

REINHOLD ENVIRONMENTAL Ltd.



**2015 APC Round Table
& Expo Presentation**

July 13 & 14, 2015, in Atlanta, GA / Hosted by Southern Company

All presentations posted on this website are copyrighted by Reinhold Environmental, Ltd (RE). Any unauthorized downloading, attempts to modify or to incorporate into other presentations, link to other websites, or obtain copies for any other uses than the training of attendees to RE's Conferences is expressly prohibited, unless approved in writing by RE or the original presenter. RE does not assume any liability for the accuracy or contents of any materials contained in this library which were presented and/or created by persons who were not employees of RE.



INSTITUTE OF
CLEAN
AIR
COMPANIES

GUIDANCE DOCUMENT ON STARTUP AND SHUTDOWN UNDER MATS & NSPS

July 13, 2015

Panel

Connie Senior –ADA ES

Kevin Crown – Southern Co

J. Berley –Duke

Tony Licata –Licata Energy

ICAC

- ▶ The Institute of Clean Air Companies (ICAC) is the national non-profit trade association of companies that supply air pollution control and monitoring systems, equipment, reagents, and services. ICAC has promoted the air pollution control industry and encouraged the improvement of engineering and technical standards since 1960. Our members include over 90 companies who are leading manufacturers of equipment to control and monitor emissions of particulate matter (PM), volatile organic compounds (VOC), sulfur dioxide (SO₂), nitrogen oxides (NO_x), hazardous air pollutants (HAP), mercury, acid gases, and greenhouse gases (GHG). ICAC is in a unique position to provide technical guidance on the startup and shutdown provisions of the Mercury and Air Toxics Standard (MATS). ICAC's collective technical expertise is, and will continue to be, an important resource for coal-fired boilers facing challenging new regulations.

Objectives

- ▶ The objective is to provide industrial & utility boiler operators with guidance on safe and effective methods of starting the APC equipment & on measurement issues in order to comply with EPA's startup and shutdown provisions in the rule and operating permits.
- ▶ Boiler startups, are characterized by rapid transient changes in flue gas composition, quantity, temperature, & moisture conditions that may impact the performance of APC equipment/ environmental compliance

- ▶ The MATS startup and shutdown provisions apply to both (EGUs) and industrial boilers (IB).
- ▶ These rules apply to startup and shutdown under MATS and to the startup and shutdown provisions for the PM standard in the utility called New Source Performance Standard (NSPS), and IB National Emission Standards for Hazardous Air Pollutants (NESHAP), i.e. IB Maximum Achievable Control Technology (MACT).



INSTITUTE OF
CLEAN
AIR
COMPANIES

New Actions

- ▶ 5/22/15 EPA issued a final rule directing 36 states to stop providing exemptions for emission violations during the startup, shutdown or malfunction (SSM) of a power plant.
- ▶ The 36 states directed to change their policies to prohibit exemptions for SSM events have until Nov. 22, 2016 to comply.
- ▶ Eliminate affirmative defense from State Rules



INSTITUTE OF
CLEAN
AIR
COMPANIES

Option 1

- ▶ Must comply with all MATS and NSPS standards at the time of electricity generation.
- ▶ Require use “clean” fuel during startup & shutdown.
- ▶ Startup ends when first power is generated or useful thermal energy is produced. Any fraction of an hour counts as a full hour. This hour is the first MATS compliance hour.



INSTITUTE OF
CLEAN
AIR
COMPANIES

Option 1

When burning the primary fuel:

- ▶ Must engage all of the applicable control technologies except dry FGD and SCR
- ▶ Do not have to engage dry flue gas desulfurization (DFGD) or SCR;
- ▶ Engage DFGD and SCR when **RELEVANT STANDARDS** are applicable;
- ▶ Must comply with all applicable emissions limits at all times except for periods that meet the applicable definitions of startup and shutdown. Required to meet all CAA or State Permit limits

Option 2

- ▶ Must comply with all MATS and NSPS standards within **four hours** of the time of electricity generation. To utilize Option 2 there are additional reports and information that need to be provided to EPA by an independent Professional Engineer. The report must be submitted with the EGU's Notification of Compliance Status and must show the following slides.



INSTITUTE OF
CLEAN
AIR
COMPANIES

Option 2 Report

- ▶ How the current condition of the PM device, including any modifications, can meet the rule requirements.
- ▶ Time needed to engage PM device after initial fire.
- ▶ PM device effectiveness at initial operation and under normal operation.
- ▶ PM emission rate.
- ▶ Uncontrolled PM emission rate.
- ▶ The capacity of auxiliary fuels for each unit.

Option 2 Actions

- ▶ Clean auxiliary fuels defined in § 63.10042 must be utilized to the maximum extent possible throughout the entire startup period. The EGU must have sufficient clean, auxiliary fuel capacity to engage and operate the PM control device within 1 hour of adding primary fuel to the unit.
- ▶ PM equipment must be engaged no more than **one hour** after firing primary fuel.
- ▶ Engage all other APCDs as expeditiously as possible, and in any case to support all other emission standards.
- ▶ Must meet the startup period work practice requirements as identified in §§63.10020(e).



