Next Generation Regulations Affecting Stationary Gas Turbines in the U.S., Asia, South America, and Africa

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Gas Turbine Association (GTA)

• Founded in 1995
• The GTA Serves as the Unified Voice for the Gas Turbine Industry
  • Advocates for Gas Turbine R&D
  • Advocates for Rational and Achievable Emissions Regulations
• Committees
  • Government Affairs
  • Environment Affairs
  • Technical Affairs

GTA Member Companies

Alstom Power - Florida Turbine Technologies - GE Energy
Meggitt Vibro-Meter Inc. - OPRA Turbines - PCC Airfoils
Pratt & Whitney - PW Power Systems - Siemens Energy
Solar Turbines Incorporated - Strategic Power Systems
Agenda

• U.S.
  • EGU GHG NSPS – New, Modified, and Reconstructed
  • EGU GHG NSPS – Existing Source Performance Standard (ESPS)
  • Proposed Revision to 8-hr Ozone Standard
  • 1-hr NO₂ Standard
  • PM₂.₅

• Asia
• South America
• Africa

EGU – Electric Generating Unit
GHG – GreenHouse Gas
NSPS – New Source Performance Standard
EGU GHG NSPS for New, Modified, and Reconstructed Gas Turbines

• Proposal Sets CO₂ Performance Standard for Gas Turbines That Supply More Than 1/3 of Their Potential Electric Output and More Than 219,000 MWh (25MW x 8760 hours) Net Electric Output to the Grid Per Year

• 1000 lb/MWh CO₂ if Design Heat Input >850 MMBtu/hr HHV (~100 MW)
  • Equivalent to Thermal Efficiency on Natural Gas of ~43.6%

• 1100 lb/MWh CO₂ if Design Heat Input <850 MMBtu/hr HHV (and >250 MMBtu/hr HHV, ~25 MW)

• Emissions Standards are Based on a 12-month Rolling Average Including All Potential Operating Conditions

• Separate Emissions Level Proposal for Coal Plants

• To Be Finalized in Summer 2015

EGU – Electric Generating Unit
GHG – GreenHouse Gas
NSPS – New Source Performance Standard
EGU GHG NSPS for New, Modified, and Reconstructed Gas Turbines

• GTA’s Primary Comments to Proposal
  • Suggested a 1,200 lbs CO$_2$/MWh Emissions Standard
  • Exclude Simple Cycle Gas Turbines or Adopt a Sliding Capacity Scale Based on the Gas Turbine Efficiency
  • Exempt Startup/Shutdown and Load Operation Below 50%
  • Exempt Combined Heat and Power (CHP) Units
  • Exclude from Compliance Averaging the Emissions That Occur When Alternative Fuels Are During Emergencies, or When Natural Gas Is Curtailed (or Unavailable)

A full copy of the GTA comments are available on [www.gasturbine.org](http://www.gasturbine.org)
EGU GHG NSPS for New, Modified, and Reconstructed Gas Turbines

• Other GTA Comments
  • Modify The Cut-Point Between Large and Small Gas Turbines to a Level of 1,500 MMBtu/hr HHV (~150 MW)
  • Ensure The Regulation Does Not Discourage Adoption of Combined Cycle Gas Turbines
  • Determine Compliance With a CO$_2$ lb/MWh Standard at the Maximum Continuous Rating Point of the Gas Turbine and Steam Turbine During the Initial Performance Testing on Natural Gas
  • Simplify the Method for Computing the 12-Month Rolling Average
  • Specifically Prohibit the NSPS CO$_2$ Limit From Being Adopted as the Presumptive CO$_2$ BACT Level for Simple Cycle Turbines
  • Utilize The Option of a New NSPS Subpart TTTT Versus Including Language in Subparts Da or KKKK
EGU GHG NSPS for New, Modified, and Reconstructed Gas Turbines

