



DOE's Industrial Technical Assistance Programs

Thomas Wenning, PE

AVI Meeting
May 4, 2017
Knoxville, TN

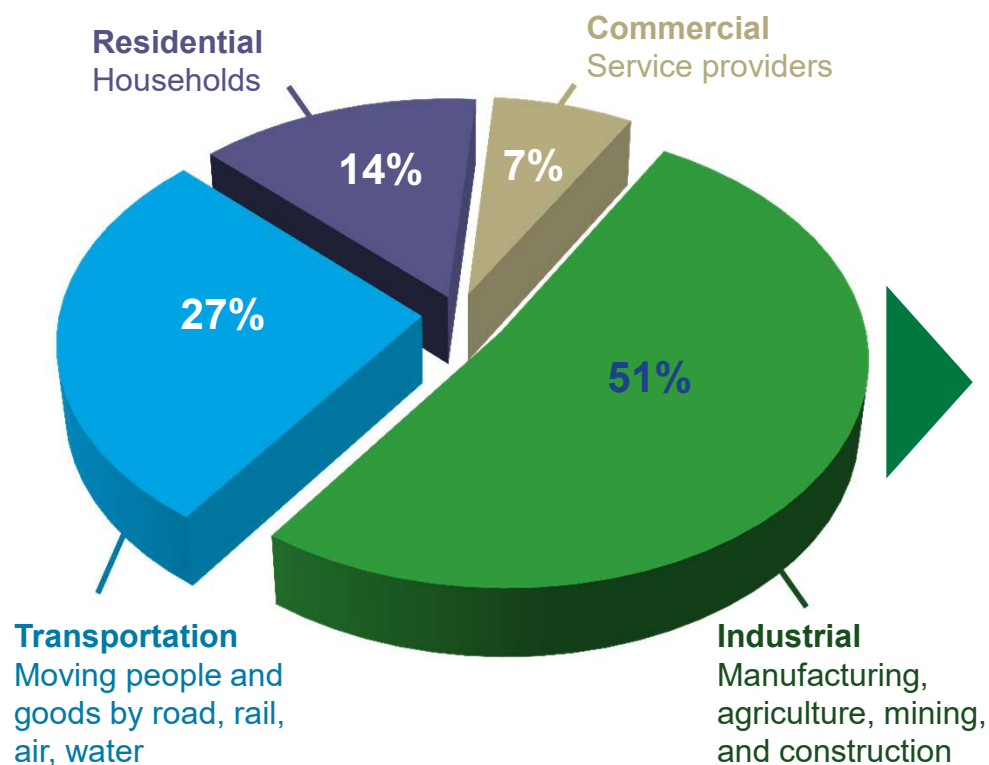
Overview

- Background
- DOE's Better Plants & Other Programs
 - Better Plants
 - Industrial Assessment Centers
 - CHP Deployment
 - 50001 Ready & SEP
- DOE Energy System Software Tools

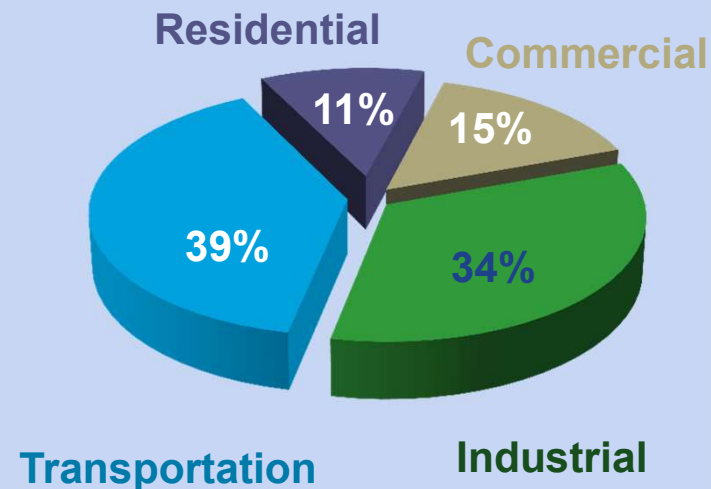
Energy Consumption Worldwide

More than half of world energy is currently consumed by industry.

Total World Delivered Energy Consumption, 2007



Total U.S. Delivered Energy Consumption, 2007



Note: Delivered energy consumption in the end-use sectors consists of primary energy consumption and electricity retail sales excluding electrical system energy losses.
Source: U.S. Energy Information Administration. International Energy Outlook 2010: [World Energy Demand and Economic Outlook](#), Reference Case. 27 July 2010. EIA, [Annual Energy Review 2010](#). August 2010.

A Closer Look at U.S. Manufacturing Energy

Materials and process industries produce 50% of the total dollar value of manufacturing shipments while consuming 86% of total manufacturing site energy use (fuel use only, non-feedstock).

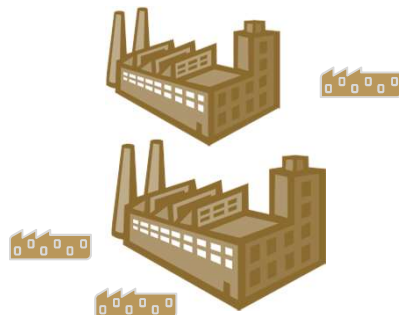
Facilities' Energy Management in 2006

- 5% had an energy manager
- 20% had established goals for improving energy efficiency
- 22% received an energy assessment
- 8% received energy management training for employees

Manufacturing Supply Chain

Energy and cost-saving benefits accrue at each plant and accumulate downstream.

Materials and Process Industries



Key Sectors: Petroleum Refining, Chemicals, Cement, Glass, Steel, Aluminum, Food & Beverage, Wood & Paper Products

13.5 Quads (site)* 56,000 facilities

Fabrication and Assembly Industries



Key Sectors: Transportation Equipment, Fabricated Metals, Plastics, Machinery, Electrical Equipment

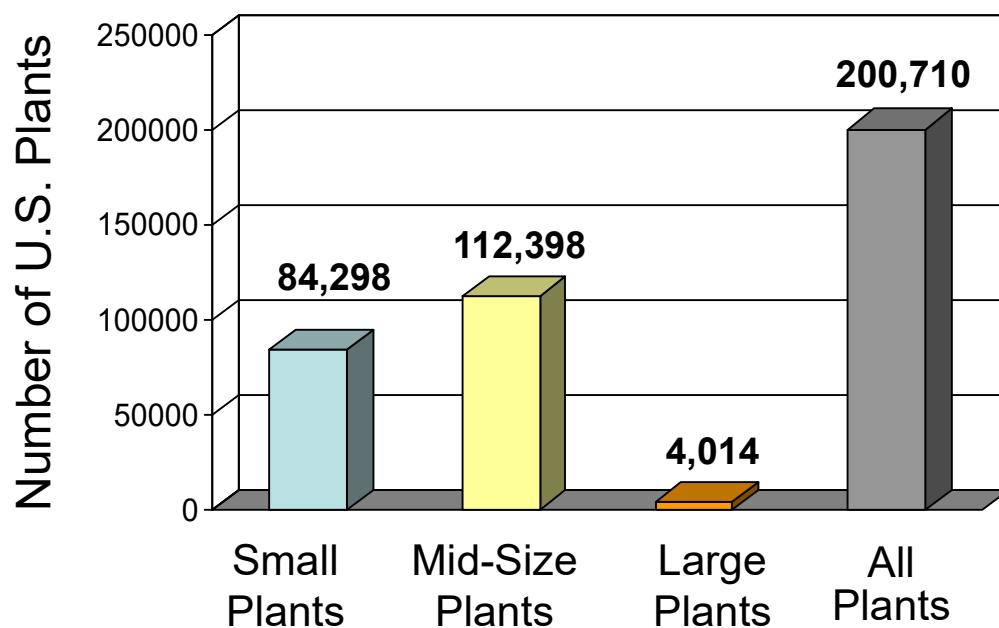
2.1 Quads (site)* 138,300 facilities

* Excludes feedstock energy

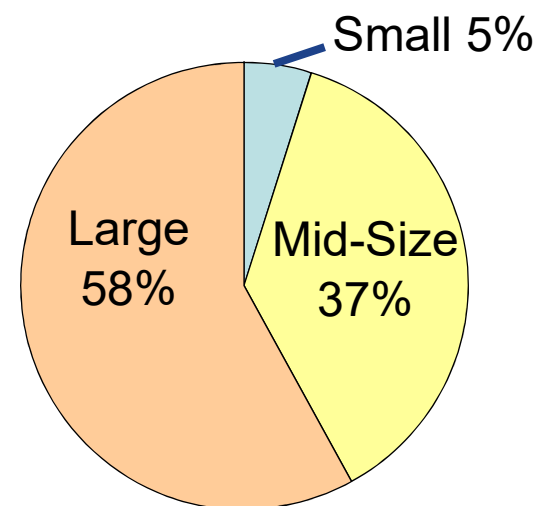
Partners have business relationships throughout the manufacturing supply chain.

Industry Breakdown

U.S. Manufacturing Plants: By Size



Percent of Total U.S. Manufacturing Energy



Experience has showed us that the Energy Savings Opportunities tend to be:
5-15% for Large Plants
10-30% for Medium Plants

Industrial Efficiency Opportunity

- Across the United States, manufacturers spend **more than \$200 billion on energy** each year to operate their plants.
- The industrial sector has the potential to **invest more than \$100 billion in energy-efficiency technologies** by 2020, which would result in annual energy savings of almost \$50 billion.





DOE's Better Plants Program & other resources



BETTER PLANTS OVERVIEW

Better Buildings, Better Plants

- Better Plants is a key component of DOE's **Better Buildings Initiative**, which seeks to improve the energy efficiency of commercial and **industrial** buildings.
- Through Better Plants:
 - Set **long-term efficiency goals**
(Ex: 25% energy intensity over 10 years)
 - Receive **technical assistance, networking opportunities** and **national recognition**
- Manufacturers have two opportunities to engage in Better Plants:
 1. Broader-based *Program* level
 2. Higher-level *Challenge*



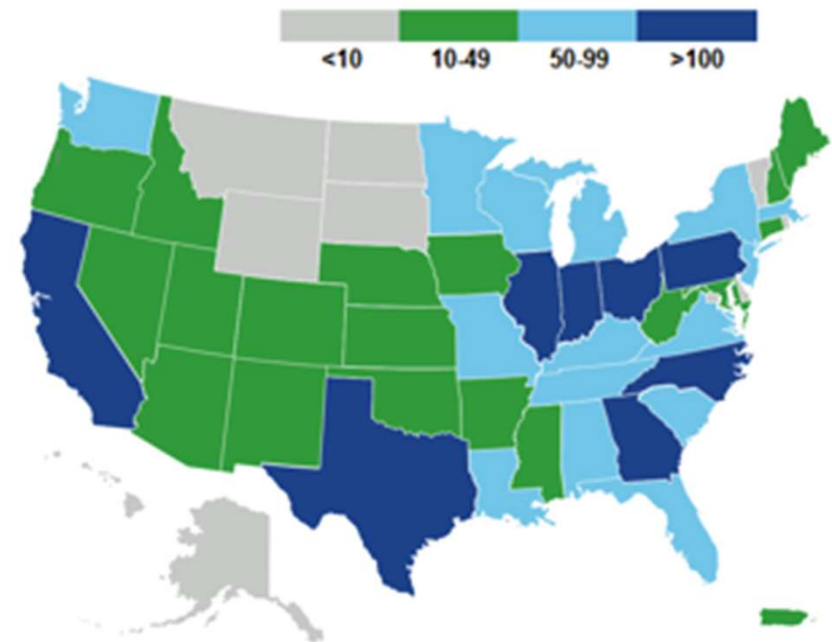
Better Plants Overview

Energy savings and program footprint continue to grow

Better Plants Snapshot

Accomplishments	Total
Number of Partners	187
Approximate Number of Plants	2,600
Percent of U.S. Manufacturing Energy Footprint	11.5%
Reported Savings	
Cumulative Energy Savings (TBtu)	600
Cumulative Cost Savings (Billions)	\$3.1
Cumulative Avoided CO ₂ Emissions (Million Metric Ton)	34.7
Average Annual Energy Intensity Improvement Rate	3.0%

Regional Distribution of Better Plants Facilities



Better Plants Challenge



Partnership Benefits

- National recognition
- Technical Assistance
 - In-Plant Trainings
 - Diagnostic Equipment Loan
 - Technology Transfer
- Networking opportunities
- Access to an expert Technical Account Manager
 - Your “offsite” energy manager
- Priority access to other DOE energy efficiency resources
 - Supply Chain, Water Efficiency



National Recognition & Awards



DOE Secretary Moniz at May 2014 Better Buildings Summit

NOVEMBER 4, 2014

W. Hartford firm's marathon reduces energy use 15%



West Hartford manufacturing firm Legrand reduced its total North American energy use 15.4 percent over a 26.2 day competition in October called the Energy Marathon.

