2014

Energy Efficiency Program for Business

HVAC Gas Opportunities

Safety First

Exits

Restrooms

Other site features

Safety First

Agenda

8:30 - Energy Efficiency Program for Business Overview

8:50 - Darryl Trombley – Metro Controls

9:20 - **Break**

9:30 - Chad Forester – Energy Optimization Solutions

10:00 - Greg Merlo – Merlo Energy

10:30 - **Networking**

2014

Energy Efficiency Program for Business

Yazmin Nava
Energy Efficiency Advisor

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Program purpose

To help **commercial** and **industrial contractors** and **customers*:**

- **Improve** energy efficiency.
- **Increase** energy efficiency awareness.
- **Reduce** energy consumption.
- **Reward** businesses for installing energy-saving measures.

**Residential and Multi-Family customers do not qualify for this Program*

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Program funding

- Michigan Public Act 295 (2008) implemented a statewide "Energy Optimization Surcharge" that is added to all rate payers' bills each year to achieve these goals:
  - **Help customers save energy, manage costs.**
  - **Reduce generation, offset new capacity.**
- This "surcharge" is rebated through the program as ***incentives*** that:
  - **Target specific energy-saving equipment and technologies.**
  - **Encourage energy-efficiency building and systems design.**

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Since 2009

- *More than **$75 million** in cash rebates has been paid to Michigan businesses.*
  - Electric: **$64 million**
  - Gas: **$11 million**
- *More than **30,000 projects** have been completed.*
- *More than:*
  - ***1,516 GWh***
  - ***4 million Mcf** and*
  - ***$147 million***

…have been realized in energy savings.

Program Overview

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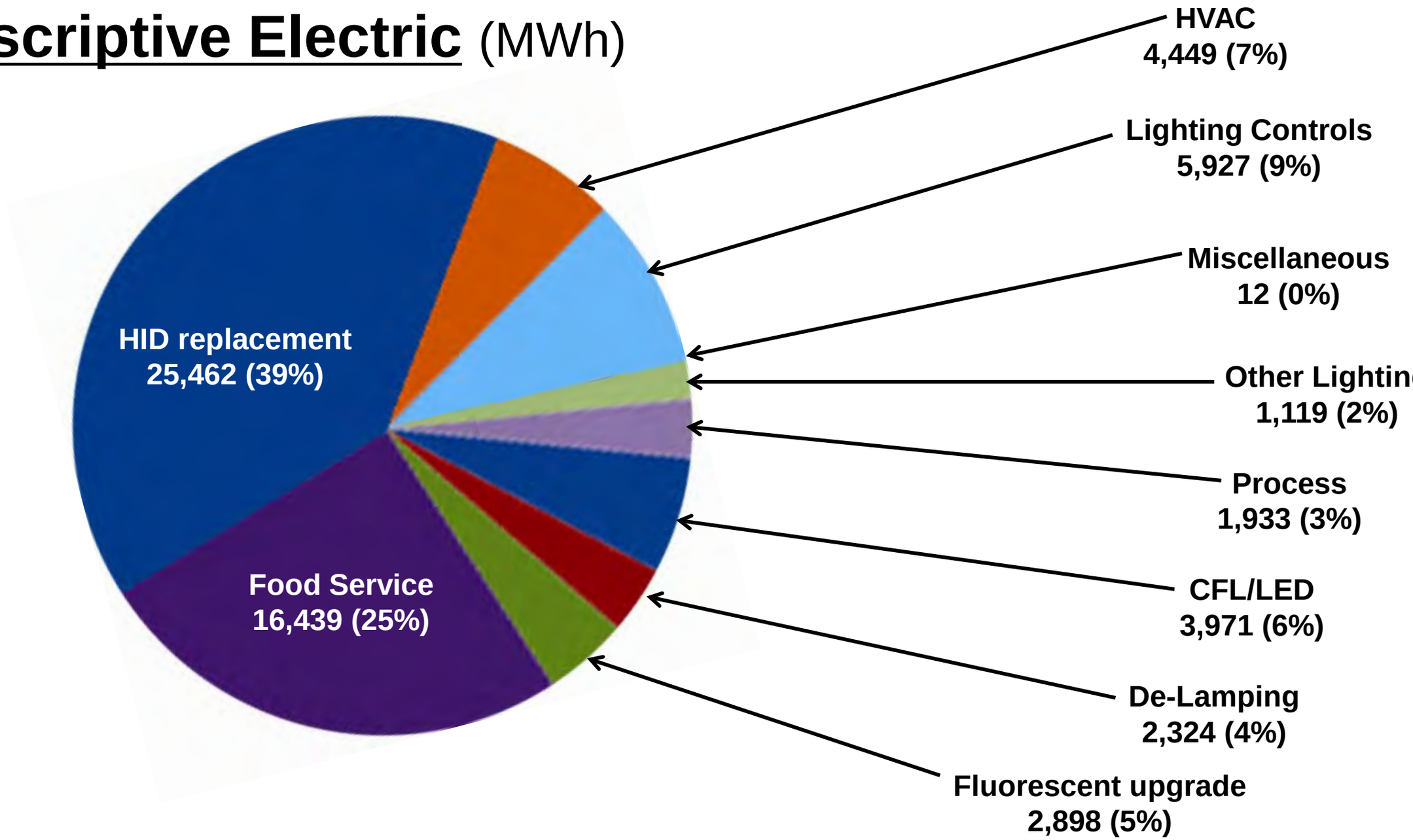
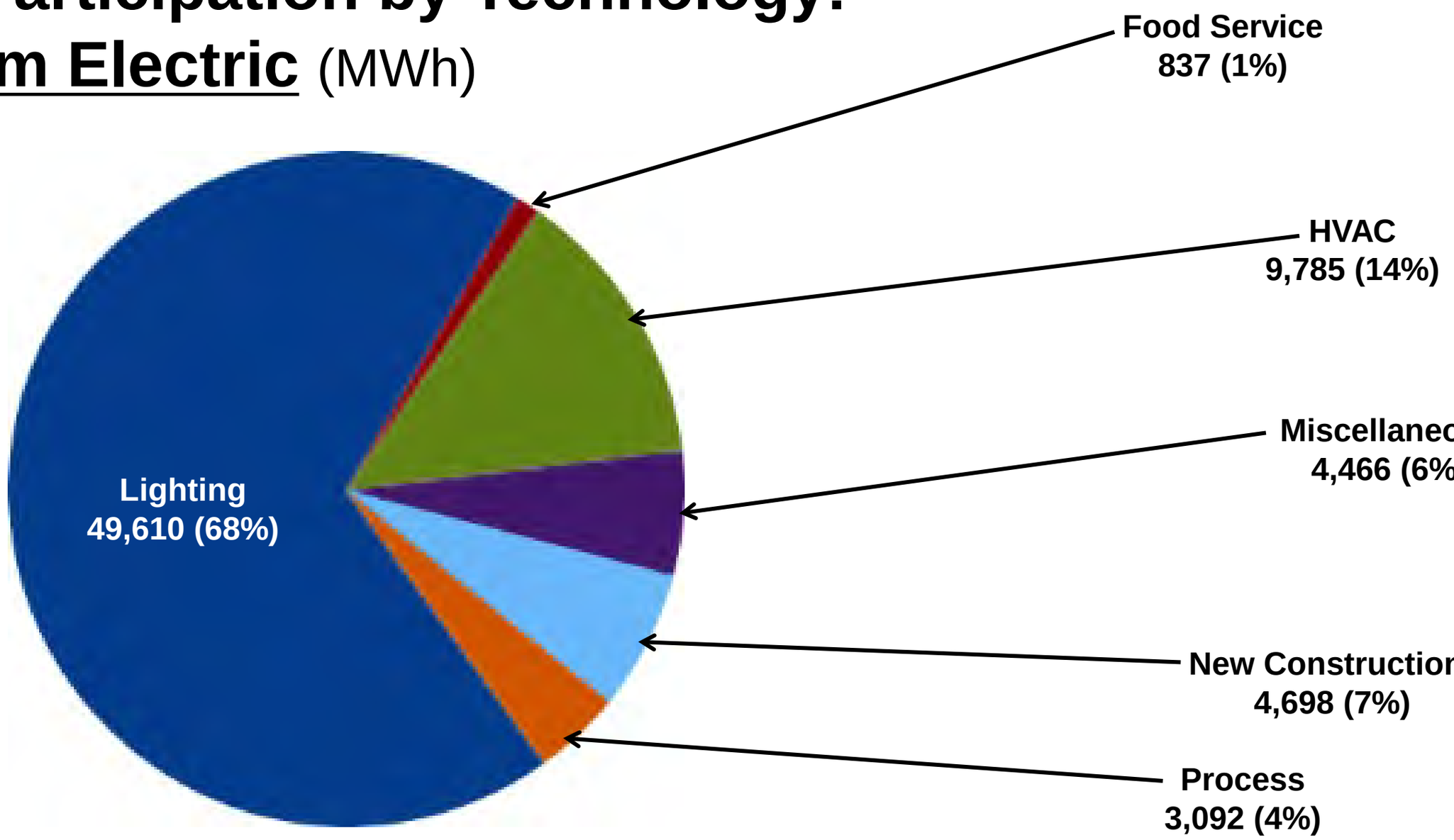
2013 Participation by Technology:
Prescriptive Electric (MWh)



**As of Dec. 31, 2013; does not include DI and Tstat*

2013 Participation by Technology:
Custom Electric (MWh)



**As of Dec. 31, 2013; does not include DI and Tstat*

†Can include several technologies in the same project

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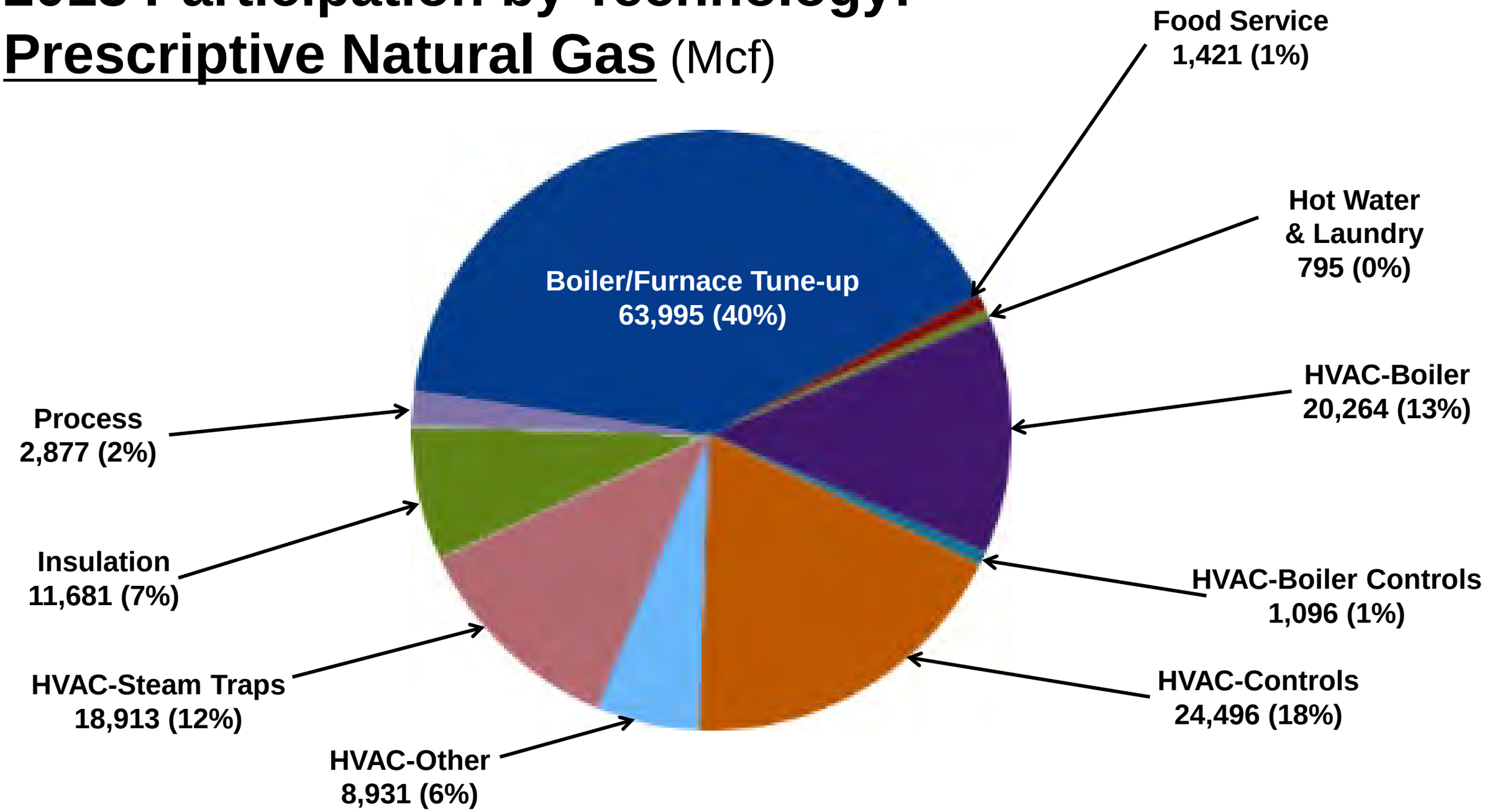
2013 Participation by Technology:
Prescriptive Natural Gas (Mcf)



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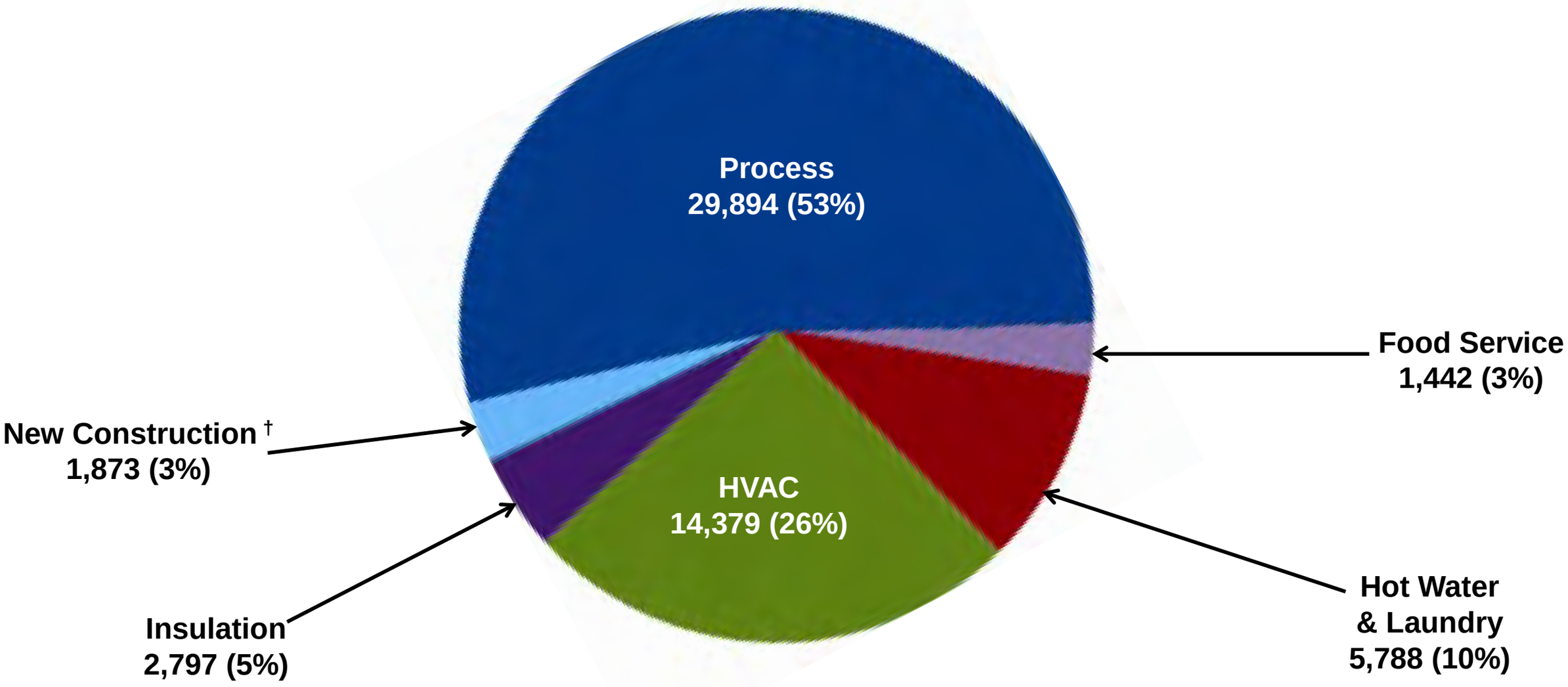

*As of Dec. 31, 2013; does not include DI and Tstat

†Can include several technologies in the same project

About our Designated Trade Allies

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About our Designated Trade Allies

- **Designated Trade Allies** are businesses that are already familiar with our rebate program, the application process and incentive criteria.
- They include:
  - Contractors, suppliers, designers and consultants.
  - They are listed and searchable on DTE Energy's website database.

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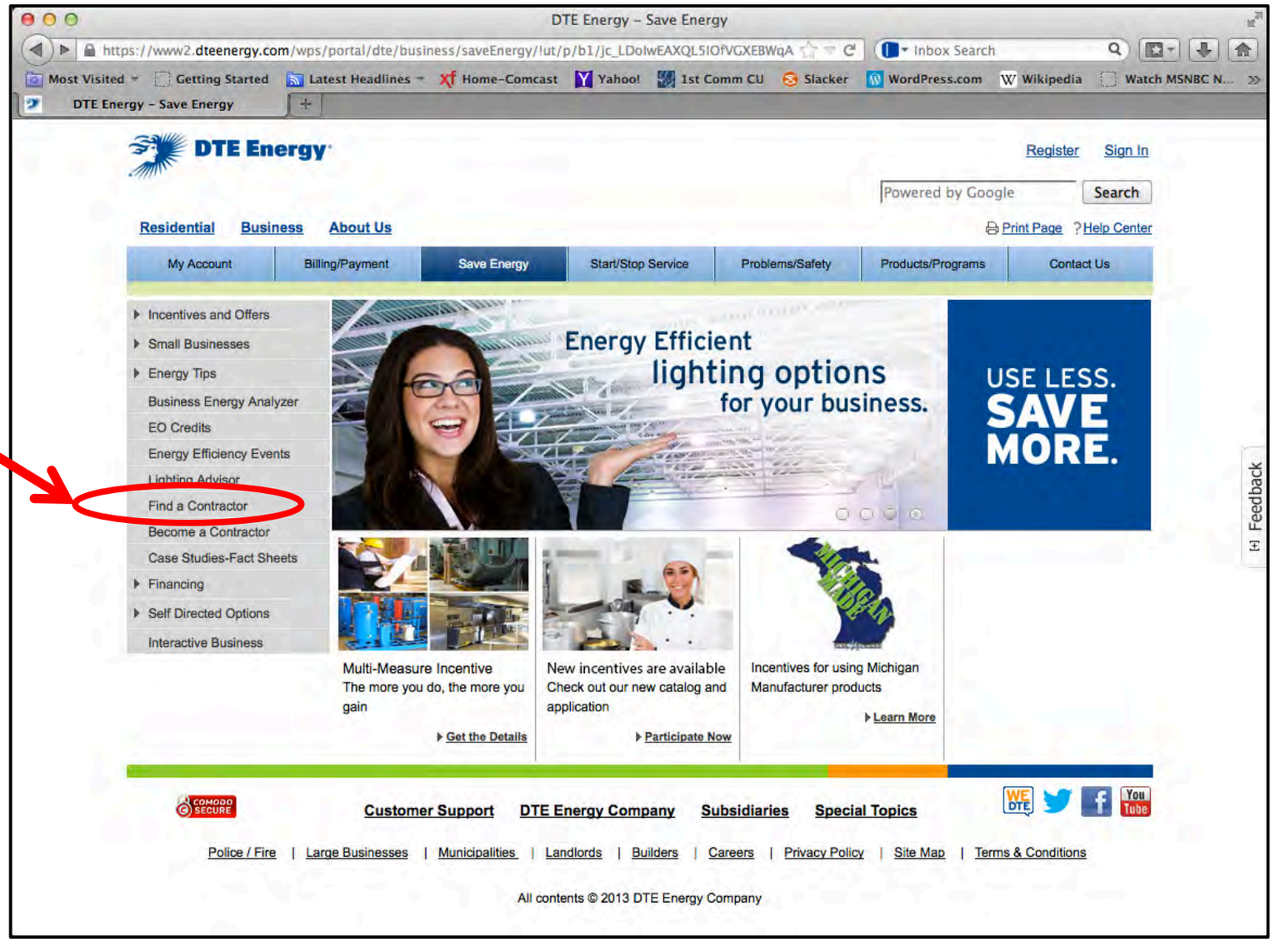
How customers find TAs

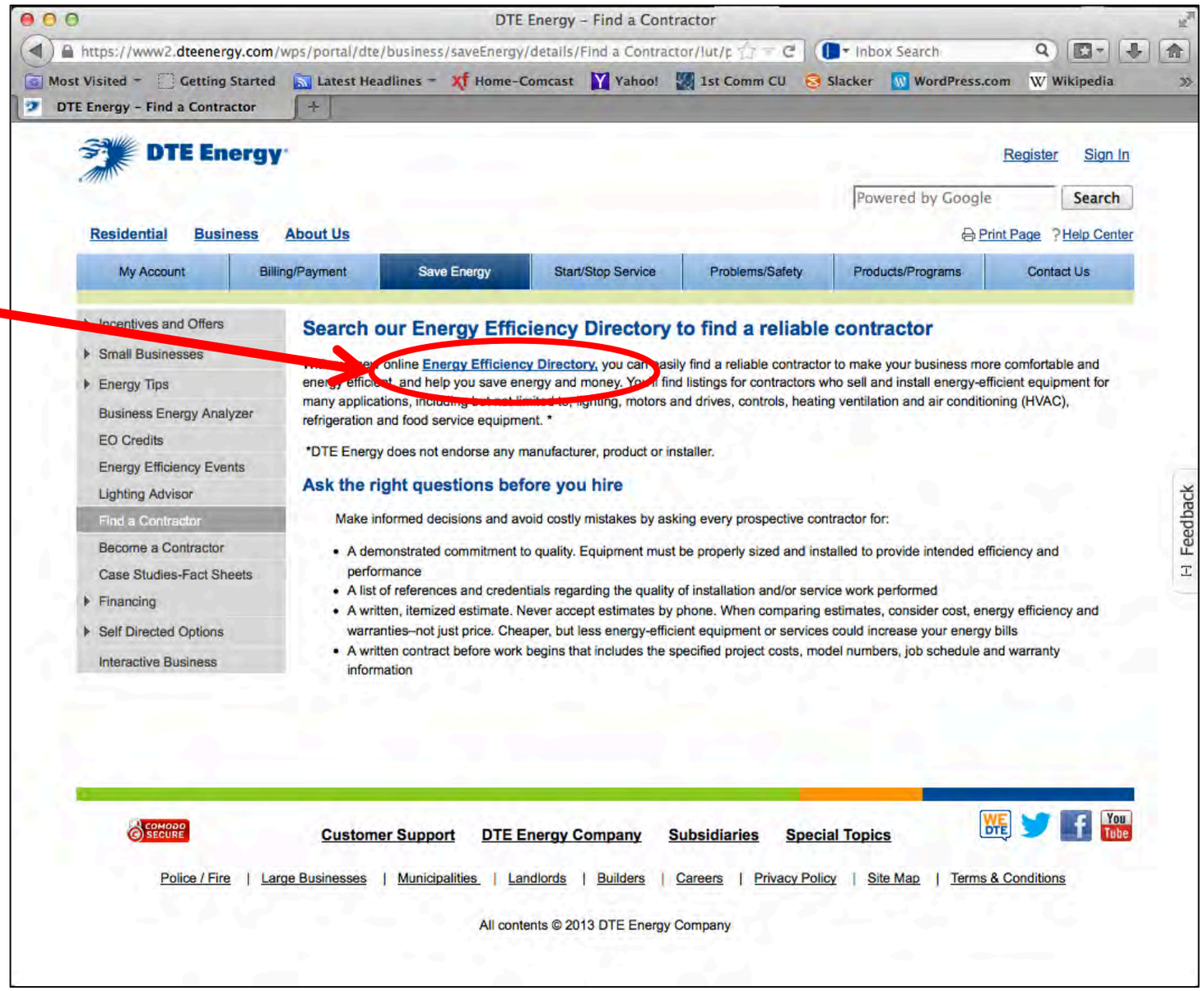
- They click on: **dteenergy.com/savenow**

- Then they click on the link at left: **Find a Contractor**



How customers find TAs

- Then they click on **Energy Efficiency Directory** link

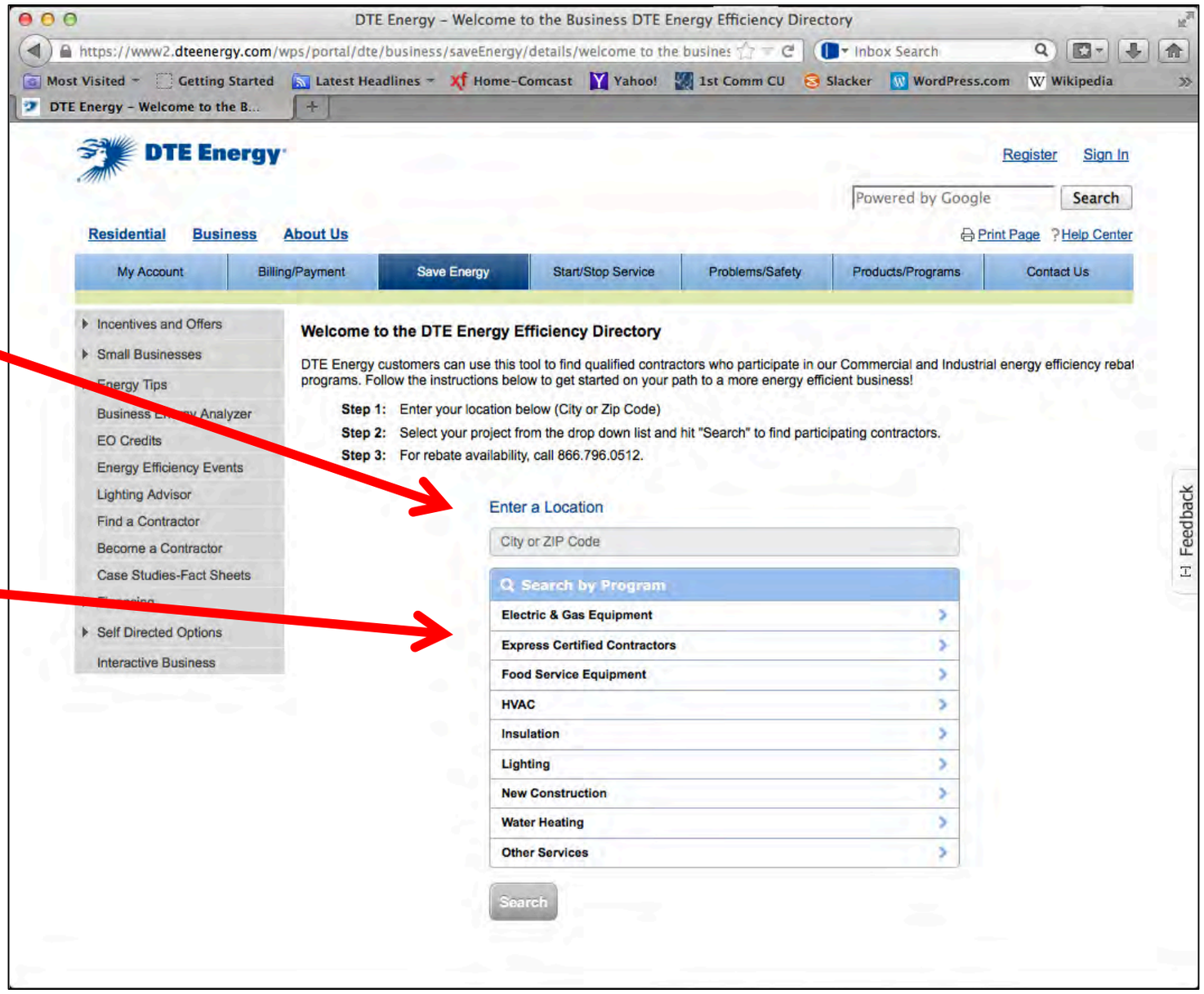


How customers find TAs

- They can search by their **Location** (city or ZIP)

or

- They can search by **Program Type**



Sources of funding:

- **Michigan Saves**
  - *michigansaves.org*
- **PACE** (Property Assessed Clean Energy - private)
  - *leanandgreenmi.com*
- **PACE** (Property Assessed Clean Energy - public)
  - *cec-mi.org/communities/programs/ann-arbor-pace*
- **DEGC** (Detroit Economic Growth Corporation)
  - *degc.org*

Other funding:

- **Municipal bonds** (schools and government)
- **Energy Credits**

About Incentives

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There are three types of projects

Prescriptive

- **Predetermined** measures and incentives for the installation of various energy efficient improvements.
- Incentives typically average 20% to 50% of the incremental cost.

Custom

- **Capital investment** projects that increase energy efficiency and are **NOT** eligible for a Prescriptive Incentive may qualify as a Custom Measure.
- Custom Incentives are determined on a case-by-case basis and are paid per unit energy saved (ex: $0.08/kWh and/or $4/Mcf).

New Construction Major Renovation

- **New facilities/major renovations** of existing facilities or change of use projects.
- Adding load.

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About Reservations

Reservation Applications set aside funds for your project to ensure availability when your project is completed and you submit your Final Application. Here are our guidelines:

Prescriptive

- Reservation Applications are not required for most Prescriptive projects, ***BUT*** they are ***highly recommended***.
- A Reservation Application ***is required*** for certain measures: check the Application for details.

Custom

- A Reservation Application ***is required*** for all Custom projects.

New Construction
Major Renovation

- A Reservation Application ***is required*** for all New Construction and Major Renovation projects (up to 18 months).

Do NOT start your project until you receive a Reservation Letter!*

**Could take 4-6 weeks to receive the letter*

For a customer to receive incentives

- Qualified measures must be installed at facilities served by DTE Energy.
- Projects must involve a **capital investment** that results in an improvement in energy efficiency of a system or building.
- The equipment installed must be new and meet the specifications spelled out in the Catalog.
- For each site, there must be at least one meter that is on an eligible rate schedule.
- The customer must be in good standing with DTE Energy and **not** be a Residential or Multifamily customer.

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These do not qualify for an incentive

- Customers who self-direct (and have opted out of the program)
- Load shifting/demand limiting projects.
- Renewable energy projects.
- Power quality improvements.
- Fuel switching projects.
- On-site electricity generation.
- Changes in operational and/or maintenance practices or simple control modifications that do **NOT** involve capital costs.

Program Overview

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Our Program timeline is simple:

Reservation Application

↓

Application Review (may require pre-inspection)

↓

Reservation Letter issued (Proceed with project)

↓

Install Measures

(Project must start within 30 days and be completed within 90 days of approval or end of Program year, whichever comes first.)

↓

Final Application & Review (may require post-inspection)

↓

$$$$$

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Our Program timeline is simple:

Reservation Application to Letter: 4-6 weeks

Letter to Final Application: 90 days or less

Final Application to Check: 4-6 weeks

ation Application

Ap cation Review (may require pre-inspection)

Reservat with project)

Install asures

(Project must start within 30 days and be completed within 9 of approval or end of Program year, whichever comes first.)