• Impacts to Gas Turbine Markets
  • Potential To Discourage Use of Simple Cycle Turbines
    • Simple Cycle Needed for Grid Stability to Support Deployment of Renewables
    • Risk of Non-Power Generation Simple Cycle Turbines to be Captured
  • Discourages Use of Back-Up Fuels Which are Necessary to Ensure Grid Stability
  • May Promote User to NOT Interconnect to Avoid Regulation
  • Could Favor Non-Affected Combustion Sources
    • Discourage Gas Turbines Compared to Other Cycles
  • Rule Places Unnecessary Regulatory Burden on Combined Heat and Power
Existing Source Performance Standard

- EPA’s Proposal to Regulate CO₂ Emissions from Existing Power Plants
- Proposal Establishes State Specific Emissions Targets
- Impetus is on States to Design, Implement, and Comply
- Very Controversial Proposal
- Many Believe Proposal Oversteps EPA’s Authority
- Combined Cycle Gas Turbines Can Fill a Gap Due to Lower CO₂ Emissions
- Utilization of Gas Turbines Likely To Increase So States Can Meet Targets
- To Be Finalized in Summer 2015
Proposed Revision to 8-hr Ozone Standard

- Ozone Standards at the Levels in EPA’s Proposal Could Push Virtually the Entire Country Into “Nonattainment”
- EPA Proposed a Level Between 65 and 70 ppb
- Final Rule in Late ‘15 or Early ‘16
- Several Years to Implement, Litigation Delays Likely
- GTA Commented to EPA to Maintain Current Standard at 75 ppb and Allow the 2008 Standard to be Fully Implemented
  - 23 States, National Association of Manufacturer’s (NAM), U.S. Chamber, Council of State Governments, and Numerous Trade Organizations Also Commented to EPA to Maintain the Current Standard
1-hr NO₂ Standard

• Original 1971 ('85 and '96) Annual Standard
• EPA Promulgated a 1-hr NO₂ NAAQS (2010)
  • 100 ppb 1-hr Average Is Much More Stringent Than Long Standing 53 ppb Annual Standard
• New Standard has Significant Impact on Industrial Point Source Air Quality Compliance
• Dispersion Modeling Challenges
  • AERMOD Is Believed to Over Predict By a Factor of 2 Or More
• Challenging for New State-of-the-Art Facilities to Pass Modeling
  • Especially Impacts Gas Turbine Installations During Start-up and Shutdown
  • May Drive Emissions Reductions on Existing Equipment to Pass Modeling
  • Some Will Make It, Others Won’t
• Compliance Being Determined by Computer Models vs. Ambient Monitoring
PM$_{2.5}$ Challenges

- Federal Permitting Modification Thresholds Are Low
  - 10 tpy for PM$_{2.5}$
  - 15 tpy for PM$_{10}$
- Annual Ambient Standard is Low
  - 12 mg/Nm$^3$ (Was 15 mg/Nm$^3$)
- Dispersion Modeling Challenges
- Offsets Not Available in Some Non-Attainment Areas
- Testing Error is the Largest Contributor to PM$_{10/2.5}$ Emissions Compliance Demonstration
Asia

- Fuel Flexibility, Not Emissions Control, is Market Driver
- Significant Volumes of LNG Coming On-Line
- Abundant Natural Gas Resources Driving Shift to Natural Gas
- Region Primarily Utilizes Conventional Combustion Design
- Old CHP Being Replaced With Gas Turbines
- Emissions Regulation Levels Often Not Tied to a Specific Combustion Technology Capability
South America

• Regulatory Emissions Levels Vary Greatly Country to Country
• Some Countries Regulations Require Dry Low Emissions Levels of NO\textsubscript{x}
• In Other Countries, Higher NO\textsubscript{x} Levels are Acceptable
• Often Inconsistent Application of Regulation Within A Country
• World Bank Thermal Power Plant or General EHS Guidelines Occasionally Referenced on Non-World Bank Financed Projects
Africa

• Grid System Is Not Interconnected
  • Patchwork System Drives Smaller Systems

• South Africa Different Scenario Than Rest of Continent
  • Predominately Coal Based

• Vague and Unclearly Written Regulations and Inconsistent Emissions Levels Across Industry Type

• World Bank Thermal Power Plant or General EHS Guidelines Sometimes Referenced Non-World Bank Financed Projects
Thank You!

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