Boiler MACT - One Time Energy Assessments

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Eastman Chemical Company
CIBO March 2013 Quarterly Meeting

What Hat Do You Wear?

Agenda


Rule Interpreting Hat
Real World Hat
Management Hat
EPA's Hat
End of Regulations Hat

Scope of Energy Assessment

- What must be assessed?
  - Boiler **System(s)**
    - Means boiler and associated equipment
      - Feed water system
      - Combustion air system
      - Fuel System (including burners)
      - Blowdown system
      - Combustion control systems
      - Steam systems
      - Condensate return systems

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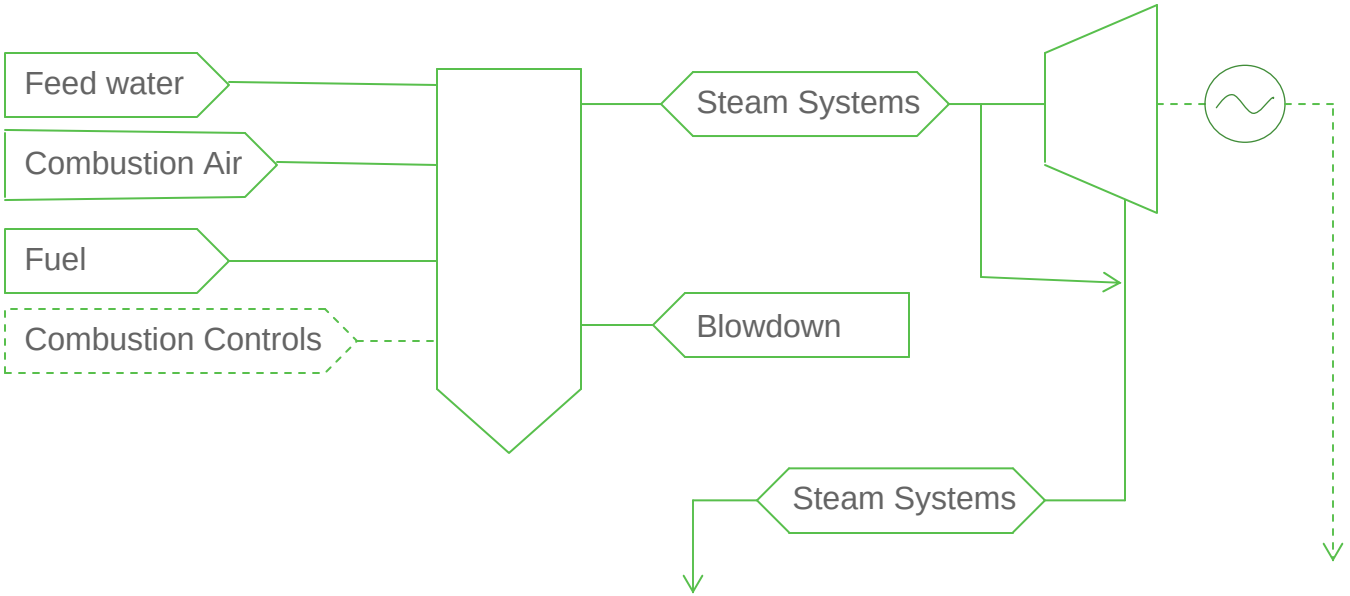
BOILER SYSTEM



