
SUM	100%	100%			42%	42%

The sum of columns B and C should be 100%



Part 4, Score Card questions, envelope and lighting, not changed from default

E1	Enter percent of total building wall and roof/attic areas of all heated and/or cooled buildings that could have insulation (or additional insulation) added?	percent	50	25
E2	Could large unsealed openings or broken windows in walls or roofs be sealed or repaired?	1 / 0 for yes/no	1	20

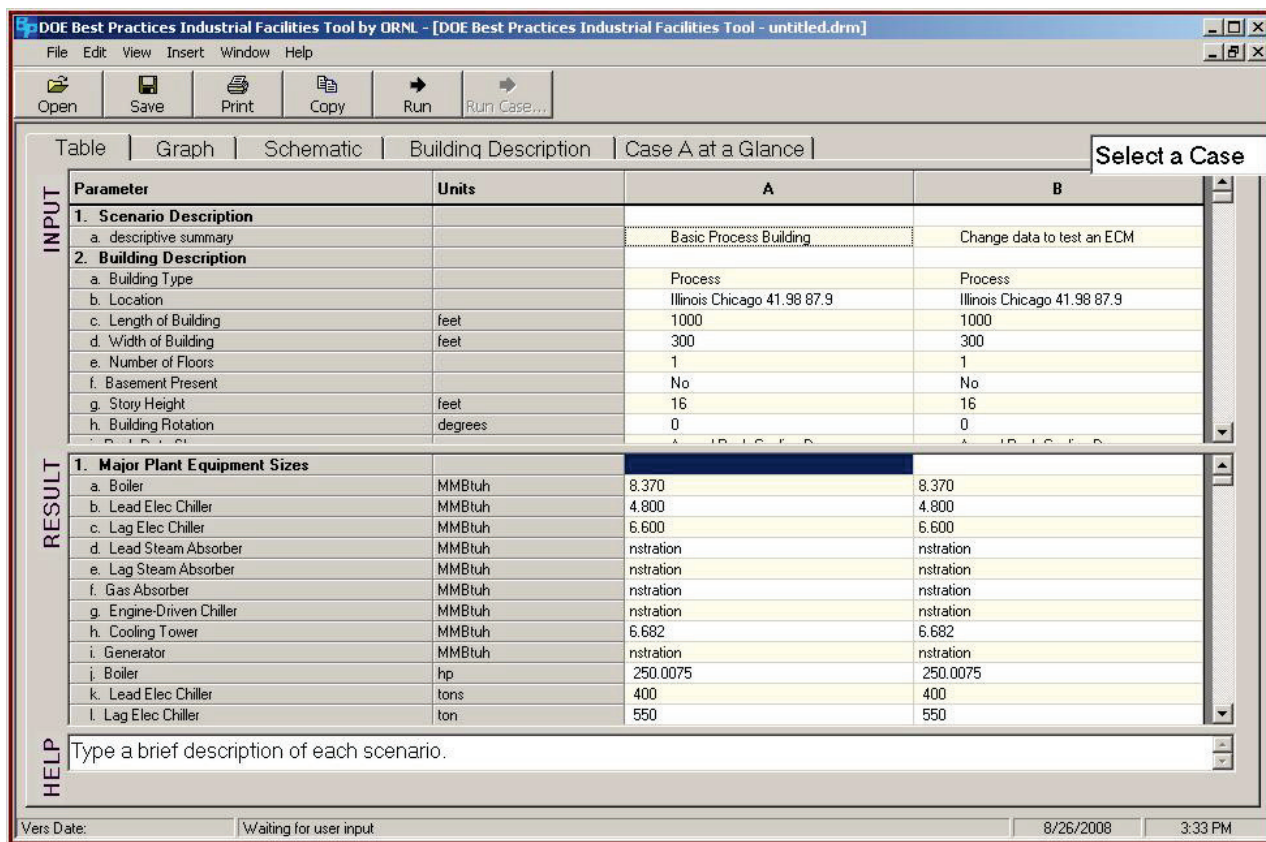
L2	What percent of total floor area is lit by older fluorescent (T12) or incandescent lighting that could be retrofit to T8?	percent	75	18.75
L3	What percent of total floor area has lighting left on all the time or most of the time when little or no activity is occurring? Or lights cannot be turned off due to lack of switching?	percent	75	37.5

Part 5, Score Card Results, potential savings for envelope and lighting

Buildings Energy System	Scorecard Potential out of 100	Electricity	Fuel/Steam	Electricity	Fuel/Steam
		kWh/yr	Million Btu/yr	\$/yr	\$/yr
Envelopes	45	14,798	488	\$1,036	\$5,861
Lighting	56	258,961	0	\$18,127	\$0

IFSAT Beta Facilities Tool

- Tool has simple spreadsheet-type input, as shown here, for a baseline and a savings case
- Each case is a simulation run, and savings are based on differences between runs
- Beta version available from website for testing
- Extensive results are provided



DOE Best Practices Industrial Facilities Tool by DRNL - [DOE Best Practices Industrial Facilities Tool - untitled.drm]

File Edit View Insert Window Help

Open Save Print Copy Run Run Case...