Final Application & Review

$$$$$

Submitting your Final Application

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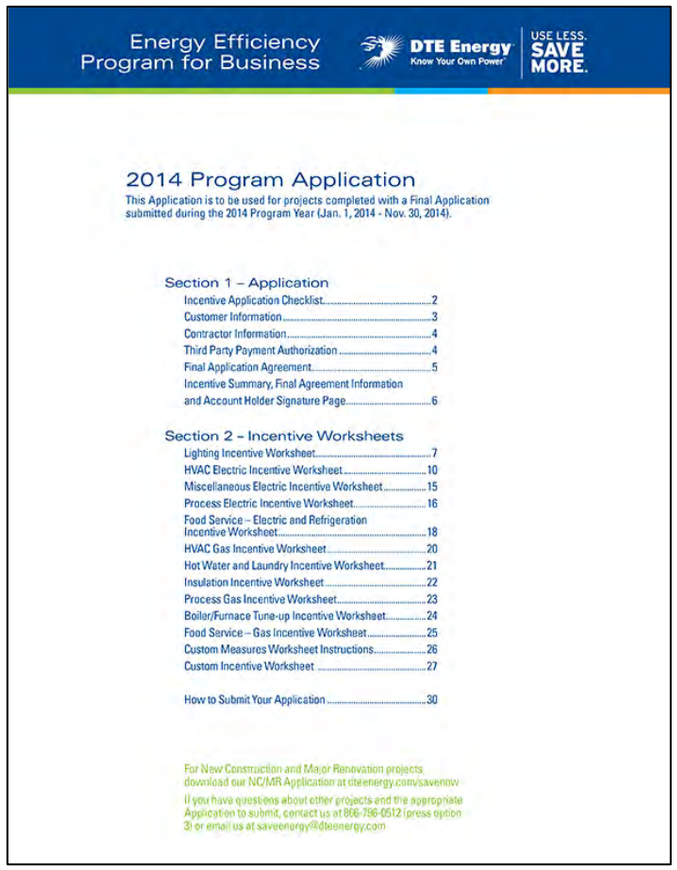
About your Final Application:

- Your **Final Application** must be submitted within 60 days of completion of your project – ***and*** include all supporting documentation.
- Failure to do so could result in delay of payment or cancellation of your Application.



Energy Efficiency Program for Business

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2014 Program Application

This Application is to be used for projects completed with a Final Application submitted during the 2014 Program Year (Jan. 1, 2014 - Nov. 30, 2014).

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Section 2 – Incentive Worksheets

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If you have questions about other projects and the appropriate Application to submit, contact us at 866-796-0512 (press option 3) or email us at saveenergy@dteenergy.com

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Prescriptive → $

Prescriptive

- **Pre-determined** measures with specific energy savings and cash rebates:

PRESCRIPTIVE MEASURE CATEGORIES

ELECTRIC

Lighting
- CFLs
- Controls
- Delamping
- Exit Signs
- Interior/Exterior Linear Fluorescent replacing HID
- High Performance (HP) Linear Fluorescents
- LED Lamps
- LED Refrigerated Door Case Lighting
- Low Wattage (LW) Linear Fluorescents
- Occupancy Sensors
- Pulse Start Metal Halide

HVAC
- Air-Cooled/Water-Cooled Chillers
- Air Source/Closed Loop/Ground Source Heat Pumps
- Chilled Water Reset
- Cool Roof
- Hotel Guestroom Energy Management System (AC)
- HVAC Occupancy Sensor for Large Office Building
- Packaged Terminal Air Conditioner & Heat Pump
- Programmable Thermostat (AC)
- Setback/Setup Controls (AC)
- Unitary and Split Air Conditioning Systems
- Variable Frequency Drive - HVAC Fan/Pump
- Window Film

Miscellaneous Electric
- High Efficiency Clothes Washer
- Intelligent Surge Protector
- PC Network Energy Management Controls

Process Electric
- Barrel Wraps for Injection Molders & Extruders
- Compressed Air measures
- Electronically Commutated Plug Fans
- High Efficiency Process Pumps
- Industrial 3-Phase High Frequency Battter Charger
- Insulated Pellet Dryer Ducts
- Variable Frequency Drive for Process Pumping
- VSD Air Compressor

Food Service & Refrigeration
- Anti-Sweat Heater Controls
- Beverage Vending Machine Controllers
- Commercial Kitchen Ventilation Hood
- Door Gaskets on Coolers and Freezers
- Energy Efficient Ice Machines
- ENERGY STAR® Commercial equipment
- Evaporator Fan Motor Controls
- Floating Head Pressure Controls
- Strip Curtains on Walk-in Cooler and Freezer Doors
- Vertical Night Covers

GAS

HVAC
- Boiler Modulating Burner Control
- Controls
- Demand Controlled Ventilation
- Destratification Fans
- High Efficiency Furnace
- Infrared Heaters
- Programmable Thermostat
- Setback/Setup Controls
- Space Heating Boilers
- Steam Traps

Hot Water and Laundry
- Domestic Hot Water Heating System
- Dry Cleaning Boiler Descale (Kettle/Tube-Type)
- Gas Water Heater
- High Efficiency Clothes Washer
- High Efficiency Pool Heater (Gas Heat)
- Ozone Laundry System

Insulation
- Domestic Hot Water Pipe Wrap
- Greenhouse Heat Curtain
- Greenhouse Infrared Film
- Pipe Wrap – Steam and Hot Water Boiler
- Pool Covers
- Roof Insulation (Flat/Attic)
- Truck Loading Dock Seals
- Truck Loading Dock Leveler Ramp Air Pit Seals
- Wall Insulation

Process Gas
- Air Compressor Exhaust Heat Recovery
- Furnace Tube Inserts
- High Efficiency Process Boiler (Water/Steam)
- Tank Insulation

Boiler/Furnace Tune-up
- Boiler Tune Up
- Domestic Hot Water Boiler Tune-up
- Furnace/RTU Tune-up
- Process Boiler Tune-up

Food Service
- Commercial Kitchen Ventilation Hood
- ENERGY STAR® Convection Ovens
- ENERGY STAR® Fryers
- ENERGY STAR® Griddles
- ENERGY STAR® Steam Cookers
- Large Vat Fryers
- Night Covers (vertical)
- Ovens
- Pre-Rinse Sprayers (Gas Water Heat)

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Custom

Custom:

- Measures that do not fall within any specific prescriptive program.
- Energy savings and cash rebates are calculated on a case-by-case basis.
- Can be combined with prescriptive measures.

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New Construction
Major Renovation

New Construction/Major Renovation:

- New facilities/major renovations of existing facilities/change of use.
- Adding load.
- **Two types of Applications:**
  - **Whole Building Design Approach**:
    - Based on three tiers of efficiency
    - Requires energy modeling.
  - **System Approach:**
    - Pre-determined to optimize energy systems.

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About

HVAC Gas Opportunities

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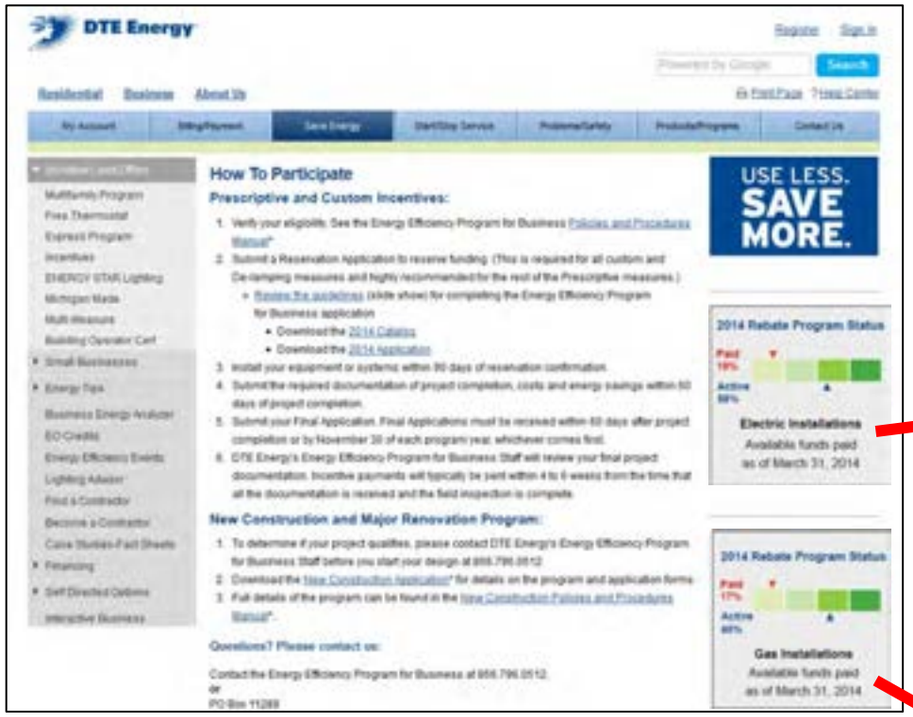
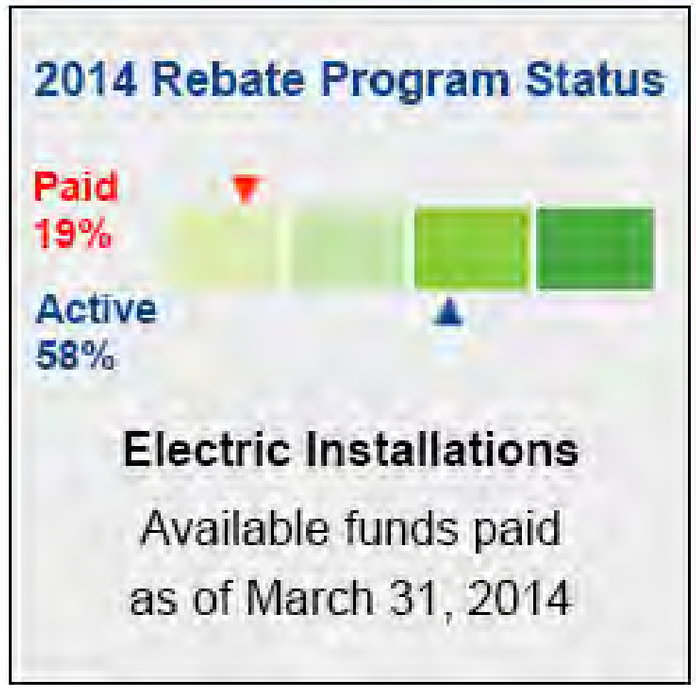
Examples of HVAC Gas Heating

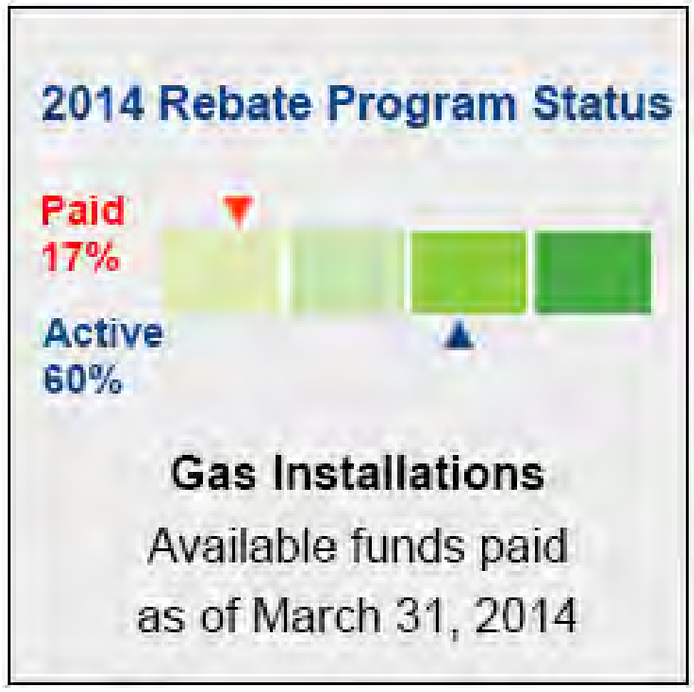
- Boilers and Furnaces
- Boiler/Furnace/RTU Tune-ups
- Steam Traps
- Infrared Heaters
- Destratification Fans
- HVAC Controls
- Hot Water
- Gas Storage Water Heater
- Laundry
- Pipe Wrap
- Greenhouse
- Loading Dock Seals
- Food Service Equipment

Getting Started

About Program funding







These funding gauges provide real-time information on the Program's progress throughout the year.
This is especially important as the Program Year winds down and funding becomes limited.

2014 Program Catalog & Application

DTE Energy® Know Your Own Power™

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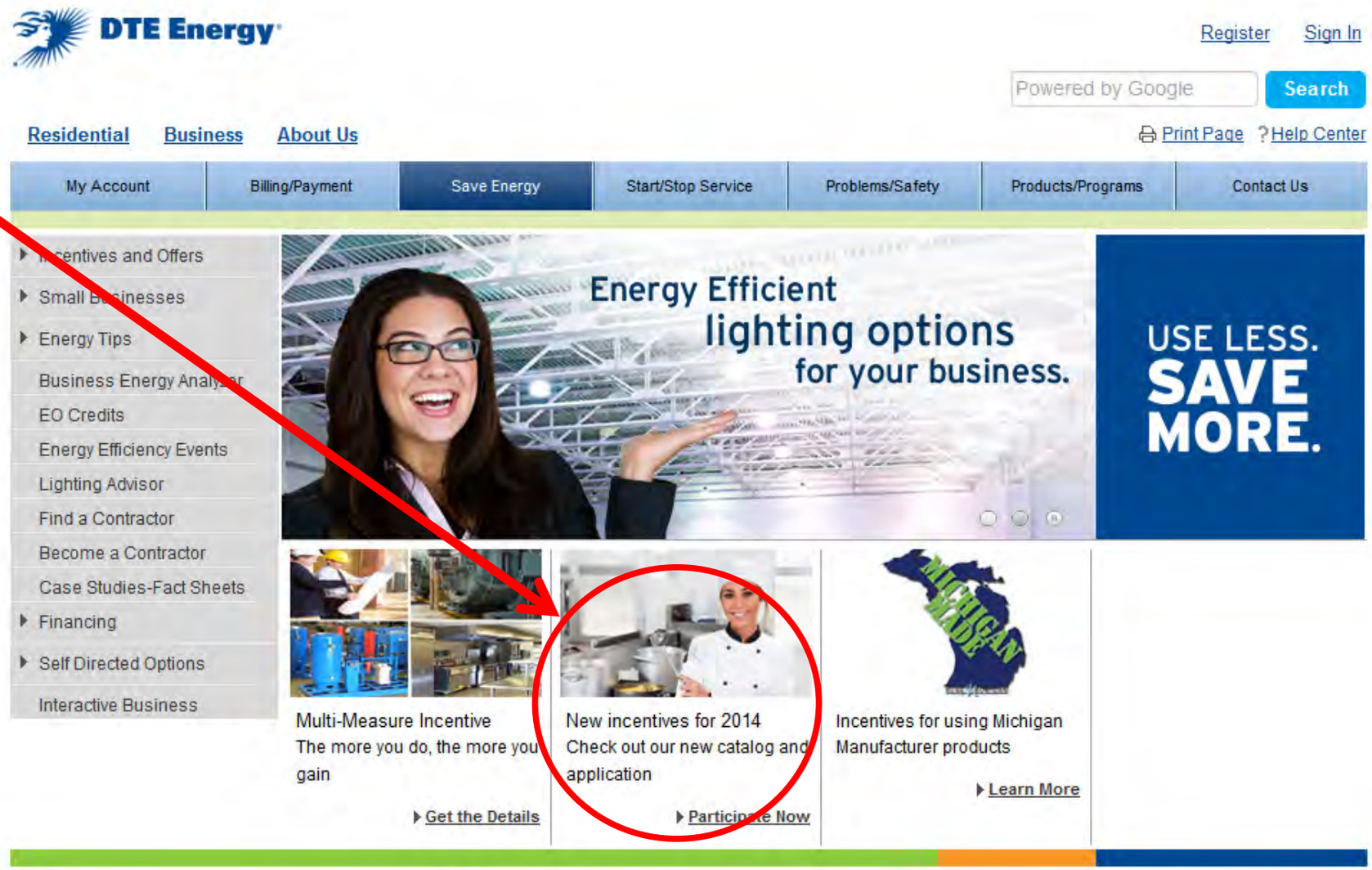
To find the gauges – and download an electronic Catalog and Application

1) visit: dteenergy.com/savenow

Then select:

2) "Participate Now"



**Requires Acrobat Reader*

2014 Program Catalog & Application

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1) visit: dteenergy.com/savenow

Then select:

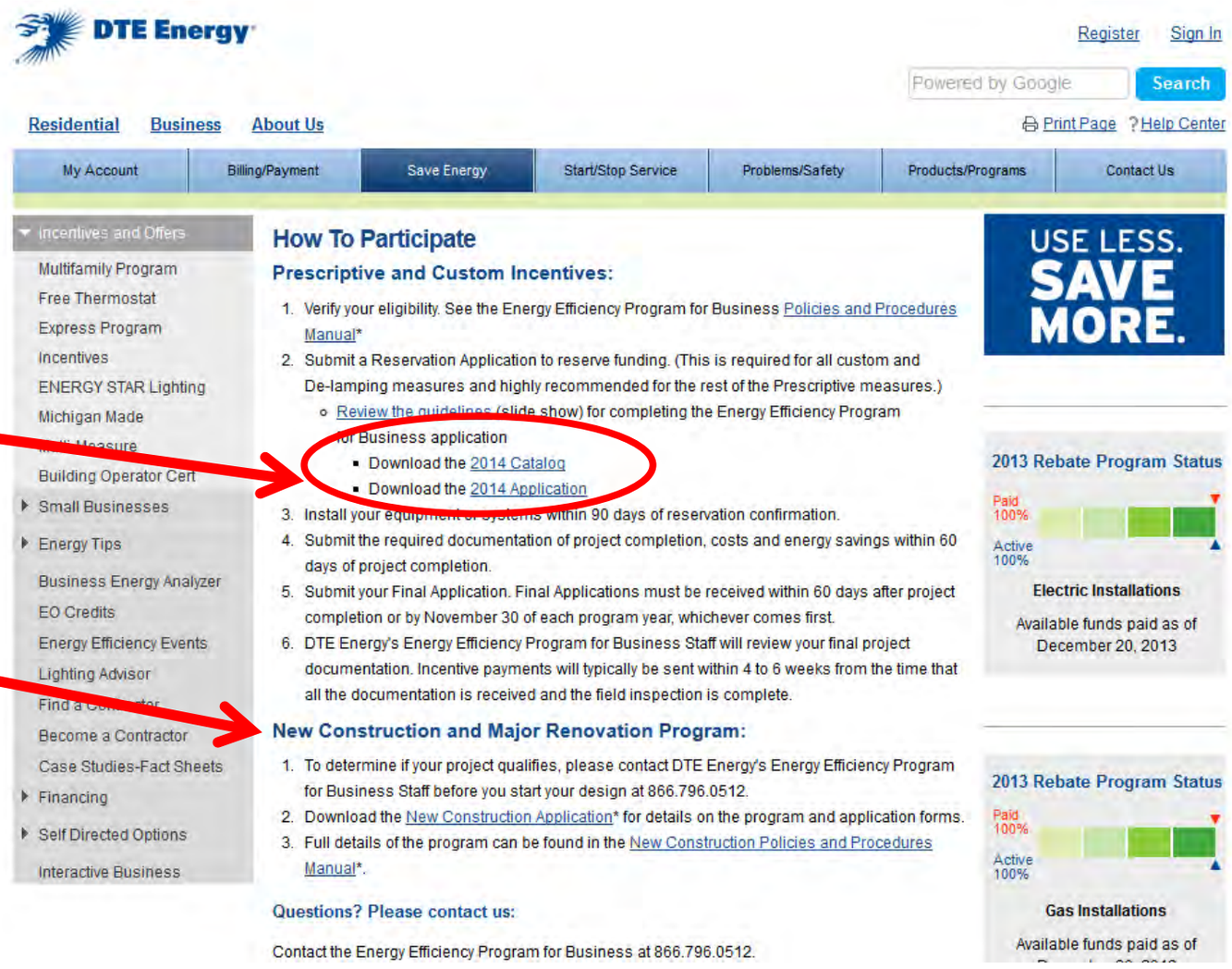
2) "Participate Now"

3) Select and download:

- 2014 Catalog*
- 2014 Application

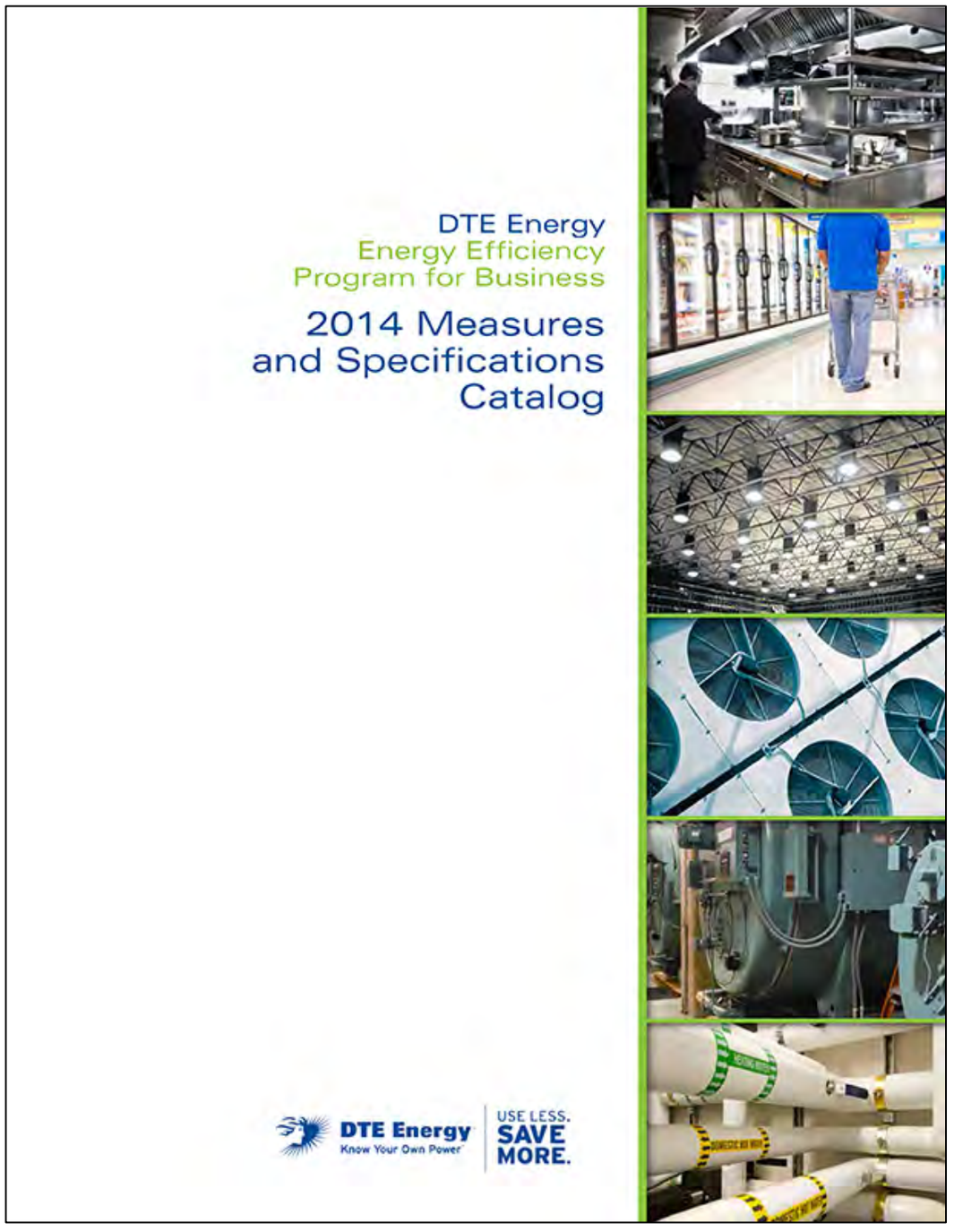
4) The New Construction Application is below

**Contact us for a print copy*



About our Catalog

- It includes specifications and details for every **Prescriptive** incentive measure.
- It includes specifications and details on how to submit a **Custom** project.
- Use it as a desktop reference for all your projects.



2014 Program Catalog

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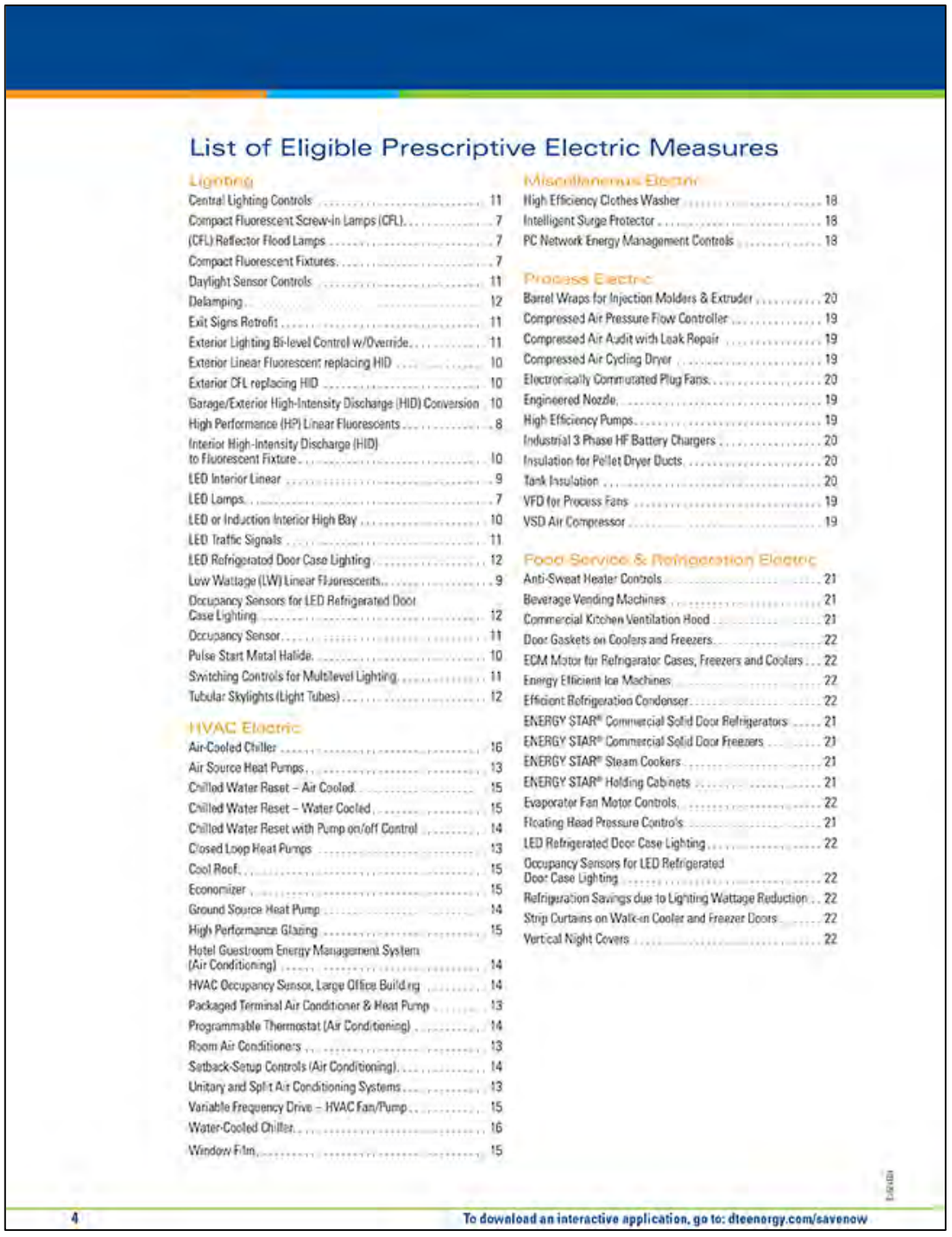
There are five <u>electric</u> categories of measures in the Catalog:

- Lighting
- Miscellaneous
- Process
- Food Service/Refrigeration
- HVAC

There are 64 measure areas

- Each area lists specific types of measures within that section

The Application matches the Measure sequence of the Catalog



List of Eligible Prescriptive Electric Measures

2014 Program Catalog

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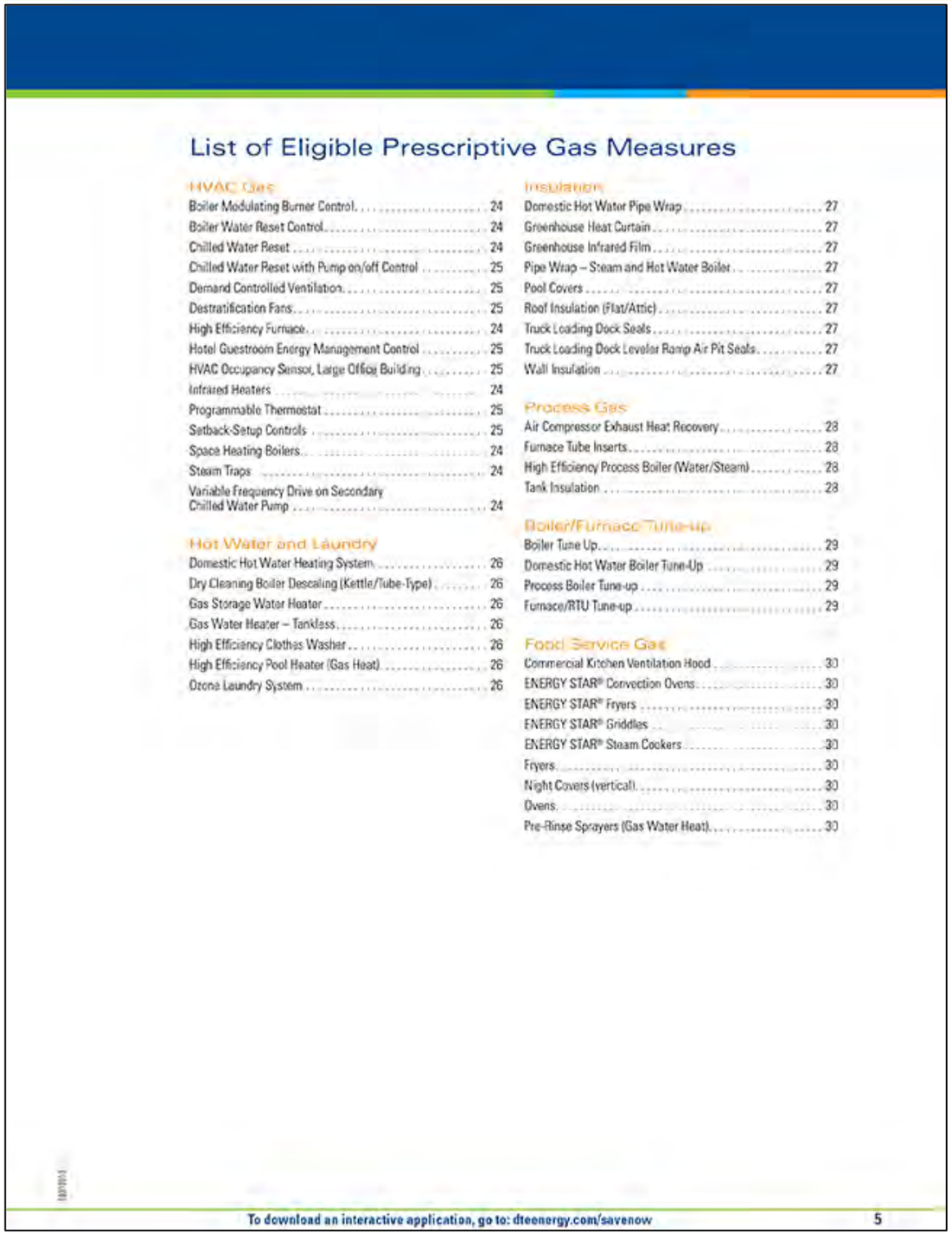
There are six <u>natural gas</u> categories of measures in the Catalog:

- HVAC
- Insulation
- Process
- Hot Water & Laundry
- Boiler/Furnace Tune-up
- Food Service

There are 44 measure areas

- Each area lists specific types of measures within that section

The Application matches the measure sequence of the Catalog



List of Eligible Prescriptive Gas Measures

2014 Program Catalog

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eezer
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TAR®
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TAR®
ıcentive

Unit
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beverage vending machine controllers. The controller must include a passive infrared occupancy sensor to turn off fluorescent lights and other vending machine systems when the surrounding area is unoccupied for 15 minutes or longer. Incentive is per vending machine.

Anti-Sweat Heater Controls

Incentives are available for anti-sweat heater controls. Eligible control devices that sense the relative humidity in the air outside of the display case and reduces or turns off the glass door (if applicable) and frame anti-sweat heaters at low-humidity conditions. Technologies that can turn off anti-sweat heaters based on sensing condensation on the inner glass pane are also eligible. Incentive is per total number of doors controlled.

Floating Head Pressure Controls

Incentives are available for installing automatic controls to lower condensing pressure at lower ambient temperatures in multiplex refrigeration systems. Controls installed must vary head pressure to adjust condensing temperatures in relation to outdoor air temperature. The controls must replace existing constant pressure or manually controlled systems to achieve lowered head pressure in order to maintain a minimum saturated condensing temperature of 70°F, or a 20°F variance below design head pressure during mild weather conditions. Incentive is per ton of refrigeration.