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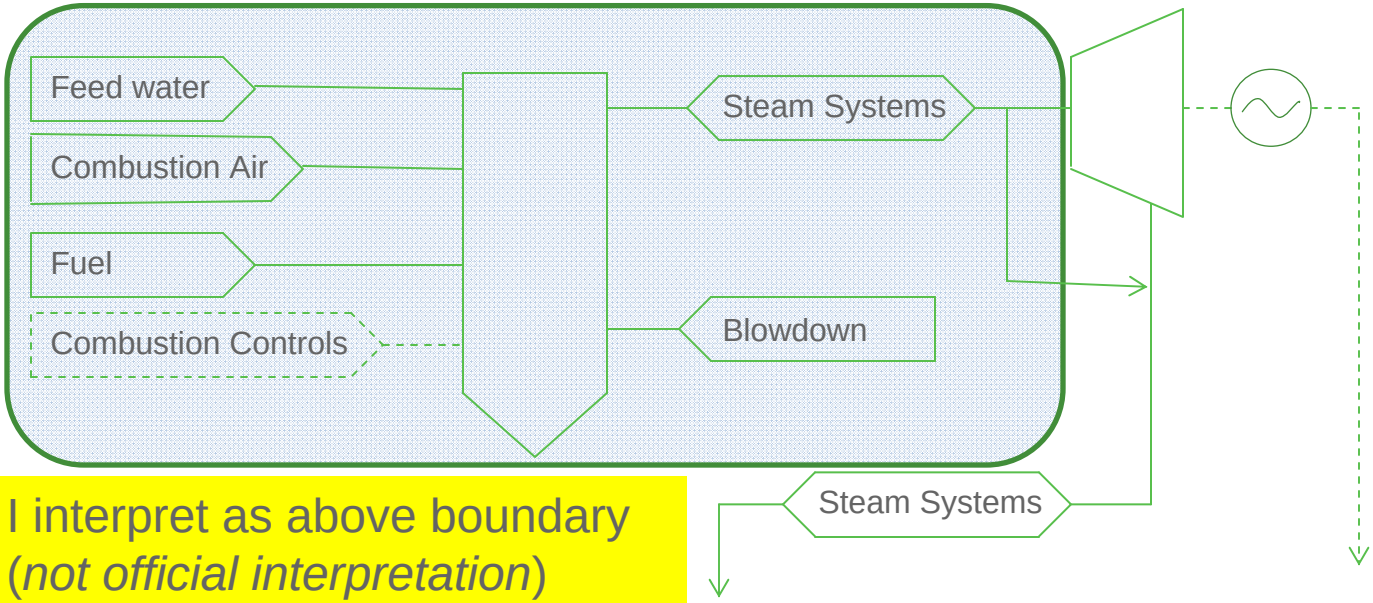
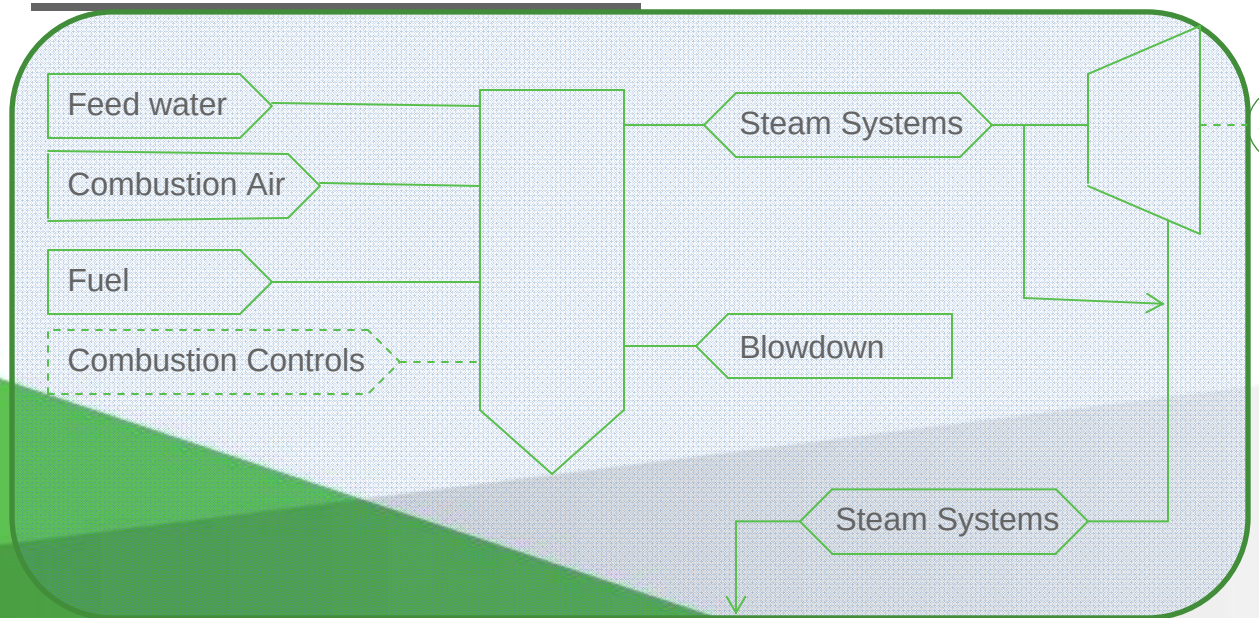
BOILER SYSTEM

What is “Boiler System” boundary?



I interpret as above boundary
(*not official interpretation*)

BOILER SYSTEM



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Scope of Energy Assessment

- What must be assessed?
  - *Boiler* ***System(s)***
  - Process Heater(s)

Scope of Energy Assessment

- What must be assessed?
  - *Boiler **System(s)***
  - *Process Heater(s)*
  - Energy use system(s) accounting for at least 20% of the energy (e.g., steam, process heat, hot water, or electricity) production
    - Energy Use System includes systems that use energy provided by boiler or process heater
      - Process heating
      - Compressed air systems
      - Machine drive (motors, pumps, fans)
      - Process cooling
      - Facility heating, ventilation, and air-conditioning systems
      - Hot water systems
      - Building envelop
      - Lighting
      - OR other systems that use steam, hot water, process heat, or electricity provided by affect boiler or process heater.
    - Only include systems using energy clearly produced by affected boilers and process heaters

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ENERGY USE SYSTEM

Process Heating
Heat Exchangers
Heat Tracing
Columns
Insulation
Etc.

Compressed Air
Plant Air
Instrument Air
Etc.

Machine Drives
Motors
Pumps
Fans
Turbines
Etc.

