

Energy Efficiency as a Regulatory Requirement

AWMA

Greenhouse Gas Strategies in a Changing
Climate

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CARDINAL
ENGINEERING

Executive Summary



Energy Assessments as featured in the Boiler MACT Rules

- Assessment scope
- Auditor qualifications

Energy Efficiency as featured in the Tailoring Rule

- BACT guidance
- Issued PSD Permits

Boiler MACT Rules



- Final rule signed February 2011
 - 40 CFR 63 Subpart JJJJJJ – Area Source Boilers
- Final rules signed February 2011, then stayed:
 - 40 CFR 63 Subpart DDDDD – Major Source Boilers
 - 40 CFR 60 Subpart CCCC – Performance Standards for CISWI Units
 - 40 CFR 60 Subpart DDDD – Emissions Guidelines for CISWI Units



Area Source Boiler MACT

- New small units (constructed/reconstructed after 6/4/2010)
 - Biennial tune up
- New large units
 - Biomass/oil – Biennial tune up, numeric PM limit
 - Coal – numeric PM, CO, Hg limits

Area Source Boiler MACT

- Existing small units
 - Biennial tune up
- Existing large units
 - Biomass/Oil – Biennial tune up
 - Coal – Numeric limits for CO and Hg
 - **One-time energy assessment**



Major Source Boiler MACT

- Boilers / Process Heaters
 - Units < 10 MMBtu/hr, limited use boilers
 - Biennial tune up
 - Natural gas / refinery gas / equivalent gas boiler
 - Annual tune up
 - All other boilers/process heaters
 - Emission limits on mercury, dioxins, PM, HCl, and CO based on fuel type and existing/new status
 - **One-time energy assessment for all existing subject facilities**

Energy Assessment



□ *Definition*

- in-depth assessment of a facility to identify immediate and long-term opportunities to save energy, focusing on the steam and process heating systems which involves a thorough examination of potential savings from energy efficiency improvements, waste minimization and pollution prevention, and productivity improvement.

Energy Assessment



□ Area sources

- Boiler system / boiler energy use systems only
- Conducted by March 21, 2014
- Notice of compliance due by July 19, 2014

□ Major sources

- Boiler system / boiler energy use systems only
- Cost Estimate - \$3,500 to \$75,000

Energy Assessment



If your facility has Boiler Annual Heat Input, as measured in Trillion Btu/yr (Tbtu/yr), of ...	And the energy use system accounts for this percent of the energy output from these units...	Then the length of the energy assessment should not exceed¹...
Less than 0.3	At least 50%	1 Day
0.3 to 1	At least 33%	3 Days
Greater than 1.0	At least 20%	No limit

¹Longer assessments may be warranted under the discretion of the affected facility.

Energy Assessment




- Identify energy conservation measures
 - efficiency improvements
 - pollution prevention
 - productivity improvements
- Can include process changes and other efficiency modifications
- “Cost-effective” (payback period ≤ 2 yrs) energy conservation measures must be identified
- Report, with signed certification, would be submitted to EPA

Energy Assessment - Major Sources



- EPA ENERGY STAR Facility Energy Management Assessment Matrix - recommended

 ENERGY STAR[®] Energy Management Assessment Matrix				
	Little or no evidence	Some elements	Fully implemented	Next Steps
Make Commitment to Continuous Improvement				
Energy Director	No central or organizational resource Decentralized management	Central or organizational resource not empowered	Empowered central or organizational leader with senior management support	
Energy Team	No company energy network	Informal organization	Active cross-functional team guiding energy program	
Energy Policy	No formal policy	Referenced in environmental or other policies	Formal stand-alone EE policy endorsed by senior mgmt.	
Assess Performance and Opportunities				
Gather and Track Data	Little metering/no tracking	Local or partial metering/tracking/reporting	All facilities report for central consolidation/analysis	
Normalize	Not addressed	Some unit measures or weather adjustments	All meaningful adjustments for organizational analysis	
Establish baselines	No baselines	Various facility-established	Standardized organizational base year and metric established	
Benchmark	Not addressed or only same site historical comparisons	Some internal comparisons among company sites	Regular internal & external comparisons & analyses	

Energy Assessment



- Includes the following:
 - Boiler system inspection – cracks/leaks/etc.
 - Establish operating characteristics of the facility, energy system specifications, operating and maintenance procedures, and unusual operating constraints,
 - Identify major energy consuming systems,
 - Review of available architectural and engineering plans, facility operation and maintenance procedures and logs, and fuel usage