Legrand held the competition at its 22 North American locations as a fun way to have employees find creative ways to reduce the company's energy usage, including installing sensors and changing personal habits. Daily updates and communications

Cummins' green initiative takes root

Nov 5, 2014, 12:26pm EST



★ Save Order Reprints Print



David Bertola

Buffalo Business First Reporter-
Buffalo Business First

Email | Twitter | Google+

The U.S. Department of Energy is recognizing the Cummins Inc. Jamestown engine plant as a showcase project for its Better Buildings Better Plants Challenge.



Enlarge Photo

A Cummins engine at the Jamestown plant. (file photo)

According to the Department of Energy's



EERE Deputy Assistant Secretary Kathleen Hogan poses with Better Plants Partners at October 2013 WEEC

Technical Account Manager Support

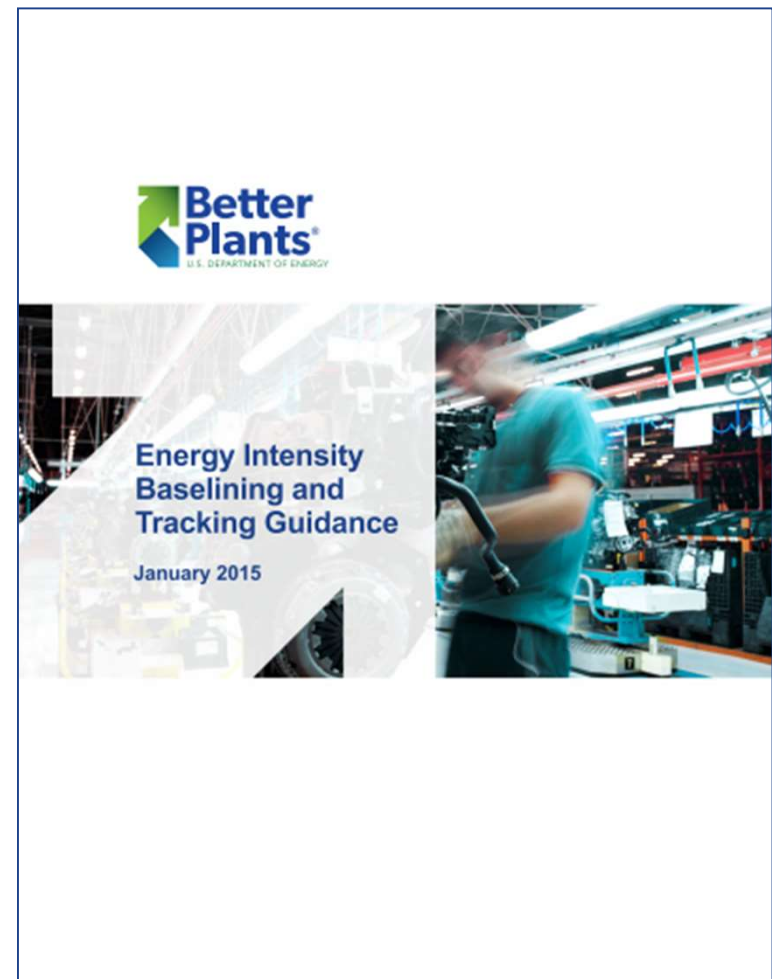
TAMs Goal: Help the company improve their energy management program and achieve their goal

Some activities include:

- Help establish or improve data collection and analysis methods; assist in annual reporting
- Provide guidance/support on DOE tools; help access additional resources
- Relay information regarding program developments, upcoming events, new resources, and other opportunities
- Connect partners to one another for peer-to-peer learning

Resources for Data Analysis and Baselineing

- Guidance on energy baselines and data tracking/reporting
- Guidance aligned with DOE's EnPI 4.0 tool
- DOE Technical Account Managers help companies compile and continuously improve metrics and methodology
- Free guidance document available



Technical Assistance: In-Plant Trainings

- Teach participants how to conduct assessments, use DOE tools, and implement projects
- Open to employees from host plant, peer companies, suppliers
- ~60 INPLTs covering steam, compressed air, process heating, pumps, and fans since 2011
- ~850 participants
- Identified > 3 TBTu and \$14 million in energy savings
- Pre-INPLT webinars available on program website



Process heating INPLT at an ArcelorMittal plant in Nov. 2013. Photo courtesy ArcelorMittal and ORNL.

<http://energy.gov/eere/amo/better-plants/>

Technical Assistance: In-Plant Trainings

Existing Trainings:

- Compressed Air
- Pumping
- Steam
- Process heating
- Fans

New Trainings:

- Treasure Hunt exchanges
- Water/Wastewater treatment
- Industrial Refrigeration
- Strategic Energy Management (SEM)



Technology Transfer: Diagnostic Equipment Loan Program

- Goal: Provide diagnostic equipment to partners free of charge (think Autozone or Home Depot rental)
- Historically:
 - Currently loan equipment to Energy Experts for INPLTs
 - Inventory of equipment available
- Equipment used for:
 - INPLTs
 - Internal energy investigations
 - Implementation M&V
 - Test the equipment before buying
- Timeframe – 1 day up to 4 weeks
- Rolling application process – first come, first serve
- Generic Policy – “You break it, you buy it”



Technology Transfer: Diagnostic Equipment

HOBO U12 Data
Logger + 600 AMP Split
Core Current
Transformer

HOBO H22 Energy
Logger – Multi Channel
Multi Transducer Data
Logger

HOBO U12-014 Logger
– 0 to 1800 degree
thermocouple

Pelican 1510
Case

Kill-A-Watt
120VAC outlet
energy meter

Dickson
Pressure
Logger

Fluke 345 – Clamp
Meter (Power
Factor / Energy
Logging)

UE Ultrasonic
Leak Detector



New Initiative: Technology Transfer

Leveraging ORNL assets

Neutron scattering: SNS and HFIR

- World's most intense pulsed neutron beams

Leadership-class computing: Titan

- Nation's most powerful open science supercomputer

Carbon fiber manufacturing

- Open-access carbon fiber process development facility

Advanced materials

- DOE lead lab for basic to applied materials R&D

Science and technology park

- Co-location for industry collaboration



Peer-to-Peer Networking

- DOE provides/sponsors forums for partners to learn from each other
 - Better Buildings Summit, IETC, WEEC, ACEEE Summer Study
- In-Plant Trainings – open to outside participants
- Regional Energy Efficiency Organization events
- Webinars with partner presentations



Better Plants: Supply Chain Initiative

- 4 Better Plants partners are working with ~30 suppliers to set energy-saving goals and track progress
- Suppliers receive DOE technical support, including priority access to free energy audits

Legrand	UTC	Lockheed Martin	Honda NA
Chapco	GKN Aerospace	Cascade Engineering Technologies, Inc.	KYB Americas
Coilplus	Hitchiner	Clearwater Engineering, Inc.	Newman Technologies
Complete Design & Packaging	MB Aerospace	Cooperative Industries Aerospace & Defense	Asama Coldwater Manufacturing
Durex	RTI International Metals, Inc.	The Harva Company, Inc.	American Mitsuba
Lynam	Selmet, Inc.	Research Electro-Optics	NSK Americas
Magnetic Metals	Weber Metals, Inc.	Savage Precision Fabrication	MAHLE Engine Components
Rowley Spring & Stamping	Jedco, Inc.	Vanguard Space Technologies	Cardington Yutaka Technologies
Stanley Spring & Stamping		Tri-State Plastics, Inc.	Cooper Standard

Better Plants: Water Efficiency

- DOE is working with 37 Better Buildings/Plants Challenge partners to set water savings goals
- Eight industrial partners are participating
- Cross-sector effort with representation from commercial, public and multifamily housing sectors
- Partners set water saving goals and share their solutions with the market

2014 Water Savings from industrial partners are equivalent to:



540 Olympic swimming pools



3,000 households' average annual water consumption



20 million showers

Better Plants: Water/Wastewater Sector

- Better Plants expanded to water and wastewater treatment agencies
- 22 organizations joined, 9 Challenge level
- DOE working with this sector to understand key challenges, refine metrics, and share solutions

Better Plants Water & Wastewater Treatment Agencies

Alexandria Renew Enterprises	Los Angeles Department of Water & Power
Bath Electric Gas & Water	MWRA (Boston)
City of Phoenix Water	Orange Water & Sewer Authority
Bucks County Water & Sewer Authority	Narragansett Bay Commission
Delta Diablo	New York City Department of Environmental Protection
Encina Wastewater Authority	Pima County Regional Wastewater Reclamation Department
Ithaca Area Wastewater Treatment Facility	St. Petersburg Water Resources Department
Kent County, DE	Victor Valley Wastewater Reclamation Authority
Los Angeles Bureau of Sanitation	Western Lakes Superior Sanitary District
Des Moines Water Works	Grand Rapids Water Resource Recovery Facility
City of Roseville Water	New Water (Green Bay)