Process Cooling
Chilled Water
Glycol
Refrigerant
River Water Loops
Etc.

Facility HVAC
Heating
Ventilation
Air Conditioning

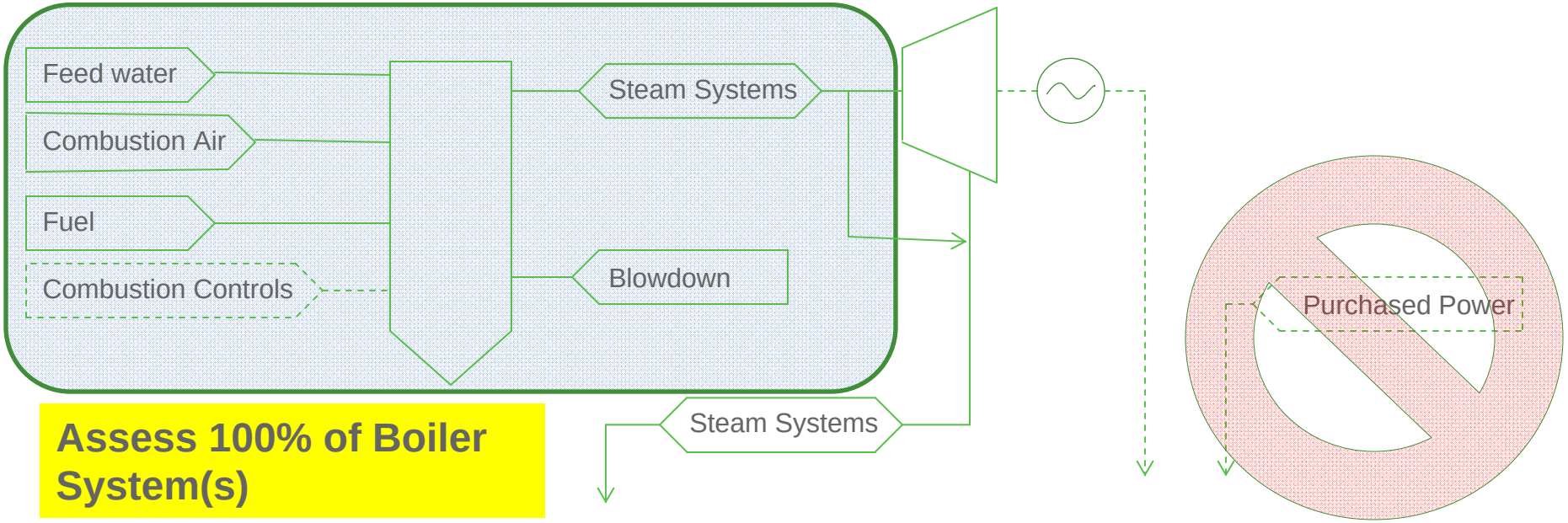
Hot Water Systems
Heat Exchangers
Insulation
Etc.

Building Envelop
Insulation
Windows
Etc.

Lighting
LED
CFL
Ballasts
Etc.

Other
Inert Gases
Turbine Generators?

BOILER SYSTEM



Assess 100% of Boiler System(s)

ENERGY USE SYSTEM

Process Heating	Compressed Air	Machine Drives	Process Cooling	Facility HVAC
Heat Exchangers	Plant Air	Motors	Chilled Water	Heating
Heat Tracing	Instrument Air	Pumps	Glycol	Ventilation
Columns	Etc.	Fans	Refrigerant	Air Conditioning
Insulation		Turbines	River Water Loops	
Etc.		Etc.	Etc.	

Hot Water Systems	Building Envelop	Lighting	Other
Heat Exchangers	Insulation	LED	Inert Gases
Insulation	Windows	CFL	TG's
Etc.	Etc.	Ballasts	
		Etc.	