Energy Assessment

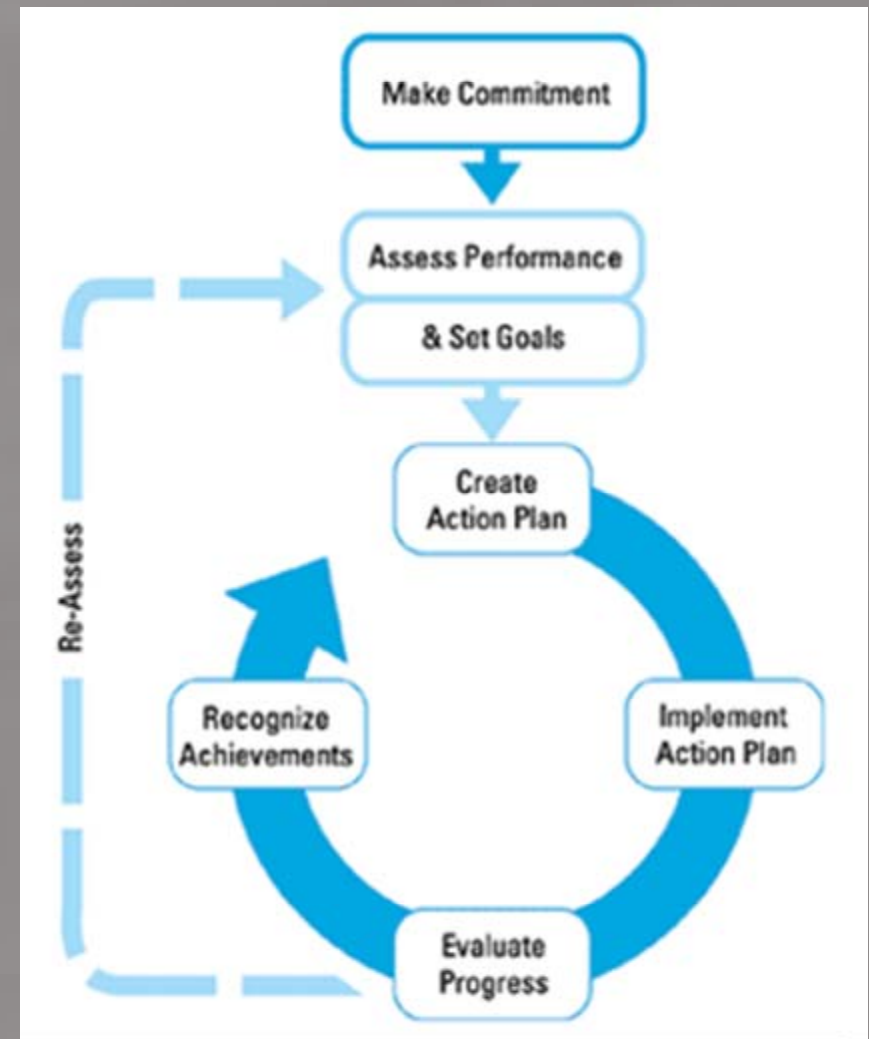


- Report to include:
 - List of major energy conservation measures,
 - The energy savings potential of the energy conservation measures identified,
 - A comprehensive report detailing the ways to improve efficiency, the cost of specific improvements, benefits, and the time frame for recouping those investments, and
 - A facility energy management program developed according to the ENERGY STAR guideline for energy management (Major sources only).

Energy Assessment - Major Sources



- Facility to use the ENERGY STAR Guidelines for Energy Management to development an energy management program





Energy Assessment - Auditor Qualifications

- Assessment to be conducted by *qualified energy assessors*
- Energy assessors must have *demonstrated capabilities to evaluate a set of the typical energy savings opportunities available in opportunity areas for steam generation and major energy using systems*



Energy Assessment - Auditor Qualifications

- Included in initial proposal:
- DOE Qualified Specialist
 - Completed the DOE Qualified Specialist Program (for all systems) – generally training, hands-on exam, & written exam
 - Steam systems
 - Fan systems
 - Process heater systems
 - Compressed air systems
 - Pump systems



Energy Assessment - Auditor Qualifications

- Also included in initial proposal:
- Association of Energy Engineers Certified Energy Manager
 - Must have appropriate education / experience
 - Must complete application, attend AEE seminar, pass CEM exam

Energy Assessment - Potential Concerns

- Energy saving projects are not required to be implemented
- Payback period calculation
- Qualified auditors
- Compliance demonstration

Tailoring Rule - BACT



□ BACT steps:

- 1) identify all available control technologies;
- 2) eliminate technically infeasible options;
- 3) evaluate and rank remaining control technologies;
- 4) evaluate cost effectiveness of controls and energy and other environmental impacts; and
- 5) select BACT.

Tailoring Rule



- On-site energy efficiency (primary GHG emissions)
 - Energy efficient technologies at the source
 - Individual emissions unit (i.e., supercritical boiler)
 - Greenfield facility wide energy efficiency - focus on equipment that consumes the largest amount of energy, as an overall category to compare to benchmarks
 - Considered in Step 1 (identify available technologies)
 - Without “redefining the source”

Tailoring Rule



- Off-site energy efficiency (secondary GHG emissions)
 - Reductions in facility's demand for energy (does not affect emissions within the boundary of the facility)
 - Considered in Step 4 (evaluate cost effectiveness of controls and energy and other environmental impacts)

Tailoring Rule - Tools



- Benchmarking
- ENERGY STAR sector-specific tools
- Energy Performance Indicators (EPIs)
- GHG Control Measures Whitepapers -
<http://www.epa.gov/nsr/ghgpermitting.html>
 - Combustion control optimization
 - Cooling system heat loss recovery
 - Flue gas heat recovery
 - Low-rank coal drying
 - Sootblower optimization
 - Steam turbine design

GHG BACT



□ Calpine Russell City

- PSD Permit issued 2/3/2010
- Included GHG BACT and GHG permit limits
 - Thermal efficiency - Turbine heat rate limit (7,730 Btu/kWhr)
 - Hourly, daily, annual CO₂e limits for turbine/HRSGs
 - Fire pump engine limit – testing/emergency use only
 - Circuit breaker SF₆ emissions limit (with leak detection system)

GHG BACT



- Hyperion Energy Refinery – South Dakota
 - Greenfield refinery & IGCC plant
 - BACT analysis in application include CCS, good combustion practices, energy-efficient plant design, among others
 - SD-DENR – conducted benchmarking on emissions per bbl crude oil refined

GHG BACT



- Lower Colorado River Authority, Thomas C. Ferguson Plant
 - Texas – EPA issued
 - Replacing a gas-fired boiler with two new combined cycle units/HRSGs
 - Per unit of power, uses 30-40% less fuel & approximately 50% of the emissions

Questions



Thank you very much!