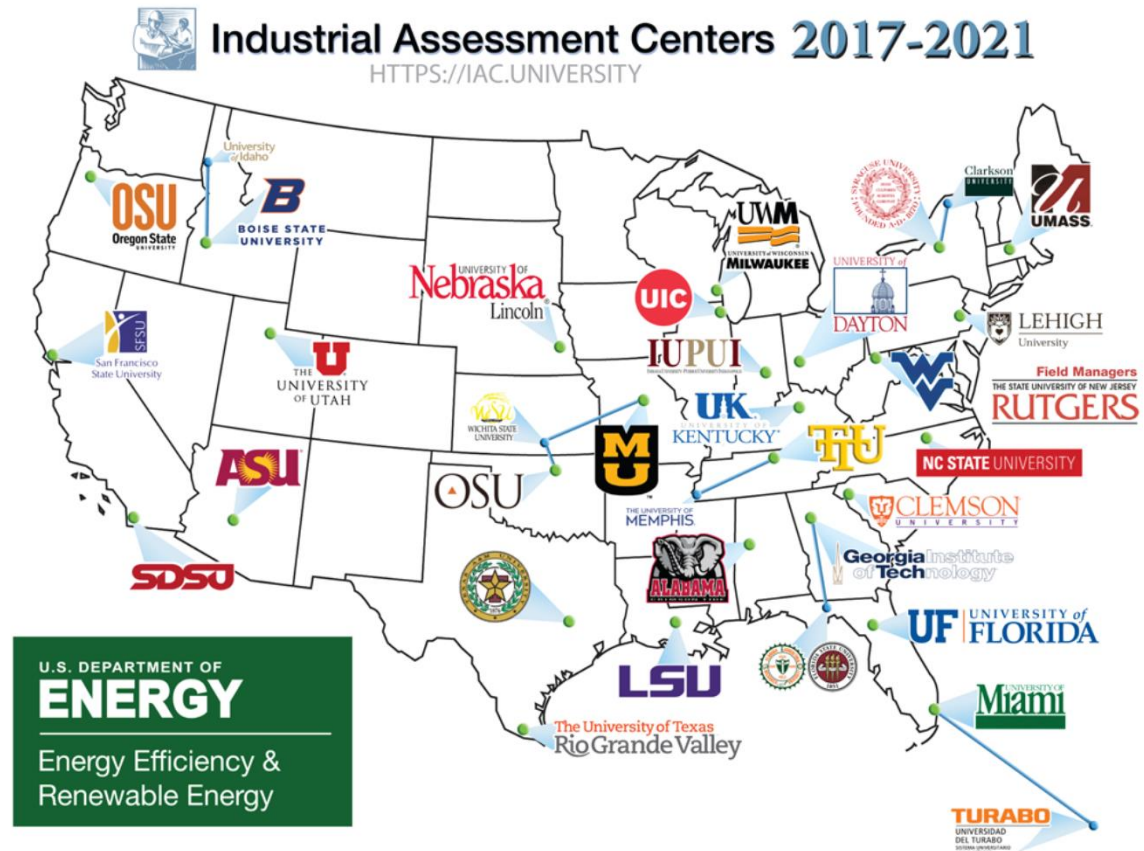
Other DOE Industrial Technical Assistance Programs

Industrial Assessment Centers
CHP TAPS

Energy Management – 50001 Ready & SEP

Access to Industrial Assessment Centers

- Receive no-cost energy assessments from DOE's IACs.
- IACs are university-based centers, led by professors and staffed by engineering students.
- Typical audit uncovers savings equal to about 8% of plant-wide energy consumption
- <https://IAC.University>



Better Plants Partners Receive Priority Access to IAC Assessments
Better Plants Partners also receive access to “solid” summer intern students

CHP Technical Assistance Partnerships

CHP TAPs provide:

- Market Opportunity Analysis
- Education and Outreach
- Technical Assistance

CHP Technical Assistance Partnerships

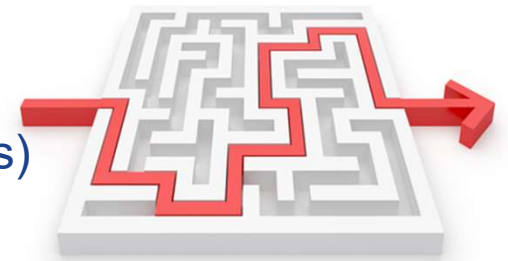


Better Plants Partners receive free CHP screenings

<https://energy.gov/eere/amo/chp-technical-assistance-partnerships-chp-taps>

50001 Ready Overview

- A voluntary program that recognizes a facility's self-attestation to ISO 50001
- DOE recognition requires 2 steps:
 - Use “50001 Navigator” online tool and guide to self-attest implementation of ISO 50001.
 - Validate **energy calculations** (with relevant variables) using DOE's EnPI-Lite tool, Portfolio Manager or alternative tools
- 50001 Navigator tool can be rebranded and owned by service providers, utilities, states, municipalities



50001 Ready provides guidance for the critical elements of ISO 50001



=

Completed
tasks in
50001 Navigator

+

Validated energy
savings (*Portfolio
Manager, QEST, others*)

Superior Energy Performance® (SEP™)

SEP is a DOE certification program that verifies energy management excellence and sustained energy savings.



SEP is ISO 50001 plus:

- **Deeper, sustained savings at less cost** through robust tracking and measurement with advanced tools
- **Credible, third-party verification** by ANSI-ANAB accredited entity that market can reward supply chains, utilities, and carbon trading  
- **National recognition** by U.S. DOE identifying sustainability leaders



iStock photo: 16418416

SEP Certification



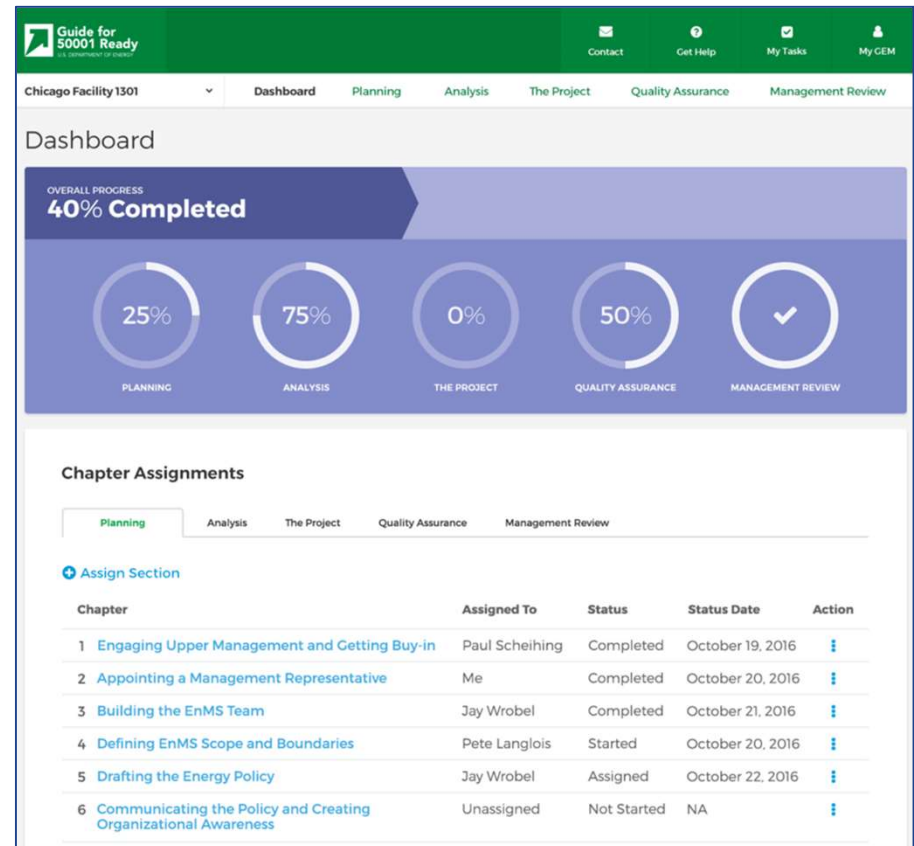
ISO 50001 certification



Verified energy performance improvement

50001 Navigator: Preview

- ✓ Step-by-step “Turbo Tax” approach to 50001
- ✓ Extensive guidance available in each module
- ✓ Ability to assign tasks to team members
- ✓ Requires energy savings data from the EnPI calculator or similar tool



<https://navigator.industrialenergytools.com/>

SUMMIT

WASHINGTON, D.C.
MAY 15-17, 2017

REGISTER TODAY

U.S. DEPARTMENT OF
ENERGY

Join 900+ Better Buildings Partners and Allies

► EXPLORE AND SHARE

innovative strategies, emerging trends, and high-impact technologies in energy and water efficiency

► CONTRIBUTE

to interactive sessions focused on industry-specific and proven solutions to help you take on what's next

► PARTICIPATE

in showcase building tours, financial ally speed dating, ask-an-expert meetings, peer-to-peer networking

► LEVERAGE

your organization's commitment to sustainability

Register early - space is limited

REGISTRATION OPENS JANUARY 2017

FOR MORE INFORMATION AND TO REGISTER:

betterbuildingsinitiative.energy.gov/summit



Better Buildings Solution Center



- Nearly 200 industrial solutions tested and proven by Partners – 100 added in 2016
- Find solutions by topic, building type, solution type, building size, sector, technology, location, and more.

energy.gov/bbsc

CURRENT DOE SOFTWARE TOOLS

AMO Resources: Key Tools

Energy Performance Tracking

Baselining EnPI Tool

Corporate Energy
Performance
Tracking for Better
Plants partnership

Facility Energy
Performance
Tracking for
Superior Energy
Performance

Energy Management

eGuide& eGuide
Lite for ISO 50001
Implementation

Energy Footprint
Tool

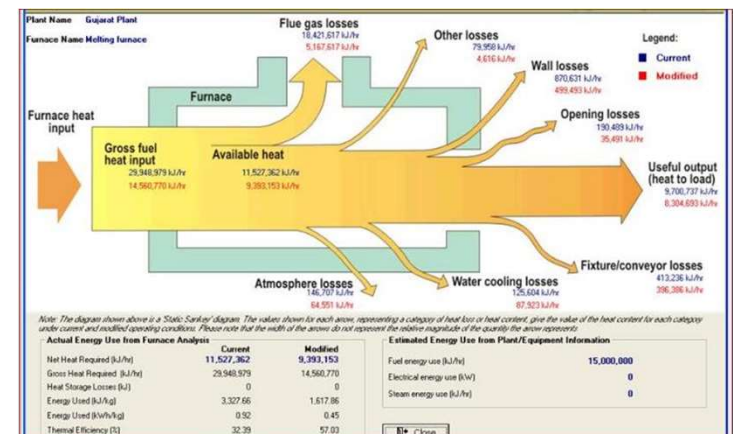
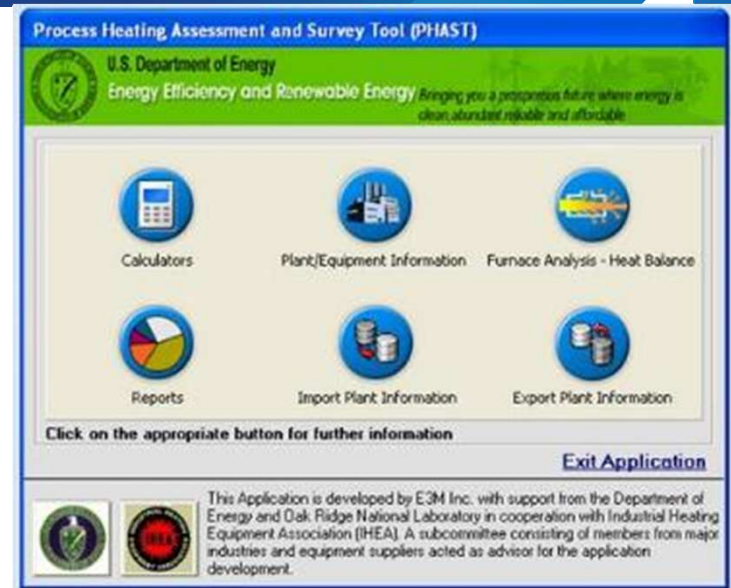
PEP (Plant Energy
Profiler)

Energy Systems Analysis

- Motors
- Pumps
- Fans
- Compressed Air
- Steam
- Process Heating
- Data Centers
- Simple Calculators

AMO Tool Modernization Overview

- **Issues:**
 - Many tools no longer work with updated systems
 - DOE does not own software code
 - Difficult to fix bugs or add new capabilities
- **Path Forward:**
 - DOE will own and control code
 - Upgrade tool capabilities where feasible
- **Create Open Source Software!**
 - Government-wide Open Source Software
<https://sourcecode.cio.gov/SourceCodePolicy.pdf>
 "...free Software for other public agencies as well as the general public to use, study, share and improve the software."
 - MIT License – "Do whatever, but please provide attribution"



AMO Tool Modernization (cont.)