Assess 20% of Energy Systems
Don't include purchased power

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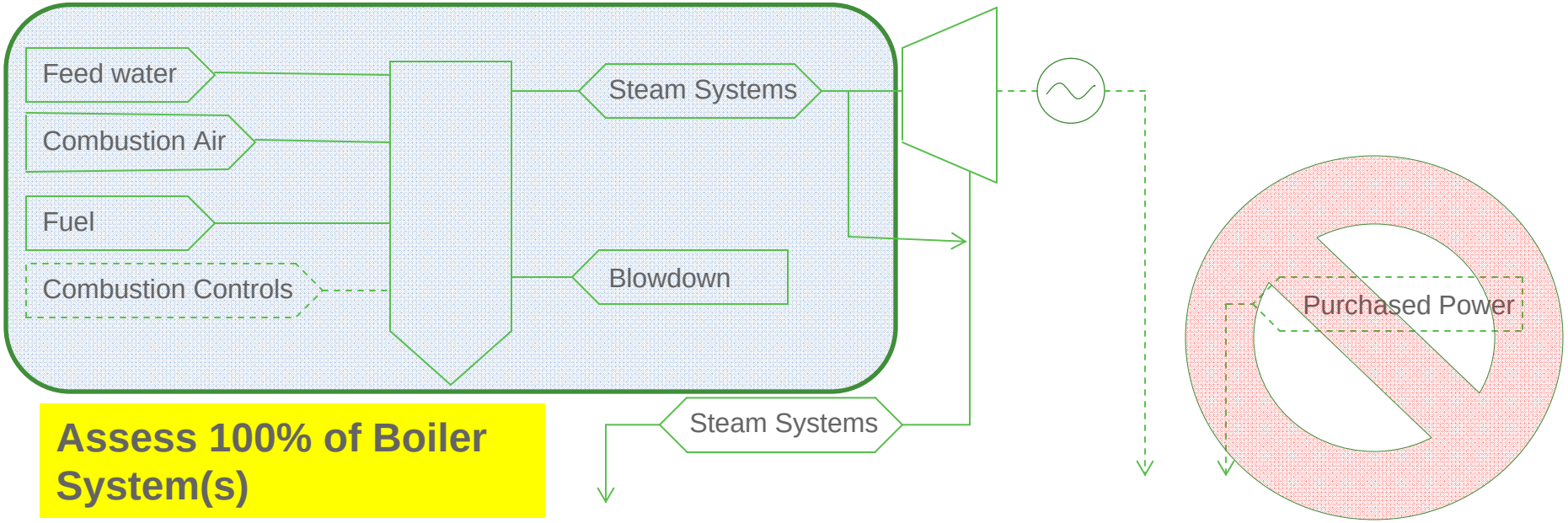
BOILER SYSTEM



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Columns	Etc.	Fans	Refrigerant	Air Conditioning
Insulation		Turbines	River Water Loops	
Etc.		Etc.	Etc.	

Hot Water Systems	Building Envelop	Lighting	Other
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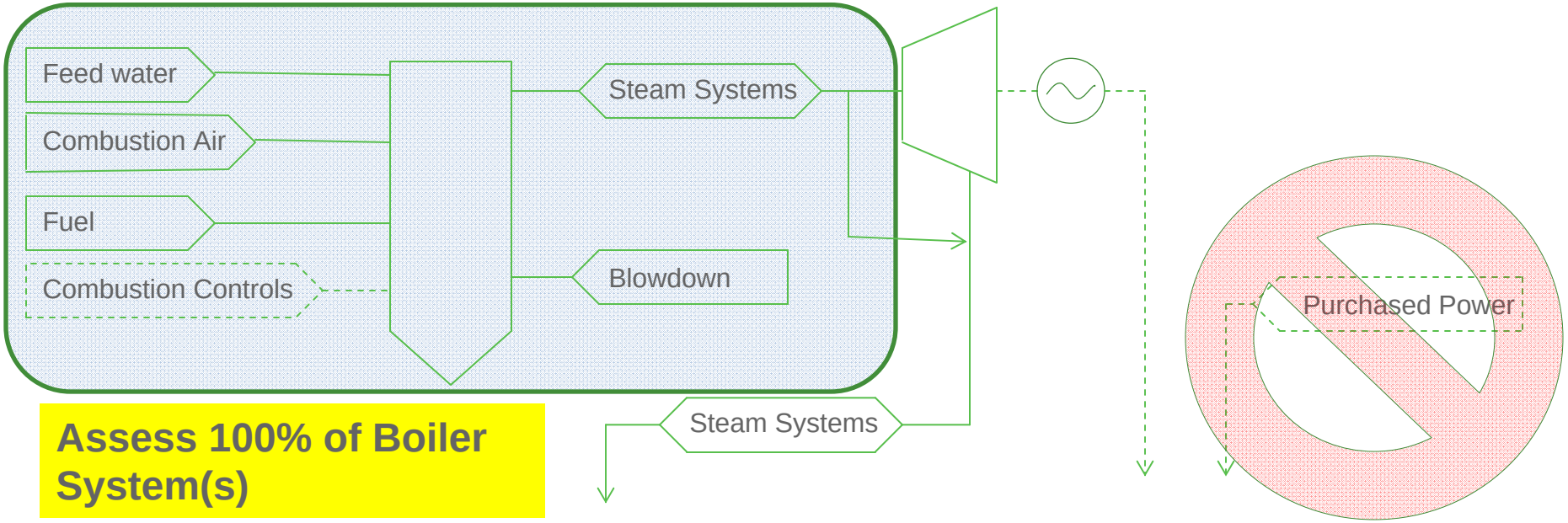

Assess 100% of Boiler System(s)

ENERGY USE SYSTEM

Process Heating
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Etc.

Compressed Air
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Etc.

Machine Drives
Motors
Pumps
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Turbines
Etc.

Process Cooling
Chilled Water
Glycol
Refrigerant
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Etc.

Facility HVAC
Heating
Ventilation
Air Conditioning

Hot Water Systems
Heat Exchangers
Insulation
Etc.

Building Envelop
Insulation
Windows
Etc.

Lighting
LED
CFL
Ballasts
Etc.