Commercial Kitchen Ventilation (CKV) Hood with Demand Control

Food Service – Electric

Specifications are detailed for every prescriptive measure offered under the 2014 Program.

About our Application

Use it as a:

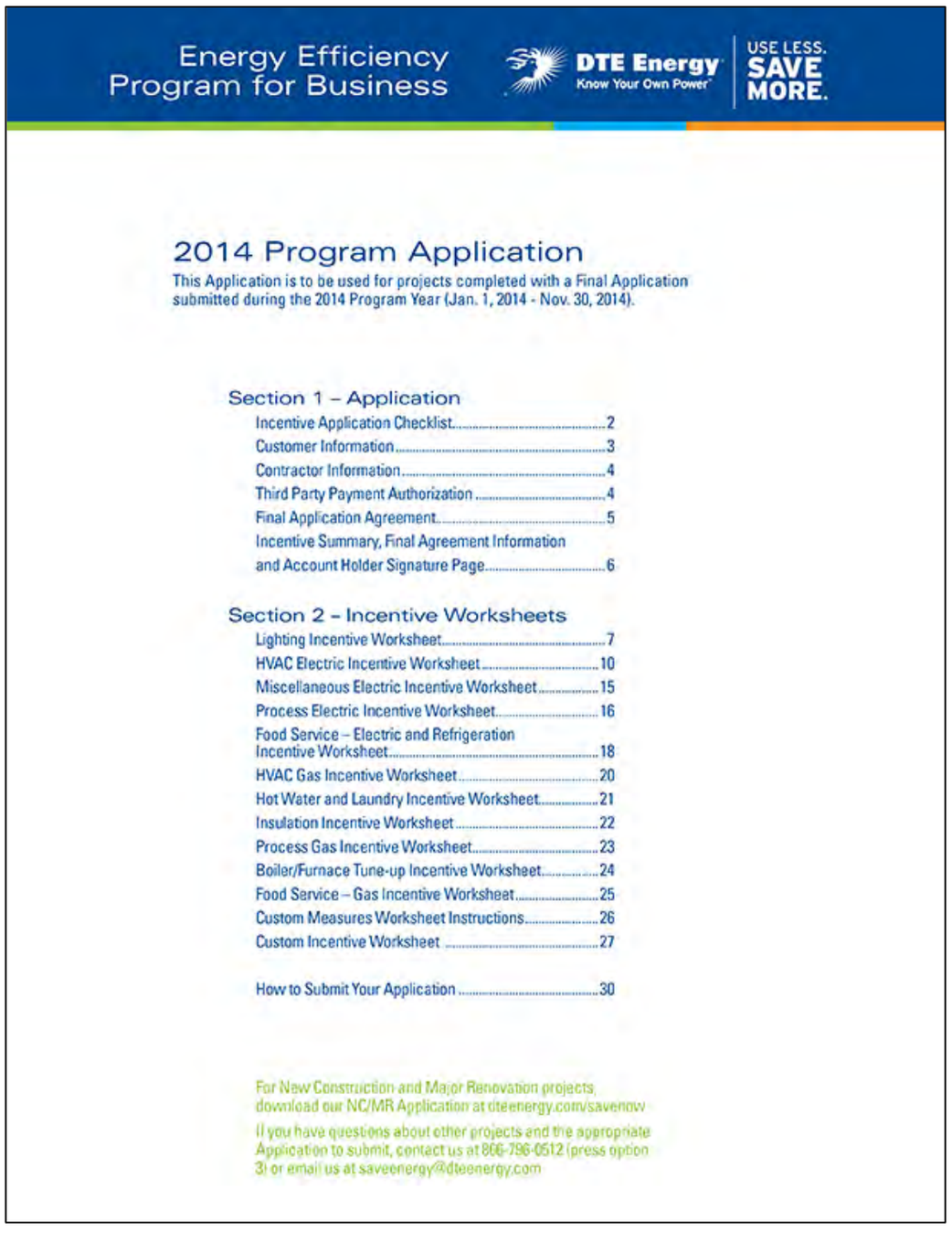
- **Reservation** Application

and a

- **Final** Application

NOTE: Funds **must** be reserved for all custom projects and for certain prescriptive measures.

We **encourage** you to submit a Reservation Application for all **prescriptive** projects.



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Technology Presentations

2014

Energy Efficiency Program for Business

Darryl Trombley
Metro Controls

Darryl Trombley

METRO CONTROLS, INC.

AUTOMATEDLOGIC®

METRO CONTROLS, INC.

AUTOMATEDLOGIC®

Energy Control / Building Management Systems

What is the purpose of a BMS?

2 reasons

Energy Control / Building Management Systems

What is the purpose of a BMS?

1. Keep occupants comfortable

Energy Control / Building Management Systems

What is the purpose of a BMS?

1. Keep occupants comfortable
2. Save lots of money

Energy Control / Building Management Systems

What do you need to know about BMS?

- Is your staff proficient at using it?
- Do you understand the capabilities of your BMS?
- How do you measure the performance of your building?

Energy Control / Building Management Systems

Is your staff proficient with your BMS?

- Schedules
- Trends
- Reports
- Alarms
- Logic

Energy Control / Building Management Systems

Do you understand the capabilities of your BMS?

- Data Acquisition & Reporting
- Special Features
- Demand Limiting
- Complex Scheduling
- Optimized Set Points
- Alarm Routing

What’s measured is managed, …

… what isn’t measured is ignored

How do you measure the performance of your facility?

Energy Control / Building Management Systems

BMS Implementation Example

- **Selfridge Air National Guard Base**
- **40 buildings with 13 different BMS Systems**
- **Many of those with pneumatic controls**
- **Standardized on one system**
- **All HVAC staff trained on the ALC System**
- **$125,000.00 in Rebates**

Energy Control / Building Management Systems

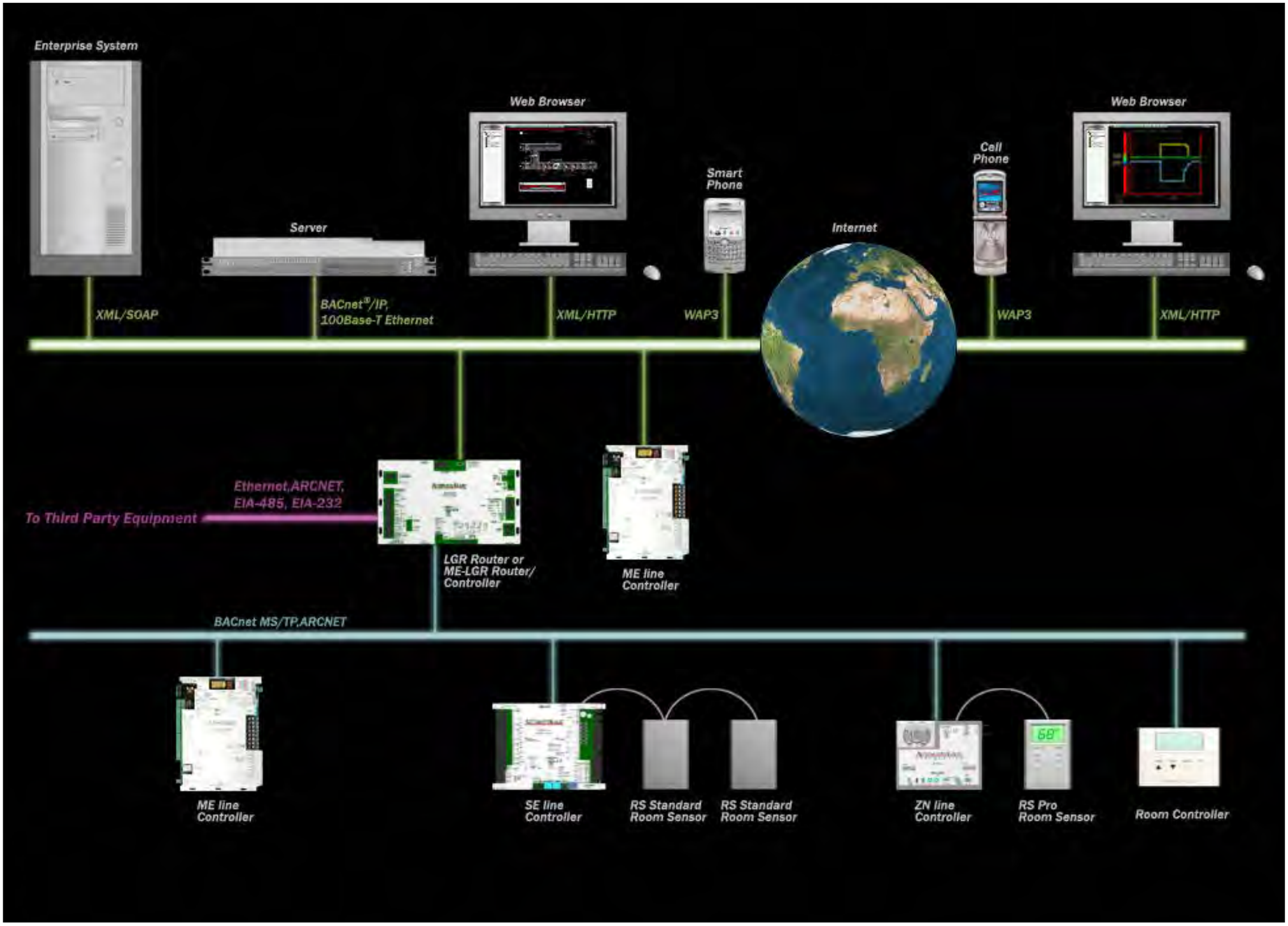
BMS Implementation Example

- **Macomb Township**
  - **10 buildings with 3 different BMS Systems**
  - **Many of those with stand alone controls**
  - **Standardized on one system**
  - **Township Hall realized 50% reduction in electricity and natural gas consumption.**

Energy Control / Building Management Systems

BMS Implementation Example

- Bethesda Christian Church
  - 300,000 sq ft facility Church & School
  - 80 single zone constant volume RTUs
  - Aging BMS was difficult to schedule
  - 62% reduction in gas consumption from 1 year ago
  - 7% colder month this year
  - Estimated ROI approximately 5 years


Enterprise System
Server
Web Browser
Smart Phone
Internet
Cell Phone
Web Browser
XML/SOAP
BACnet®/IP, 100Base-T Ethernet
XML/HTTP
WAP3
WAP3
XML/HTTP
Ethernet,ARCNET, EIA-485, EIA-232
To Third Party Equipment
LGR Router or ME-LGR Router/ Controller
ME line Controller
BACnet MS/TP,ARCNET
ME line Controller
SE line Controller
RS Standard Room Sensor
RS Standard Room Sensor
ZN line Controller
RS Pro Room Sensor
Room Controller

Live Demonstration

Unique Features of Automated Logic's

Environmental Index

Quantifies comfort for real time display of building comfort performance

Energy Reports

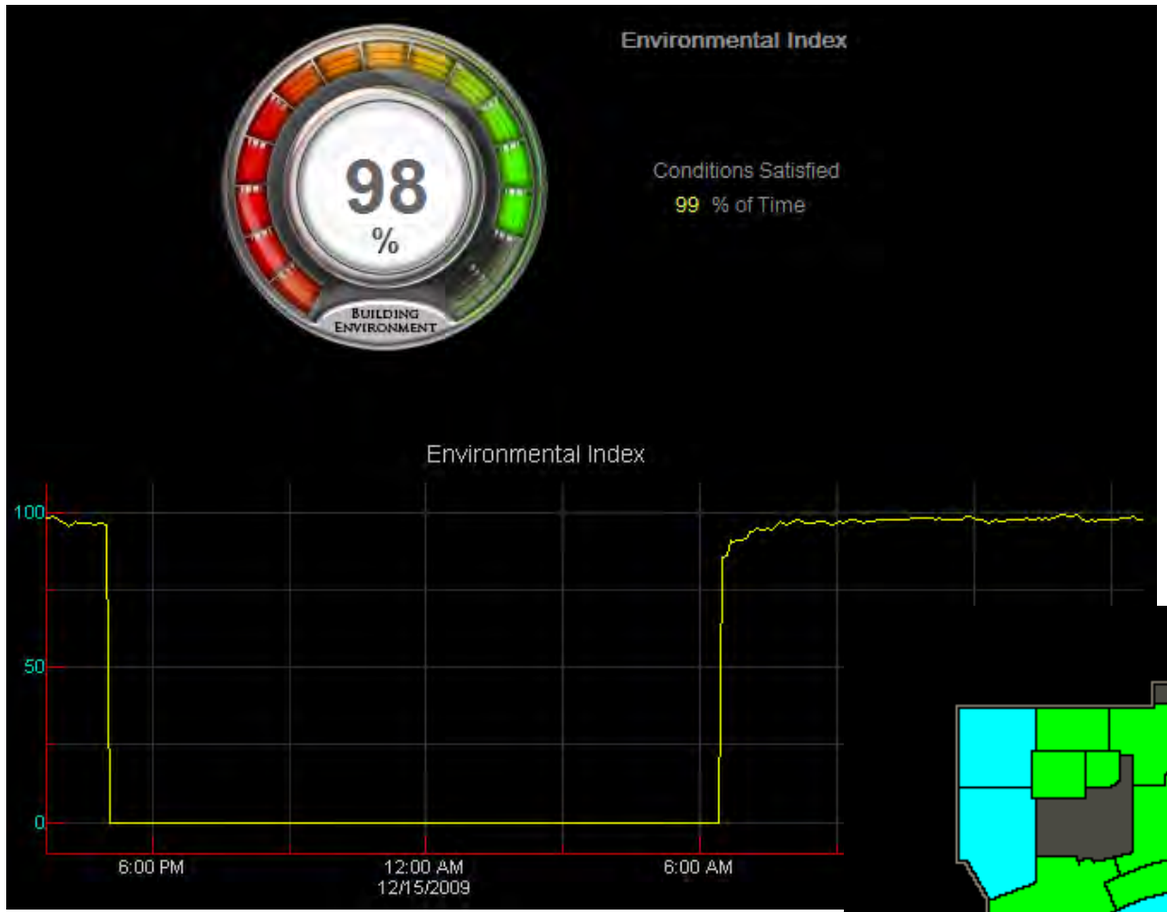
Daily reports of utility usage allows for easy monitoring of energy reduction

Standard Energy Savings Features

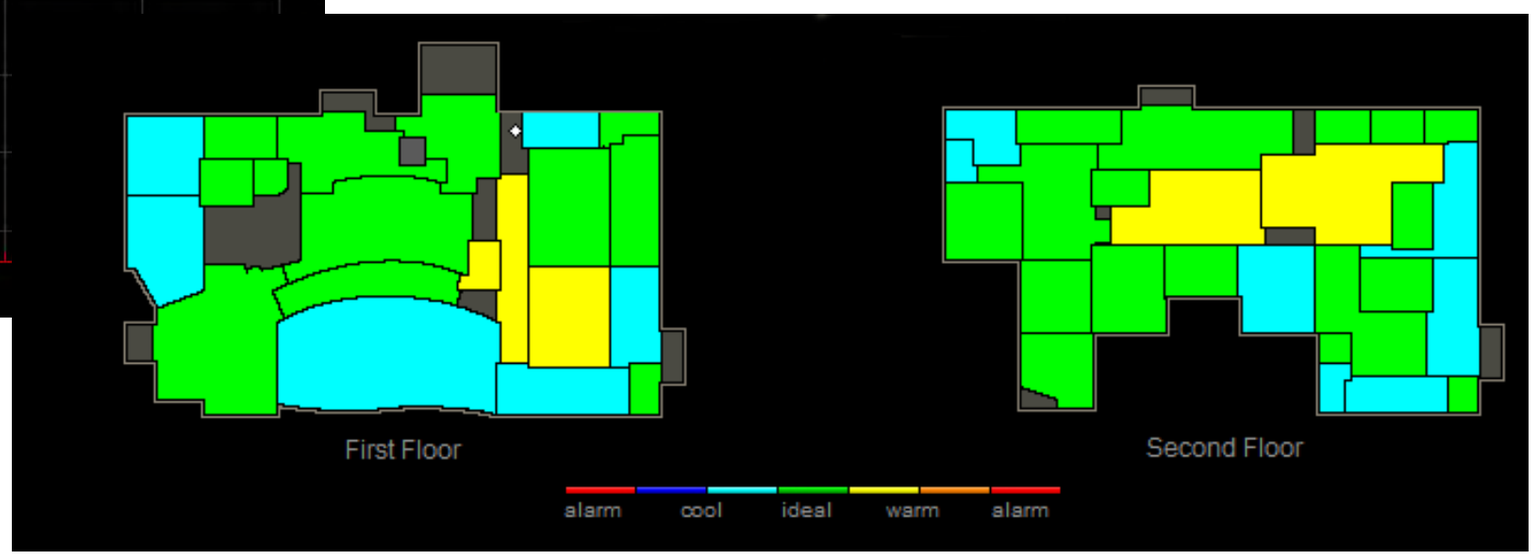
Environmental Index

Standard Energy Savings Features

Environmental Index



How many points do **you** want to read?



Energy Reports

Standard Energy Savings Features of Automated Logic's

Set Point Optimization
Zone Level Scheduling
Optimum Start
Demand Control

Standard Energy Savings Features

Set Point Optimization

Automatically adjusts the unit output to the energy requirements of the building within the limits you set.

Perfect for days when only partial staff is in the facility.

Supply Air Temp = 68

Supply Air Temp = 55

Standard Energy Savings Features

Zone Level Scheduling

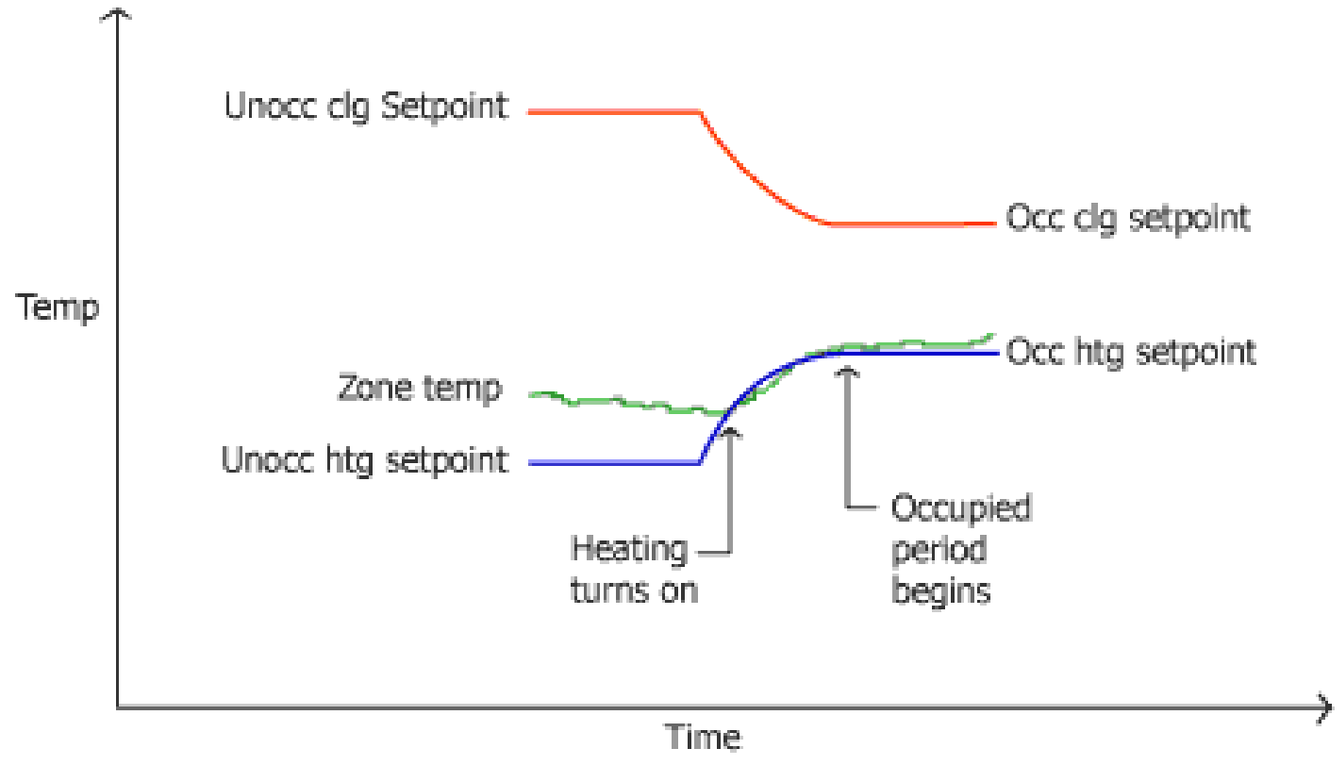
Allows for easy shut down of unoccupied rooms. This allows the air to be delivered only to the occupied areas as needed.

Standard Energy Savings Features

Optimum Start

Gradual adjustment of ***unoccupied*** space set point so the space is at temperature at the schedule start time.

Software adjusts the curve based upon how the building responds to meet the needs in varying conditions.

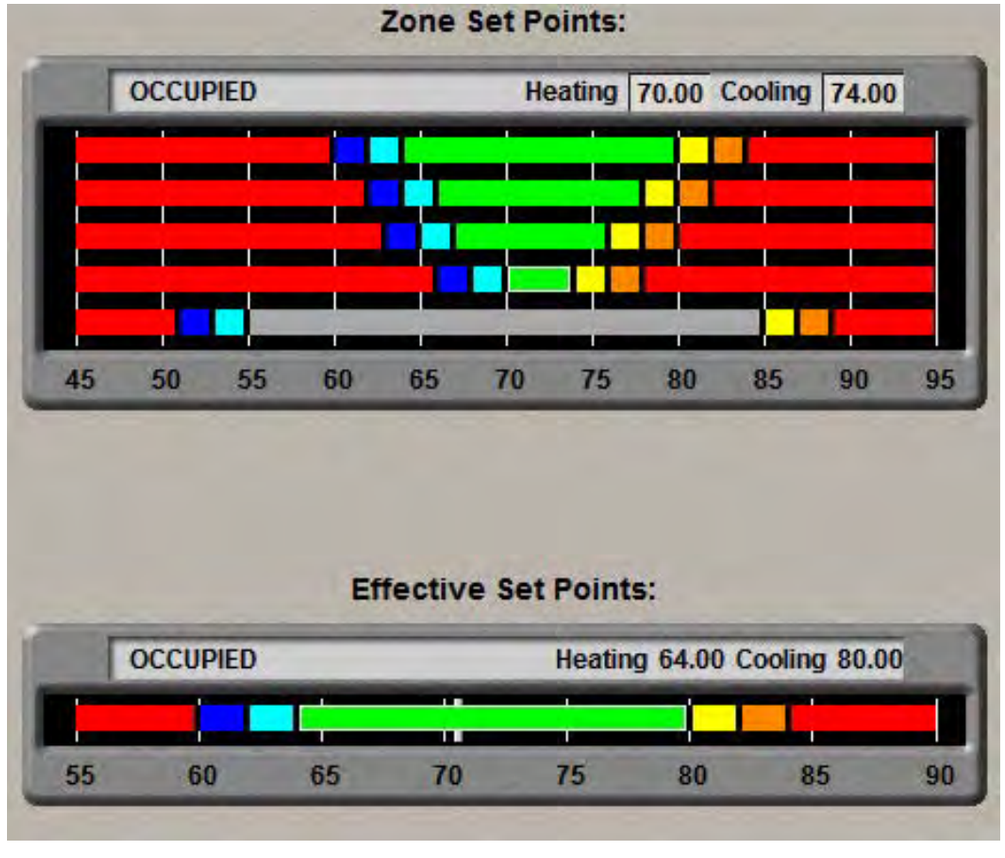


Standard Energy Savings Features

Demand Control

Automated zone setpoint adjustment based upon meter inputs.

User definable thresholds provide for a simple means of benchmark adjustment as efficiencies improve.



Remarkable Ease of Use

Thermographic Floorplans

Processed information for exceptional understanding of facility conditions

In Depth Web Technology

Developed to work as a Web platform instead of an adaptation

Hierarchal Scheduling

Simple means of Holiday Schedule Exceptions
to provide energy savings.

THANK YOU!

Metro Controls, Inc.

Celebrating over 25 years of creating
Building Intelligence

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2014

Energy Efficiency Program for Business

Chad Forester

Energy Optimization Solutions

MIURA

Modular On-Demand Boiler Systems

Engineered for Greater Efficiency, Lower Costs, & Reduced Environmental Impact

Chad Forester Energy
Optimization Solutions LLC

Presentation Overview

- “Efficiency” – A meaningless term. Review boiler efficiency basics & BEST PRACTICES
- A new effiency definition is required
- Introduction to modular *On-Demand* boiler technology
- First Steps: Boiler performance benchmarking
- Case Studies of successful projects

Why Is This?

You have less than 25% of boiler capacity load 59% of the year

- 59% of the year the temperature range is 47˚-65˚F utilizing 0-25% boiler capacity
- 24% of the year the temperature range is 28˚-48˚F utilizing 25-50% boiler capacity
- 11% of the year the temperature range is 8˚-28˚F utilizing 50-75% boiler capacity
- 6% of the year the temperature range is below 8˚F utilizing 75-100% boiler capacity

- N+1 or Redundancy Not Considered

Conventional Boiler In-Service Efficiency

2. Efficiency should be set to 80% for process loads and 60% for heating loads. In a heating application such as this one, the operating efficiency of the system may be much lower than the stack efficiency of the boiler. The reason for this is that the boiler may fire for only a few minutes in the morning. During the long off-cycle, heat is transferred from the boiler to its surroundings, allowing the steam contained within the boiler to cool and condense. When steam is again required, this lost heat must be replaced through several minutes of operation before steam may be supplied. Typical efficiencies for this type of operation range from 50 to 75%.

By Boiler Book of Cleaver Bro

Evaluating Conventional Boilers:

Opportunities for Innovation

MIURA

- **Design Limitations of Conventional Boilers:**
  - **Physical Size / Footprint**
  - **Excessive Warm-up Cycle**
  - **Excessive Radiant Losses**
  - **Poor Response to Changing Loads**
  - **Poor System Turn-Down Capability**
  - **Sub-par Overall Operational Efficiency / Load Management Capabilities**
  - **Innate Safety Issues via Explosive Energy**
  - **Lack of Integrated NOx Emissions Control**
  - **Lack of Integrated Heat Recovery**

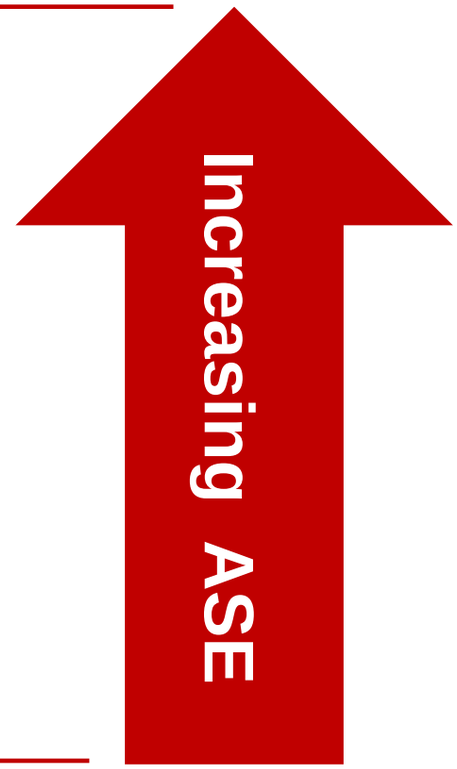
ASHRAE Standard 155-P

- **More meaningful measure of boiler performance**
- **Applicable to steam & hot-water boilers with ≥ 300,000 Btu/hr capacity**
- **Applicable to individual, modular and/or multiple boilers**
- **Purpose of the standard:**
  1. **Comprehensive measure of boiler operating efficiency, including:**
     - **Steady-state thermal efficiency**
     - **Part-load efficiency**

ASHRAE Standard 155-R

MIURA

- **Application Seasonal Efficiency (ASE):**
- **Seasonal "bin-based" calculation whereby hourly building loads are divided into 101 bins, 0-100**
- **Each "bin" is a snapshot of the boiler system load factor percentage based on heating demand**
- **In any bin, various boilers may be:**
  - **Off and isolated (via modular, on-demand system)**

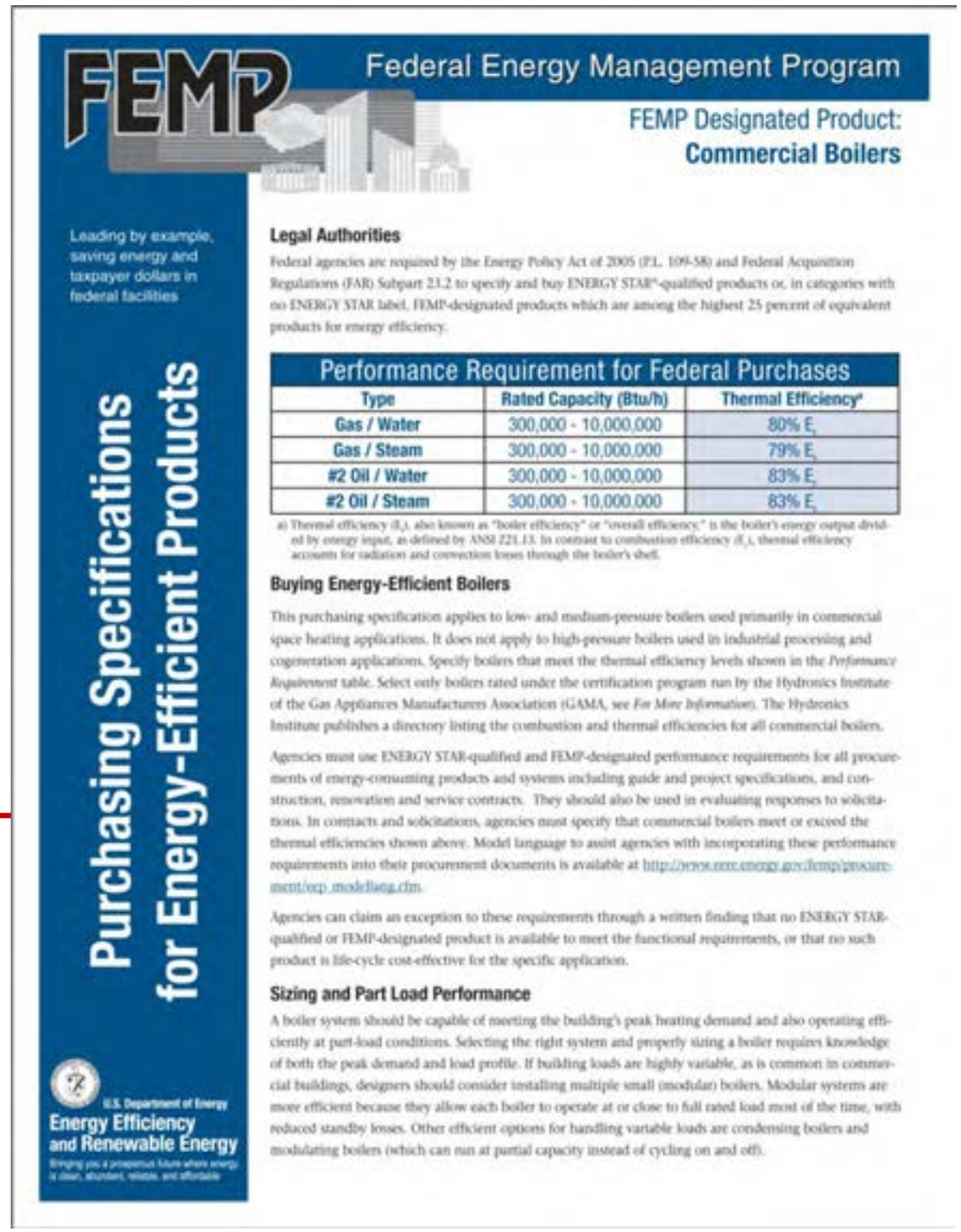


FEMP Guidelines:

Boiler Selection Criteria

- **FEMP = Energy Star for larger energy-using equipment**
- **Minimum boiler efficiency guidelines**
- **Boiler system selection & sizing guidelines**

"If building loads are highly variable, as is common in



FEMP

Federal Energy Management Program

FEMP Designated Product:
Commercial Boilers

Leading by example, saving energy and taxpayer dollars in federal facilities

Purchasing Specifications for Energy-Efficient Products

Legal Authorities

Federal agencies are required by the Energy Policy Act of 2005 (P.L. 109-58) and Federal Acquisition Regulations (FAR) Subpart 23.2 to specify and buy ENERGY STAR®-qualified products or, in categories with no ENERGY STAR label, FEMP-designated products which are among the highest 25 percent of equivalent products for energy efficiency.