INSTITUTE OF
CLEAN
AIR
COMPANIES

Option 2

Startup ends **four** hours after any power is generated.

- ▶ All MATS compliance tracking, recordkeeping and compliance requirements resume the hour that startup ends. For example, if the unit first generates power at 0300, MATS resumes at 0700. If the unit first generates power at 0350, MATS resumes at 0700. The hour at which the Startup Period ends is the hour at which all compliance standards resume.



INSTITUTE OF
CLEAN
AIR
COMPANIES

Option 2

In the event of concern about safety of operation or inability of a source to comply, the source can apply to the administrator for an EGU-specific case-by-case emission standard. This requires:

- ▶ Manufacturer of device certifies that there is a safety issue, and
- ▶ Proof that the APCD is adequately designed to meet the final limit
- ▶ Among other specifics described at 40 CFR 63.10011(g)(4)

Other Provisions of the Rule

Diluent cap for non-IGCC boilers: default values may be used for calculations of emission rates during startup and shutdown periods for CO₂ and O₂:

- ▶ Default of 5% for CO₂ when CO₂ is less than 5%;
- ▶ Default of 14% for O₂ when O₂ is above 14%.

The rule provides alternative that can be used for Hg measurements during startup and shutdown.

- ▶ 1. Use CEMS at all times.
- ▶ 2. Use two separate sorbent trap systems and switch at startup/shutdown.
- ▶ 3. Use a single sorbent trap system and include startup and shutdown periods in compliance averaging period (30-day or 90-day).