Other
Inert Gases
TG's

Assess 20% of Energy Systems
Don't include purchased power

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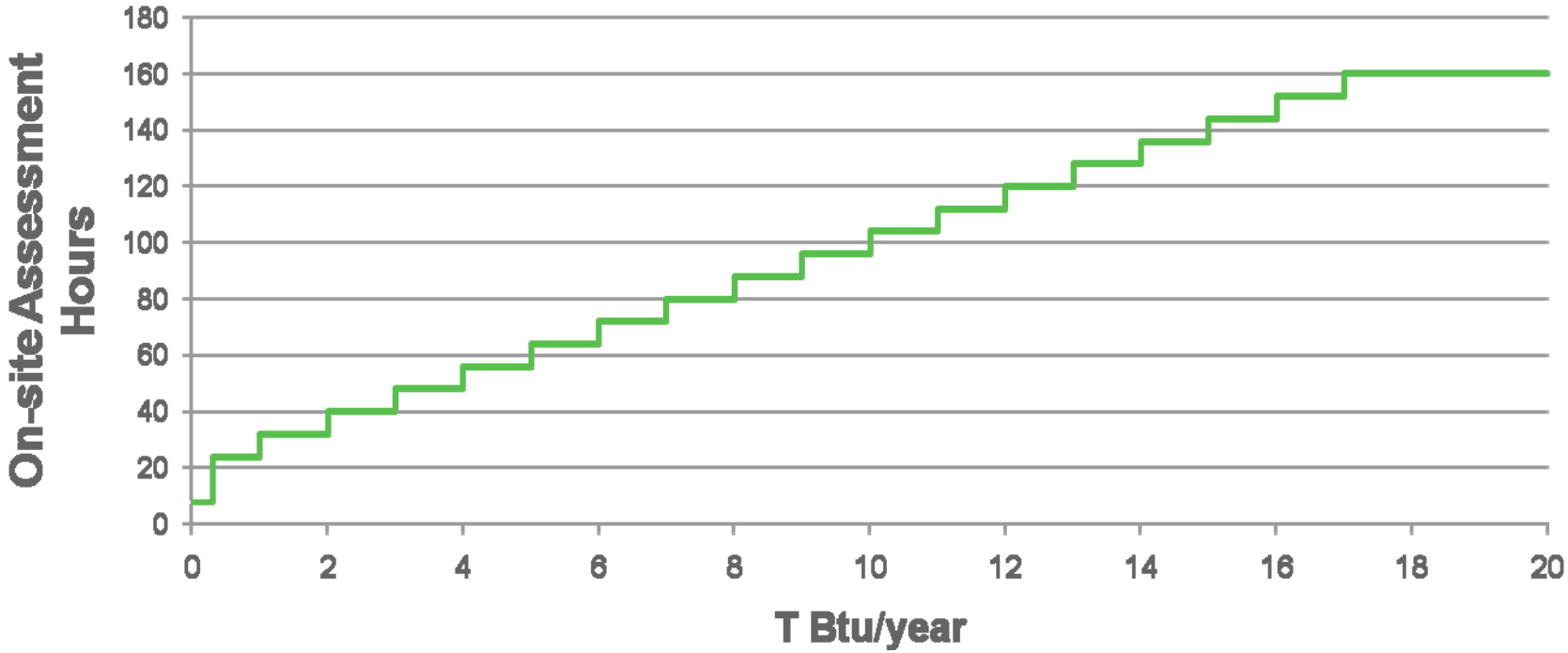
POP QUIZ TIME!

- Of your Energy Use Systems, you need to assess
  - A. 20% of the steam flow from your boilers
  - B. 20% of the energy from Steam at boiler outlet AND Power from TGs
  - C. 20% of the energy from boiler outlet
  - D. Any of the above
- Hint: Energy Assessment…any on-site energy use system(s) accounting for at least 20 percent of the energy (e.g., steam, process heat, hot water, or electricity) production

Assessment Time Requirements



- Multiply above numbers by 115 to get MMBTU/hr
- Definition says to not exceed the above hours, but may go longer.
  - No specified minimum

Qualified Energy Assessor Definition

- Someone who has demonstrated capabilities to evaluate energy savings opportunities for steam generation and major energy using systems, including, but not limited to:
  - Boiler combustion management
  - Boiler thermal energy recovery, including
    - Conventional feed water economizer
    - Conventional combustion air preheater, and
    - Condensing economizer.
  - Boiler blowdown thermal energy recovery
  - Primary energy resource selection, including
    - Fuel (primary energy source) switching, and
    - Applied steam energy vs direct-fired energy vs electricity
  - Insulation issues
  - Steam trap and steam leak management
  - Condensate recovery
  - Steam end-use management

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Qualified Energy Assessor Definition (cont.)