Performance Requirement for Federal Purchases

Type	Rated Capacity (Btu/h)	Thermal Efficiency[a]
Gas / Water	300,000 - 10,000,000	80% E_t
Gas / Steam	300,000 - 10,000,000	79% E_t
#2 Oil / Water	300,000 - 10,000,000	83% E_t
#2 Oil / Steam	300,000 - 10,000,000	83% E_t

a) Thermal efficiency (E_t), also known as "boiler efficiency" or "overall efficiency," is the boiler's energy output divided by energy input, as defined by ANSI Z21.13. In contrast to combustion efficiency (E_c), thermal efficiency accounts for radiation and convection losses through the boiler's shell.

Buying Energy-Efficient Boilers

This purchasing specification applies to low- and medium-pressure boilers used primarily in commercial space heating applications. It does not apply to high-pressure boilers used in industrial processing and cogeneration applications. Specify boilers that meet the thermal efficiency levels shown in the *Performance Requirement* table. Select only boilers rated under the certification program run by the Hydronics Institute of the Gas Appliances Manufacturers Association (GAMA, see *For More Information*). The Hydronics Institute publishes a directory listing the combustion and thermal efficiencies for all commercial boilers.

Agencies must use ENERGY STAR-qualified and FEMP-designated performance requirements for all procurements of energy-consuming products and systems including guide and project specifications, and construction, renovation and service contracts. They should also be used in evaluating responses to solicitations. In contracts and solicitations, agencies must specify that commercial boilers meet or exceed the thermal efficiencies shown above. Model language to assist agencies with incorporating these performance requirements into their procurement documents is available at http://www.eere.energy.gov/femp/procurement/eep_modellang.cfm.

Agencies can claim an exception to these requirements through a written finding that no ENERGY STAR-qualified or FEMP-designated product is available to meet the functional requirements, or that no such product is life-cycle cost-effective for the specific application.

Sizing and Part Load Performance

A boiler system should be capable of meeting the building's peak heating demand and also operating efficiently at part-load conditions. Selecting the right system and properly sizing a boiler requires knowledge of both the peak demand and load profile. If building loads are highly variable, as is common in commercial buildings, designers should consider installing multiple small (modular) boilers. Modular systems are more efficient because they allow each boiler to operate at or close to full rated load most of the time, with reduced standby losses. Other efficient options for handling variable loads are condensing boilers and modulating boilers (which can run at partial capacity instead of cycling on and off).

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

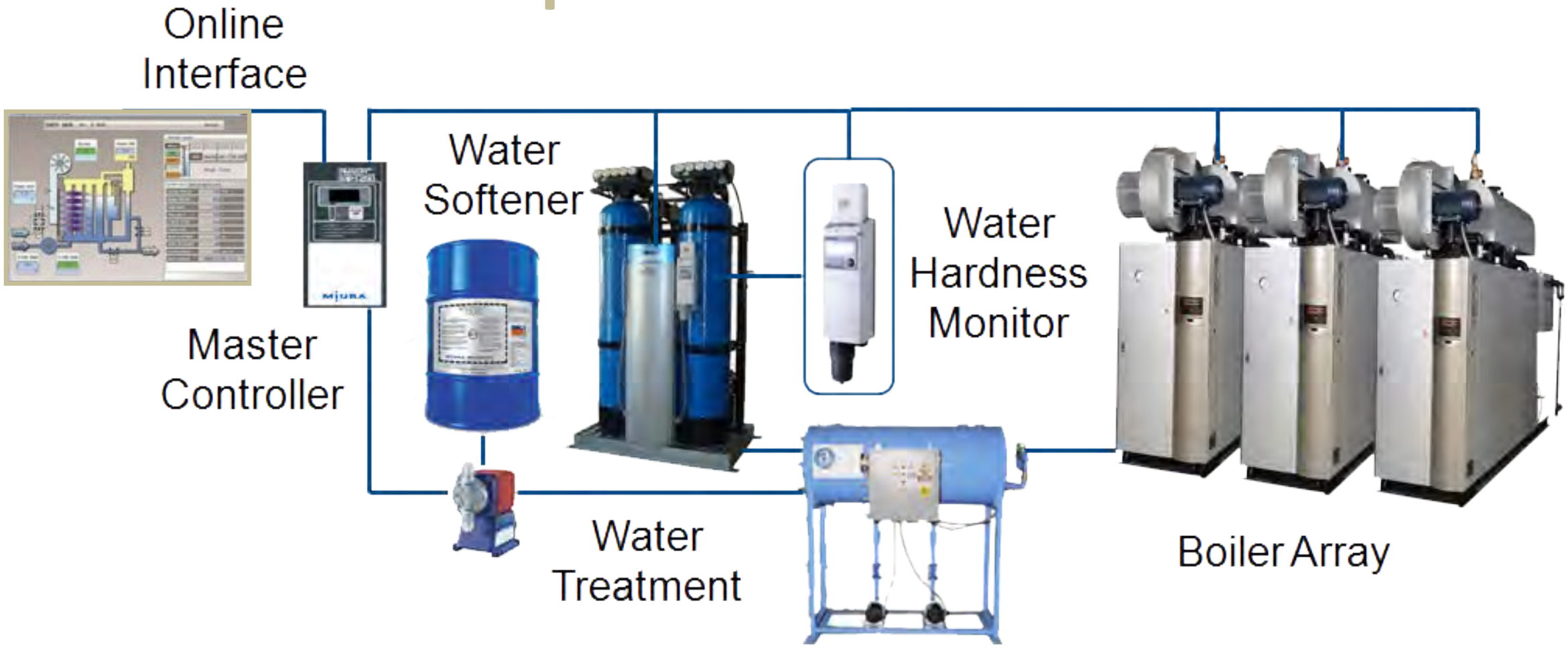
Energy nOptimization Approach:

Process

- **Assess & benchmark current system performance relative to process loads**
- **Maximize heat recovery within system**
- **“Right-size” system relative to optimized heat recovery**
- **Optimize system load matching / management capability for process requirements**

Complete Fully Integrated Boiler Plant

- **Typical integrated modular, on-demand boiler plant**



LX / EX Series

MIURA

- **Easy push-button start-up / controller interface**
- **47 alarm messages**
- **38 caution messages**
- **Color-coded visual alarm interface coupled with caution / alarm messages**

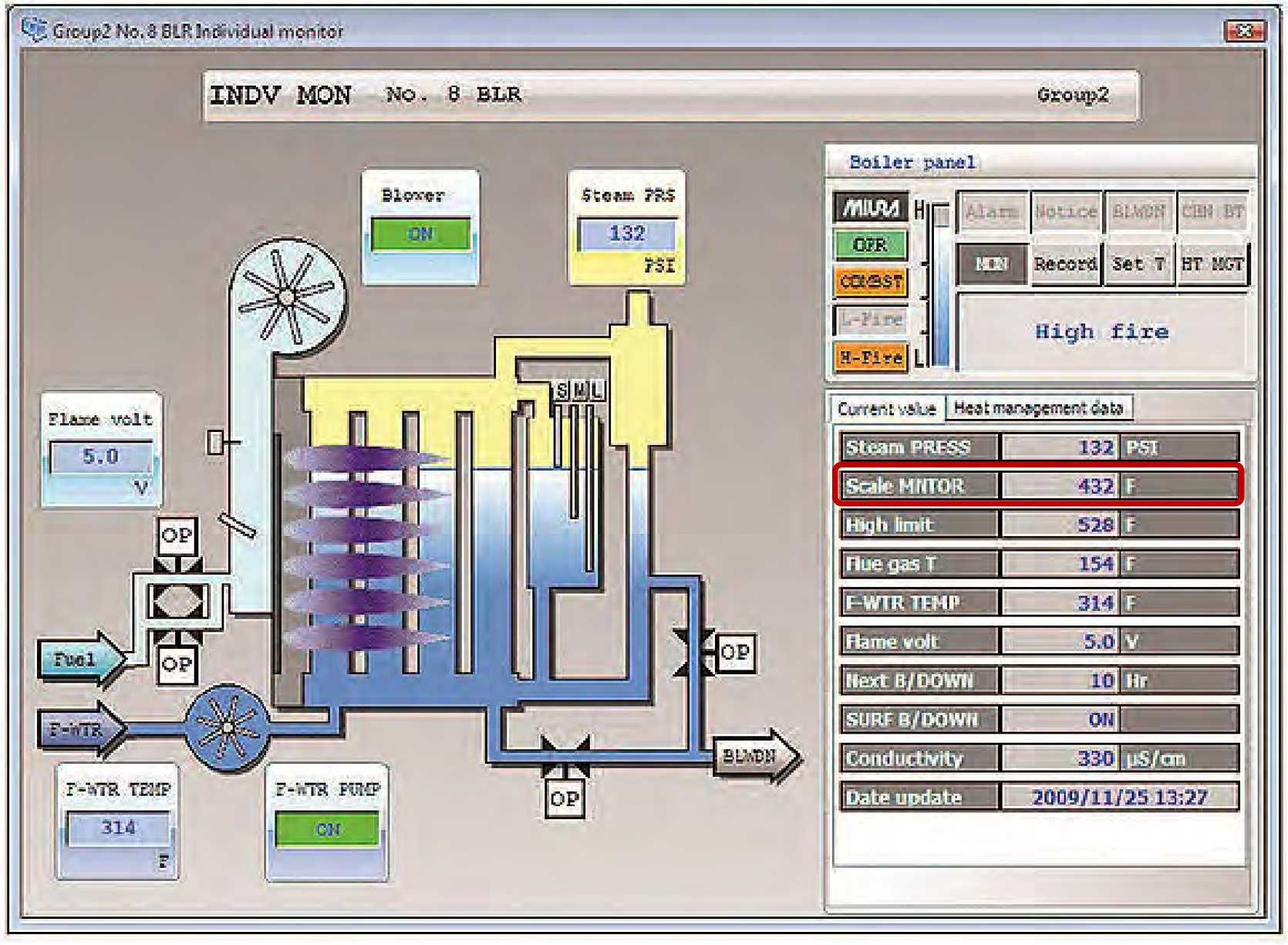
- **Probable cause and/or solution given for each alarm or caution**
- **Allows for short 10 second pre-purge and minimized post-purge via “purge cancel” feature**
- **Stores last 7 fault incidents**
- **On-line “dashboard” system interface**

ER System "Energy Dashboard"

- **24/7 Real-time Operational Parameters:**

LX Series Inte

- Firing Rate
- Steam Pressure
- Scale Monitor
- High Limit
- Flue Gas Temp
- Feedwater Temp
- Flame Voltage
- Next Blow-down
- Surface B/down
- Conductivity
- Date / Time



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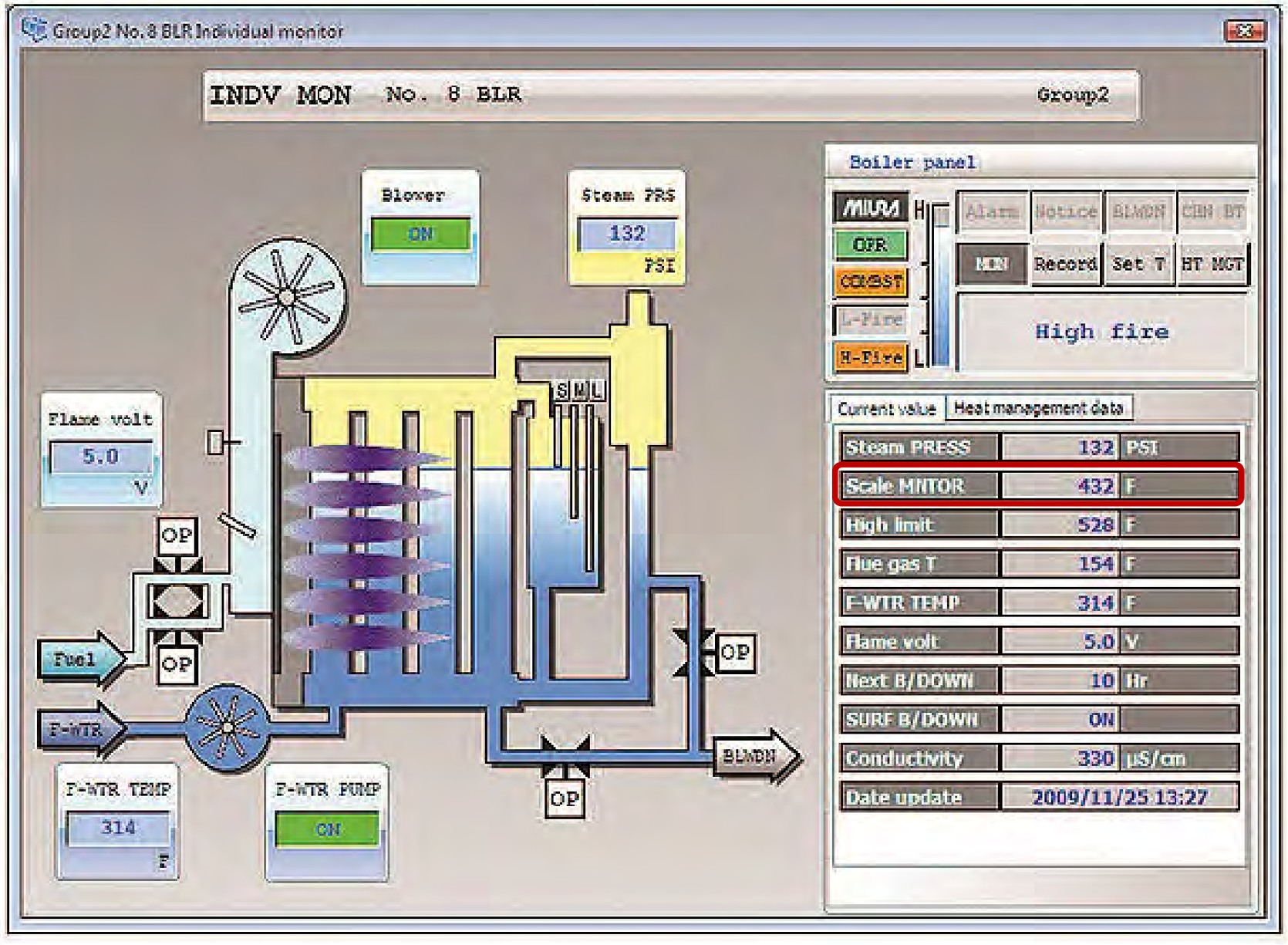
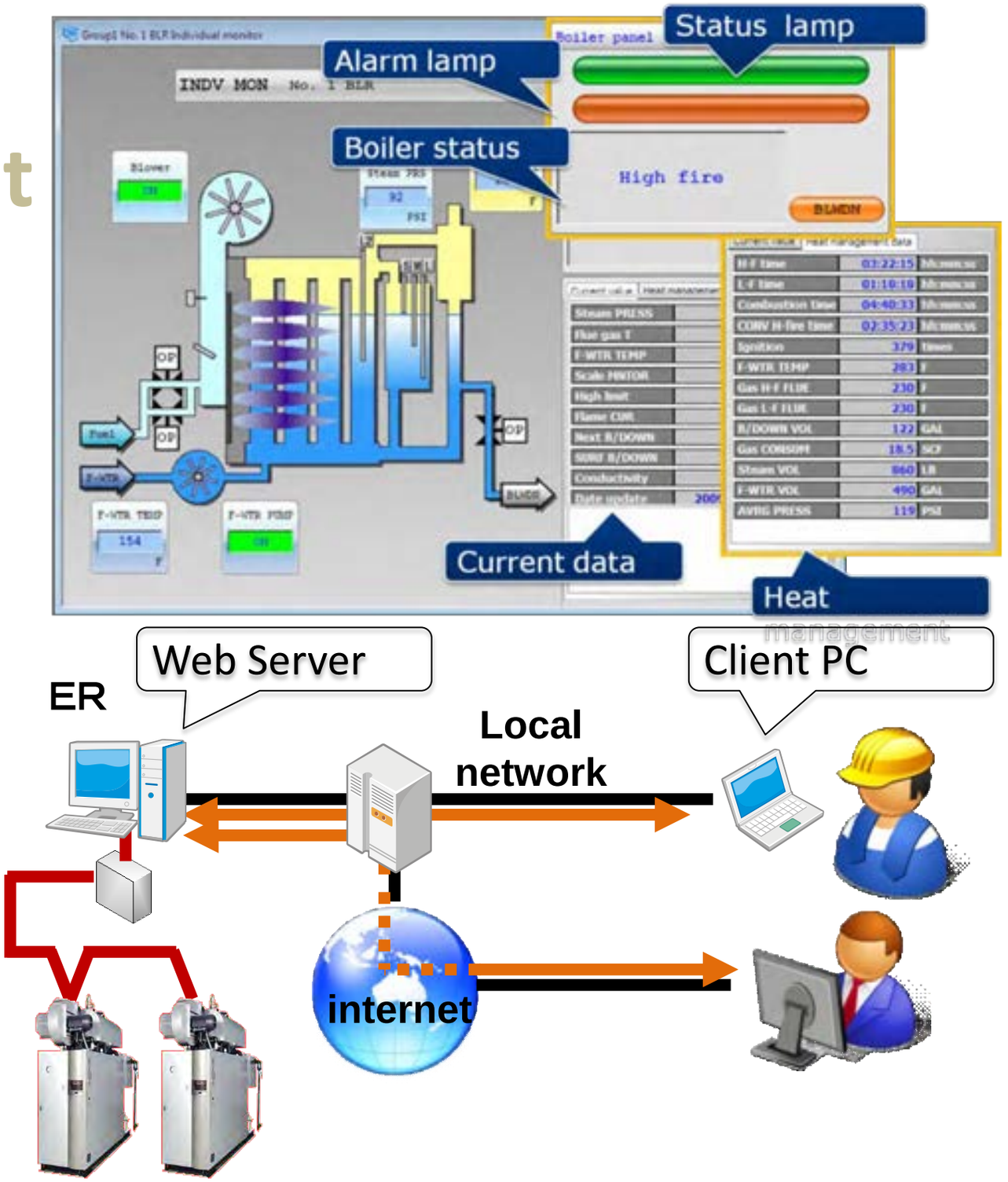


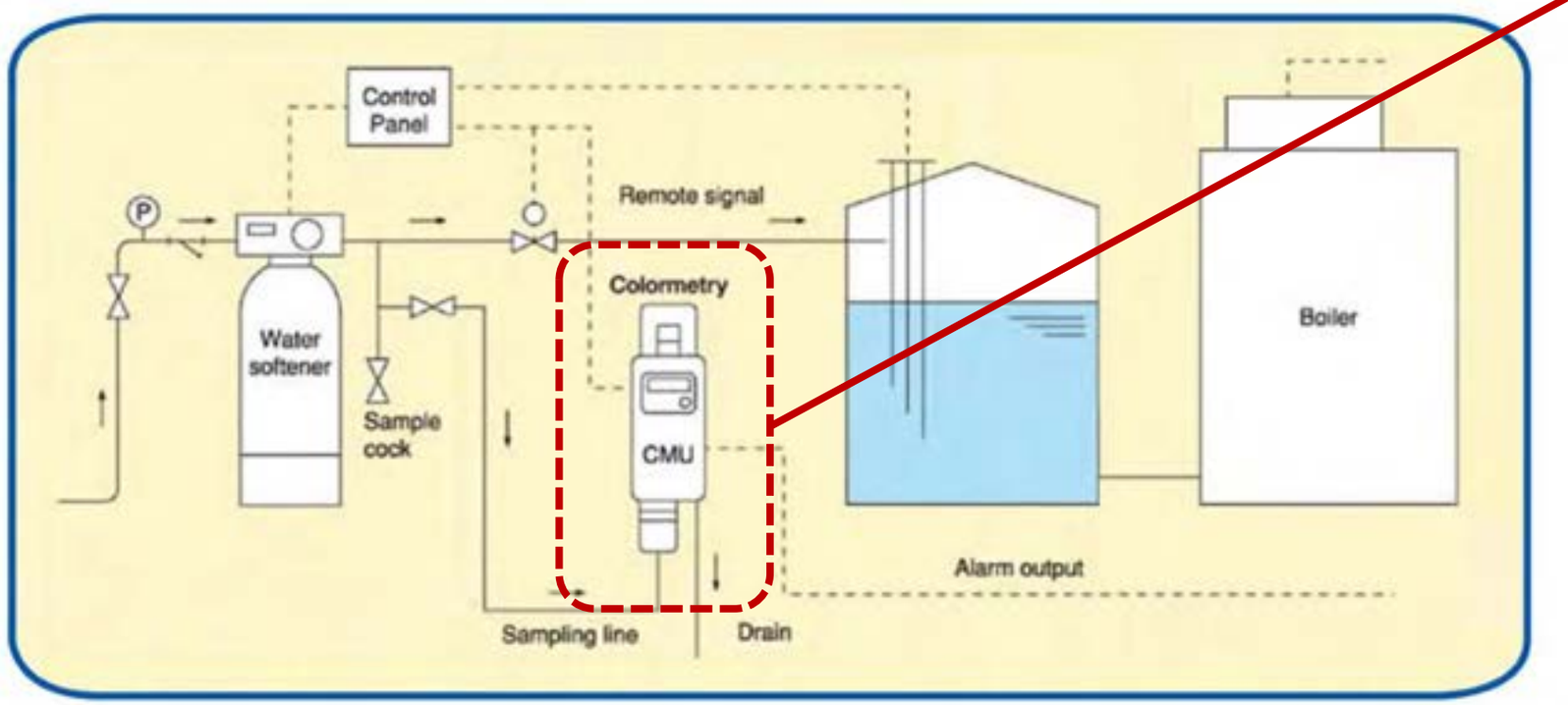
ER System “Energy Dashboard”

- Utilize online monitoring system that interfaces with boiler control system as thermal energy management “dashboard”
- Provides 24/7 online M&T/ M&V online maintenance system
- Real-time 24/7

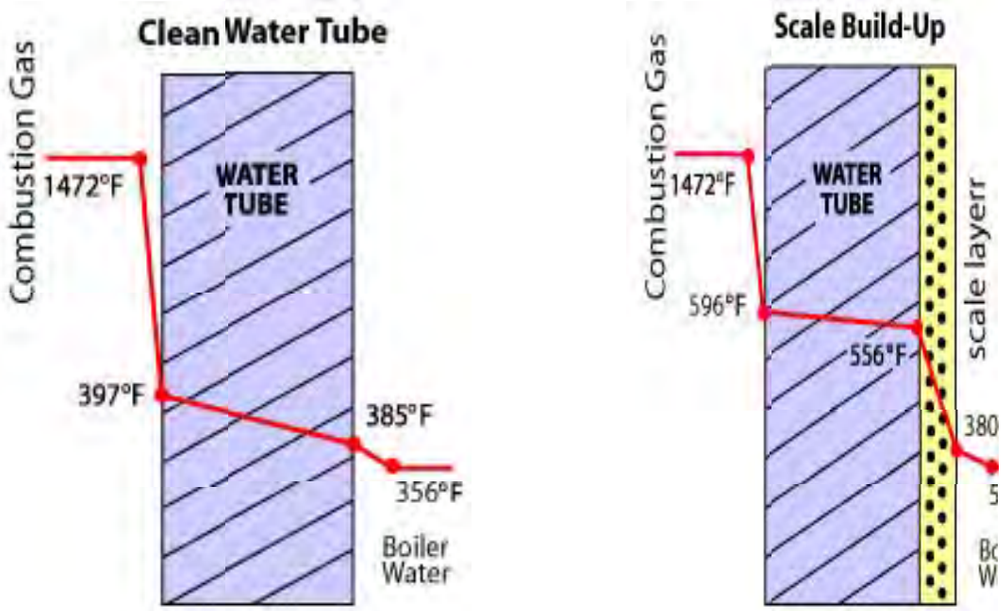


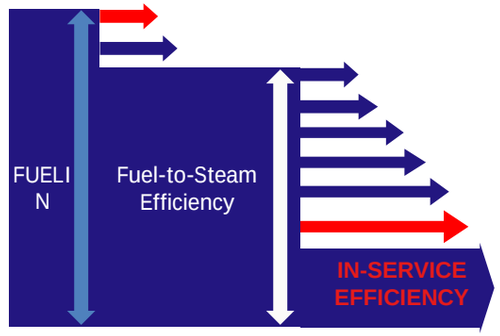
Water Hardness Monitoring

- **Installed between water softener & feed water tank**
- **Colormetry “sips” feed water every 30 minutes**
- **Detects water hardness below 1 ppm**
- **Automatically increases surface blow-down when water hardness is detected**
- **Interfaces with BL Controller & M.O.M. System**
- **Easily replaceable cartridges**



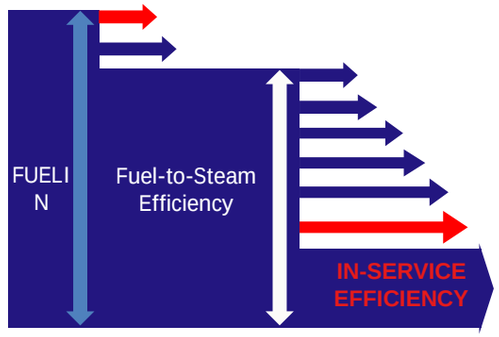
- **An eggshell thickness of scale can reduce boiler efficiency as much as 10%***



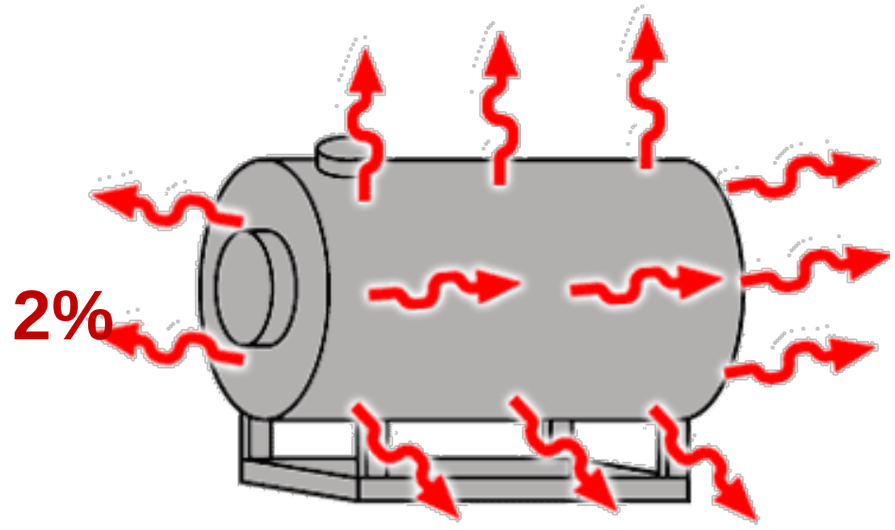


Losses:

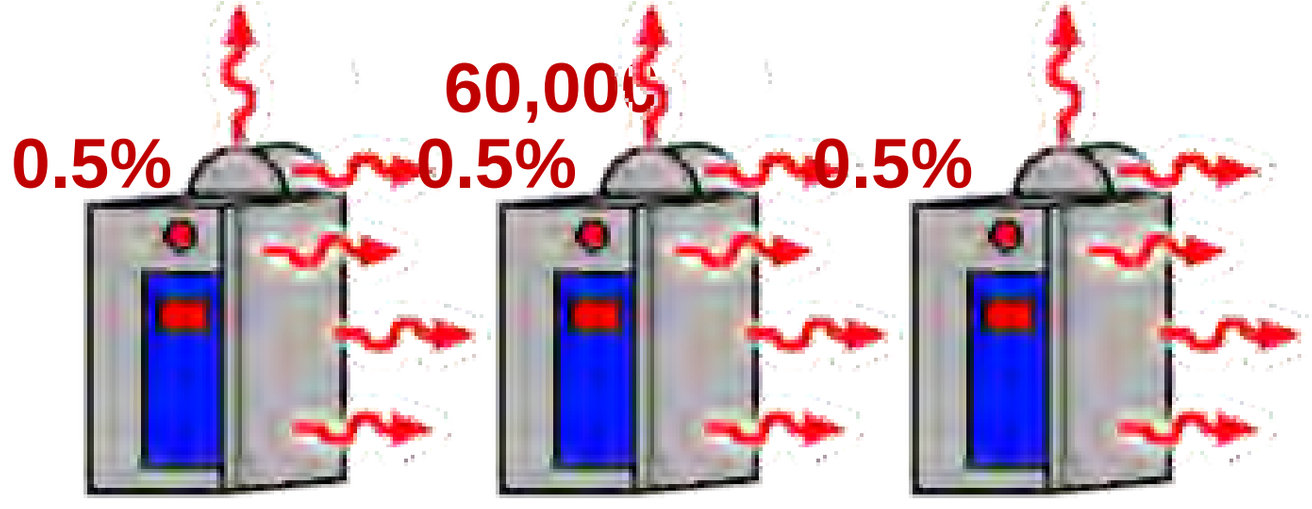
Radiant Losses



- **Radiant Losses: 12 MMBtu/hr input at 100% output**
- **Option A – Conventional System:**
  - **Single 12 MMBtu/hr unit input**
  - **Rated at 2% radiant loss**
  - **240,000 Btu/hr energy loss**

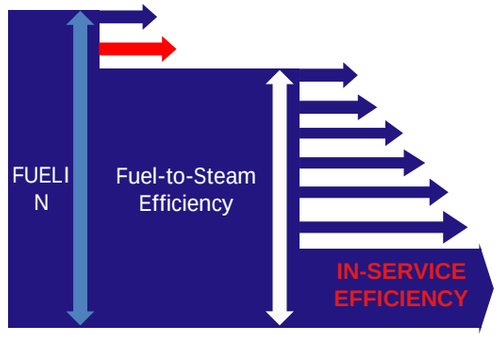


- **Option B – Modular System:**
  - **3 x 4 MMBtu/hr unit input**
  - **Rated at 0.5% radiant loss**
  - **3 x 20,000 Btu/hr losses = Btu/hr energy loss**



Losses:

Exhaust Losses



- **Utilize feed-water economizer for built-in waste heat recovery**
- **Feed-water economizers increase efficiency by capturing waste exhaust gases to preheat feed-water entering the boiler**
- **Boiler efficiency can be increased by 1% for every 40ºF decrease in stack gas temperature**

Recoverable Heat from Boiler Flue Gases

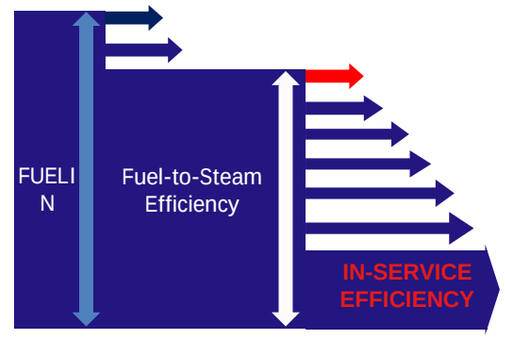
Initial Stack Gas Temperature, °F	Recoverable Heat, MMBtu/hr			
	Boiler Thermal Output, MMBtu/hr			
	25	**50**	**100**	**200**
400	1.3	2.6	5.3	10.6
500	2.3	4.6	9.2	18.4
600	3.3	6.5	13.0	26.1

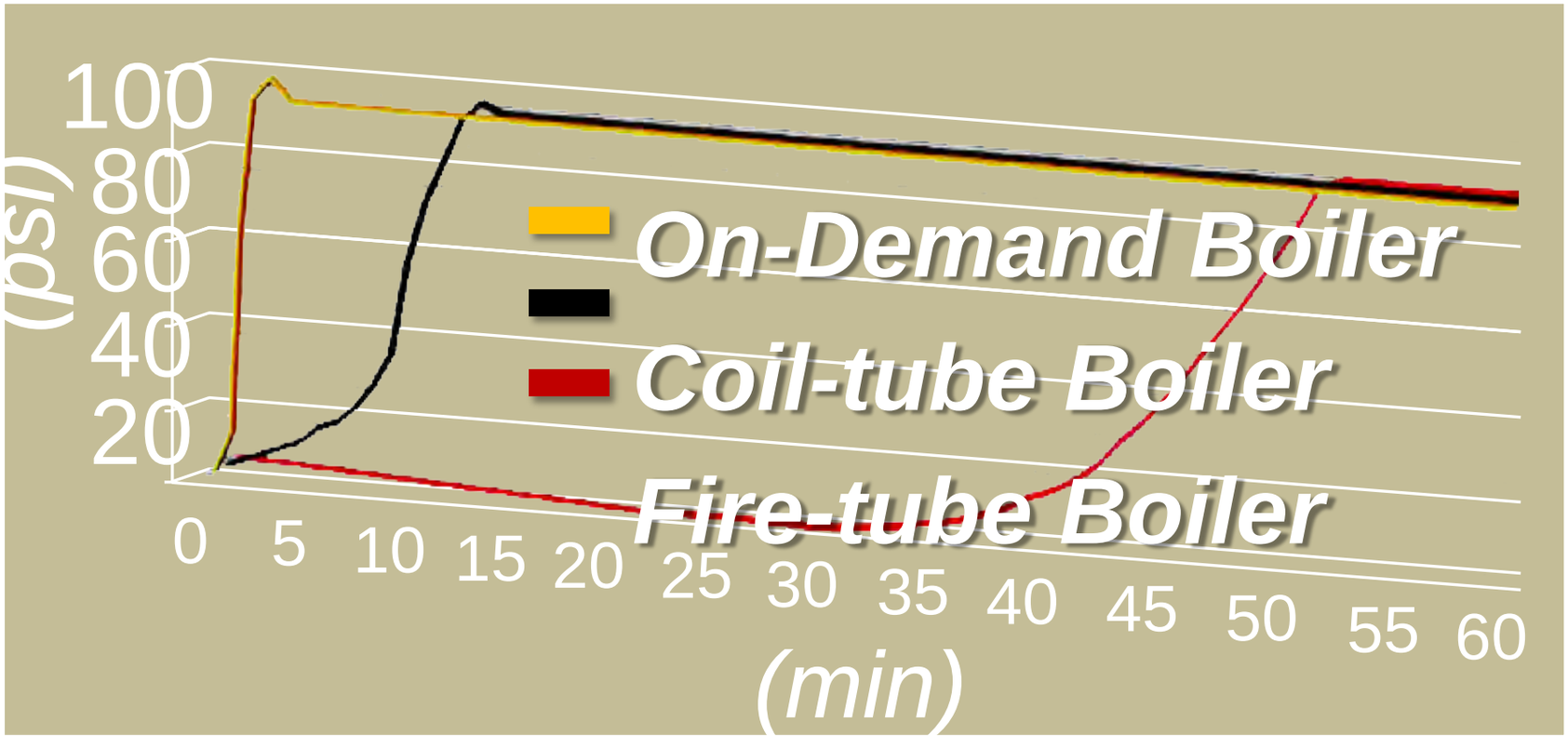
Based on natural gas fuel, 15% excess air, and a final stack temperature of 250°F.