- Designed for Multiple interfaces
 - Web / Desktop / Mobile
- GitHub repository for Open Access -
<https://github.com/ORNL-AMO>
- Other Benefits:
 - Common software engine library
 - Auto-Update capability (silent updates)
 - Crash reporting to assist in debugging
 - Consistency in appearance across all platforms



Ongoing Feedback link- <https://www.surveymonkey.com/r/DOE-AMO-TOOLS>

How To Access DOE Resources

The screenshot displays the Energy.gov website, specifically the 'Technical Assistance Activities' page. The browser's address bar shows the URL energy.gov/eere/amo/ta. The website's header features the 'ENERGY.GOV' logo and the 'Office of Energy Efficiency & Renewable Energy' name. A navigation menu includes links for SERVICES, EFFICIENCY, RENEWABLES, TRANSPORTATION, ABOUT US, and OFFICES. A search bar is located in the top right corner.

The main content area is titled 'TECHNICAL ASSISTANCE ACTIVITIES'. On the left, a sidebar lists various resources: Advanced Manufacturing Home, Key Activities, Research & Development Projects, Facilities, Technical Assistance (highlighted), Better Plants, Superior Energy Performance, Industrial Assessment Centers (IACs), Combined Heat & Power Deployment, Information Resources, Financial Opportunities, AMO Contacts, News, and Events.

The central content area is divided into several sections:

- Technical Assistance Programs:** Describes AMO's Industrial Technical Assistance, which supports the deployment of manufacturing technologies and practices, including strategic energy management and combined heat and power, across American industry to increase productivity and reduce water and energy use. It includes a photo of a 'Better Buildings' event.
- AMO TA State Activities:** Features a map of the United States and a link to 'View AMO Technical Assistance Activities by state.'
- Bimonthly Update:** Lists recent updates, including 'Advanced Manufacturing Office Update, March 2015' and 'Advanced Manufacturing Office Update, January 2015'.
- Energy Resource Center:** Includes a photo of two workers in safety gear and lists resources such as Software Tools, Training, Technical Publications, Case Studies, State and Utility Engagement, and Industrial Assistance and Projects.
- Other Industrial Support:** Lists Plant Energy System Areas, including Plant Wide, Steam, and Process Heating.

Final Thoughts

Why State An EE Goal?

Organizations with publicly stated goals*:

- Implemented *50% more* efficiency and renewable energy measures than organizations without goals
- Are 2.7x more likely to increase *investments*
- Adopted more *energy management* practices
- Gain brand value, property value, and other co-benefits beyond energy savings

*2013 Energy Efficiency Indicator Survey by the Institute for Building Efficiency

Energy Conservation Also Yields: Capital, Operations, Recognition and Environmental Benefits

“CORE” Benefits are Highly Probable and Worth a Double-Digit Improvement to Energy Savings

Eric A. Woodroof, Ph.D., CEM
Wayne C. Turner, Ph.D., PE, CEM
Warren Heffington, Ph.D., PE, CEM
Barney Capehart, Ph.D., CEM

A Peer Reviewed Publication

ABSTRACT

Previous research indicates there are additional (often unreported) benefits from saving energy.^{1,2} This paper identifies these “additional benefits” and describes how to calculate their value.^{3,4} In addition, we found a high percentage of facility managers experienced some of these benefits. For example, in a recent survey, 92% of facility managers experienced reduced maintenance material costs as a result of energy conservation (primarily because lights, filters and other equipment lasted longer when operated less hours per year). Due to site-specific factors, not all facility managers will experience every benefit, however a high percentage of respondents (92%, 71% and 63%) did experience three of the six “additional benefits” surveyed. Because facility managers do receive some of these “additional benefits”, we developed two approaches to quantify their value. When applicable, these benefits should yield a direct and verifiable dollar savings a majority of the time. Via a simple example, we calculated these benefits to be worth approximately 31% of additional value beyond the direct energy dollar savings (and that was only applying half of the possible benefits). There are other benefits that defy quantification, some of which we list at the end of the paper for use in future research and when evaluating energy conservation projects and programs.

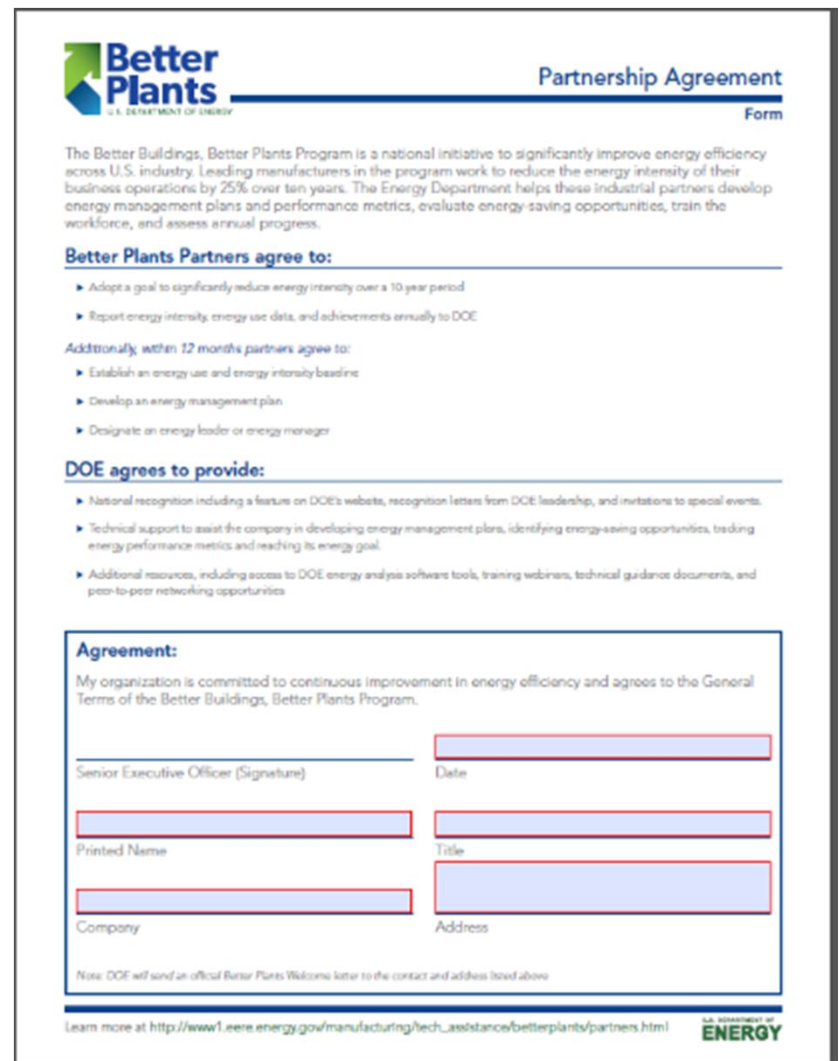
Survey Results

Additional Benefits of Energy Conservation	% of Facility Managers that Experienced this Benefit
1. Reduced Maintenance Material Costs	92%
2. Reduced Maintenance Labor Costs	71%
3. Permanently Avoided Capital Investment	33%
4. Avoided Procurement Costs	63%
5. Avoided Purchases of Carbon Offsets	10%
6. Enhanced Image, Public Relations or Recognition	44%
7. Reduced Sales Taxes/Environmental Penalties	Not Surveyed
8. Improved Building Value	Not Surveyed

How Do I Join?

- Simple 2-page partnership agreement form
- Should be signed by CEO or a senior executive
- Lists Partner and DOE roles; explains voluntary nature of agreement
- For more information contact BetterPlants@ee.doe.gov

<http://energy.gov/eere/amo/downloads/better-plants-partnership-agreement-form>



The image shows a thumbnail of the 'Better Plants Partnership Agreement Form' from the U.S. Department of Energy. The form is titled 'Better Plants Partnership Agreement Form' and includes the DOE logo. It describes the Better Buildings, Better Plants Program as a national initiative to improve energy efficiency. The form lists the commitments of Better Plants Partners and the support provided by DOE. At the bottom, there is an 'Agreement' section with a statement of commitment and fields for the Senior Executive Officer's signature, date, printed name, title, company, and address. A note states that DOE will send an official Welcome letter. A URL for more information is provided at the bottom.

Better Plants
U.S. DEPARTMENT OF ENERGY

Partnership Agreement
Form

The Better Buildings, Better Plants Program is a national initiative to significantly improve energy efficiency across U.S. industry. Leading manufacturers in the program work to reduce the energy intensity of their business operations by 25% over ten years. The Energy Department helps these industrial partners develop energy management plans and performance metrics, evaluate energy-saving opportunities, train the workforce, and assess annual progress.

Better Plants Partners agree to:

- ▶ Adopt a goal to significantly reduce energy intensity over a 10 year period
- ▶ Report energy intensity, energy use data, and achievements annually to DOE

Additionally, within 12 months partners agree to:

- ▶ Establish an energy use and energy intensity baseline
- ▶ Develop an energy management plan
- ▶ Designate an energy leader or energy manager

DOE agrees to provide:

- ▶ National recognition including a feature on DOE's website, recognition letters from DOE leadership, and invitations to special events.
- ▶ Technical support to assist the company in developing energy management plans, identifying energy-saving opportunities, tracking energy performance metrics, and reaching its energy goal.
- ▶ Additional resources, including access to DOE energy analysis software tools, training webinars, technical guidance documents, and peer-to-peer networking opportunities.

Agreement:
My organization is committed to continuous improvement in energy efficiency and agrees to the General Terms of the Better Buildings, Better Plants Program.

Senior Executive Officer (Signature) _____ Date _____

Printed Name _____ Title _____

Company _____ Address _____

Note: DOE will send an official Better Plants Welcome letter to the contact and address listed above.

Learn more at http://www1.eere.energy.gov/manufacturing/tech_assistance/betterplants/partners.html

U.S. DEPARTMENT OF ENERGY



Partnership Agreement

Form

The Better Buildings, Better Plants Program is a national initiative to significantly improve energy efficiency across U.S. industry. Leading manufacturers in the program work to reduce energy intensity throughout

Better Plants Partner agrees to:

- ▶ **Adopt a corporate-wide goal** to significantly reduce energy intensity over a 10 year period
- ▶ **Report** energy intensity, energy use data, and achievements annually to DOE

Additionally, within 12 months partners agree to:

- ▶ **Establish** an energy use and energy intensity baseline
- ▶ **Develop** an energy management plan
- ▶ **Designate** an energy leader or energy manager

DOE agrees to provide:

- ▶ **National recognition** including a feature on DOE's website, recognition letters from DOE leadership, and invitations to special events.
- ▶ **Technical support** to assist the company in developing energy management plans, identifying energy-saving opportunities, tracking energy performance metrics and reaching its energy goal.
- ▶ **Additional resources**, including access to DOE energy analysis software tools, training webinars, technical guidance documents, and peer-to-peer networking opportunities

Printed Name

Title

<http://energy.gov/eere/amo/downloads/better-plants-partnership-agreement-form>



Questions?