- Capabilities and knowledge includes, but is not limited to:
  - Background, experience, and recognized abilities to perform the assessment activities, data analysis, and report preparation.
  - Familiarity with operating and maintenance practices for steam or process heating systems
  - Additional potential steam system improvement opportunities including improving steam turbine operations and reducing steam demand
  - Additional process heating system opportunities including effective utilization of waste heat and use of proper process heating methods.
  - Boiler-steam turbine cogeneration systems
  - Industry specific steam end-use systems.

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Qualified Energy Assessor

- No certification required
  - Only “demonstrated” capabilities
- Can be done in house
  - No brief case required

What are you looking for?

- Energy Conservation Measures
  - Implemented to improve the energy efficiency of the boiler or facility
- Cost Effective
  - A measure with <2 year payback
  - Must develop list of all cost effective energy conservation measures

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What are you looking at?

- Visual inspection of boiler or process heater system
- Operating characteristics, specifications, procedures, constraints
- Inventory of major energy use systems
- Architectural/Engineering plans, O&M procedures/logs, fuel usage
- Energy Management practices

Reporting

- Include a **signed certification** that the energy assessment was complete with your Notification of Compliance Status.
  - NoCS is due 60 days after compliance date

- It does NOT say…
  - Include results of assessment
  - Include final report of assessment
  - Include list of cost effective energy conservation measures

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Timing

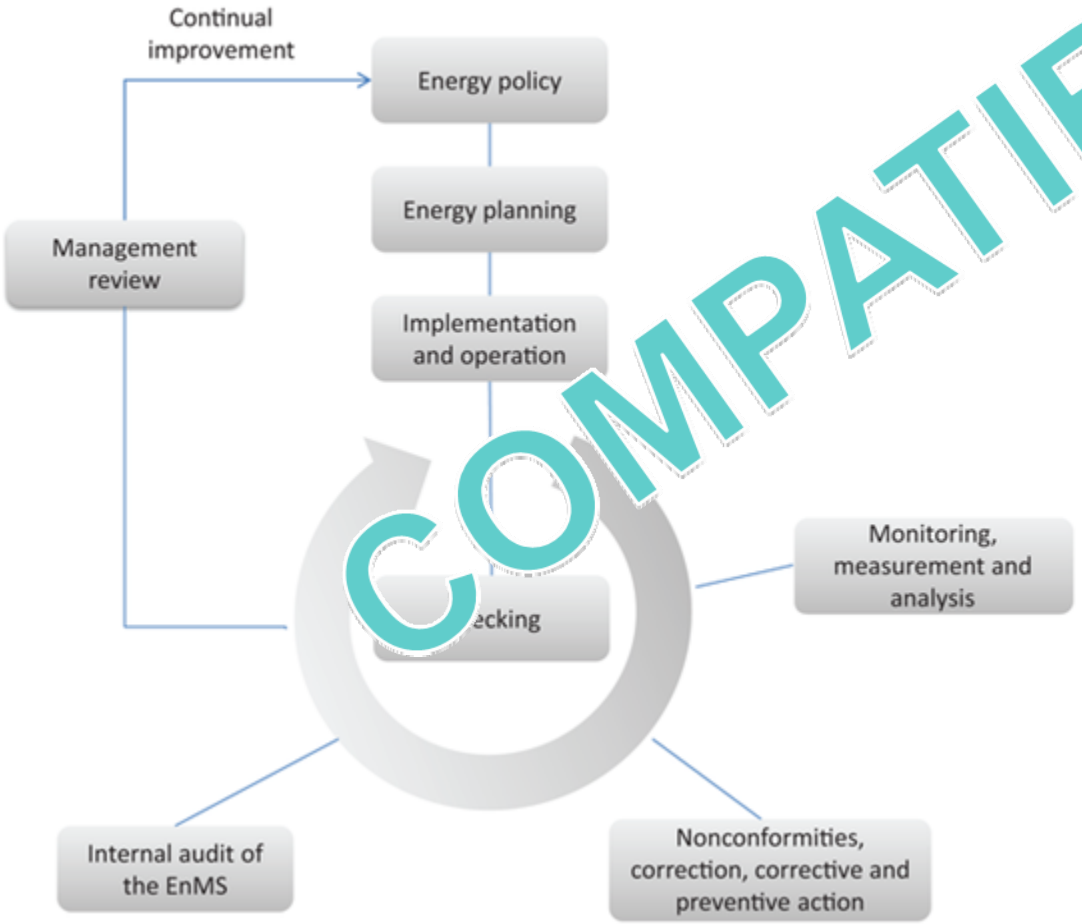
- Can use an energy assessment performed after January 1, 2008
  - It is okay to make modifications to an old assessment to fit MACT requirements
- Must be complete before January 31, 2016.

ISO 50001
“Energy Management Systems”

- If you have an Energy Management Program that is **COMPATIBLE** with ISO 50001 you DO NOT have to perform a one-time energy assessment.

ISO 50001
Energy Management System Model

Figure 1 — Energy management system model for this International Standard



EPA
Energy Management Overview

http://www.energystar.gov/index.cfm?c=guidelines.guidelines_index

Put On Real World Hat

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Energy Assessments

- Are worth doing
  - Typically pay for themselves
  - Resulting investments usually low risk
- However, they are not free
  - Marginal facility is worried about paying bills, not doing projects with a short payback period.