Losses:

Start-up Losses

- **Thermal shock - primary constraint on boiler performance**
- **Conventional boiler performance is limited by thermal stress resulting in inefficiency by requiring slow start-up & perpetual idling**
- **Firetube boilers: 60-90 min warm-up cycle & must remain idling in stand-by mode**

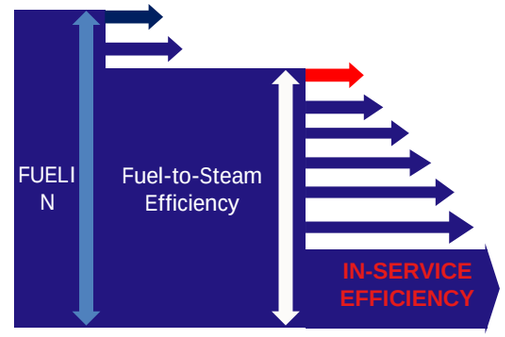


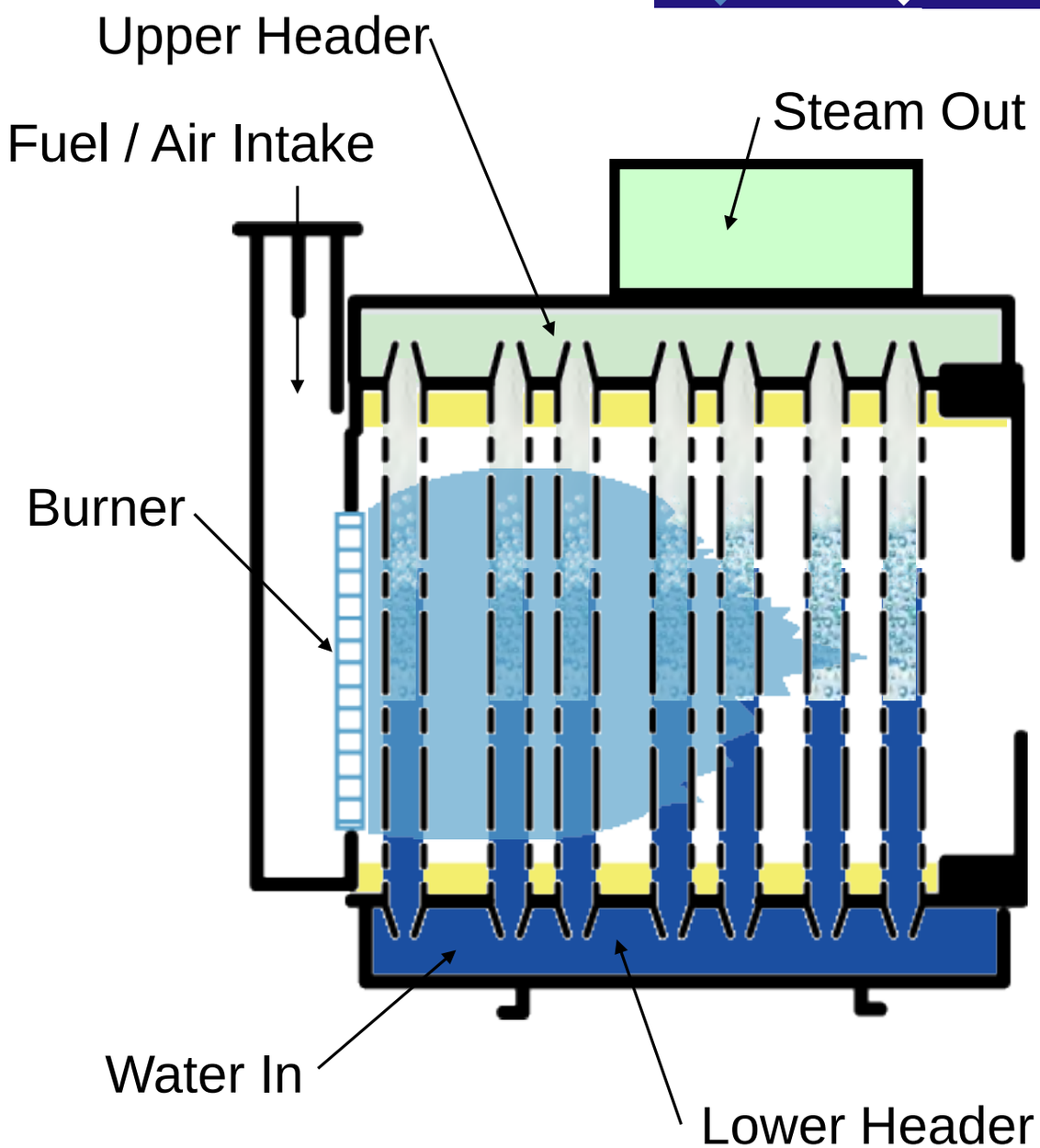


Losses!

Start-up Losses

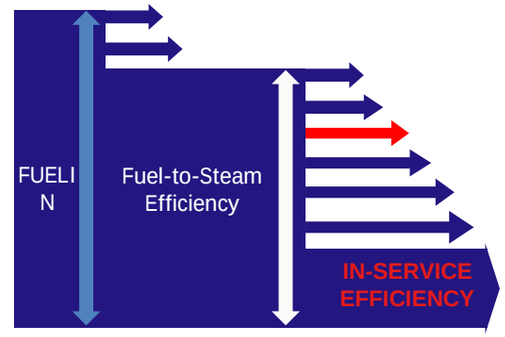
- **Innovative “Floating Header” pressure vessel design eliminates thermal shock**
- **All welded tube to tube-sheet construction**
- **X-ray & dye-penetrant quality control with heat treatment for stress relief of steel**
- **Single-pass design for even temperature distribution**
- **No more “re-rolling tubes” or “tube popping”…**
- **Allows for steam production in 5 minutes from cold start**





Losses:

Blow-down Losses



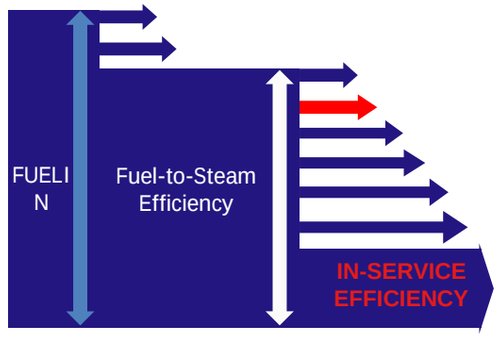
- **U.S. DOE steam systems BEST PRACTICES recommendation:**

  "Improve boiler efficiency and reduce water consumption by utilizing automatic surface blow-down in lieu of continuous and/or manual blow-down."

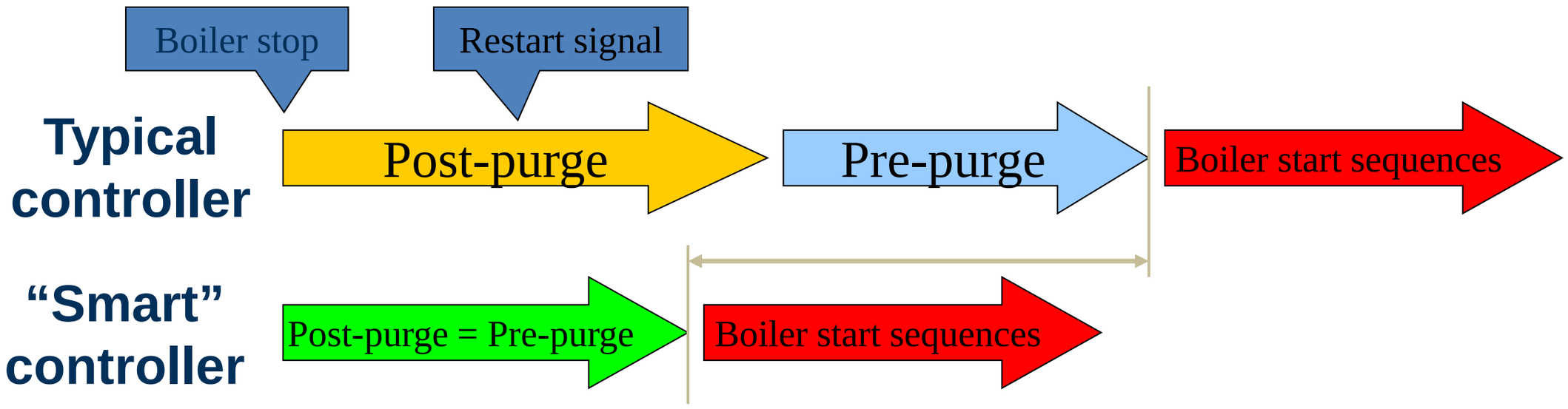
- **Miura's BL Controller boiler control system includes automatic blow-down for optimization of blow-down for highest efficiency operation.**
- **Automatic blow-down is managed by the BL Controller via a proportional flow system & back-up conductivity probe that monitor TDS to maximize boiler performance and efficiency.**

Losses?

Pre- & Post-Purge Losses



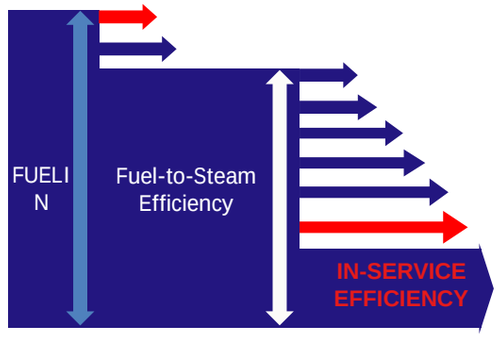
- **Utilize a control system that includes an intelligent purge system to optimize boiler performance**
- **“Purge Cancel” function interrupts post purge when fast restart is required, eliminating heat loss and improving response time**
- **Optimized response time (w/in 10 seconds) = increased efficiency + reduced emissions**

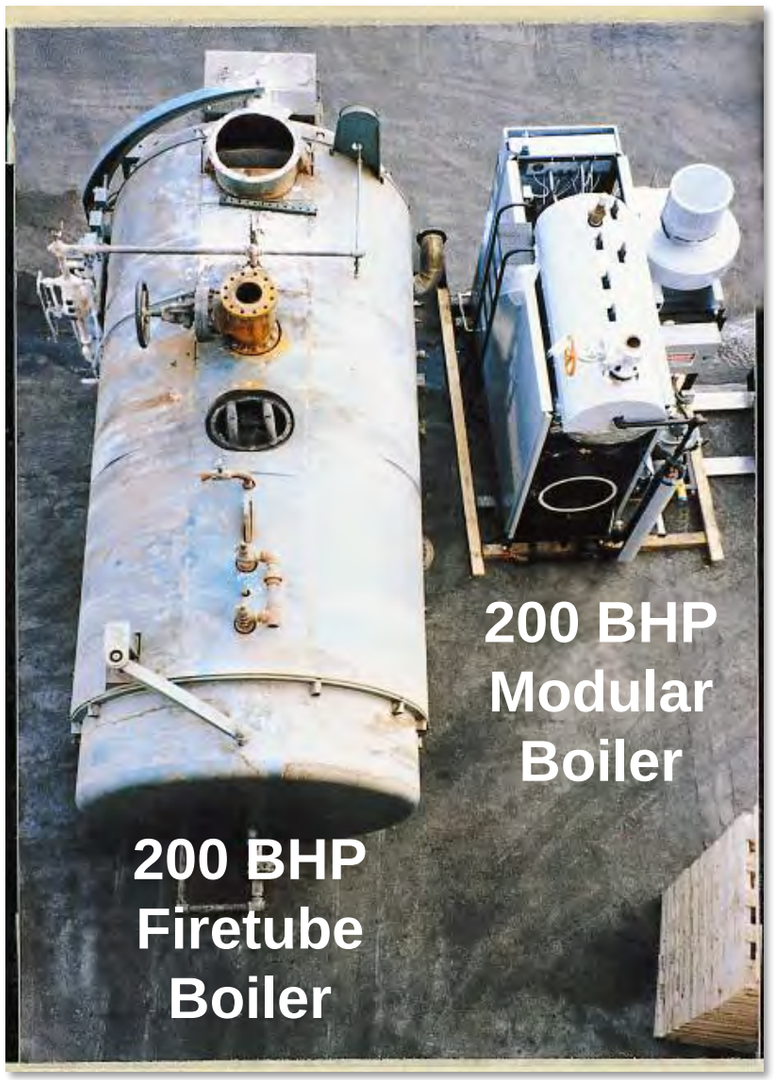


Losses:

Radiant Losses

- **With energy efficiency, size matters…**
- **Increase efficiency by reducing boiler thermal footprint**

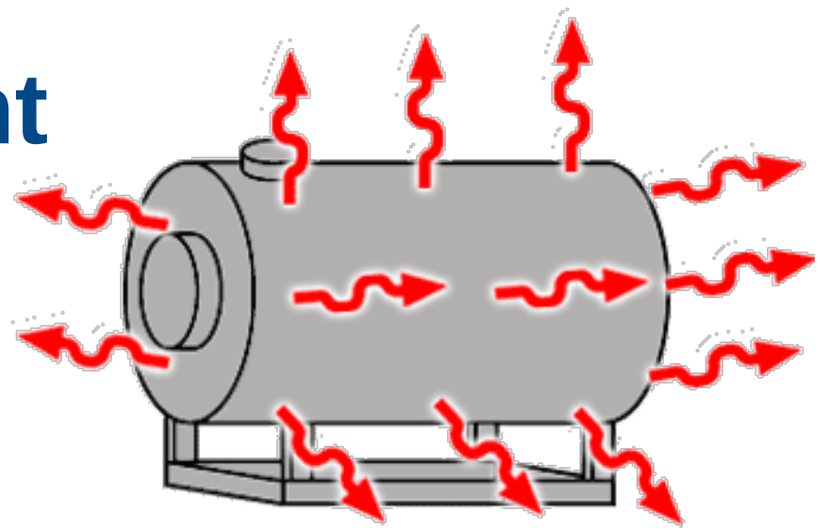


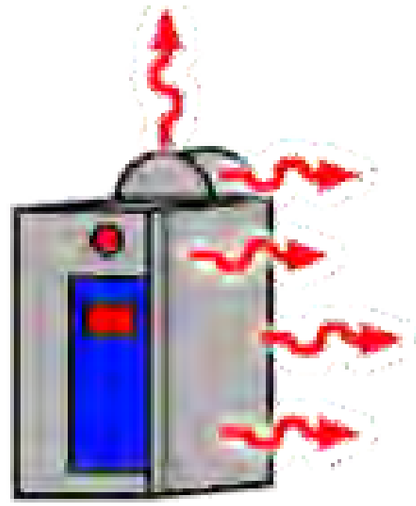


1,000+ Gallons VS **65+ Gallons**

Rate of Radiant Losses =

~300 Btu/hr-ft^2

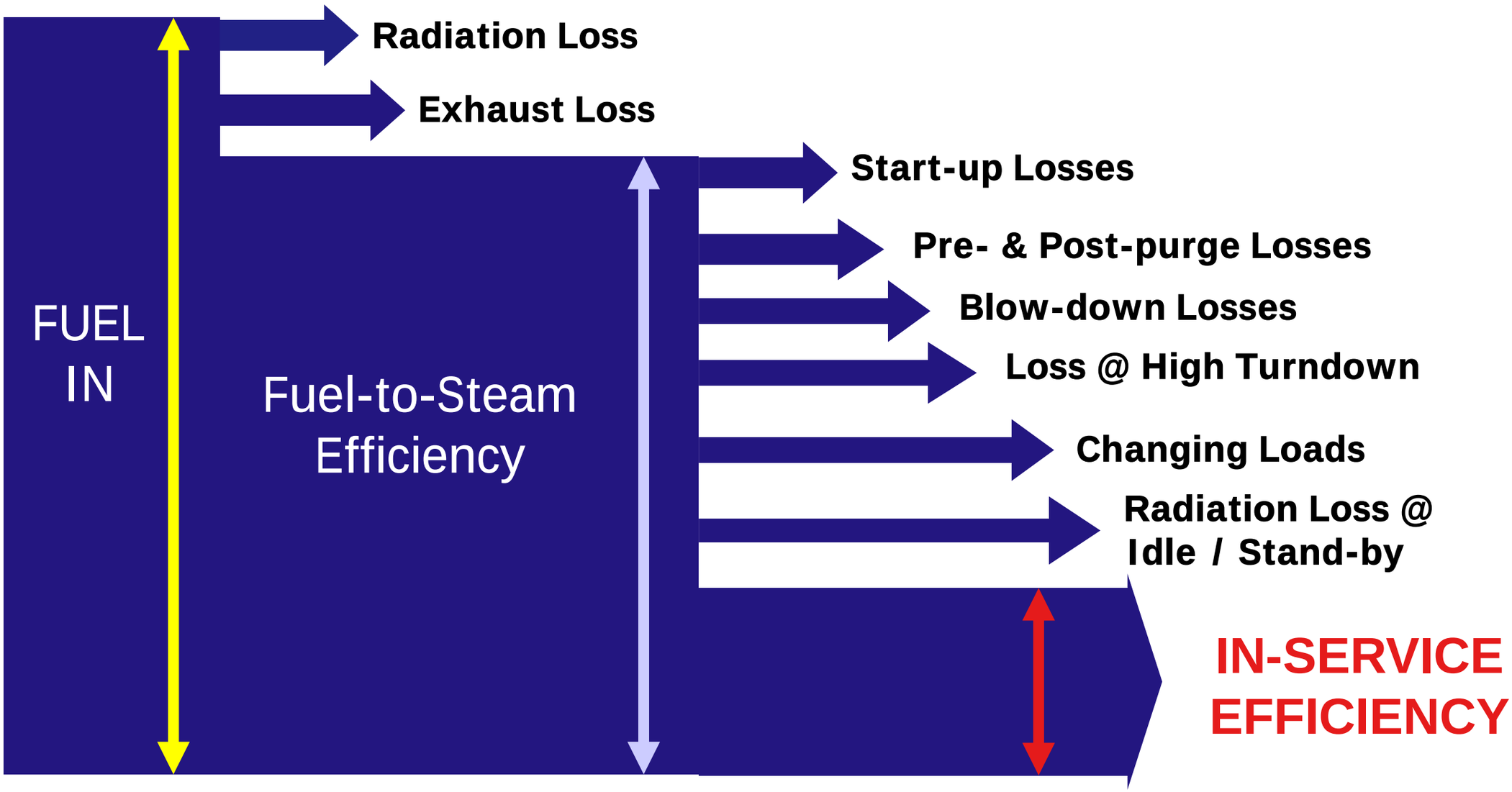




Smaller Boiler

Understanding Boiler Efficiency

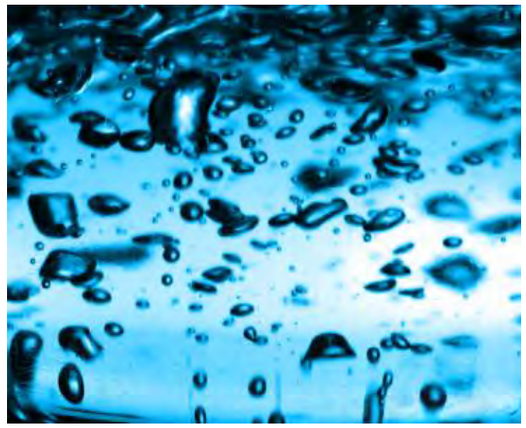
- **Fuel-to-Steam vs. In-Service Efficiency**
- **Understanding operating efficiency = tracking energy losses**



Understanding Boiler Efficiency

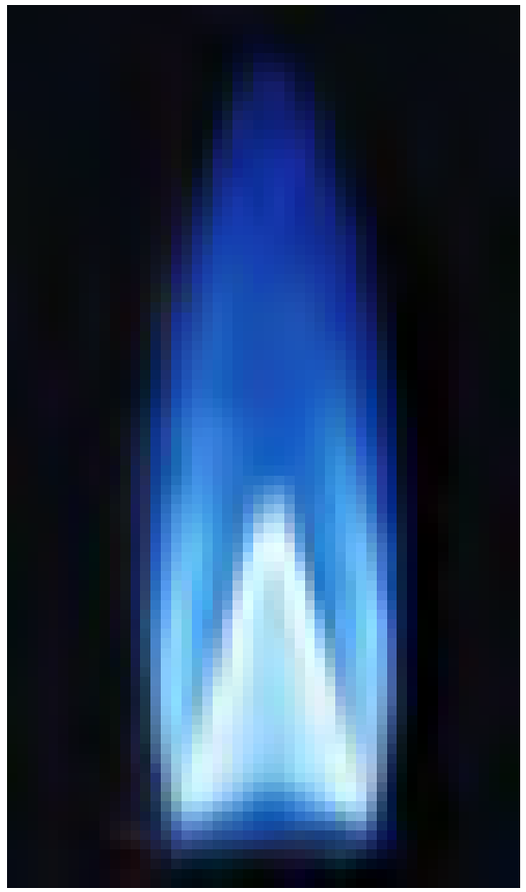
“Combustion Efficiency” (E_c)

- The effectiveness of the burner to ignite the fuel
- Per ANSI Z21.13 test protocol



“Thermal Efficiency” (E_t)

- The effectiveness of heat transfer from the flame to the water
- Per the Hydronics Institute BTS-2000 test protocol
- Recognized by ASHRAE 90.1 standard



“Boiler Efficiency”

- Often substituted for combustion or thermal efficiency

“Fuel-to-Steam Efficiency” (A.K.A. Catalog

Optimized Energy Management via *Modularity*

MIURA

- **Modular design concept:**
- **Each boiler unit acts like a single piston in the overall boiler system**

1000HP boiler system
TDR=1:15
(15 steps of modulation)

Optimized Energy Management via *Modularity*

MIURA

- **Modular design concept:**

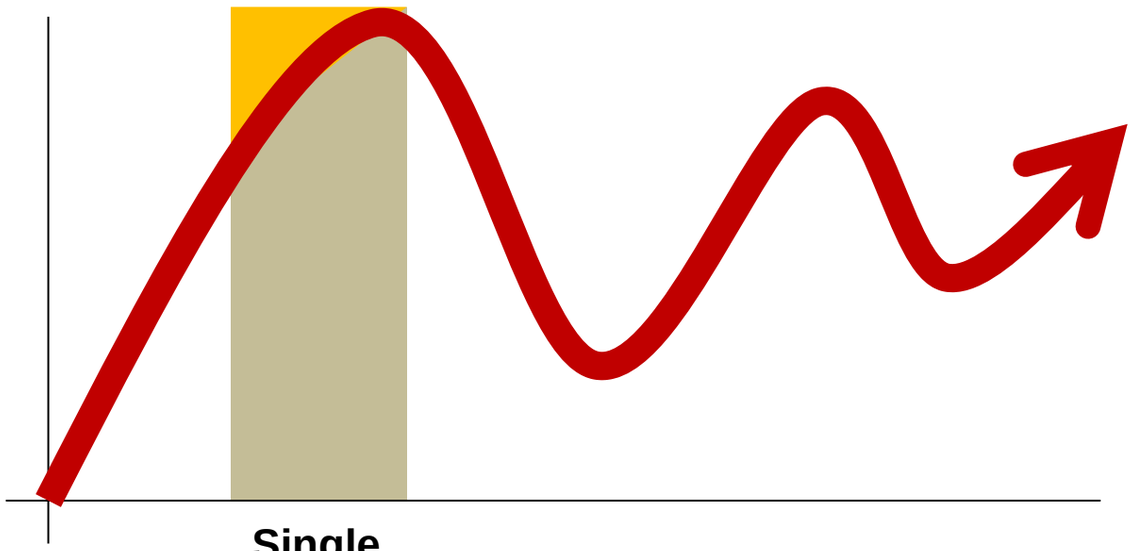
200HP TDR=1:3 Step(H,L) | **200HP TDR=1:3 Step(H,L)** | **200HP TDR=1:3 Step(H,L)** | **200HP TDR=1:3 Step(H,L)** | **200HP TDR=1:3 Step(H,L)**

Managing Energy Load Variability

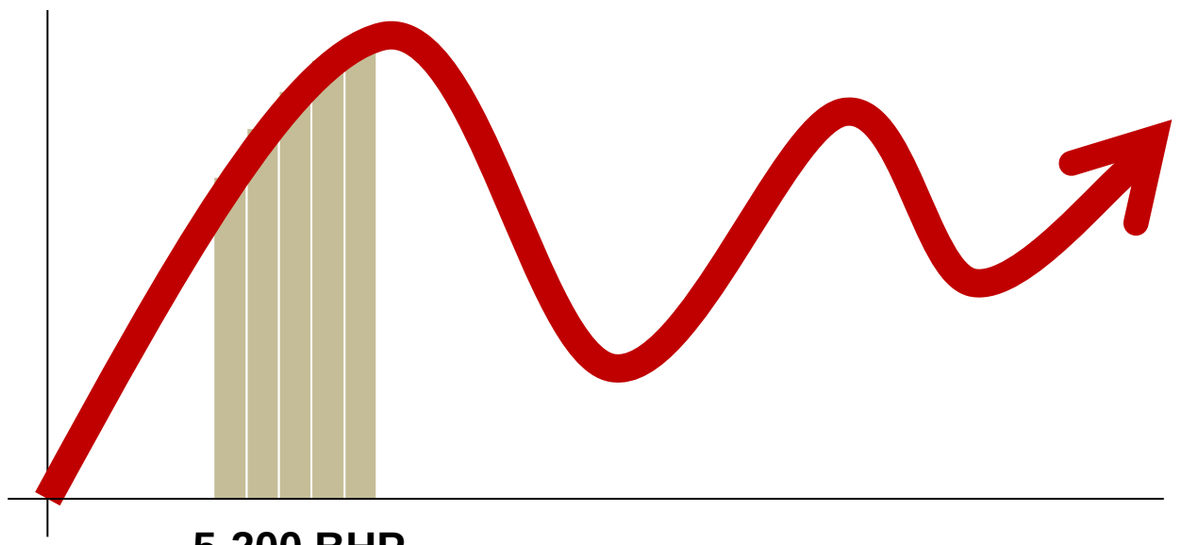
Conventional vs Modular Approach

- **Conventional approach:**
  - Over-commitment of capacity results in over-shooting demand with significant energy losses at load swings

- **Modular approach:**
  - Sub-dividing output & sequentially staging multiple modular boilers enhances energy management via precise load matching



Single
1000 BHP Boiler

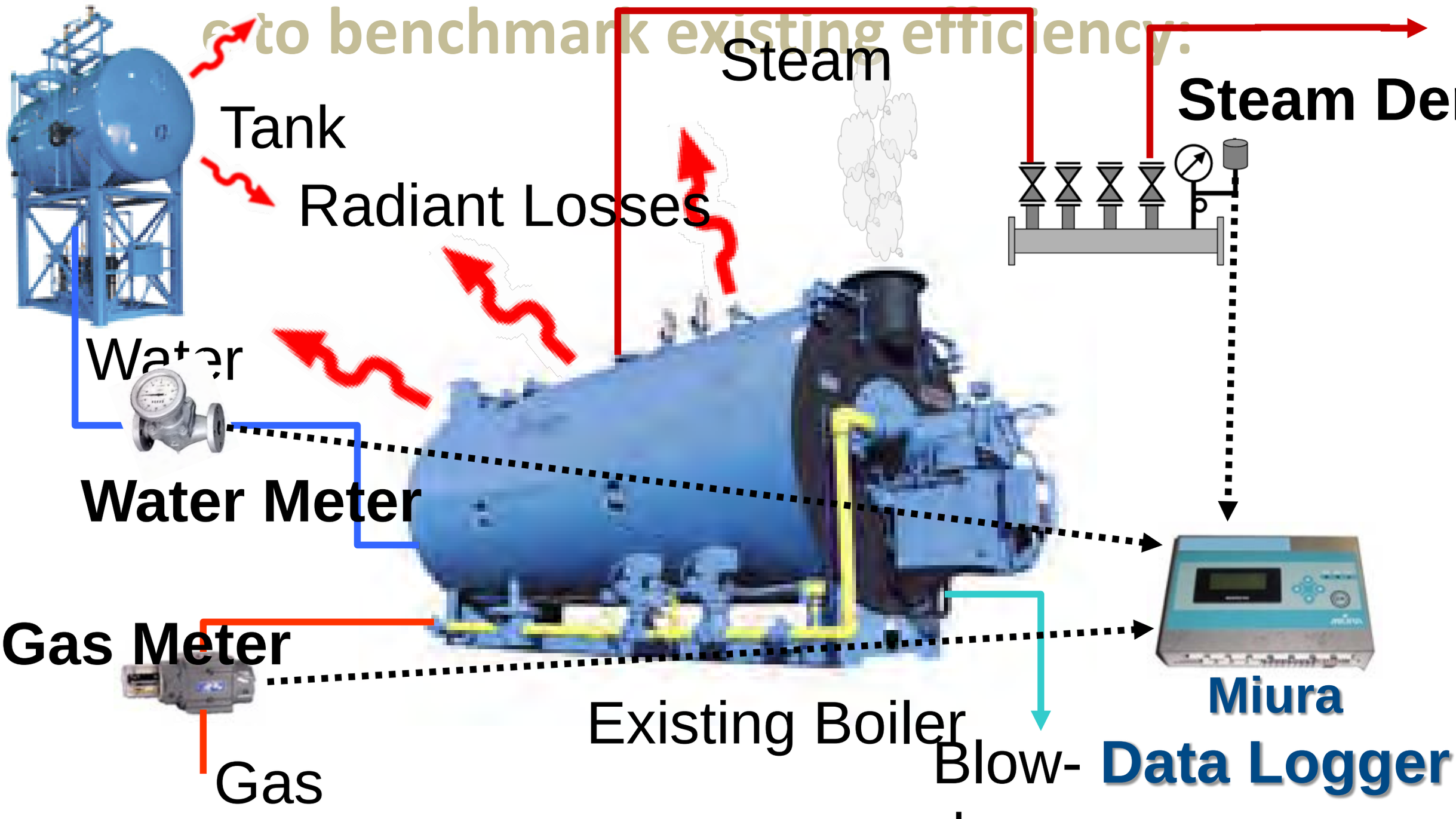


5-200 BHP
Modular Boilers

In Service Efficiency Analysis: *Benchmarking Tools*

MIURA

- **Miura's Data Logger records metered data to benchmark existing efficiency:**



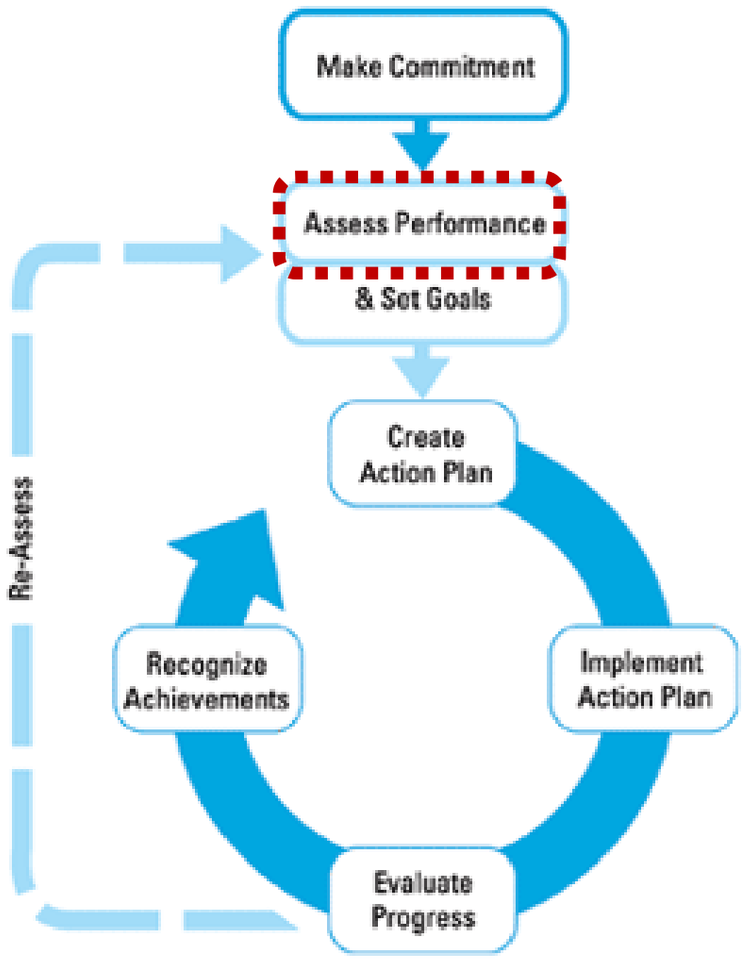
Benchmarking to Save Energy:

In-Service Efficiency (ISE) Study

MIURA

You are not managing what you do not measure…

- **Meter existing equipment & collect data on current consumption, including:**
  - **Gas & water consumption rates**
  - **Gas pressure at the meter**
  - **Gas temperature at the meter**
  - **Feedwater temperature**
  - **Steam pressure**
  - **Blow-down rate**



Courtesy of ENERGY STAR Program Guide

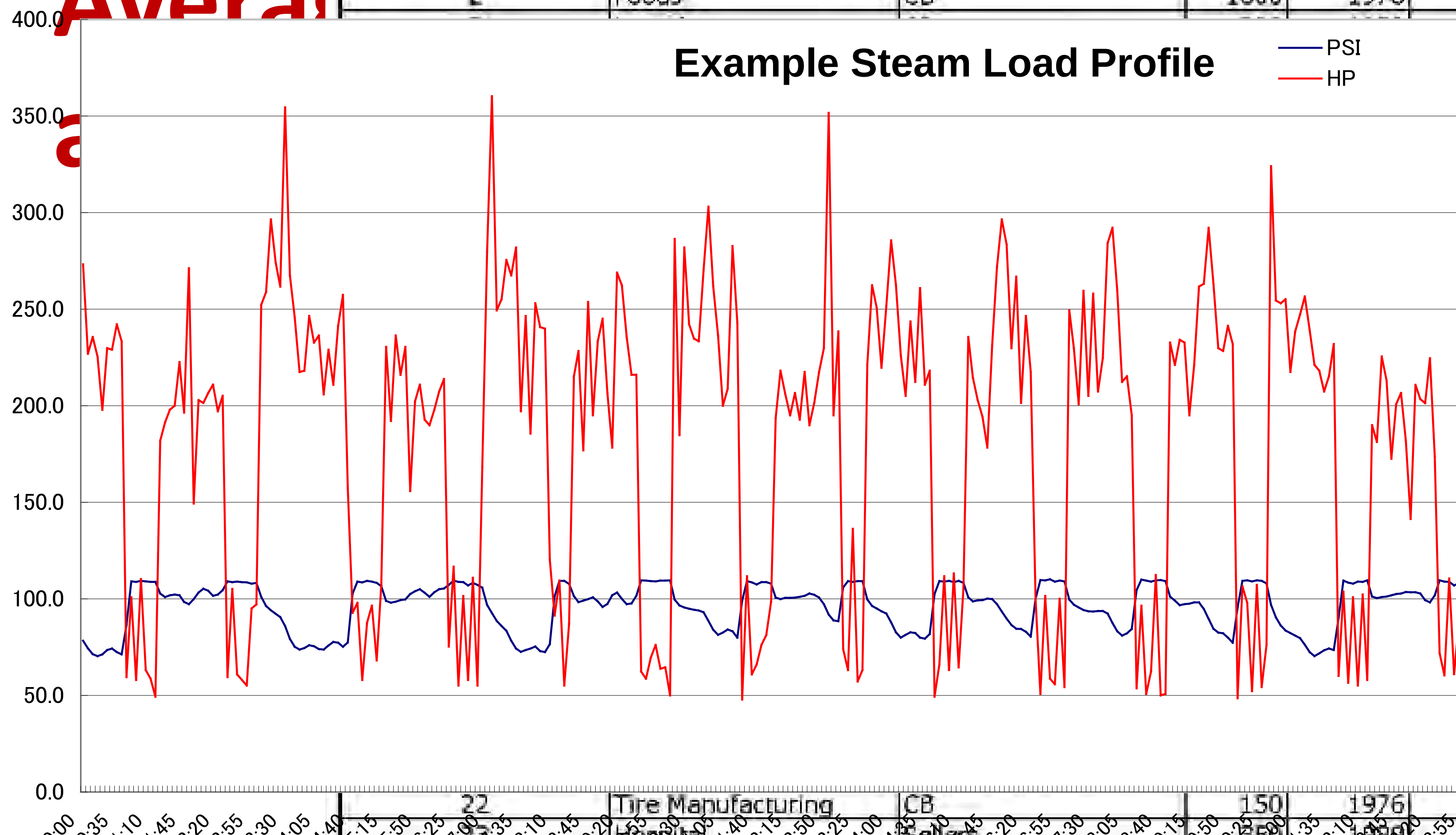
Boiler In-Service Efficiency: *Tracking Results*

- **Benchmarked energy efficiency of 25 boilers via ISE data:**

Results from ISE Studies - Competitor's Boilers (updated 2007-07-30)

Company	Industry	Manufacture	HP	Year	Ave. Load	ISE
1	Chemical					70.8%
2	Foods	CB	1600	1978	17%	73.9%
					43%	70.6%
					19%	47.7%
					18%	61.1%
					68%	70.3%
					11%	47.6%
					29%	47.7%
					45%	48.4%
					48%	69.2%
					62%	86.2%
					30%	64.8%
					8%	42.9%
					49%	72.2%
					32%	80.3%
					26%	65.7%
					32%	70.0%
					19%	59.6%
					34%	70.7%
					8%	64.4%
					21%	64.9%
					19%	86.1%
					77%	69.0%
					30%	64.0%
22	Tire Manufacturing	CB	150	1976	21%	68.9%
23	Hospital	Sellers	350	1985	34%	69.9%
24	Foods	Hurst Hurst	50 50		23%	64.3%
25	Chemical	CB	350		60%	75.9%
	Average:		**365**		**33%**	**66.0%**

- **Average ... 33%**



Steam Cost Calculator:

TCO (Total Cost of Operation) Analysis

- Fuel Cost
- Water Cost
- Sewer Cost
- Electricity Costs
- Chemical Costs
- Service Contract
- O&M Costs
- Future CO_2 Costs
- Projected Lifecycle Costs

Customer's name	Example 1			
Usage			**Reference**	
Boiler HP	400	HP	200	HP
Number of boilers	2	boilers	3	boilers
Average load	25	%	30	%
Operation time	12	hours/day	24	hours/day
	300	days/year	300	days/year

Price for customer			**Reference**	
Water (supply + sewer)	5.8	$/kgal	7.8	$/kgal
Fuel gas (oil)	0.8	$/therm	0.9	$/therm
Electricity	7	C/KWH	6	C/KWH
Chemical	0.80	$/100HP	1.00	$/100HP
Labor charge	2,500	$/month	2,000	$/month
Maintenance contract	10,000	$/y/boiler	6,000	$/y/boiler
Carbon tax	0	$/ton-CO2	12	$/ton-CO2

System information			**Reference**	
Steam pressure	130	PSI	120	PSI
Steam enthalpy	1193.5	btu/lb	1192.4	btu/lb
Blow down ratio	5	%	10	%
Feed water temp	190	F	190	F
In service Efficiency	73	%	75	%
Condensation return	30	%	50	%

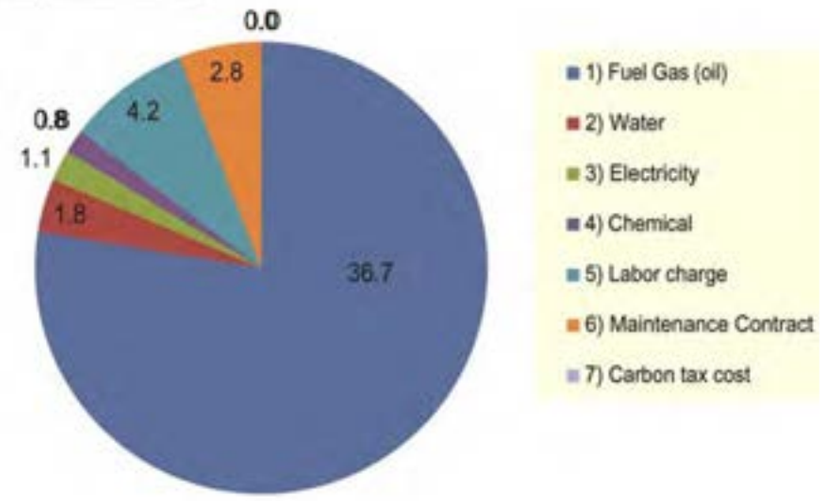
Steam Price per 100 HP

1) Fuel Gas (oil)	36.7	=($/therm)x(3,348,000)/100,000/(ISE)
2) Water	1.8	=($/kgal)x(City water usage)
3) Electricity	1.1	=(C/KWH)x15/100
4) Chemical	0.8	
5) Labor charge	4.2	=($/month)/(HP*average load*hours/m)
6) Maintenance Contract	2.8	=($/year)/(HP*average load*hours/year)
7) Carbon tax cost	0.0	=($/tonCO2)*(3,348,000)/(ISE)/100000/200
Total=	47.3	

Total price for a year

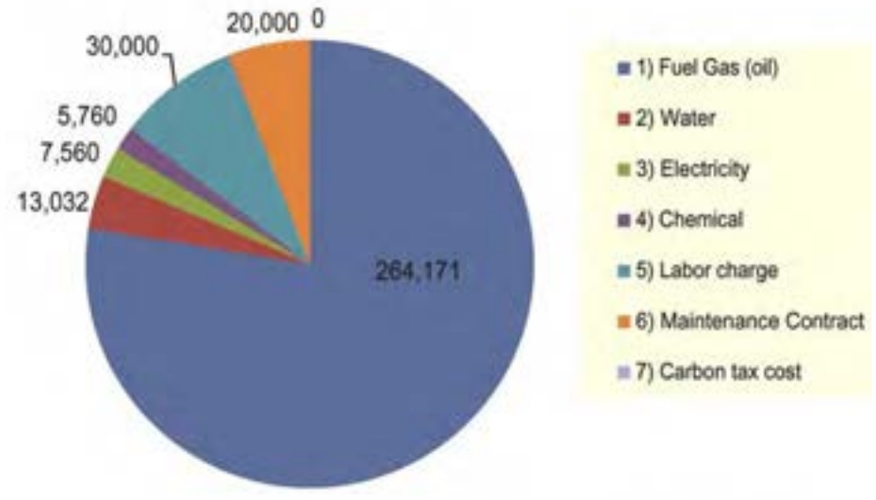
1) Fuel Gas (oil)	264,171	=($/100HP)/(100HP*boilers*average load*hour
2) Water	13,032	=($/100HP)/(100HP*boilers*average load*hour
3) Electricity	7,560	=($/100HP)/(100HP*boilers*average load*hour
4) Chemical	5,760	=($/100HP)/(100HP*boilers*average load*hour
5) Labor charge	30,000	=($/100HP)/(100HP*boilers*average load*hour
6) Maintenance Contract	20,000	=($/100HP)/(100HP*boilers*average load*hour
7) Carbon tax cost	0	=($/100HP)/(100HP*boilers*average load*hour
Total=	340,523	

Steam price per 100HP



TOTAL $ 47.3

Total price for a year



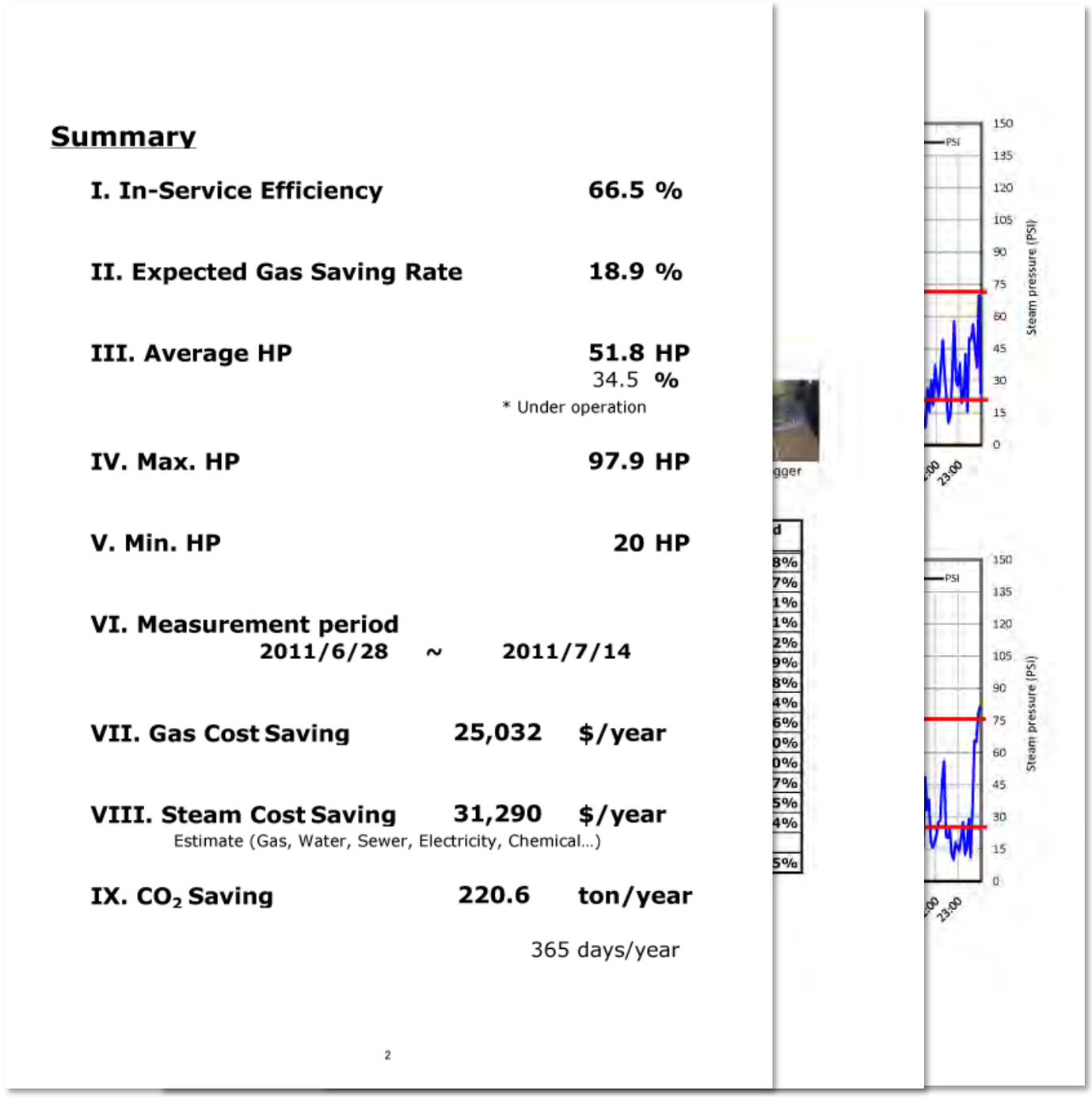
TOTAL $ 340,523

Benchmarking to Save Energy:

In-Service Efficiency (ISE) Study

MIURA

- **Metered ISE study provides detailed load profile illustrating process usage impact on steam demand**
- **Graphing load profile allows for high level of precision in “right**



Summary

I. In-Service Efficiency	**66.5 %**	
II. Expected Gas Saving Rate	**18.9 %**	
III. Average HP	**51.8 HP**	
	34.5 **%**	
	* Under operation	
IV. Max. HP	**97.9 HP**	
V. Min. HP	**20 HP**	
VI. Measurement period		
2011/6/28 ~ 2011/7/14		
VII. Gas Cost Saving	**25,032**	**$/year**
VIII. Steam Cost Saving	**31,290**	**$/year**
Estimate (Gas, Water, Sewer, Electricity, Chemical…)		
IX. CO_2 Saving	**220.6**	**ton/year**

365 days/year

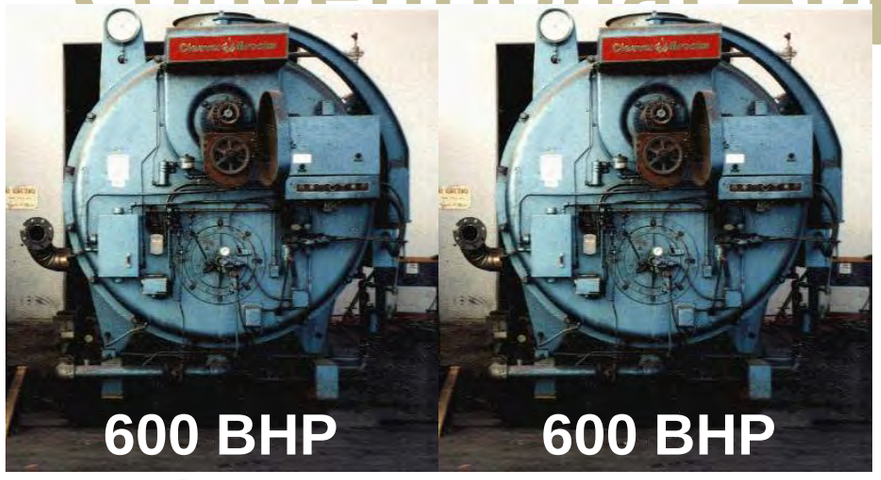
2

Modularity = Flexibility:

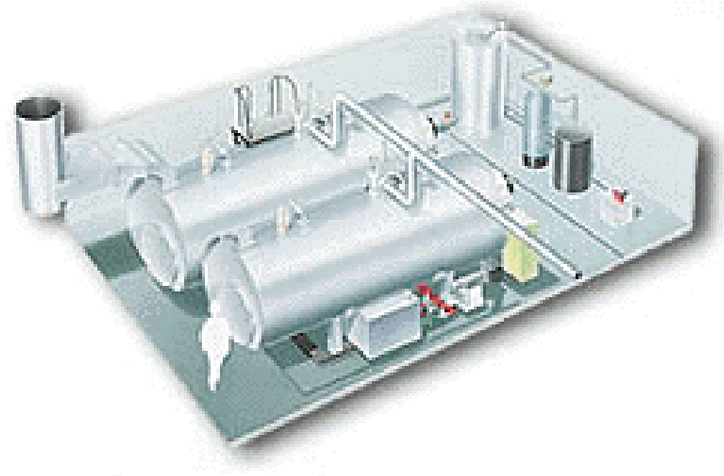
Optimize System N+1

MIURA

- **Conventional Approach: Primary +**



Primary N+1

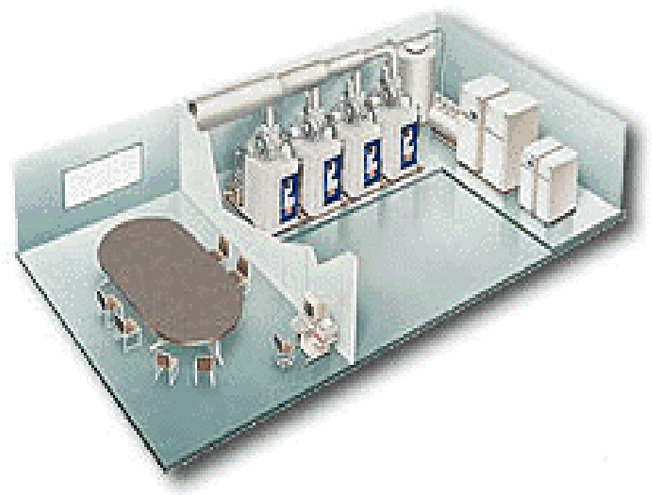


Total Capacity = 1,200 BHP

- **Back-up integrated**

200 BHP 200 BHP 200 BHP 200 BHP

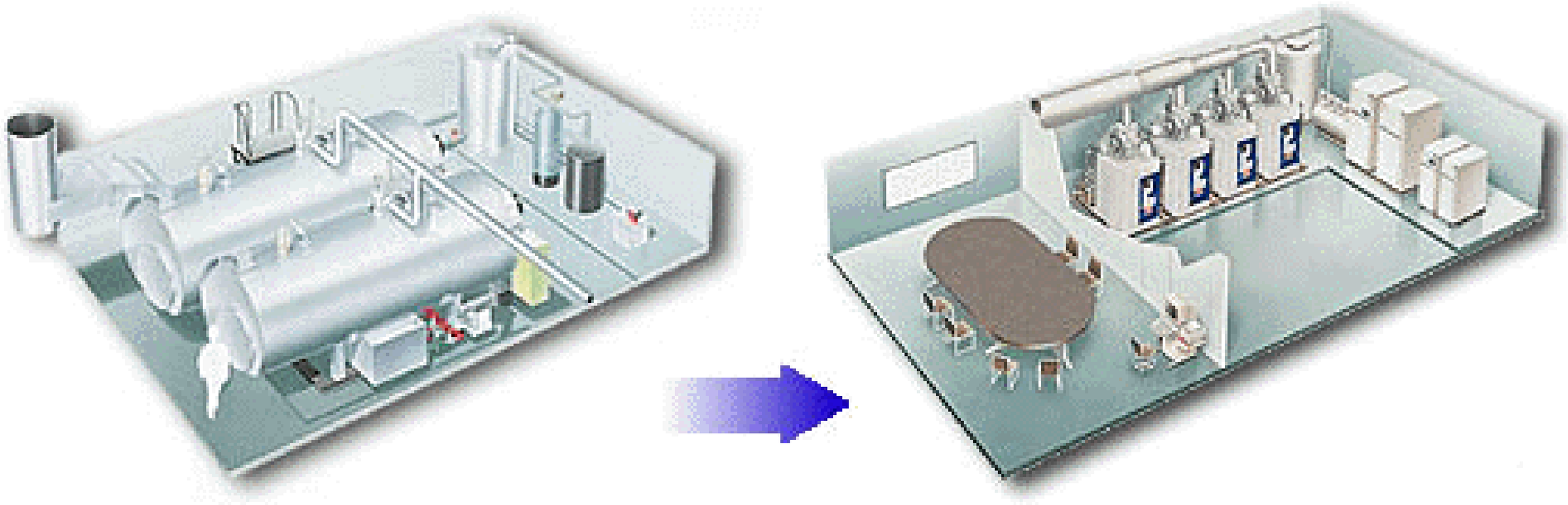
Primary N+1



Total Capacity = 800 BHP

Subtraction:

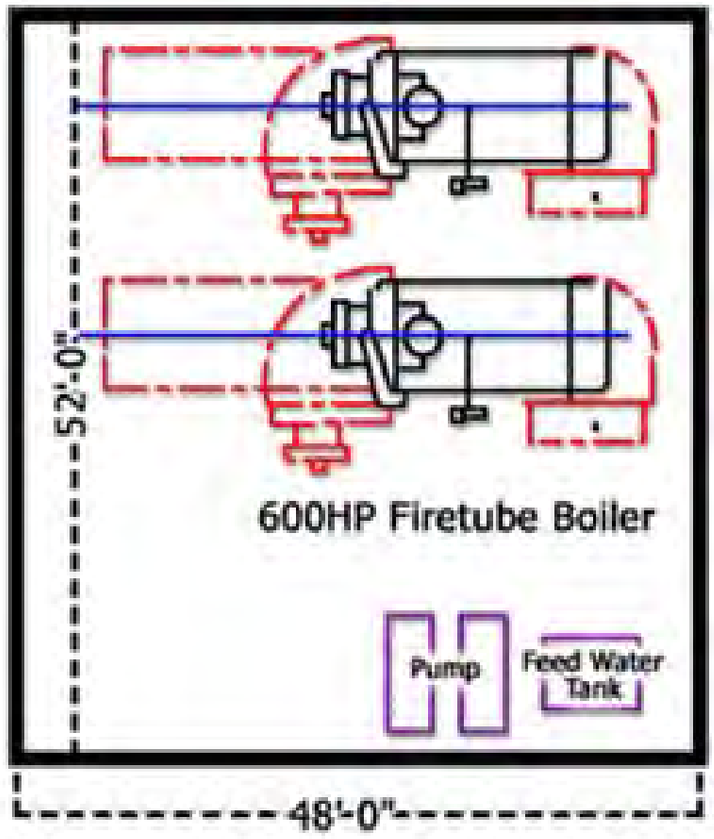
- **The 21st century boiler plant…**
- **Take advantage of freed-up space to:**
  - **Increase capacity**
  - **Incorporate other functions lieu of costly new construction)**
- **Miura has received UL certification for side-clearance modular configuration**



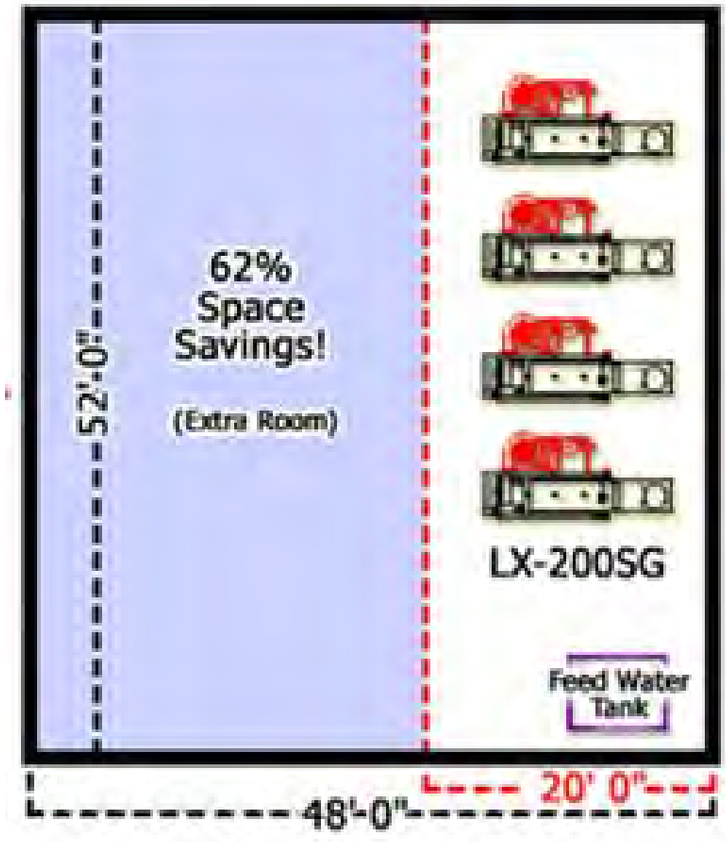
Subtraction:

- **Small boiler footprint (good for point-of-use applications)**
- **No tube-pull space required**
- **<u>Double</u> the boiler output of a typical boiler room (existing facilities)**
- **Reduce required boiler room area by over <u>50%</u> (new construction)**

Without Tube-Pull & Door-Swing Space



Modular Systems Offer Substantial Space Savings



Optimized Energy Management via *Modularity*

MIURA

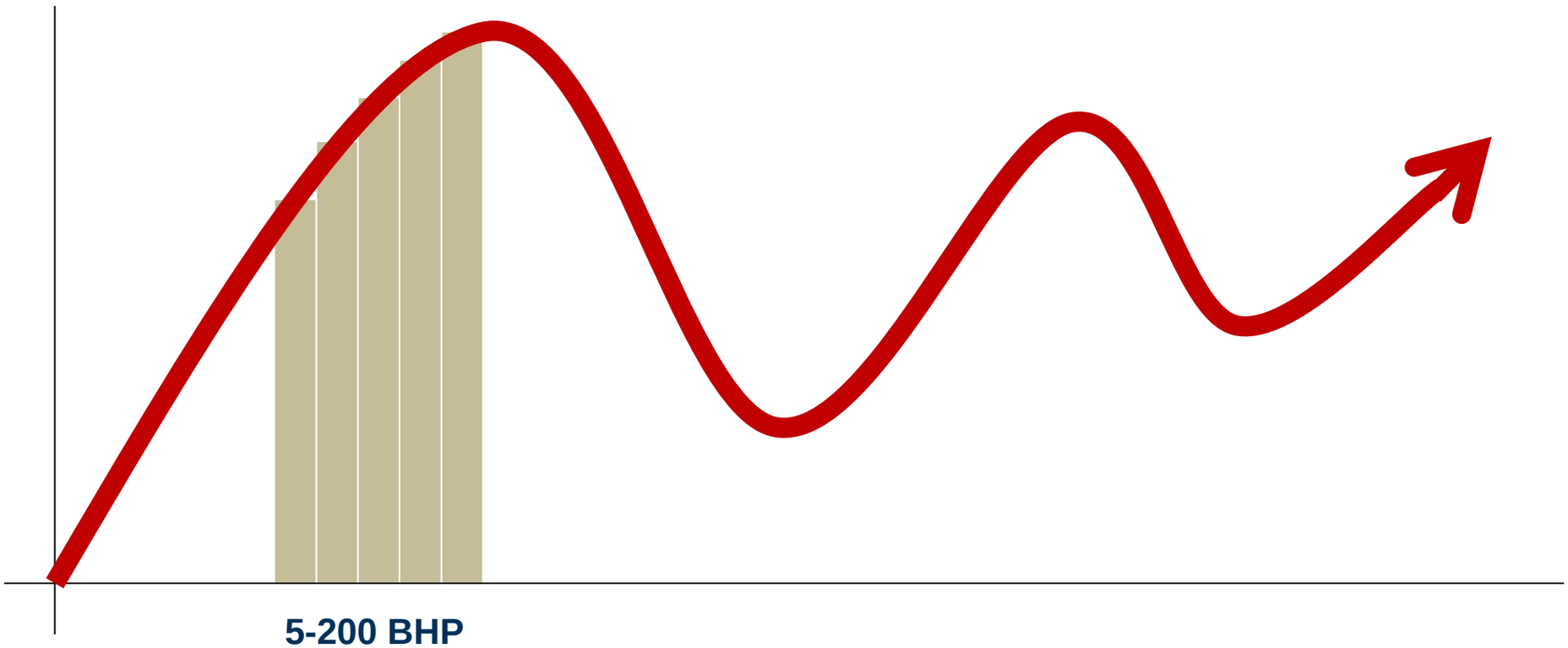
- **Modular design concept:**

200HP TDR=1:3 Step(H,L) | **200HP TDR=1:3 Step(H,L)** | **200HP TDR=1:3 Step(H,L)** | **200HP TDR=1:3 Step(H,L)** | **200HP TDR=1:3 Step(H,L)**