U.S. DEPARTMENT OF
ENERGY

For more Information

Thomas Wenning, wenningtj@ornl.gov, 865-946-1504

Eli Levine, eli.levine@ee.doe.gov, 202-586-9929

Bruce Lung, robert.lung@ee.doe.gov, 202-586-4411

BetterPlants@ee.doe.gov

Better Buildings, Better Plants:
<http://eere.energy.gov/betterplants>

Better Buildings Challenge:
<http://betterbuildingssolutioncenter.energy.gov/>

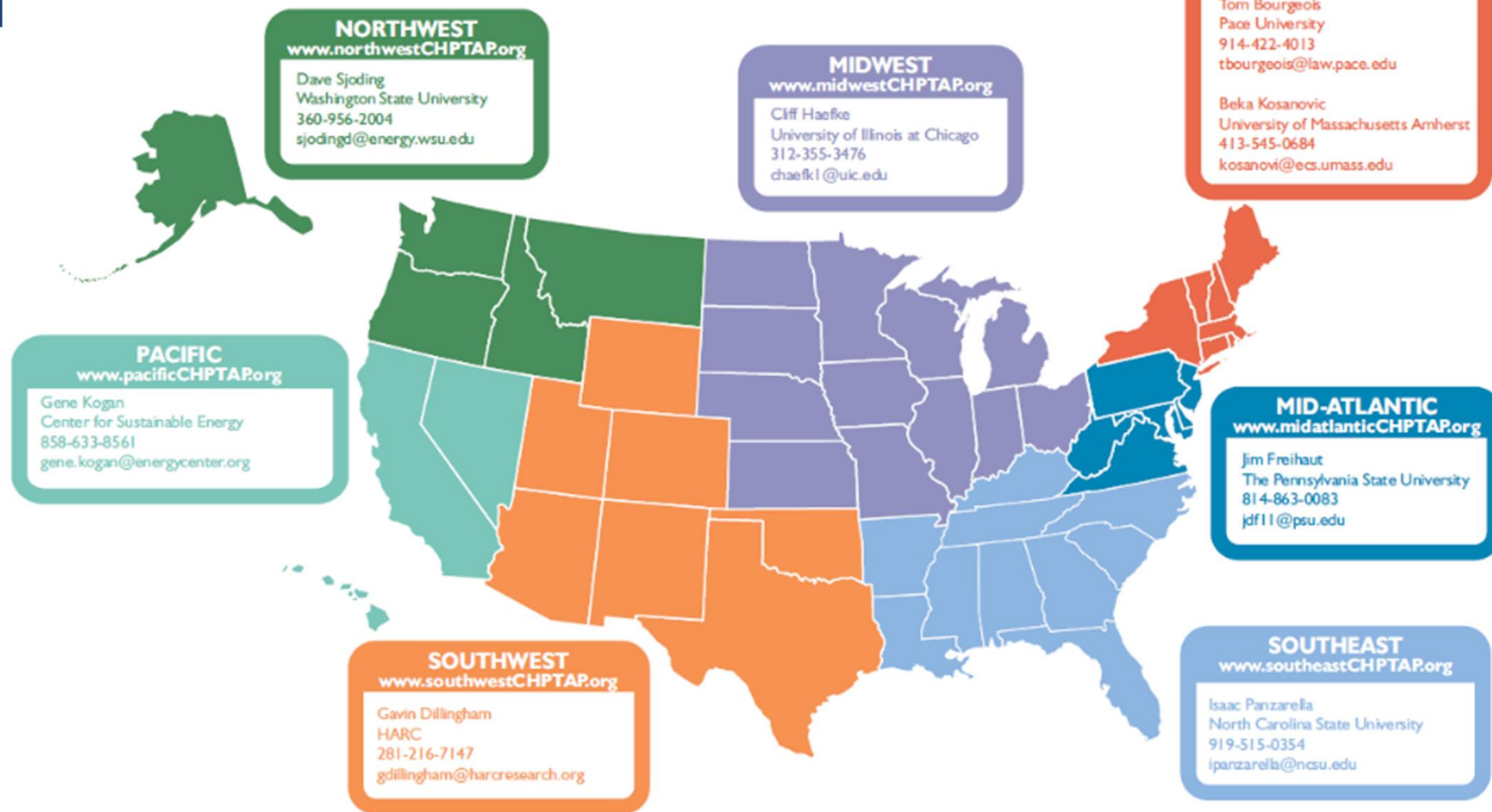
Instrument	Application
Anemometer	Measure air flow and help quantify leakage around seals (process heat, building envelope).
Combustion Analyzer	Quantify the amount of excess oxygen in boiler/combustion process exhaust.
Conductivity Meter	Quantify the amount of undissolved solids in boiler blowdown.
Current Transformer	Help quantify an actual change in the electrical consumption of a component or system.
Digital Manometer	When used with pitot tubes, digital manometers can help determine air flow rates in fan systems or ductwork.
Digital Multimeter	Measure voltage, current and resistance.
Digital Thermometer	When combined with a thermocouple this is useful for determining process temperatures.
HOBO Data Logger	When combined with the accessories below, the data logger is used to determine trends in non-steady state systems: current transformer - clamp-on; current transformer - split core; pressure transducer; temperature/RH sensor.
Infrared Camera	Useful for evaluating structures, door seals, insulation, oven hot spots, etc.
Infrared Thermometer	An infrared thermometer can be useful for non-contact temperature measurements for both manufacturing processes and building envelope applications.
Manometer–Hydronic	Used for measuring pressure drop across components in fluid systems.
Pitot Tube	Measure fluid flow velocity by using the difference between the total and static pressures.
Power Logger	Used for logging power in low voltage (<600 V) 1-Phase or 3-Phase electrical components such as pumps, fans, and compressors.
Pressure Transducer	Pressure transducers are most frequently used for compressed air and pumping systems.
Strobe Tachometer	A strobe tachometer is a non-contact method for determining the rotating speed of a shaft (motors, pumps, fans).
Thermocouple	Used to measure temperature for various applications.
Time-of-use Logger	Used for logging starts and stops of equipment with intermittent duty cycles such as sump pumps, vent fans, refrigeration units, etc.
TRMS Supermeter	Used for non-contact temperature measurement and voltage, current, resistance, inductance, capacitance, and frequency measurement.
Ultrasonic Flow Meter	Used to measure the flow rate in fluid systems without breaking the pressure boundary.
Ultrasonic Leak Detector	Used to identify leaks in compressed air or steam systems.

Industrial Assessment Centers Overview

- **Plants served:**
 - Program concentrates almost exclusively on industrial operations
 - Standard industrial classification codes (SIC) 20 through 39
 - Plant normally located within 150 miles (242 kilometers) of an IAC
- **Directed at small and medium sized manufacturers – primary customer:**
 - Has gross annual sales of \leq \$100 million
 - Consumes energy at a cost between \$100,000 and \$2.5 million/year
 - Employs no more than 500 people
 - Has no technical staff whose primary duty is energy management

DOE CHP Technical Assistance Partnerships (CHP TAPs)

Contact – Patti Garland, Patricia.Garland@ee.doe.gov



DOE CHP Technical Assistance Partnerships (CHP TAPs): Program Contacts

chp@ee.doe.gov

Claudia Tighe
CHP Deployment Program Manager
Office of Energy Efficiency and Renewable Energy (EERE)
U.S. Department of Energy
E-mail: claudia.tighe@ee.doe.gov

Jamey Evans
Project Officer, Golden Field Office
EERE
U.S. Department of Energy
E-mail: jamey.evans@go.doe.gov

Patti Welesko Garland
Enterprise Account POC
CHP Deployment Program
EERE, U.S. Department of Energy
E-mail: Patricia.Garland@ee.doe.gov

Ted Bronson
DOE CHP TAP Coordinator
Power Equipment Associates
Supporting EERE
U.S. Department of Energy
E-mail: tbronson@peaonline.com

New Initiative: Technology Transfer

A promotional banner for Technology Deployment Day. The background is dark blue with a network of glowing blue lines and hexagons. The text is white and orange. A central orange button says 'REGISTER NOW'. Two dark blue boxes at the bottom provide event details: 'WHEN March 15-16' and 'WHERE Oak Ridge, TN Oak Ridge National Laboratory'.

TECHNOLOGY
DEPLOYMENT DAY

A BETTER PLANTS CONFERENCE HOSTED BY ORNL

REGISTER NOW

WHEN
March 15-16

WHERE
Oak Ridge, TN
Oak Ridge National Laboratory

<https://bptechday.ornl.gov/>



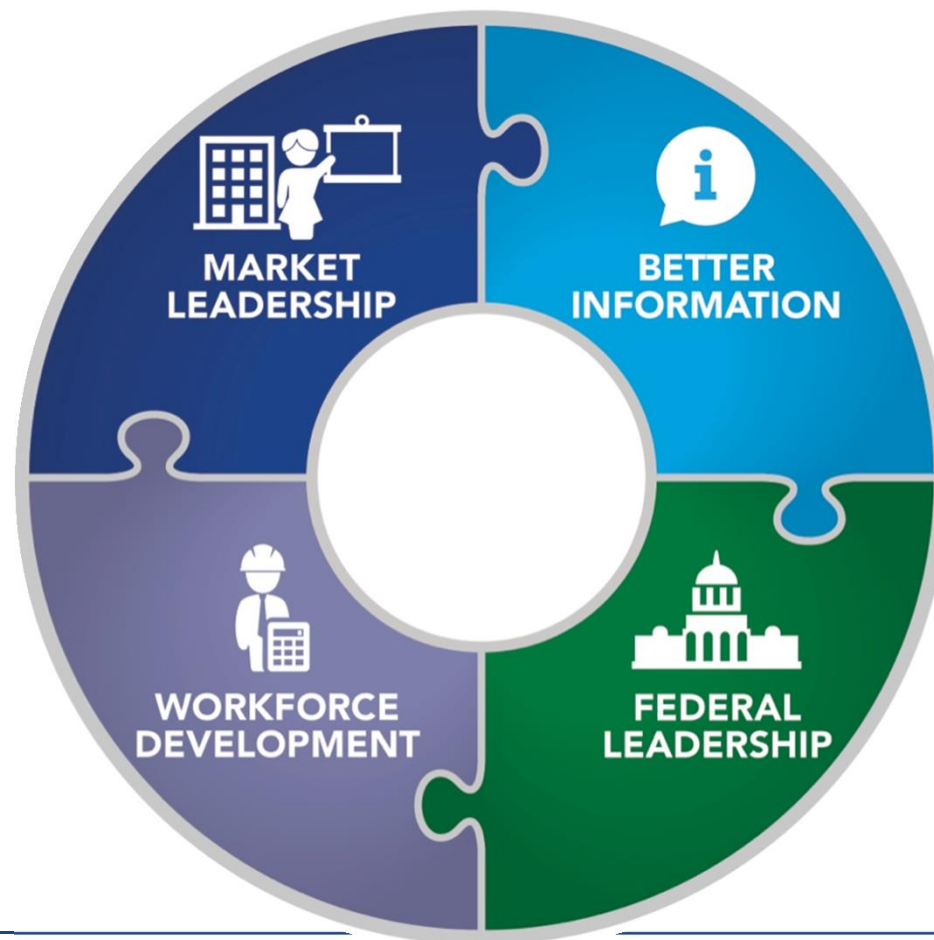
Developing Innovative, Replicable Solutions with Market Leaders

- Better Buildings Challenge
- Better Buildings Alliance
- Better Buildings, Better Plants
- Better Buildings Accelerators
- Better Buildings Residential
- Superior Energy Performance



Developing a Skilled Clean Energy Workforce

- Better Buildings Workforce Guidelines



Making Energy Efficiency Investment Easier

- Building Performance Database
- Building Energy Data Exchange Specification
- New Financing Solutions
- Building Energy Asset Scoring Tool
- Home Energy Score
- Appraisal Foundation Memorandum of Understanding



Leading by Example in the Federal Government

- New Executive Order
- President's Performance Contracting Challenge
- DOE Leadership

Comparison: Program vs. Challenge

Activities

Better Plants Program

- Corporate energy performance commitment
- Annual Report
- Monthly call with TAM
- Develop baseline

Benefits

- Technical Assistance
- Recognition
- Training

Better Plants Challenge

- Corporate energy performance commitment
- Annual Report
- Monthly call with TAM
- Develop baseline
- Data display
- Showcase Document
- Implementation model
- Quarterly call with TAM and program staff

- Technical Assistance
- Higher level Recognition
- Training
- Eligibility for water efficiency initiative
- Preferred access to speaking opportunities

A solid blue horizontal bar with a white arrow pointing to the right, located at the top of the main content area.