Typical Energy Assessment

- Before onsite visit
  - Operating area receives questionnaire. They list
    - Utilities used
    - Consumption
      - Metered? Calculated? Assumed?
    - Known opportunities
    - Known problems
    - Procedures
    - Drawings
    - Constraints
  - Energy Assessor(s) review information
    - Familiarization
    - Look for obvious (to someone with an energy hat) opportunities
      - Heat integration
      - Control valves operating <50% downstream of pump
      - Etc.

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Typical Energy Assessment (cont.)

- During onsite visit
  - Field walk down
    - Leaks
    - Missing Insulation
    - Condensate to ditch
    - PRV blowing through
    - Faulty steam traps
    - Etc.
  - Operating area describes process (flow diagrams)
  - Brainstorm energy savings opportunities
    - VFD instead of control valves
    - Heat integration
    - Metering
    - Lighting
    - Eliminate heating then cooling (or vice versa)
    - Heat Exchanger effectiveness
    - Etc.

Note:
This will be a detailed and thorough list generated.

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Typical Energy Assessment (cont.)

- After onsite visit
  - Estimate cost and benefit of brainstormed ideas
    - Start off with “back of napkin” quality
    - Increase estimate quality if project has potential
  - Present “good” projects to operating area
    - Typically further refinement is needed to list
      - “No, you can’t do that because _____”
      - “That will work but savings won’t be that high because _____”
  - Refine estimates and place qualifying projects in the capital project hopper
    - **to be chosen when it makes good financial sense.**

Site Manager Hat

Site Manager's Dilemma

- An energy audit that identifies several cost effective energy conservation measures should feel like a success.
  - Company will save money in the long run
  - Profits increase
- However, that long list now feels like a liability.
  - Will EPA/State ever ask to see your list?
    - You don't have to submit it but will they ask for it when you do a construction permit?
  - Can it fall into the hands of NGO?
    - Will they demand to see if a public comment period ever comes up for your facility?
  - Confidential information (energy costs, energy:product)
  - What if you never do a single identified project?

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Other Liabilities

- MACT does not specify the quality of “the list”
  - Low quality estimate will likely show low cost and high savings
    - “Back of napkin” energy savings are usually fairly easy & accurate but capital cost can be +/- 100% for complex projects.
  - High quality estimates are expensive to obtain
  - We should be able to throw out high risk solutions
    - Shutdown a pump so others can run more efficiently
      - Now you don’t have an operating spare
    - Use less steam and heat product to low end of specification
      - Now you have more off quality product
  - How long is the list valid?

Be careful not to over react to these liabilities

"I THOUGHT I TOLD YOU TO DO A ***BAD*** JOB ON THAT ASSESSMENT!"

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Some Tips

- While brainstorming during an energy assessment
  - Be reasonable
    - If you wouldn't do it (too risky), don't write it down
  - Recognize that there probably are some improvements that can and should be done
    - I wouldn't want to tell Agency that my assessment found nothing.
- Estimating
  - Apply appropriate contingencies based on quality of estimate
- Reporting
  - Any item listed as a "Cost Effective Energy Conservation Measure" needs to be a feasible project.
    - Don't have it listed and be forced to tell Agency you really can't do it