Table | Graph | Schematic | Building Description | Case A at a Glance | **Select a Case**

INPUT		Parameter	Units	A	B
1. Scenario Description		a. descriptive summary		Basic Process Building	Change data to test an ECM
2. Building Description		a. Building Type		Process	Process
		b. Location		Illinois Chicago 41.98 87.9	Illinois Chicago 41.98 87.9
		c. Length of Building	feet	1000	1000
		d. Width of Building	feet	300	300
		e. Number of Floors		1	1
		f. Basement Present		No	No
		g. Story Height	feet	16	16
		h. Building Rotation	degrees	0	0
RESULT		1. Major Plant Equipment Sizes			
		a. Boiler	MMBtuh	8.370	8.370
		b. Lead Elec Chiller	MMBtuh	4.800	4.800
		c. Lag Elec Chiller	MMBtuh	6.600	6.600
		d. Lead Steam Absorber	MMBtuh	nstration	nstration
		e. Lag Steam Absorber	MMBtuh	nstration	nstration
		f. Gas Absorber	MMBtuh	nstration	nstration
		g. Engine-Driven Chiller	MMBtuh	nstration	nstration
		h. Cooling Tower	MMBtuh	6.682	6.682
		i. Generator	MMBtuh	nstration	nstration
		j. Boiler	hp	250.0075	250.0075
		k. Lead Elec Chiller	tons	400	400
		l. Lag Elec Chiller	ton	550	550
HELP		Type a brief description of each scenario.			

Vers Date: | Waiting for user input | 8/26/2008 | 3:33 PM



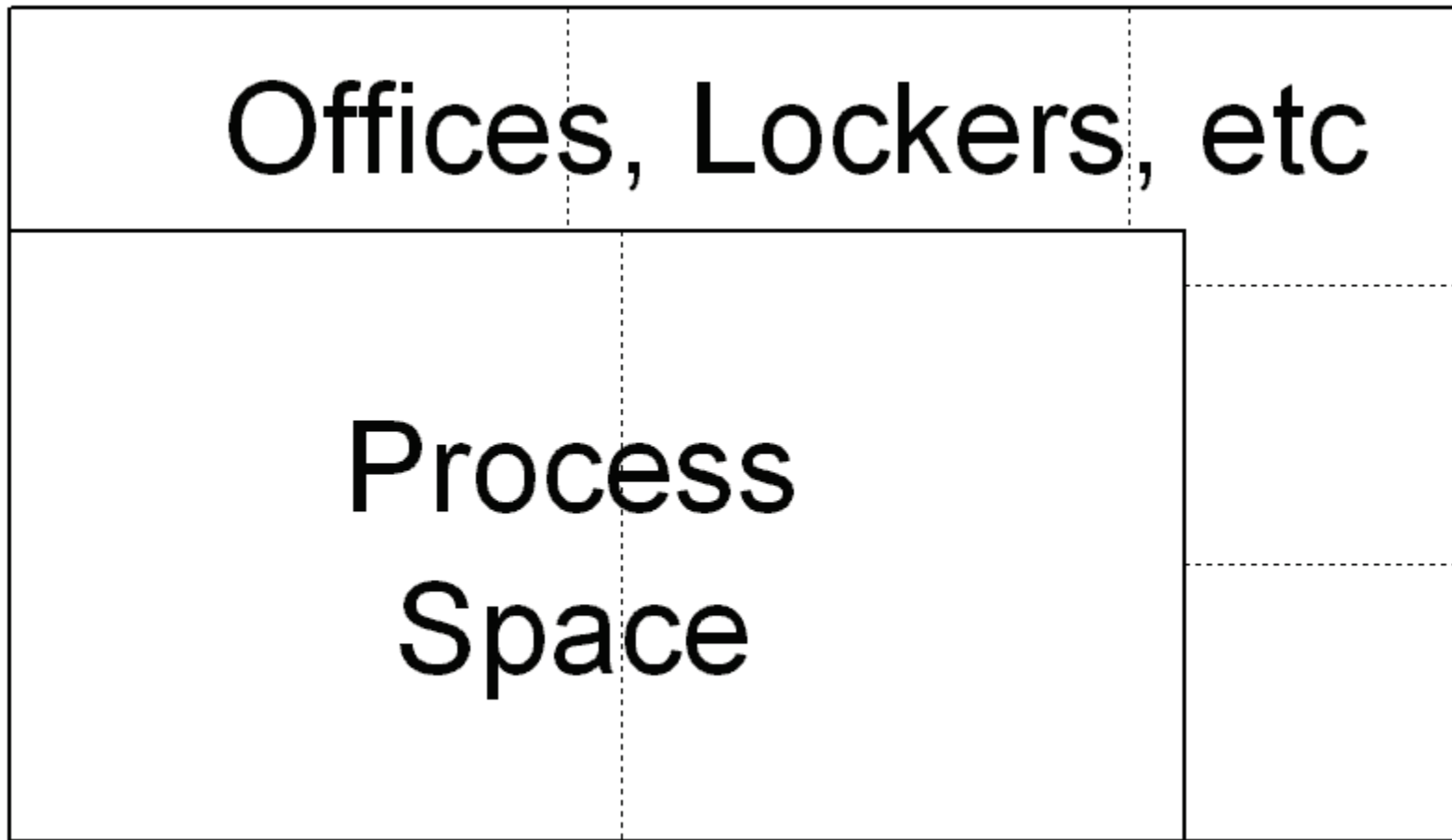
Simulation Output for base case matching to utility data