BIG PICTURE ENERGY EFFICIENCY: INSIGHTS FROM A TAM

Habits of Successful Companies

- Efficiency is a core strategy, not a sustainability “*check box*”
- Real & Sustained:
 - Leadership and organizational support
 - Resources into energy efficiency
- Sets ambitious EE goals and a plan to meet them
- Strategy relies on a robust tracking and measurement
- Effectively communicates results

Source: Pew Center, 2010

Have An Energy Policy

ABC Inc. Corporate Energy Policy

Objective

ABC Inc. is committed to using and purchasing energy in the most efficient, cost effective, and environmentally responsible manner possible. ABC shall improve energy efficiency continuously by establishing and implementing effective energy management programs that support all operations and customer satisfaction while providing a safe and comfortable work environment.

Approval

M. G. Watt, CEO & Chairman of the Board

Have An Energy Team

- Cross Functional
...to Reduce Barriers
- Led by a Champion
...to Get Results



Use an Energy Intensity Metric

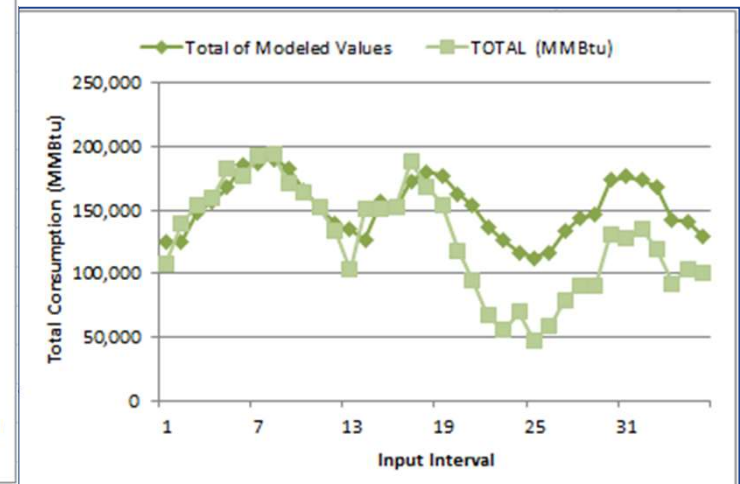
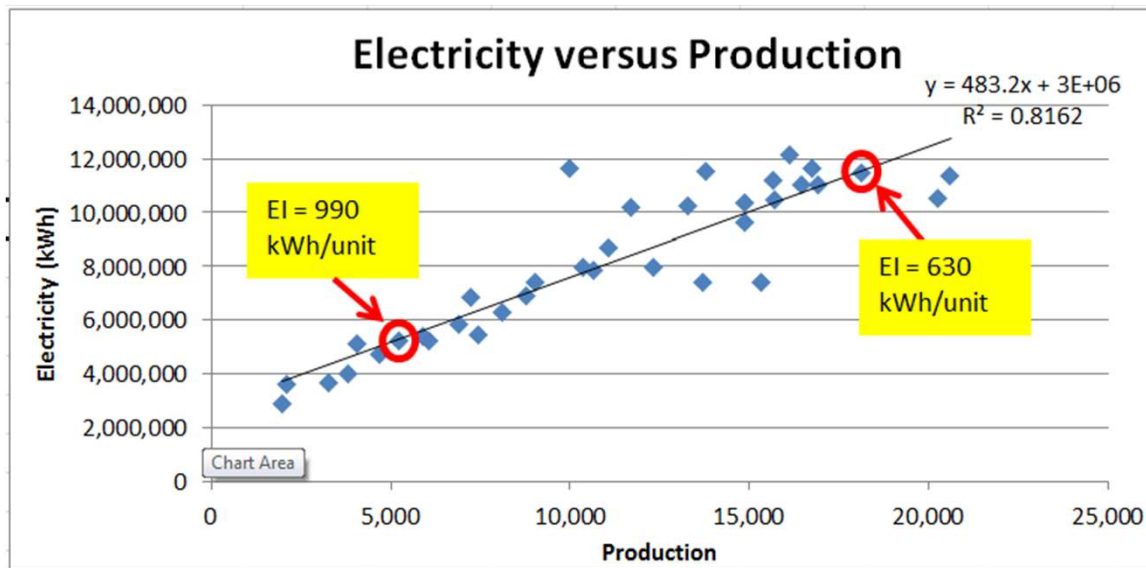
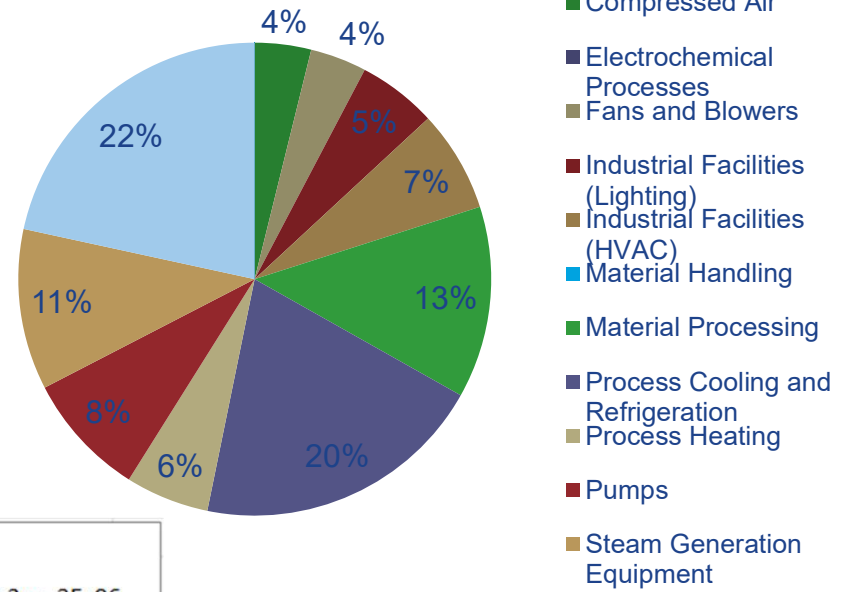
- Energy per widget... not reduction of output
- Helps to communicate project opportunities
- Savvy energy managers are getting projects approved



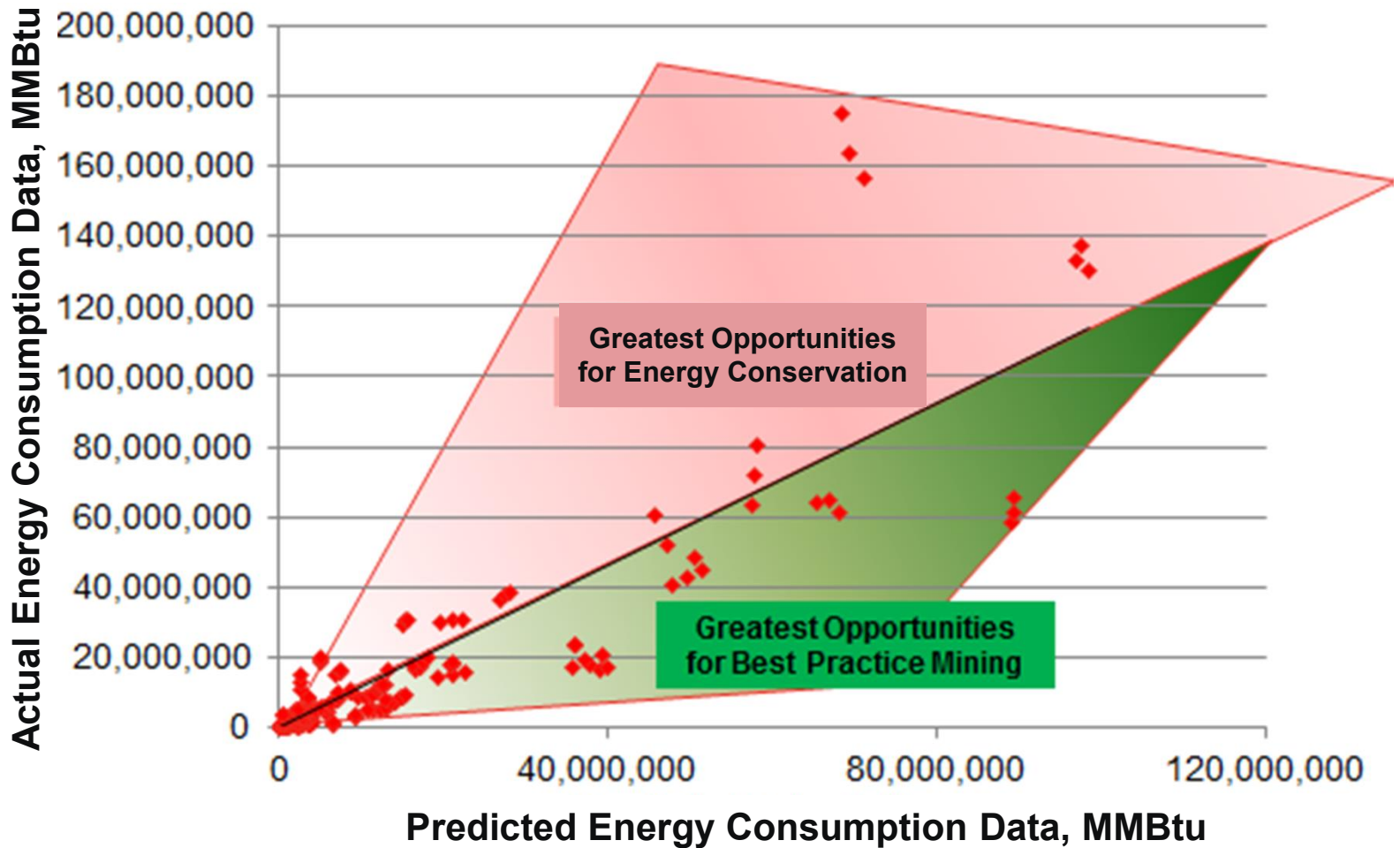
Robust Metrics

- Understand energy usage breakdown
- Advanced tracking and reporting (and forecasting)

Energy Use by System Type



Regression Analysis – Added Benefits



Know that Air is FREE

...AND that Compressed Air is **VERY** Expensive

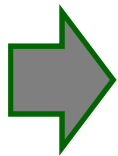
- Poor management of air supply can yield inefficiencies for costs and also in meeting demand events.
- Inappropriate uses and leaks are BIG opportunities



Prioritize



*Low-Cost
No Cost*



*Process
Improvements*



*Capital
Upgrades*



*Alt
Energy*

Kicks things off
Builds momentum

Question the
Status-Quo

Build the case
Validate results

Save this for last
Target sites

Be Ready for Re-work

“Low Hanging Fruit Always Seems to Grow Back”

- Air & steam leaks
- HVAC efficiency losses
- Results of poor maintenance
- Equipment degradation
- Operator actions
 - Set Points = Opportunities!