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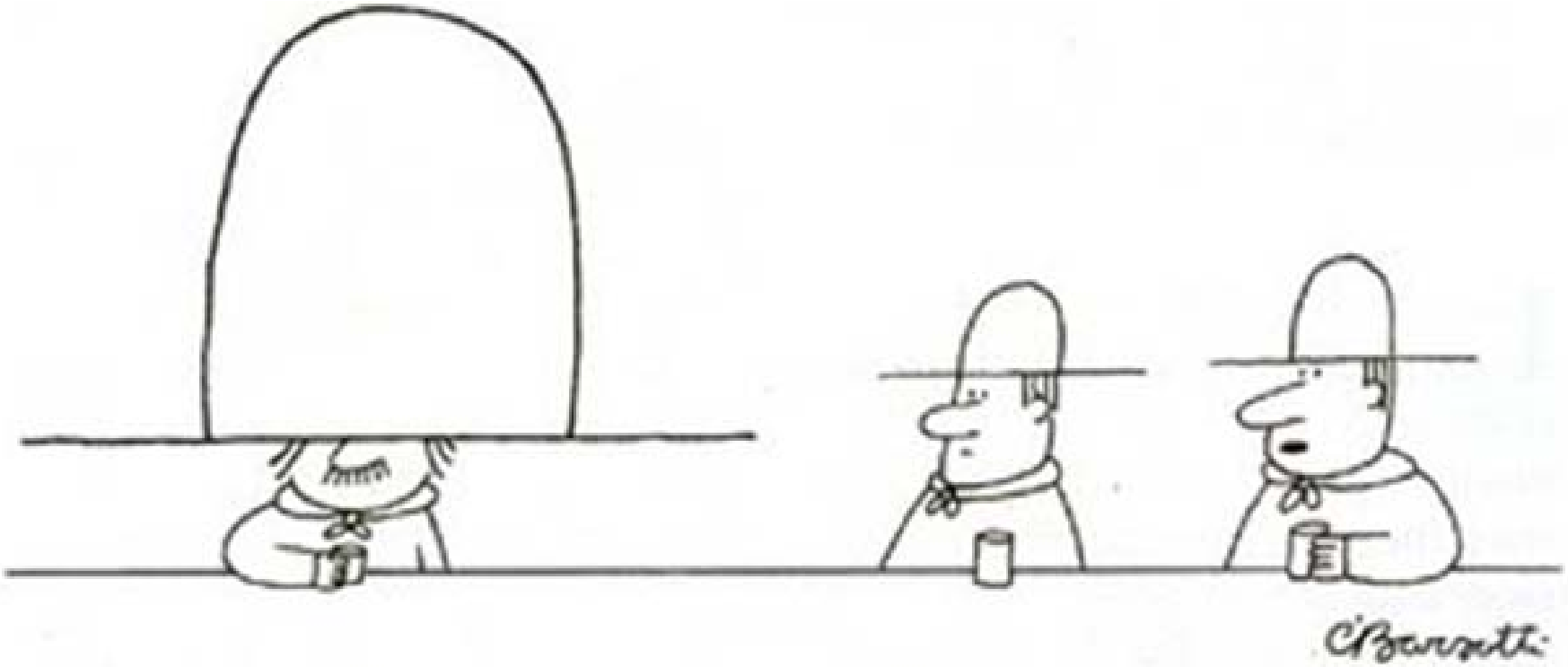
EPA's Hat



"All hat and no clue but my God, what a hat."

DEFINITIONS

- Energy assessment means the following for the emission units covered by this subpart:

  (1)…

  (2)…

  (3) The energy assessment for facilities with affected boilers and process heaters with a combined heat input capacity greater than 1.0 Tbtu/year will be up to 24 on-site technical labor hours in length for the first Tbtu/yr plus 8 on-site technical labors hours for every additional 1.0 Tbtu/yr not to exceed 160 on-site technical hours, but may be longer at the discretion of the owner or operator of the affected source. The boiler system(s), process heater(s), and any on-site energy use system(s) accounting for at least 20 percent of the energy (e.g., steam, process heat, hot water, or electricity) production, as applicable, will be evaluated to identify energy savings opportunities.

  (4) The on-site energy use systems serving as the basis for the percent of affected boiler(s) and process heater(s) energy production (1), (2), and (3) above may be segmented by production area or energy use area as most logical and applicable to the specific facility being assessed (e.g., product X manufacturing area; product Y drying area; Building Z)

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- Energy Use System includes the following systems located on-site that use energy (steam, hot water, or electricity) provided by the affected boiler or process heater: (1) process heating; compressed air systems; machine drive (motors, pumps, fans); process cooling; facility heating, ventilation, and air-condition – systems; hot water systems; building envelop; and lighting; or (2) other systems that use steam, hot water, process heat, or electricity provided by the affected boiler or process heater. Energy use systems are only those systems using energy clearly produced by affected boilers and process heaters
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- Cost-effective energy conservation measure means a measure that is implemented to improve the energy efficiency of the boiler or facility that has a payback (return of investment) period of 2 years or less.
- Boiler system means the boiler and associated components, such as, the feed water system, the combustion air system, the fuel system (including burners), blowdown system, combustion control systems, steam systems, and condensate return systems.

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- Qualified energy assessor means:
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Table 4

- An existing boiler or process heater located at a major source facility, not including limited use units
  - Must have a one-time energy assessment performed by a qualified energy assessor. An energy assessment completed on or after January 1, 2008, that meets or is amended to meet the energy assessment requirements in this table, satisfies the energy assessment requirement. A facility that operates under an energy management program compatible with ISO 50001 that includes the affected units also satisfies the energy assessment requirement. The energy assessment must include the following with extent of the evaluation for items a. to e. appropriate for the on-site technical hours listed in 63.7575
    - (a) A visual inspection of the boiler or process heater system
    - (b) An evaluation of operating characteristics of the boiler or process heater systems, specifications of energy using systems, operating and maintenance procedures, and unusual operating constraints.
    - (c) An inventory of major energy use systems consuming energy from affected boilers and process heaters and which are under the control of the boiler/process heater owner/operator
    - (d) A review of available architectural and engineering plans, facility operation and maintenance procedures and logs, and fuel usage.
    - (e) A review of the facility's energy management practices and provide recommendations for improvements consistent with the definition of energy management practices, if identified.
    - (f) A list of cost-effective energy conservation measures that are within the facility's control.
    - (g) A list of energy savings potential of energy conservation measures identified.
    - (h) A comprehensive report detailing the way s to improve efficiency, the cost of specific improvements, benefits, and the time frame for recouping those investments.

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