Managing Energy Load Variability

Modular On-Demand Systems

- **Modular on-demand boiler systems reduce energy consumption required to meet variable loads by dividing the output capacity among multiple small units (like gears in a transmission)**
- **Modular systems are designed specifically to meet varying load demands**
- **Result: Significantly reduced energy & emissions at load swings**

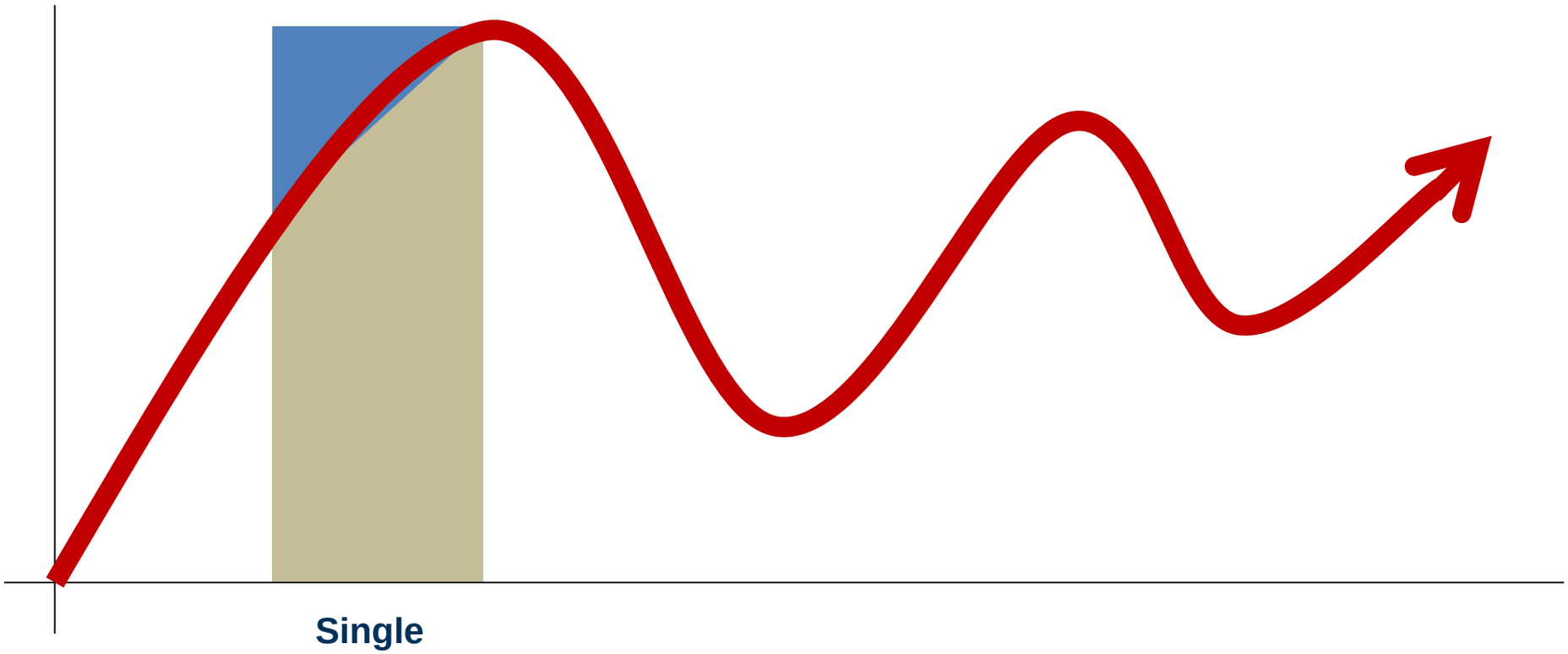


5-200 BHP
Modular Boilers

Managing Energy Load Variability

Conventional Systems

- **Conventional boiler systems expend large amounts of energy to meet variable load conditions**
- **Design limitations of conventional boilers prevent them from efficiently responding to every-changing load demands**
- **Result: Significant wasted energy & emissions at load swings**

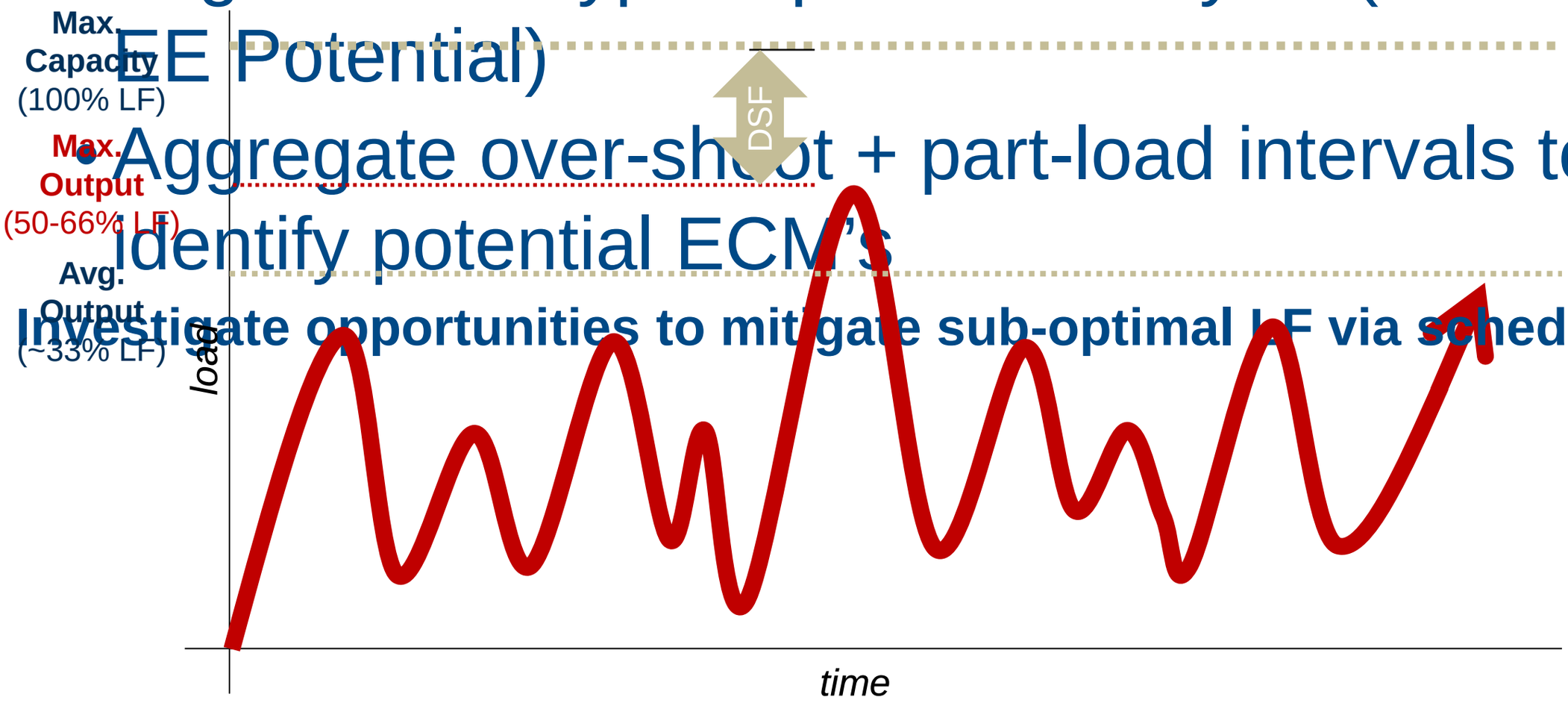


Single 1000 BHP Boiler

Managing Energy Load Variability:

"Right-Sizing" Optimization

- **Understand load profile for typical production cycle**
- **Quantify disparities between utility output & process needs**
  - Utility Design Safety Factor (1.33 – 1.5 ~2% EE Potential)
  - Avg. LF over typical production cycle (LF<60% = EE Potential)
  - Aggregate over-shoot + part-load intervals to identify potential ECM's
- **Investigate opportunities to mitigate sub-optimal LF via scheduling**



http://www1.eere.energy.gov/manufacturing/technical_assistance/m/steam.html#tipsheets

Optimization Areas with Potential Energy Savings:

- Benchmark the Fuel Costs of Thermal Energy **(~1%)**
- Minimize Radiant Losses from Boilers **(1.5-5%)**
- Minimize & Automate Boiler Blow-down **(0.5%-1.5%)**
- Utilize Efficient Burners / Combustion Systems **(2-10%)**
- Minimize Boiler Idling & Short-Cycling Losses **(5-10%)**
- Utilize Feedwater Economizer for Waste Heat Recovery **(1-4%)**
- Utilize Boiler Blow-down Heat Recovery **(0.5–2%)**
- Maintain Clean Water-Side Heat Transfer Surfaces **(0-10%)**
- Implement a Steam Trap Management Program **(0-2.5%)**
- Implement a Steam Leak Program **(0-3%)**

Energy nOptimization Approach:

Process

- **Assess & benchmark current system performance relative to process loads**
- **Maximize heat recovery within system**
- **“Right-size” system relative to optimized heat recovery**
- **Optimize system load matching / management capability for process requirements**

Case Studies

Modular On-Demand Boiler Systems

Engineered for Greater Efficiency, Lower Costs, & Reduced Environmental Impact

Case Study: College / University

University of Arkansas

- **Boiler Upgrade – (6) 300 BHP units replaced (3) existing 600 BHP Kewanee firetube boilers**
- **Summer “Peaking” Plant**
- **Placed into service – March 2008**
- **Reported energy savings = $210,000 / yr**
- **Reported reduced CO_2 emissions = ~1,400 metric tons of CO_2 / yr**

Case Study:

Texas Southern University (Texas)

- **Boiler Upgrade – (4) 200 BHP units**
- **Replaced (3) c.1986 era Firetube boilers**
- **Serving 150-acres / 40 buildings with campus steam heating**
- **Placed into service – 2010**
- **Estimated avg. fuel cost savings =**
  - **~ $400,000 / yr (~ 30% energy savings)**

Case Studies: Beverage Industry

Quaker Oats (Iowa)

- **Boiler Upgrade – (10) LX-300 BHP units**
- **Replacement of coal-fired utility's district steam sold to site**
- **Placed into service: 2010**
- **Estimated annual fuel cost savings: $295,000 / yr (410,000 therms / yr)**
- **Estimated annual reduced CO_2 emissions: 3,600 metric tons CO_2 / yr**

Case Studies: Healthcare

Mercy Medical Center (Iowa)

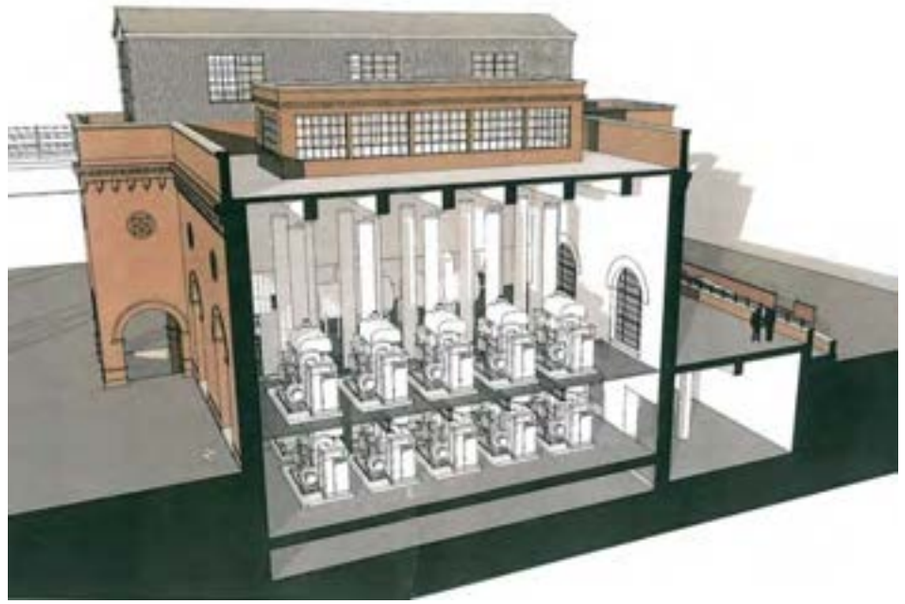
- **Boiler Upgrade –**
  (6) 300 BHP dual-fuel units
- **Placed into service – 2009**
- **Estimated avg. fuel cost savings =**
  $295,000 / yr (454,000 therms / yr)
- **Estimated avg. reduced CO_2 emissions =**
  2,270 metric tons of CO_2 / yr

- "Miura boilers take up less space than typical fire-tube boilers do. We didn't need as much space as other boiler designs would have required, which is good because we're right up against our property line. Thanks to the Miura boilers we have a very nice facility that's not cramped." – *Bob Olberding, Director of Facilities*
- "Miura's "green" technology is essential for complying with emissions standards mandated by Iowa's DNR. In addition to

Case Studies: College / University

Duke University (North Carolina)

- **Boiler Upgrade – (15) 300 BHP units**
- **Replacement of Coal-burning Plant**



- **LEED-Gold Historic Building Restoration**
- **Placed into service – February 2010**
- **Estimated avg. reduced CO_2 emissions = ~50,000 metric tons of CO_2 / yr.**

- Miura's technology provides a significant reduction in the energy

Case Study: College / University

Baylor College of Medicine (Texas)

- **Boiler Upgrade – (3) LX100 BHP Units**
- **Placed into service – 2013**
- **Energy Savings – Jan. 2013 vs. Jan. 2014: 42%**
- **Estimated annual avg. fuel cost savings: TBD**

- **Estimated annual avg. reduced CO_2: TBD**

- "The mechanical advantages of Miura boilers are a big part of our solution," explains Troy Jensen, Corporate Energy Manager for Intermountain Healthcare. "Our system goes beyond simply buying and installing Miura boilers.. I can use my iPad to cycle the boilers, turn them on and off, switch them around, and change their pressure set points." – *Troy Jensen*

- "A comparison of Jan.'13 vs. Jan.'14 NG consumption has shown a 42% decrease following Miura boiler installation." – *Troy Jensen*

Case Studies: Chemical Industry

Fuji-Hunt Chemicals (Tennessee)

- **Boiler Upgrade – (2) EX-200 BHP units**
- **Placed into service: 2011**
- **Actual System Efficiency Improvement:**
  +24%

- Estimated annual fuel cost savings: **$165,000 / yr (370,000 therms / yr)**
- Estimated annual O&M cost savings: **$107,000 / yr**
- Project Simple Pay-back: **1.85 yrs**
- **Estimated annual reduced CO2 emissions:**

Potential Applications:

- **Optimized energy management of process heating applications with sharp load swings (via centralized or point-of-use configuration)**
- **On-demand peaking capacity for “gaps” (cogen, residual heating loads, etc.) and/or low-load periods**
- **On-demand N+1 back-up capacity to eliminate perpetual idling conventional back-up system**

Questions:

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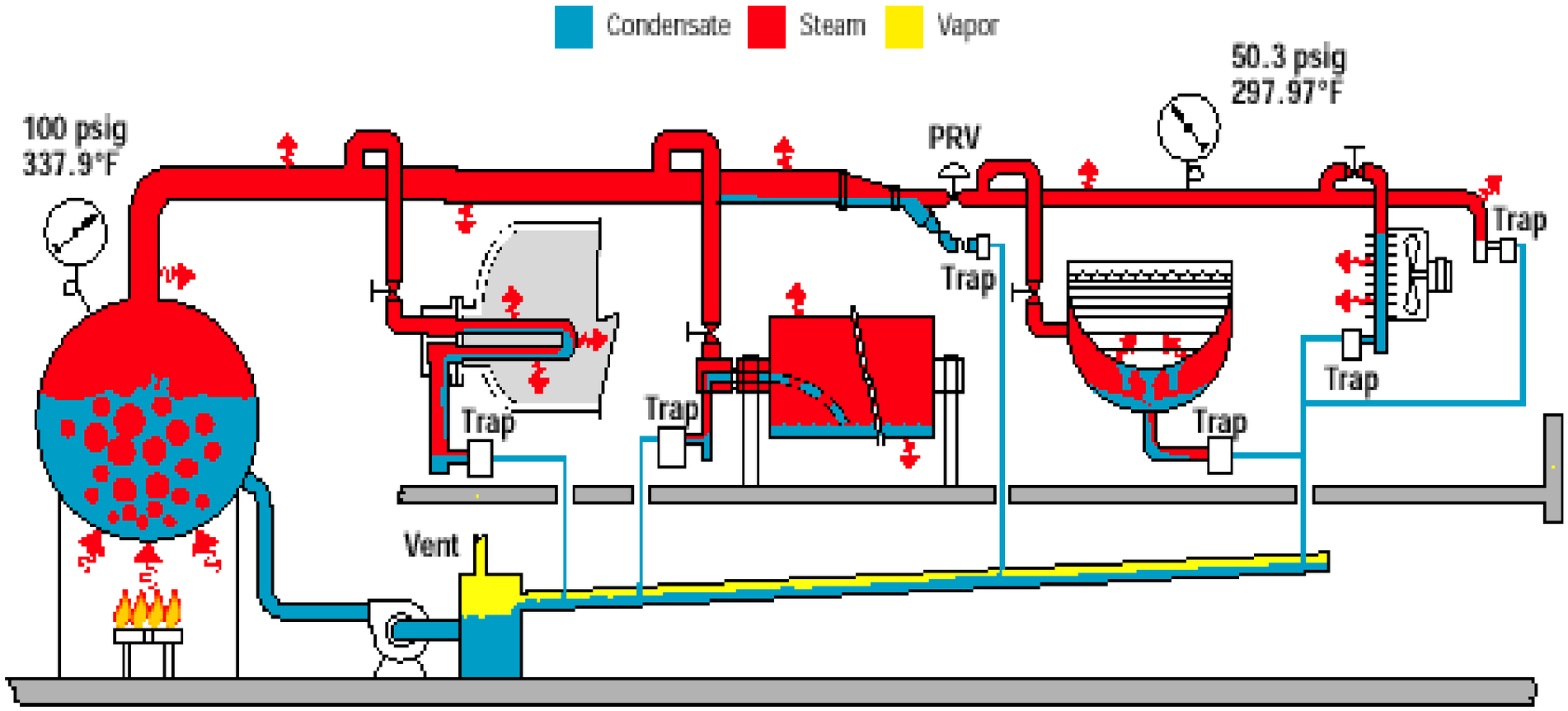
2014

Energy Efficiency Program for Business

Greg Merlo
Merlo Energy

STEAM TRAPS

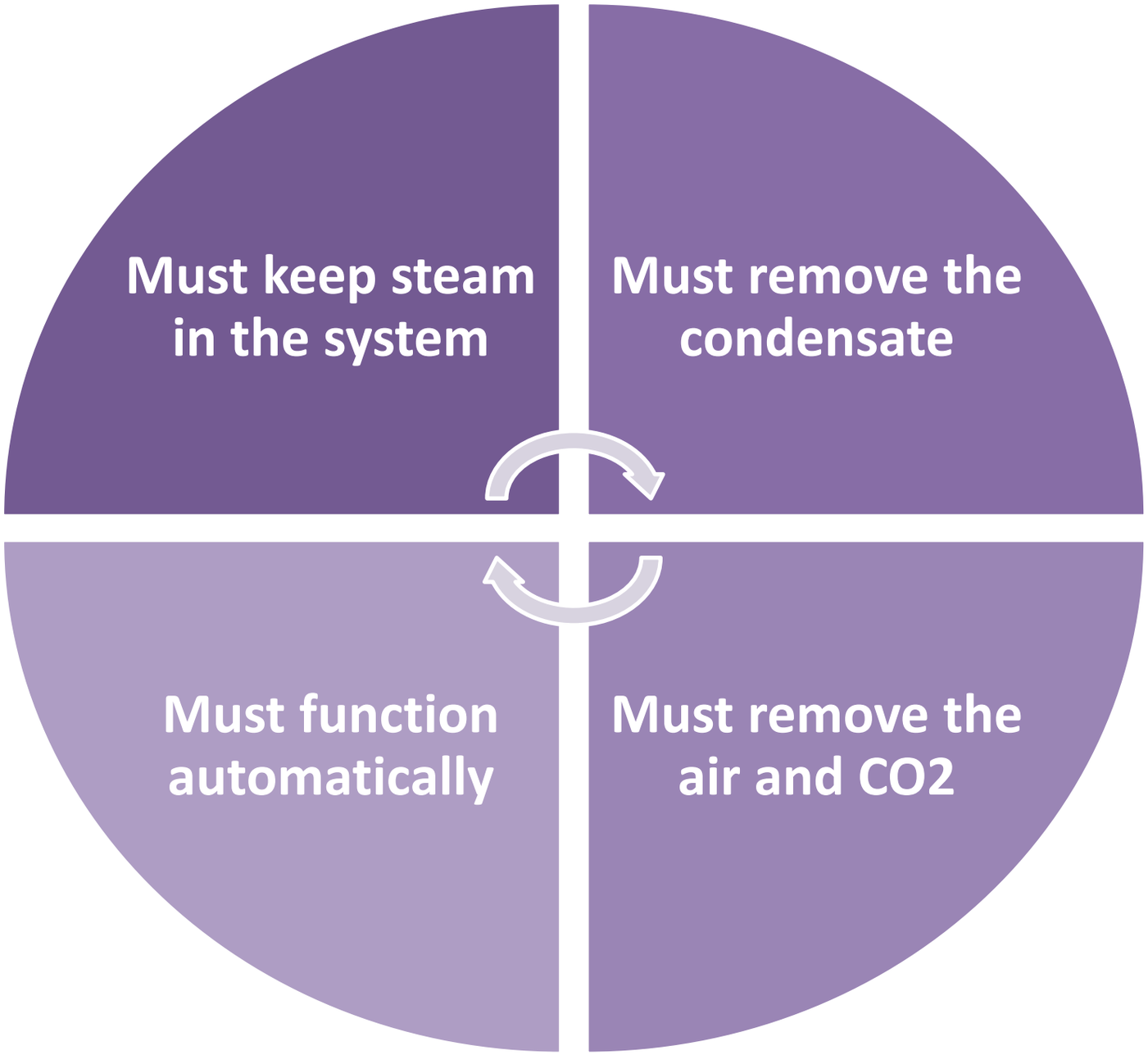


UM Dearborn

April 3, 2014

MERLO ENERGY
Smith Instrument | J.O. Galloup Company

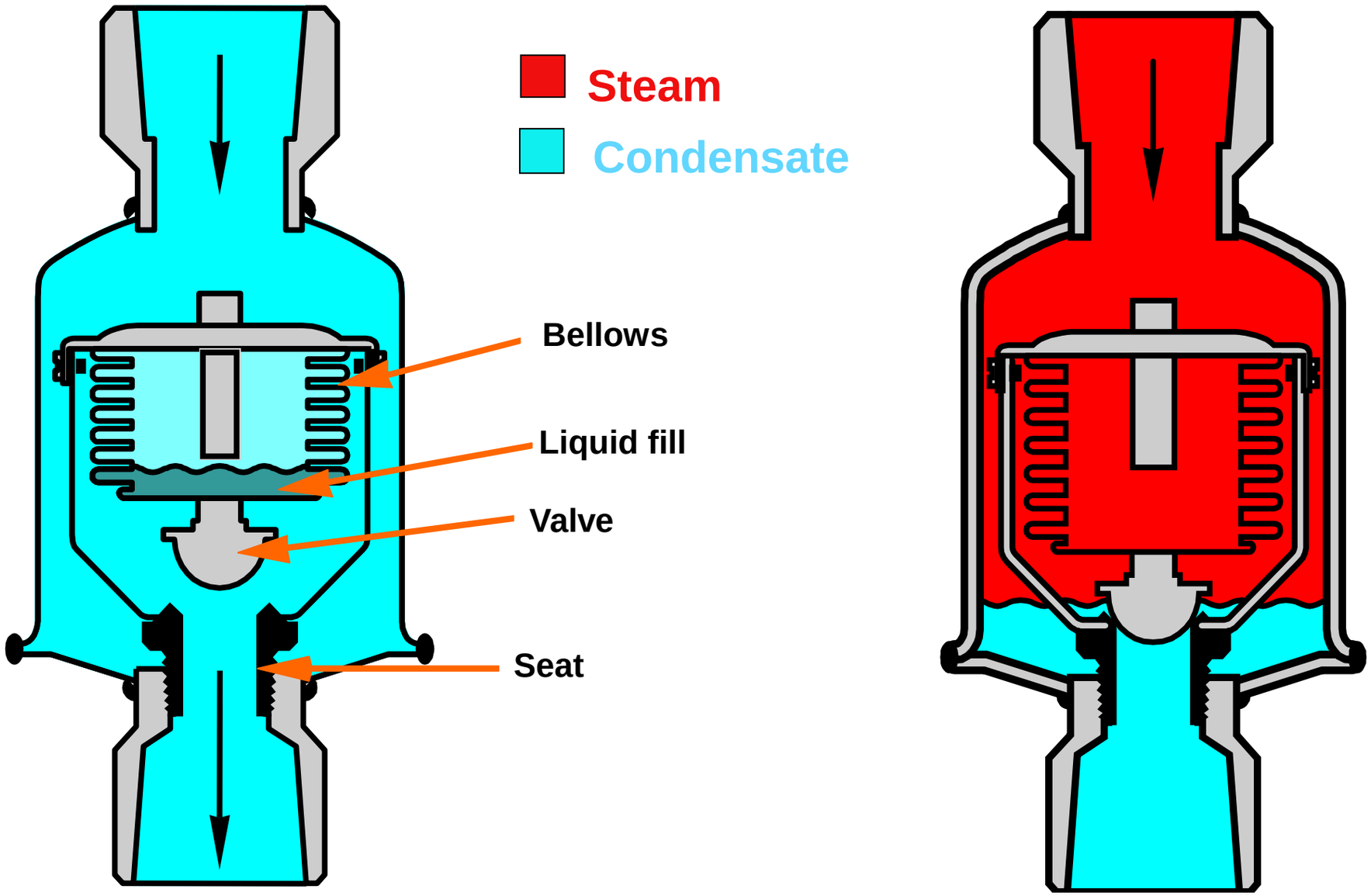
ALL STEAM TRAPS HAVE 4 FUNCTIONS



TYPES OF STEAM TRAPS

1. THERMOSTATIC
2. FLOAT & THERMOSTATIC
3. INVERTED BUCKET
4. DISC / THERMODYNAMIC

THERMOSTATIC



Thermostatic Steam Trap

Advantages

- Ability to handle start-up air loads
- Performance on very light loads

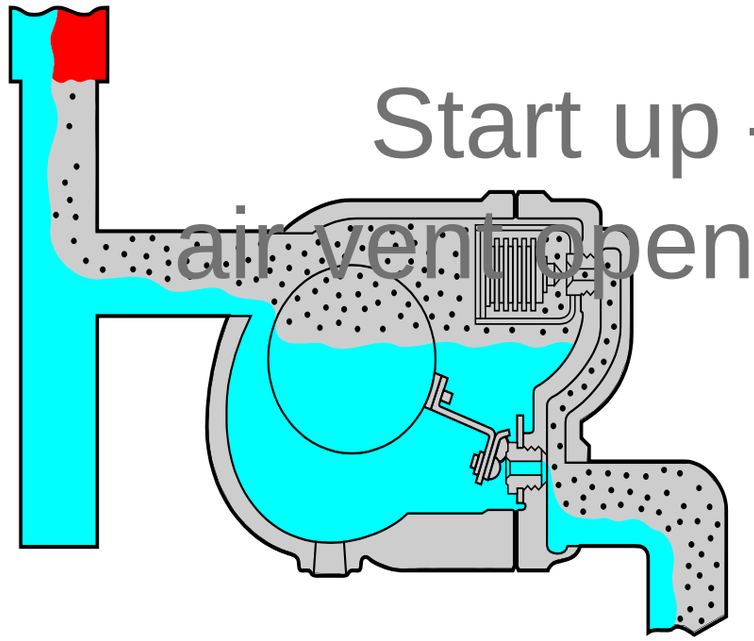
Note: Trap frequently utilized as an air vent

  - Fails open or closed

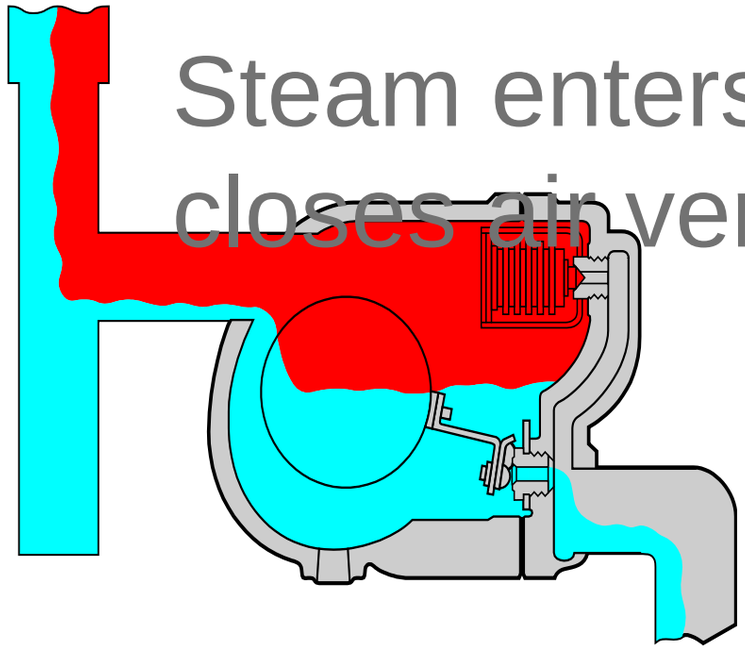
Disadvantage

- Poor resistance to
- Poor handling of
- Slow response to
- Does not vent air temperature

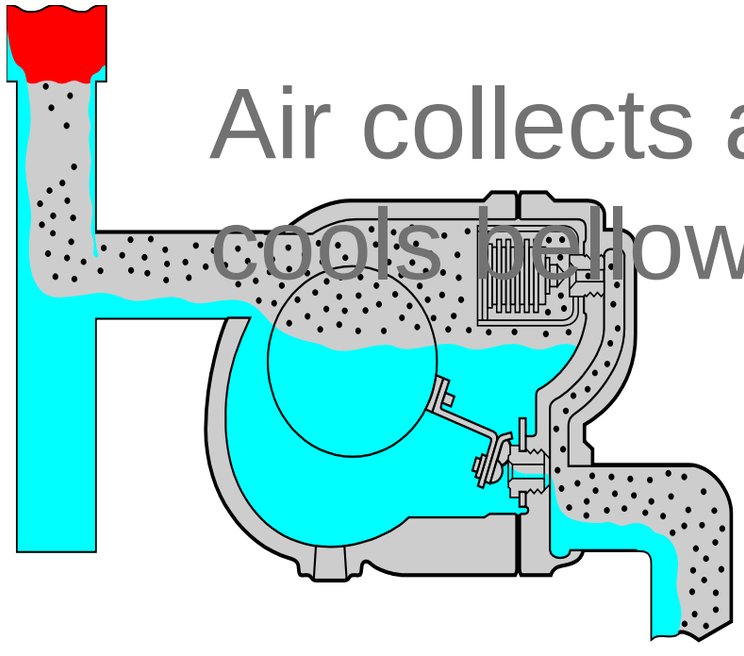
FLOAT & THERMOSTATIC



Start up – air vent open



Steam enters trap - closes air vent



Air collects at top – cools bellows

F&T Steam Trap

Advantages

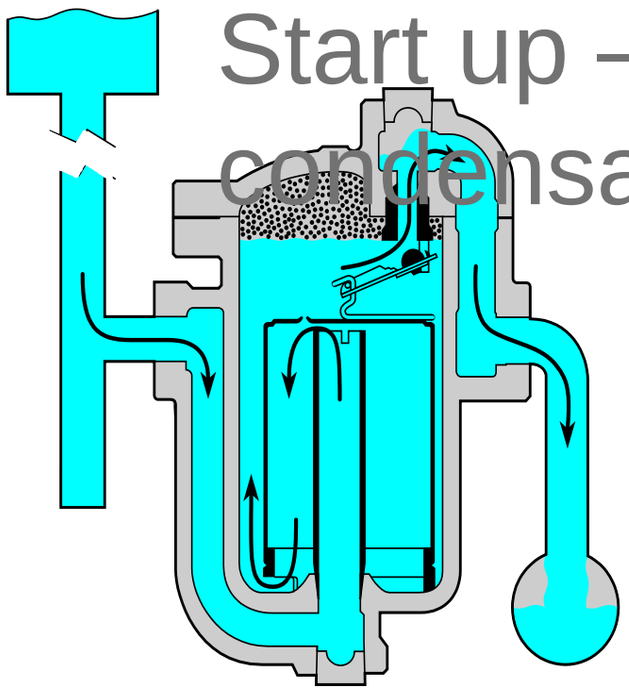
- Ability to handle air during startup
- Ability to vent air a very low pressure (1/4 psig)
- Excellent performance on very light loads