Engage Employees

Employee behavior matters – Harness it

- *Visible Activity: lights & occupancy sensors*
- *Signaling*
- *Awareness*
- *Energy Fairs*
- *Take Suggestions*
- *Recognize & Reward*

EMPLOYEE
ENGAGEMENT



Anecdote

“What would you do first...?”

Engagement

- Top management*
- Shop floor*
- Build a coalition*



Strategic Energy Management

- Holistic energy management strategies
- Encourage energy savings from changes in corporate culture, behavior, operations & maintenance
- Development of baselines, energy performance indicators and metering capabilities.
- Guides implementation of capital projects, encourages best practices in O&M



DOE Resource

Better Plants Program – Set Voluntary Long-Term Goal

- National recognition through web profiles, annual recognition letters, invitations to special events
- Access to a technical account manager
- Access to In-Plant Trainings to identify and implement energy efficiency projects in major energy-use systems
- Access to the full suite of DOE tools and resources

Get started with a simple 2-page form signed by management



Why State An EE Goal?

Organizations with publicly stated goals*:

- Implemented *50% more* efficiency and renewable energy measures than organizations without goals
- Are 2.7x more likely to increase *investments*
- Adopted more *energy management* practices
- Gain brand value, property value, and other co-benefits beyond energy savings

*2013 Energy Efficiency Indicator Survey by the Institute for Building Efficiency



What ACTIONS have world-class
companies taken...

3M

- CEO participates in Energy Program
- Internal rewards program based on performance
- Supplier / Customer outreach
- Dedicated Energy Fund
- Enterprise involvement in SEP

Eastman Chemical

- Employee Energy Fairs
- Green Team --- Metering Program
- Supplier / Customer outreach
- Dedicated \$8 million Energy Fund

Alcoa

- Best Practices shared across all BUs
- Global Network of Energy members
- Projects > \$ 2 MM – must receive EE review
- Best Practice Program – with accountability
- EE Case Studies distributed globally

Now Current Trends

- Hold Senior Managers **accountable for Energy Efficiency** – **compensation** at risk
- New **Projects** and New **Products** must **pass energy efficiency reviews**
- **Sustainability** as an umbrella
- Supplier / Customer **outreach** – Customer **retention**
- Dedicated **Energy Funds**



Energy Efficiency Quick Hitters

There are (easy-ish) Opportunities!!

- Steam: Tune-ups, steam traps, and insulation (\$)
- Process Heat: Tune-ups, scheduling, and waste heat recovery (\$\$)
- Compressed Air: Leaks, Lower Pressure, Staging
- Pumps: Closed valves and Recirculation Lines (aka: VFD's = \$\$)
- Fans: Closed dampers (aka: VFD's = \$\$)



DOE Energy System Tools

Plant Energy Profiler (PEPEX)

- Create high-level energy profile of plants
- Details energy purchases, how energy is consumed, energy savings, and a list of next steps

PEPEX Tool - Excel Wenning, Thomas J.

File Home Insert Draw Page Layout Formulas Data Review View EnPI ACROBAT Tell me Share

Clipboard Font Alignment Number Styles

Calibri 36

Conditional Formatting Format as Table Cell Styles Cells Editing

A1 fx

Plant Energy Profiler Tool - Instructions

Color Scheme

Green	User input	User input required
Pink	User input	Drop down list
Grey	NO User Input	Formula inserted

For a detailed walkthrough of the tool, please refer to the tutorial [Walkthrough Tutorial](#)

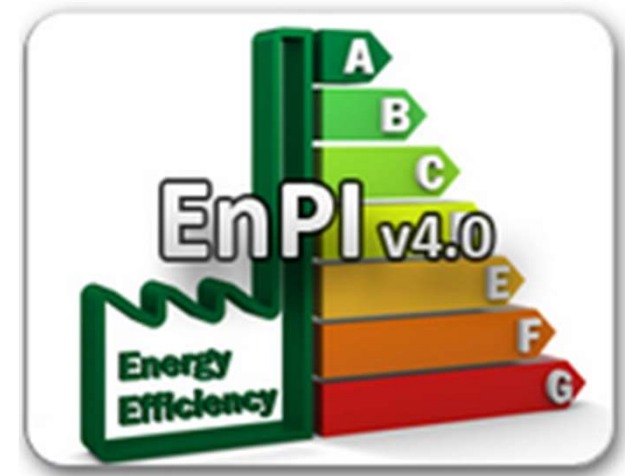
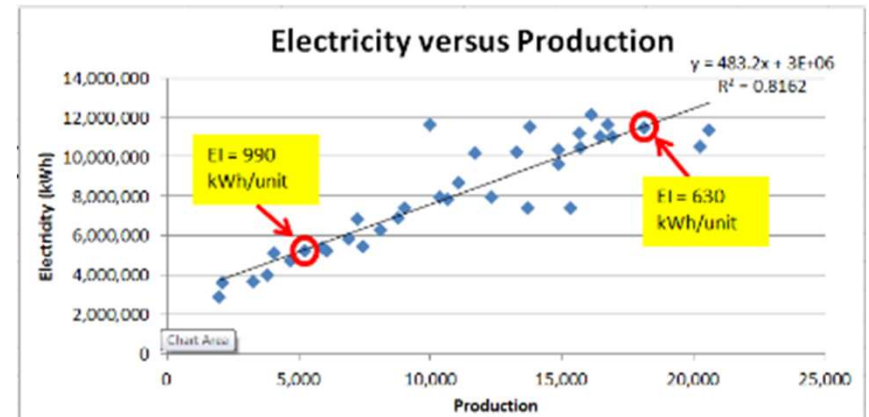
Content

Tab Title	User Information	Contains Instruction on how to fill the data collection sheet
Basic Info (Mandatory Data)	User input	Please input information on: Industry Type Location and Contact info for the plant Hours of operation General energy management questions
Energy & Production (Mandatory Data)	User input	Please input information on: Energy Consumption of plant for 2 consecutive years Electricity and fuel prices Energy source for major equipment
Energy Use System (Mandatory Data)	User input	Please input information on: Energy Systems present in a plant, their energy consumption, annual cost running the systems Rating of major Equipment and their Annual Operating hours.
Energy Saving Opportunities (Mandatory Data)	User input	Use this screen to characterize the potential energy savings opportunities for the various major systems in your plant.
CHP (Scorecard)	User input	Please answer the questions in this form if the CHP system is present in your plant
Compressed Air (Scorecard)	User input	Please answer the questions in this form if the Compressed Air system is present in your plant

Ready Disclaimer Instruction Basic Info Energy & Production Energy Use System Energy Sa ... 80%

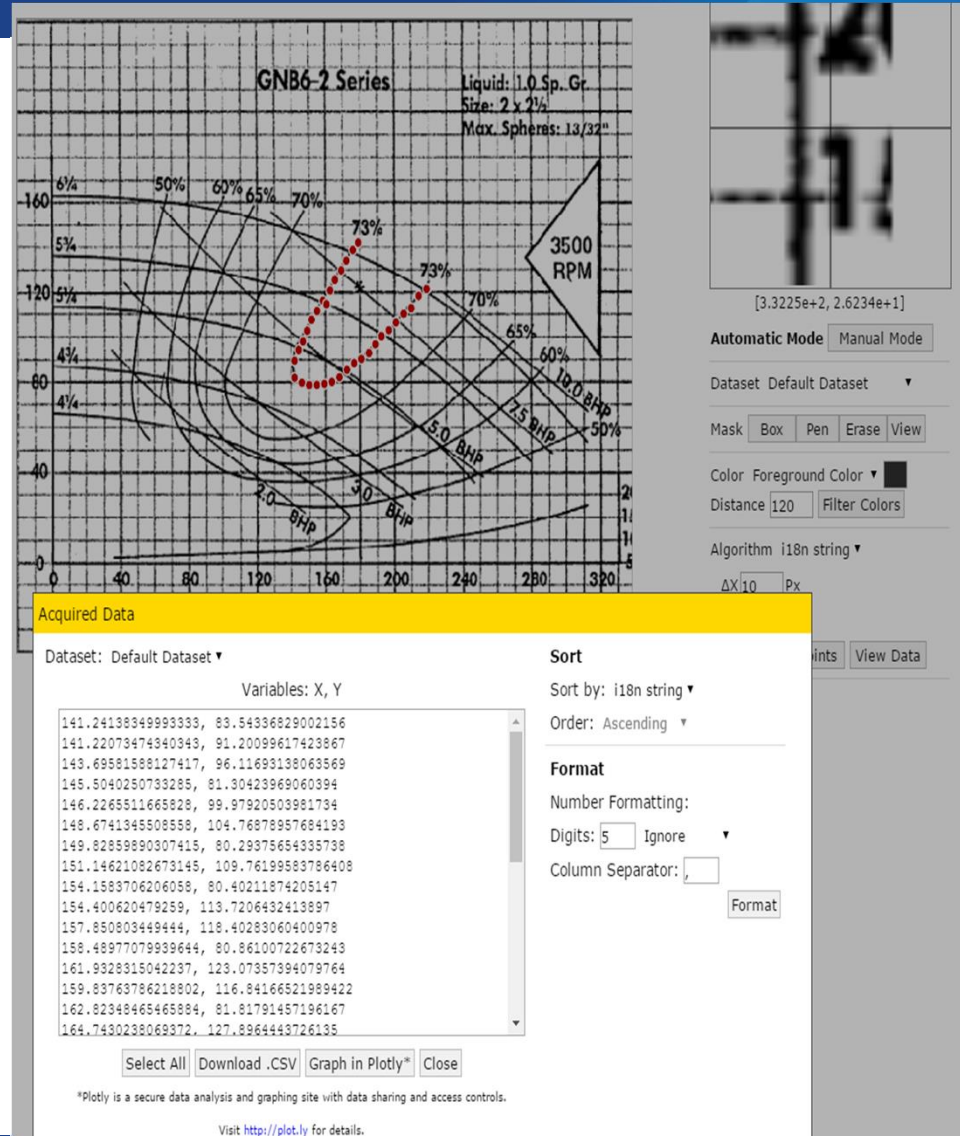
EnPI v5.0 Tool

- Facility Benchmarking and Tracking tool
- Accurate, “apples-to-apples” comparisons, holding for critical variables related to:
 - Weather
 - Production
- Validate energy savings
- Facilitates energy manager’s efforts to report EE impacts
- Improves comparative analyses for benchmarking
- Helps strategic planning