Buildings Energy Estimate

	Units	baseline A
4. Annual Electricity Consumption		
a. Lights	kWh	804,460
b. Equipment	kWh	102,406
c. Heating	kWh	
d. cooling		
(1) chiller #1	kWh	156,101
(2) chiller #2	kWh	0
(3) desiccant dehumidifier	kWh	0
(4) total cooling power	kWh	156,101
e. Cooling Tower	kWh	
f. Pump and Misc	kWh	21,583
g. Ventilation Fans	kWh	1,177,686
h. Refrigeration	kWh	
i. Supplemental Heat	kWh	
j. Service Water Heat	kWh	
k. Total Power	kWh	2,262,237
5. Annual Gas Consumption		
a. Heating	MMBtu	24,006
b. Cooling	MMBtu	
c. Supplemental Heat	MMBtu	
d. Service Water Heat	MMBtu	
e. Process Thermal	MMBtu	557
f. Generator	MMBtu	
j. Total 'Plant' and 'System' fuel consumption	MMBtu	24,562



Simplified Building Layout



Lighting ECM, reduces lighting power from 1 W/sq ft to 0.6 in the Process Space, IFSAT results

90,000 sq ft total	Annual Change for Allentown, PA climate
Lighting	222,600 kWh reduction
HVAC fans	3,700 kWh reduction
Heating	397 MMBtu increase
Cost @ \$0.07/kWh and \$12/MMBtu	\$15,800 - \$4,800 = \$11,000/yr

Roof Insulation ECM, owner plans to re-roof, add R-19, IFSAT results

150,000 sq ft total, existing R-3	Annual Change for Allentown, PA climate
Cooling	17,300 kWh reduction
HVAC fans	26,500 kWh reduction
Heating	2,400 MMBtu reduction
Cost @ \$0.07/kWh and \$12/MMBtu	\$3,000 + \$28,800 = \$31,800/yr



Reduce Exhaust ECM, assessor finds way to reduce exhaust, IFSAT results

Reduce exhaust fan CFM, 15,000 to 10,000	Annual Change for Allentown, PA climate
Cooling	7,900 kWh reduction
Ventilation and HVAC fans (mainly vent)	375,500 kWh reduction
Heating	6,100 MMBtu reduction
Cost @ \$0.07/kWh and \$12/MMBtu	$\$26,800 + \$73,200 =$ \$100,000/yr



Future Plans

- IFSAT will be released as version 1 by the Fall, with User Manual, and up to 26 simultaneous scenarios
- Score Card probably updated to version 1.2 to allow different percentages for electricity and fuel
- Extended Score Card likely to be developed that allows more ECM calculations and compacts the energy allocation steps, by Fall 2009



Cost-Saving Next Steps

1. Download and use the Industrial Facilities Scorecard spreadsheet and/or tools.
<http://www1.eere.energy.gov/industry/bestpractices/software.html>
2. Request an Energy Assessment through: our Info Center (877-337-3463), your Utility, NAESCO, or your preferred Engineering firm.
3. Visit the ITP States page for the Incentives Database
<http://www1.eere.energy.gov/industry/states>
4. See the Utilities Management page for Demand Management opportunities
<http://www1.eere.energy.gov/femp/program/utility/index.html>
5. Ask your supplier for a Wireless Sensor demonstration. Project partners include: Johnson Controls, Honeywell, Eaton, GE, Sensicast. Imagine what a secure energy awareness scenario might look like in your plant. Download the wireless sensor webcast presentation archive.
6. Download previous webcast archives:
<http://www1.eere.energy.gov/industry/resources/webcasts.html>
 - The American Recovery and Reinvestment Act Act - includes details for current combined heat & power projects, or tax credits
 - Energy Assessments for industry.
7. Request an Energy Assessment through our Information Center (877-337-3463), your Utility, NAESCO, or a preferred Engineering firm.
8. Start Saving Today!

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