Disadvantag

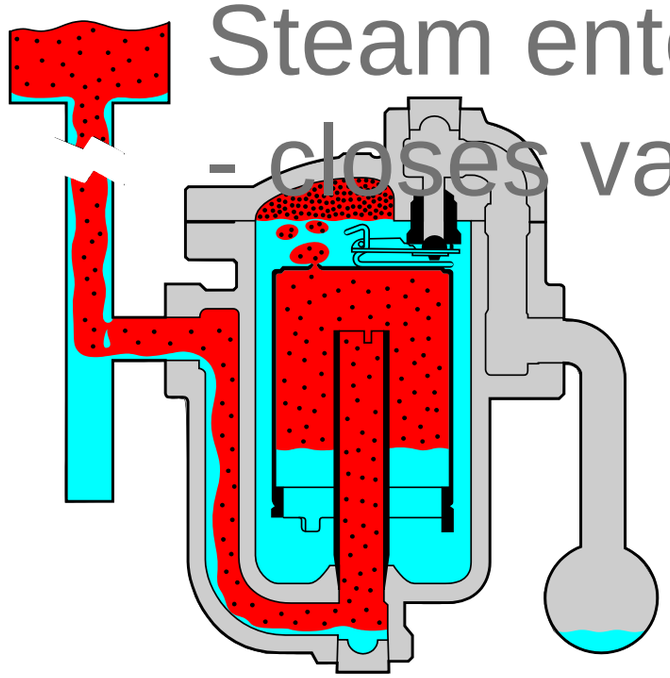
- Poor resistance to
- Inability to handle
- Poor handling of
  - Float Fails Clos
  - Air Vent Oper

INVERTED BUCKET

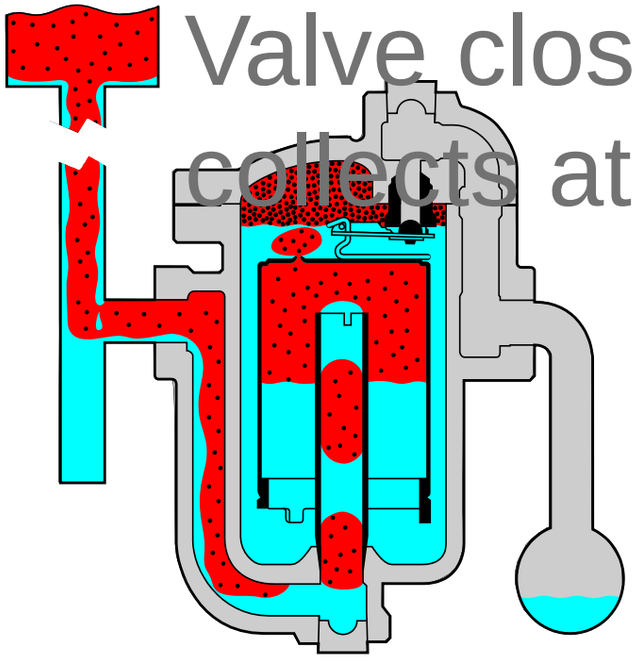
Start up – condensate



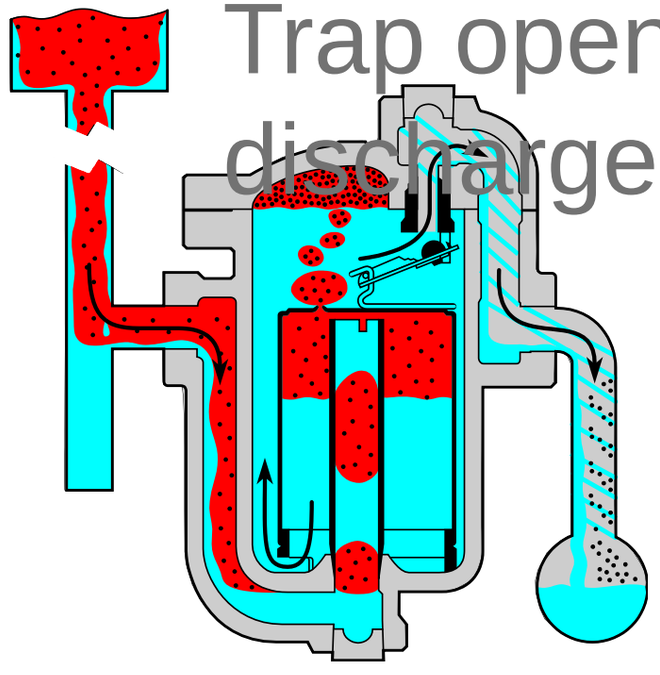
Steam enters trap - closes valve



Valve closed - air collects at top



Trap opens discharges air/cond



Inverted Bucket Steam Trap

Advantages

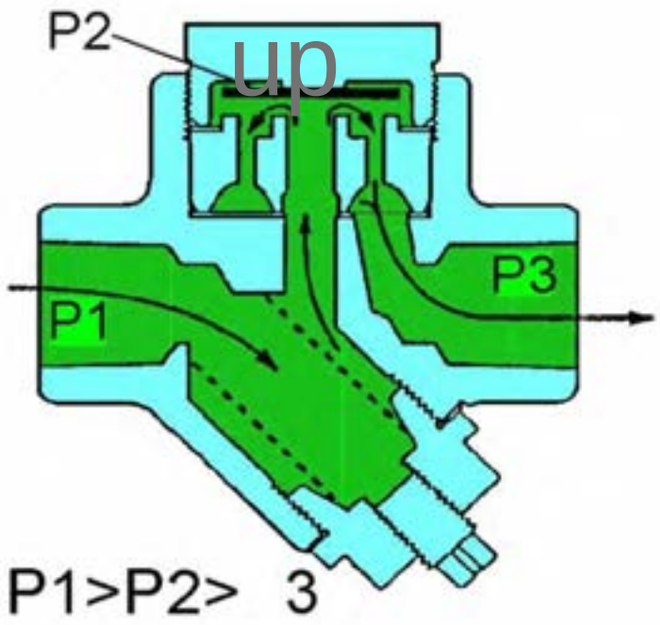
- Energy Conservation
- Ability to handle dirt
- Resistance to Wear
- Resistance to Hydraulic Shock
- Vents air and CO2 at steam temperature
- Ability to Purge System
- Excellent performance on light load
  - Fails Open

Disadvantages

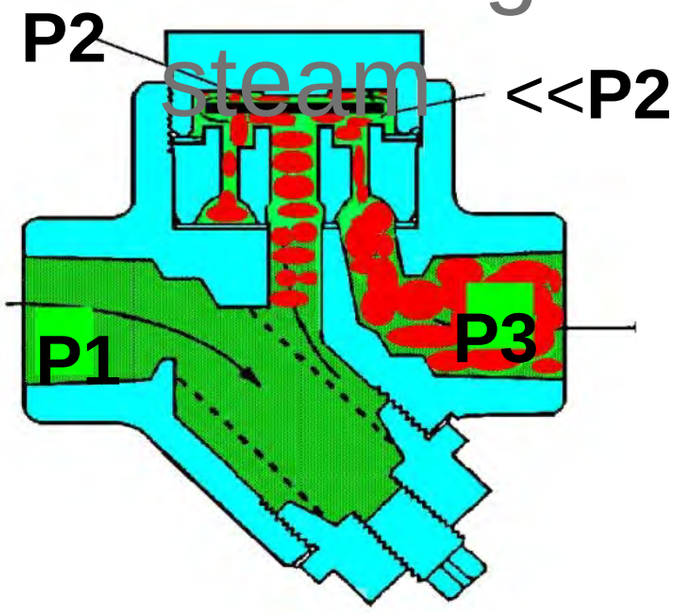
- Inability to vent air at very low pressures - (1/4 psig)
- Slow to vent air during start up
- Can loose its prime and fail open if grossly oversized

THERMODYNAMIC / DISC TRAP

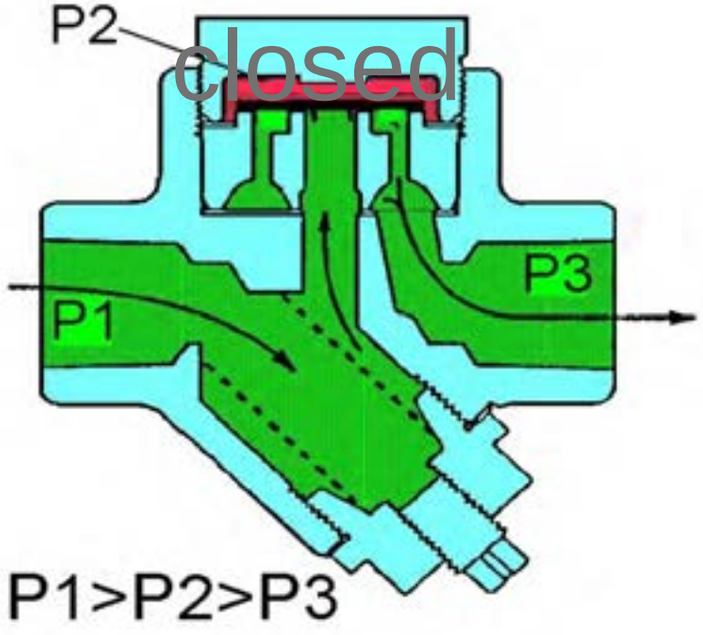
Start up



Flashing steam



Valve closed



Thermodynamic Traps

- Modulation – Fair
- Backpressure - Poor
- Dirt - Poor
- Wear - Poor
- Water Hammer - Good
- Freezing - Good

TRAP SELECTION

SELECT THE RIGHT TRAP FOR THE APPLICATION

Characteristics	Inverted Bucket	F & T	Disc	Thermostatic
Method of Operation	Intermittent	Continuous	Intermittent	Intermittent
Energy Conservation (Time in Service)	Excellent	Good	Poor	Fair
Corrosion Resistance	Excellent	Good	Poor	Fair
Resistance to Hydraulic Shock	Excellent	Poor	Excellent	Poor
Vents air and CO_2 at steam temperature	Yes	No	No	No
Operation against back pressure	Excellent	Excellent	Poor	Excellent
Resistance to damage against freezing	Good	Poor	Good	Good
Performance on very light loads	Excellent	Excellent	Poor	Excellent
Ability to handle dirt	Excellent	Poor	Poor	Fair
Mechanical failure (Open-Closed)	Open	Closed	Open	—

Steam Main Condensing Loads

(Insulation at 75% Efficient)

Cond. in Insulated Pipes at 70°F

Pressure, psig		15	30	60	125	180
Pipe Size (in)	sq ft per Lineal ft	Pounds of Condensate				
1	.344	.05	.06	.07	.10	.12
1¼	.434	.06	.07	.09	.12	.14
1½	**.497**	**.07**	**.08**	**.10**	**.14**	**.16**
2	.622	.08	.10	.13	.17	.20
2½	.753	.10	.12	.15	.20	.24
3	**.916**	**.12**	**.14**	**.18**	**.24**	**.28**
3½	1.047	.13	.16	.20	.27	.32
4	1.178	.15	.18	.22	.30	.36
5	**1.456**	**.18**	**.22**	**.27**	**.37**	**.44**
6	1.735	.20	.25	.32	.44	.51
8	2.260	.27	.32	.41	.55	.66
10	**2.810**	**.32**	**.39**	**.51**	**.68**	**.80**
12	3.340	.38	.46	.58	.80	.92
14	3.670	.42	.51	.65	.87	1.03
16	**4.200**	**.47**	**.57**	**.74**	**.99**	**1.19**
18	4.710	.53	.64	.85	1.11	1.31
20	5.250	.58	.71	.91	1.23	1.45
24	**6.280**	**.68**	**.84**	**1.09**	**1.45**	**1.71**

Warm up load at 70°F

Steam Pressure, psig		2	15	30	60	125
Pipe Size (in)	wt of Pipe per ft (lbs)	Pounds of Water Per Lineal				
1	1.69	.030	.037	.043	.051	.063
1¼	2.27	.040	.050	.057	.068	.085
1½	**2.72**	**.048**	**.059**	**.069**	**.082**	**.101**
2	3.65	.065	.080	.092	.110	.136
2½	5.79	.104	.126	.146	.174	.215
3	**7.57**	**.133**	**.165**	**.190**	**.227**	**.282**
3½	9.11	.162	.198	.229	.273	.339
4	10.79	.190	.234	.271	.323	.400
5	**14.62**	**.258**	**.352**	**.406**	**.439**	**.544**
6	18.97	.335	.413	.476	.569	.705
8	28.55	.504	.620	.720	.860	1.060
10	**40.48**	**.714**	**.880**	**1.020**	**1.210**	**1.500**
12	53.60	.945	1.170	1.350	1.610	2.000
14	63.00	1.110	1.370	1.580	1.890	2.340
16	**83.00**	**1.460**	**1.810**	**2.080**	**2.490**	**3.080**
18	105.00	1.850	2.280	2.630	3.150	3.900
20	123.00	2.170	2.680	3.080	3.690	4.570
24	**171.00**	**3.020**	**3.720**	**4.290**	**5.130**	**6.350**

Energy and $$ Losses when Steam Traps Fail

Orifice Diameter =	0.250	1/4" orf				
Steam PSIG =	15					
			Dry Steam Loss =		75	#/hr
Steam Loss			Dollars Lost at		$10.00	/1000#/hr
			Per Hour	Per Day	Per Mo	Per Yr
Drip =	37	#/hr	$0.37	$9.00	$269.88	$3,238.58
Coil =	19	#/hr	$0.19	$4.50	$134.94	$1,619.29
Ht Ex =	19	#/hr	$0.19	$4.50	$134.94	$1,619.29

Orifice Diameter =	0.125	1/8" orf				
Steam PSIG =	100					
			Dry Steam Loss =		72	#/hr
Steam Loss			Dollars Lost at		$10.00	/1000#/hr
			Per Hour	Per Day	Per Mo	Per Yr
Drip =	36	#/hr	$0.36	$8.69	$260.59	$3,127.13
Coil =	18	#/hr	$0.18	$4.34	$130.30	$1,563.57
Ht Ex =	18	#/hr	$0.18	$4.34	$130.30	$1,563.57

USE

HIGH PRESSURE ORIFICE

ON

LOW PRESSURE DRIP TRAPS

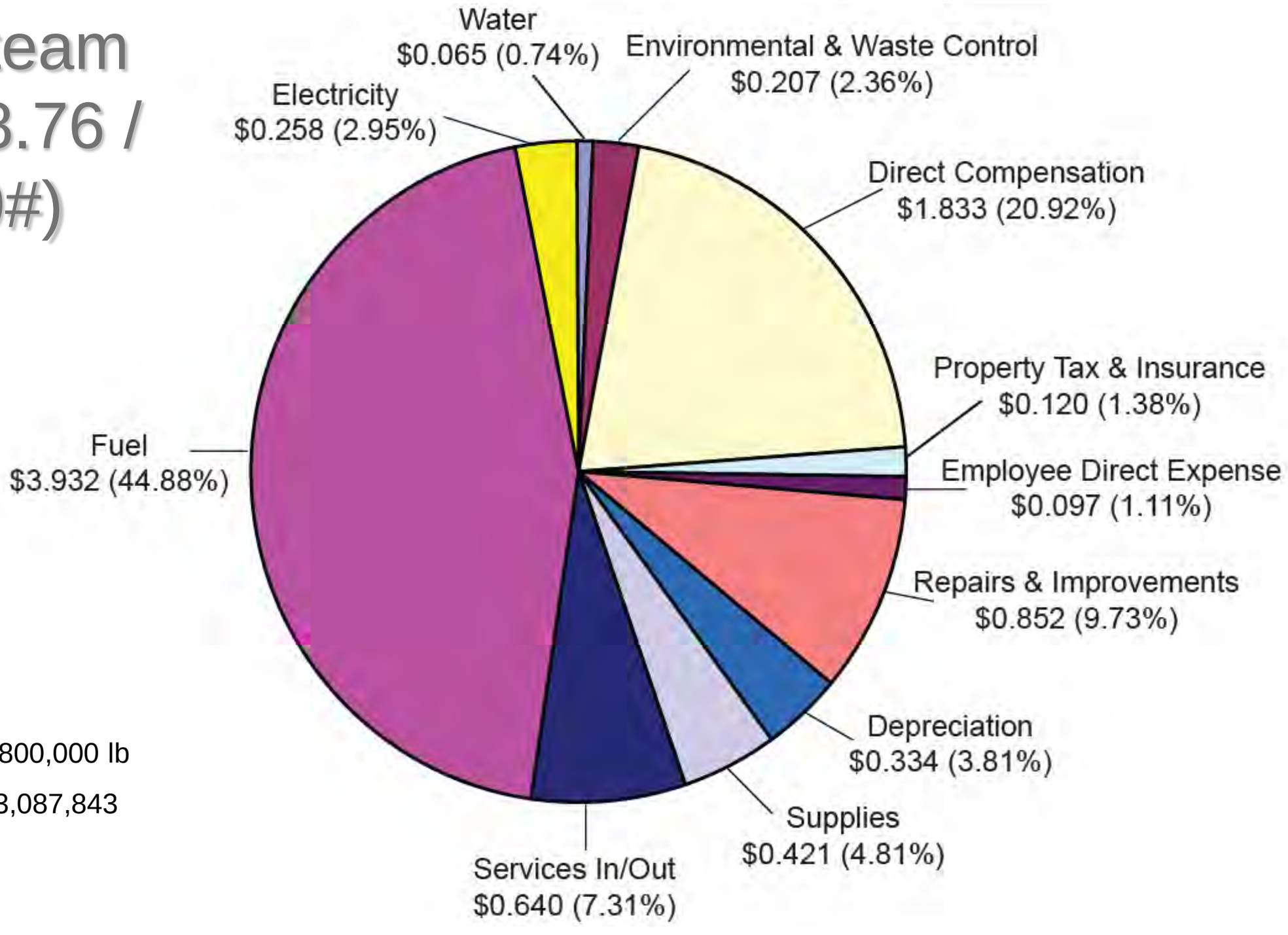
Orifice Diameter =	0.125	1/8" orf				
Steam PSIG =	15					
			Dry Steam Loss =		19	#/hr
Steam Loss			Dollars Lost at		$10.00	/1000#/hr
			Per Hour	Per Day	Per Mo	Per Yr
Drip =	9	#/hr	$0.09	$2.25	$67.47	$809.65
Coil =	5	#/hr	$0.05	$1.12	$33.74	$404.82
Ht Ex =	5	#/hr	$0.05	$1.12	$33.74	$404.82

SIGNIFICANT REDUCTION IN LOSSES WHEN TRAP FAILS

- Approximately 43% of all steam traps in a building are on drips.

What is the cost of steam?

2002 Steam Rate ($8.76 / 1,000#)



Annual Usage = 1,493,800,000 lb

Total Annual Cost = $13,087,843

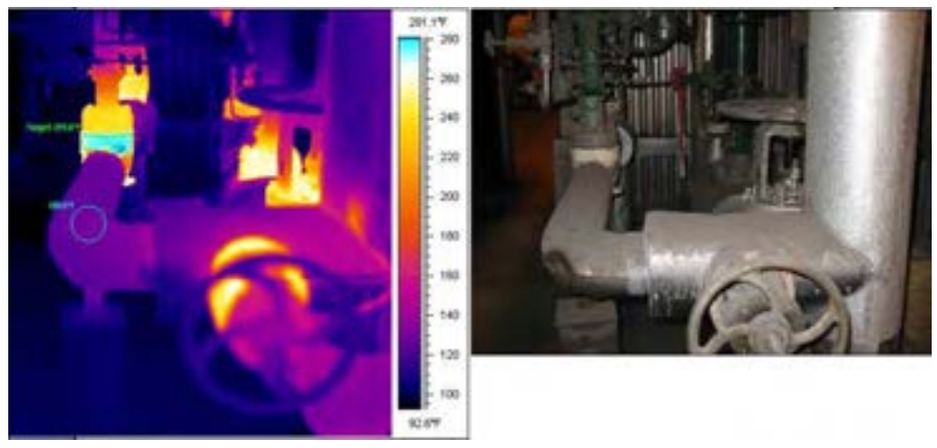
Steam Trap Testing

Temperature – surface contact or infrared

– Not reliable for trap testing

Temperature - Thermography

– Reliable w/ internal temperature visuals



Steam Trap Testing

Ultrasonic – Portable

– Reliable w/ training

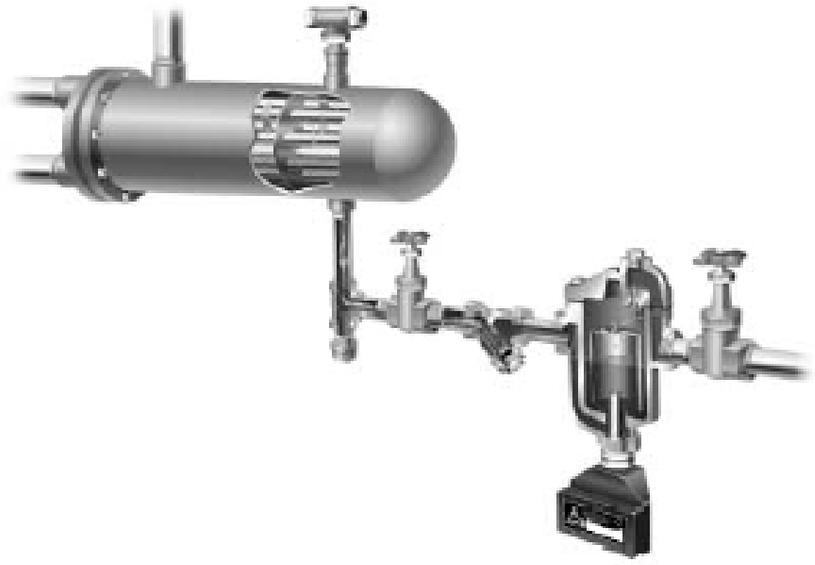
- **Steam Eye** – 24/7 monitoring
  - – Ultrasonic fixed monitoring
  - – Reliable w/out personnel trap testing training

Steam Trap Program Issues

- Budget money tight
- Facilities struggle to maintain focus on steam trap management because of other maintenance priorities
- A yearly steam trap survey only provides adequate steam savings. A trap tested as good today can fail tomorrow.
- Tracking steam savings, and generating work orders in terms of payback is challenging using existing trap evaluation methods.

How Important Is Labor Fee Steam Trap Testing?

- Immediate - 24/7 detection monitoring of failed steam traps (failed open or closed)
- Increased steam system efficiency
- Increased control over steam equipment
- Reductions in maintenance costs
- Improved profit potential
- Increased personnel safety



IMPROVING YOUR STEAM SYSTEM'S EFFICIENCY

Where to use Steam Eye

- Start small: 10 units at critical areas
- Where to apply Steam Eye:
  - Confined spaces – tunnels / pits
  - High Pressure drip traps – 24/7 operation
  - High bay areas
  - Safety Relief Valves
  - Critical process
    - 100% OA coils
    - Heat Exchangers

Achieve Best Practice
Steam System Optimization

24/7 Wireless
Labor Free Testing

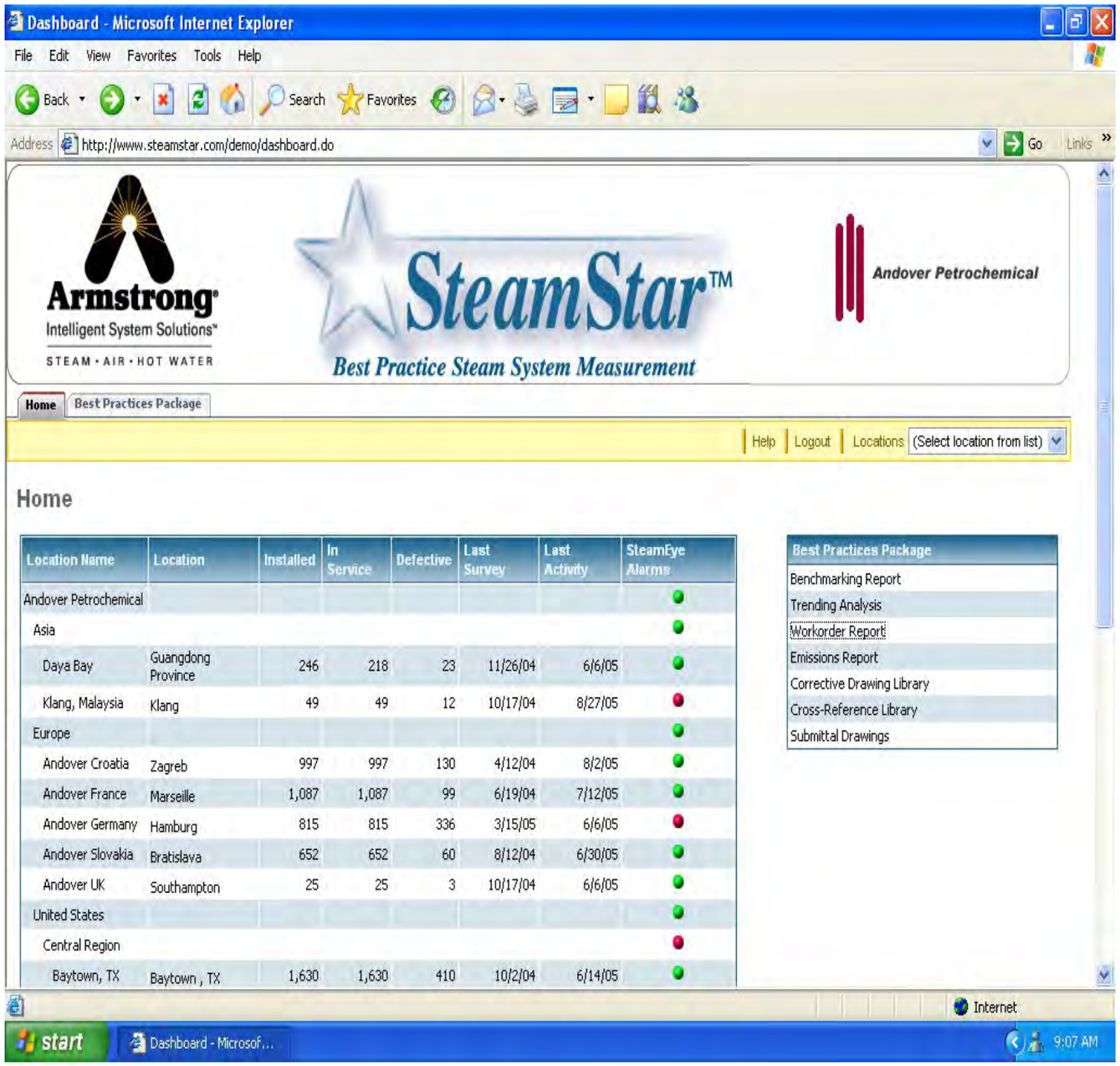
Instant notification of steam trap failure and a sustained (24/7) monitoring process.

Facility Wide Steam Trap Data Management

Company wide awareness and measurement of steam trap performance for ROI decision making.

How to Manage Steam Systems

- Steam Star Software will **monitor, measure**, and **manage** steam trap data
- Software specifically designed for use at all facility levels
- Comprehensive reporting capabilities, such as benchmarking and trending
- Emissions reporting



DTE ENERGY REBATES
$100 / TRAP

Steam Trap Repair/Replacement

Incentives are available for the repair or replacement of steam traps that have failed open and that are leaking steam. Incentive is not available for traps that have failed closed or that are plugged. Replacement with an orifice trap is not eligible. Incentive is available once per 24 month period, per trap. Steam trap repair work must be recorded and the service report must be attached to the incentive Application. Incentive is per repaired or replaced trap. The report must contain:

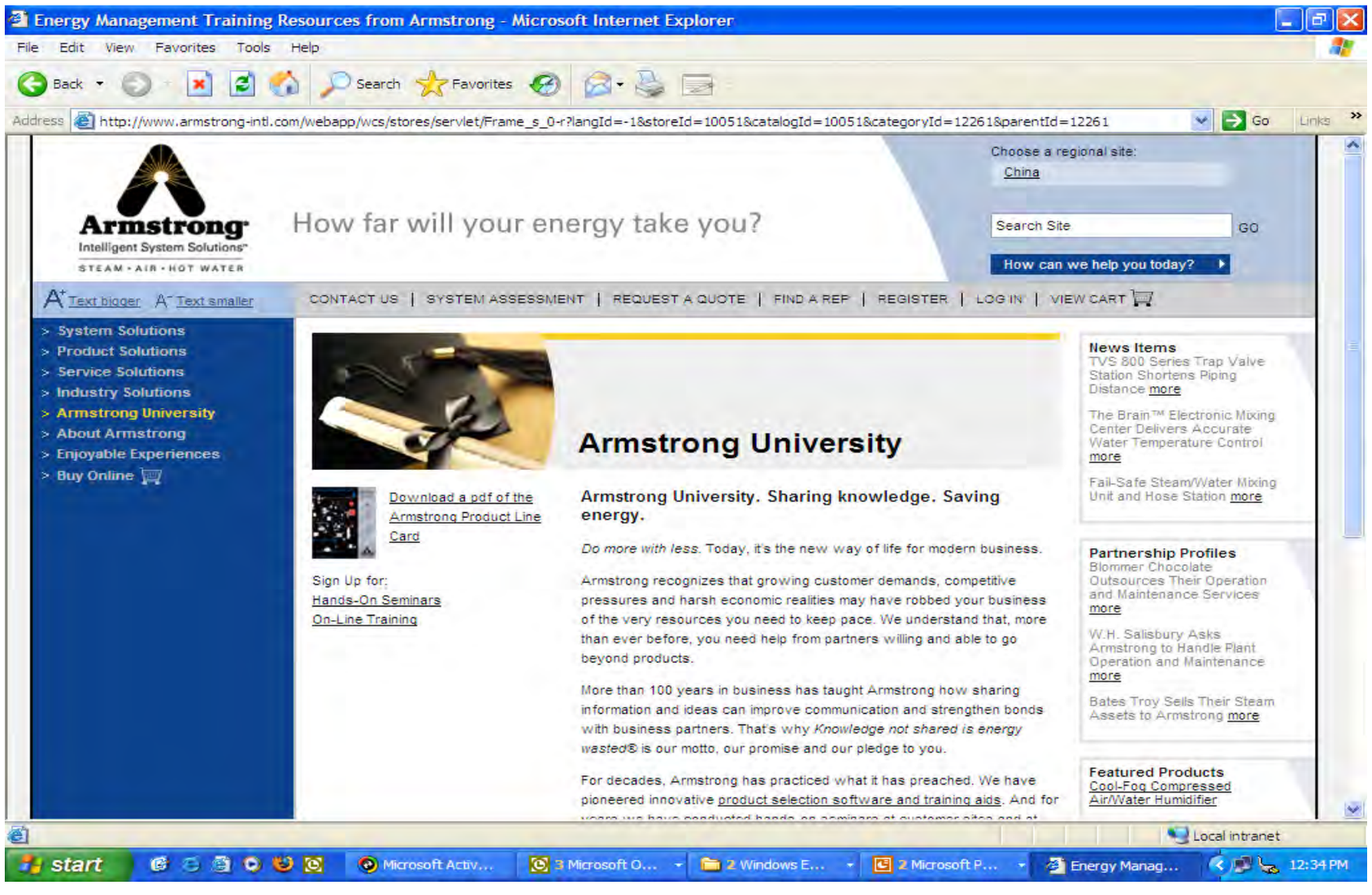
- Name of Survey/Repair Technician
- Survey/Repair Date
- System nominal steam pressure
- Annual hours of operation
- Number of steam traps serviced
- Per steam trap:
  - ID tag number, location and type of trap
  - If repair or replaced:
- Orifice Size
- Pre-and Post Conditions (e.g., Functioning/Not Functioning, Leaking/Not Leaking)

FREE

On-line Steam Training Course

www.armstronginternational.com

Click tab: Armstrong University



Thank you for joining us today!

If you have questions, please contact our office

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