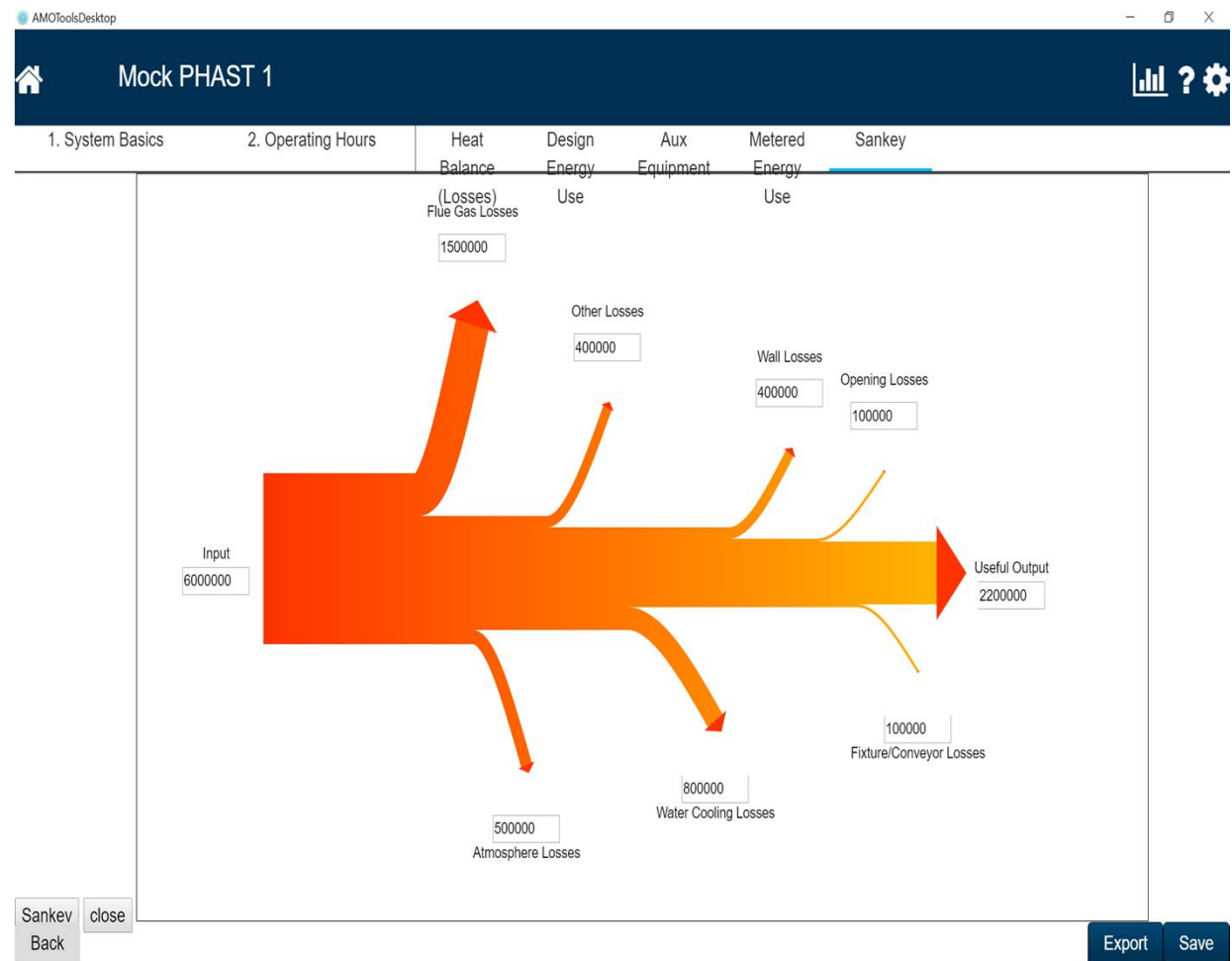
Desktop Digitizer

- Allow user to digitize curves (pump, performance, etc)
- Accepts input formats of pdfs & images
- Automatic selection of axes after points along curve chosen
- Curve fit capabilities





Dynamic Sankey Diagram – in the works

- Allow users to create self-defined Sankey diagrams
- Useful for energy flow mapping
- Will be versatile to allow flexibility



PHASTEx – Demonstration

		PHASTEx - U.S. Units Version			
Developed by E3M Inc. under contract with Oak Ridge National Laboratory					
What is PHASTEx?					
Control Page					
PHASTEx_ - US Units For Excel v1.01.xls					
No.	Items	Number of Components			
1	Plant General Information		Enter Data		
2	Furnace Data		Enter Data		
3.1	Charge material- Solids (wet or dry) Enter "0" if none	1	Enter Data		
3.2	Charge material- Liquids Enter "0" if none	1	Enter Data		
3.3	Charge material- Gases/vapors Enter "0" if none	1	Enter Data		
4	Fixtures, trays, conveyor etc. Enter "0" if none	1	Enter Data		
5	Wall surface heat losses	3	Enter Data		
6	Water or air cooling (internal) Enter "0" if none	1	Enter Data		
7	Atmosphere or makeup air Enter "0" if none	1	Enter Data		
8	Flue Gases		Enter Data		
9	Radiation losses from openings- Enter "0" if none	2	Enter Data		
10	Power use by Electric Motors & Other Devices	1	Enter Data		
11	Other heat loss or generation- Enter "0" if none	1	Enter Data		
View PHASTEx Summary Report			Go To Report		
View PHASTEx Energy Usage Distribution			Go To Report		

**PHASTEx tool and its predecessor tool (PHAST) were conceived by Dr. Arvind Thekdi and developed by E3M Inc. in collaboration with Oak Ridge National Laboratory (ORNL). Dr. Sachin Nimbalkar and Mr. Kiran Thirumaran of Oak Ridge National Laboratory (ORNL) and Dr. Jing Ke of Lawrence Berkeley National Laboratory (Berkeley Lab) contributed to the development work. The project was supported by Advanced Manufacturing, Energy Efficiency and Renewable Energy Office of The U.S. Department of Energy. The tool was tested by a team of experts from the ORNL and representatives from the US industrial companies.

PHAST DEMO

U.S. DEPARTMENT OF
ENERGY | Energy Efficiency &
Renewable Energy

ASSESSMENTS

▸ Ford Motor Co.

▸ Dearborn

▸ ABC Plant

▸ DEF Plant

▸ Furnace XYZ

▸ Pump 123

▸ Detroit

▸ Hoover Dam

▸ Oak Ridge National L...

CALCULATORS

▸ Pumps

▸ Fans

▸ Furnaces

▸ Steam

▸ Motors

APPLICATION SETTINGS

Dearborn

Ford Motor Co. / Dearborn



Sort by: Latest Activity ▾



Select All

[Generate Report](#)

[Delete...](#)

[Export...](#)

[Import...](#)



ABC Plant



DEF Plant



Furnace XYZ

20% Load Factor

960.49 Btu / lb
Energy Used

960.49 Btu / lb
Thermal Efficiency

960.49 Btu / lb
Net Heat Required

960.49 Btu / lb
Gross Heat Required



Furnace ABC

80% Load Factor

960.49 Btu / lb
Energy Used

960.49 Btu / lb
Thermal Efficiency

960.49 Btu / lb
Net Heat Required

960.49 Btu / lb
Gross Heat Required



Description Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
[Edit](#)

[Add Address](#)

[Add Point of Contact](#)

[Add Shared Energy Sources](#)

[Add Shared Fuel Sources](#)

[Customize Application Settings for This Folder](#)

Currently, this is based off your global application settings.

[Delete folder and its contents](#)

PSAT GUI – Beta version Demo

Assessment XYZ

System Setup

1. System Basics

2. Pump / Fluid

3. Motor

4. Field Data

Assessment & Analysis

Modify Conditions

Baseline		Adjustment 1	Adjustment 2
PUMP / FLUID		End Suction	End Suction
Pump Type	End Suction	1,780	1,780
Pump RPM	1,780	Direct Drive	Direct Drive
Drive	Direct Drive	- + 1	1
Kinematic Viscosity (cS)	1	1.000	1
Specific Gravity	1.000	- + 1	1.000
Stages	1	<input checked="" type="radio"/> Yes	1
Fixed specific speed?	Yes	<input type="radio"/> No	Yes
MOTOR		60 Hz	60 Hz
Line Frequency	60 Hz	200	200
Horse Power	200	- + 1,780	1,780
Motor (RPM)	1,780	Energy Efficient	Energy Efficient
Efficiency Class	Energy Efficient	460	460
Voltage	460	225.4 Estimate	225.4
Full-Load Amps	225.4	- + 0%	0%
Size Margin	0%		
FIELD DATA		1	1
Operating Fraction	1	.5000	.5000
Cost (kw/hr)	.5000	2000	2000
Flow Rate (gpm)	2000	2000	2000
Head	2000	Power	Power
Load Estimated Method	Power	150.0	150.0
Motor (kW)	150.0	460	460
Voltage	460		

Adjustment 1

60%

Optimization Rating

\$18,740

Annual Savings Potential

View Detailed Report

MODIFIED DATA

You haven't modified anything yet.

Add adjustment

WHEN FIRMS PUBLICIZE ENERGY MANAGEMENT PROJECTS THEIR STOCK PRICES GO UP:

How High? – As much as 21.33% within 150 days of an Announcement!

ABSTRACT

When selecting projects under a limited budget, a firm should implement the project that will return the most value. Ultimately, firm value is measured by stock price, which can be impacted when the firm makes a major announcement. This paper shows that announcements of energy management projects correlate with a 21.33% increase in stock price within 150 days of the announcement. This increase is in addition to the risk-adjusted return the firm would normally experience. For example, during a "bull market" a firm's expected return was 10%. After the announcement, the return would increase by 21.33%, for a net return of 31.33%. These results suggest that investors react positively to energy management projects. This outcome demonstrates one more strategic incentive for firms to implement energy management projects.

INTRODUCTION

The potential for increased profits via cost-reducing Energy Management Projects (EMPs) exists in nearly all firms. However, when allocating capital, priority is often given to revenue-enhancing projects, such as starting new product lines or joint ventures. Frequently, these projects are perceived to be superior to EMPs, even though they may yield the same increased profit and present value. A justification is that revenue-enhancing projects are more likely to attract publicity and investor attention. Investor speculation and reaction to announcements can increase the firm's stock price. Most EMPs do not

generate as much publicity as joint ventures or new product lines.

If "publicity-gaining" potential is a decision factor during project selection, then a new product line or joint venture would usually be selected over an EMP. But is this a fair comparison? There has not been any research to determine if an EMP announcement increases a firm's stock price. In theory, it should because most EMPs increase profits (via cost reduction instead of increased revenues). From a cash flow perspective, an EMP is equivalent to any other profit-enhancing project.

This paper seeks to determine whether an EMP announcement correlates with an abnormal increase in a firm's stock price. If such announcements positively impact stock price, then the firm has one more incentive to implement EMPs.

LITERATURE REVIEW

The purpose of this literature review is three-fold:

1. To demonstrate that EMPs are credible investments, with relatively low risk;
2. To present some background on stock price reaction to announcements of typical capital investments; and
3. To show that abnormal increases in stock prices from EMP announcements have not been measured.

² To whom all correspondence should be addressed.

John R. Wingender and Eric A. Woodroof, *Strategic Planning for Energy and the Environment*, Vol. 17(1), pp. 38-51, 1997