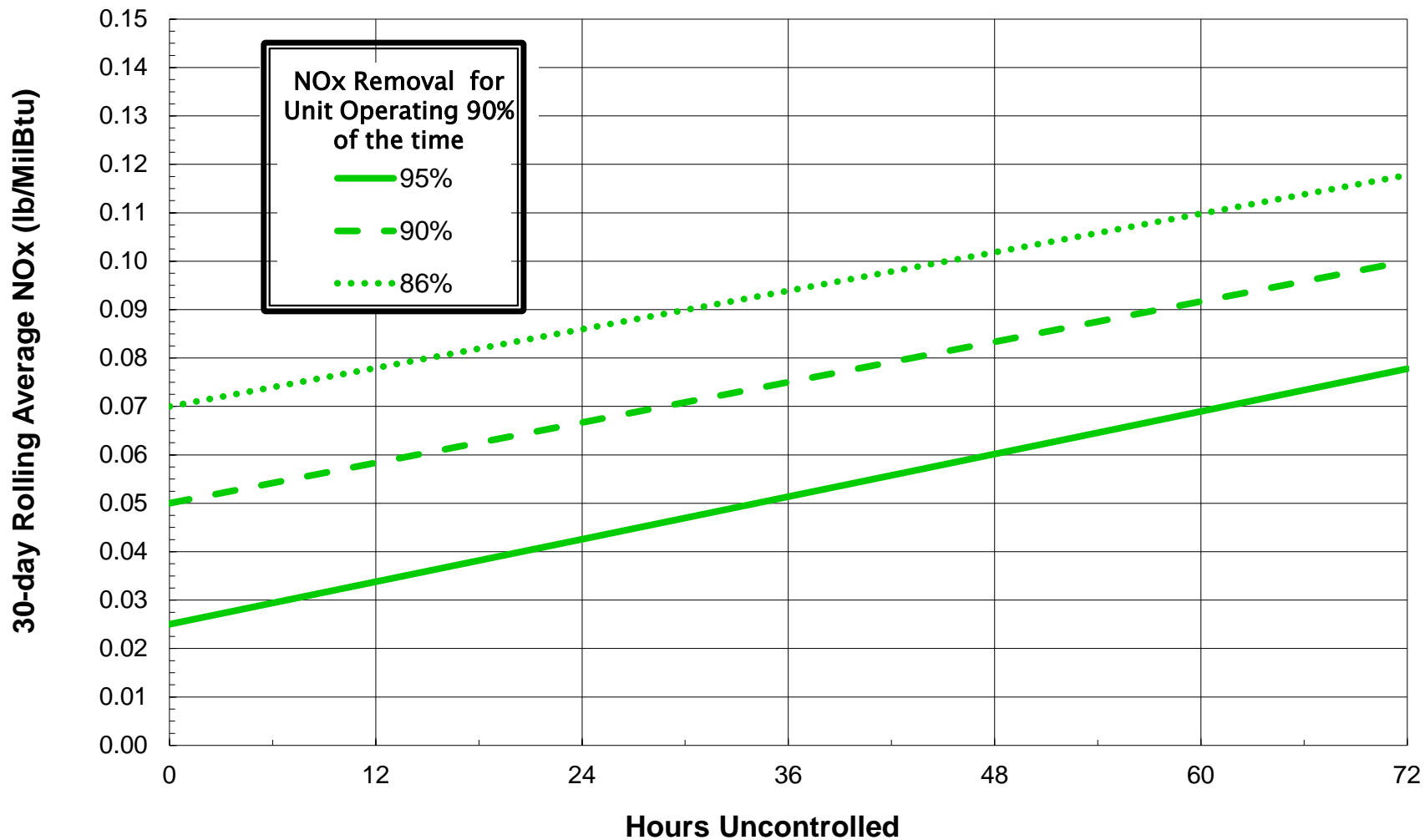


INSTITUTE OF
CLEAN
AIR
COMPANIES

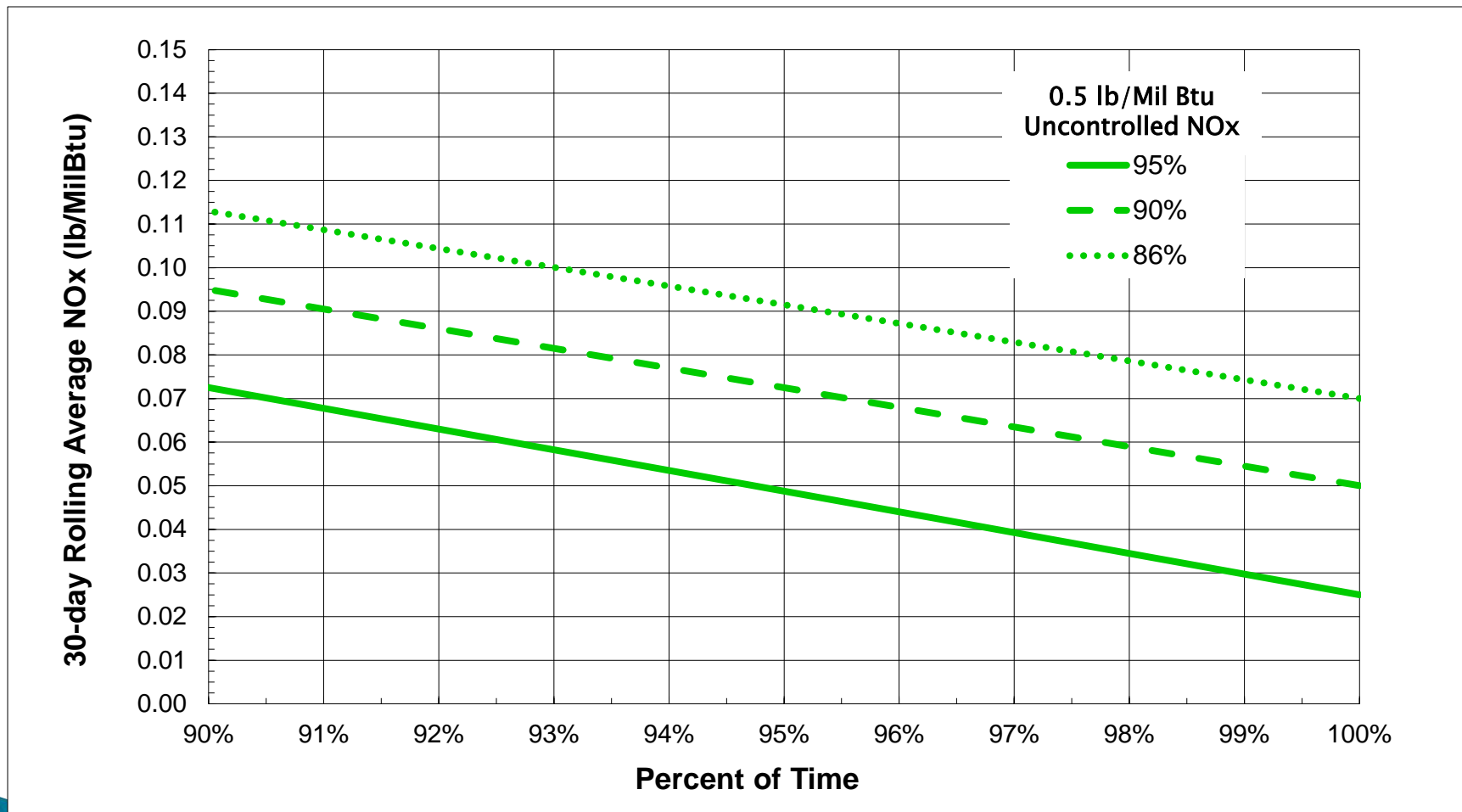
Over compliance to achieve 30 day rolling average

Data provided by Terry Ake of Babcock Power

EFFECT OF % OF TIME UNCONTROLLED ON A 30-DAY ROLLING AVERAGE NOX VALUE



EFFECTS OF NOX REMOVAL (THE REMAINING TIME UNCONTROLLED) ON A 30-DAY ROLLING AVERAGE NOX VALUE



Starting A Steam Generation Power Plant

- ▶ Unit Purging
- ▶ Water Chemistry
- ▶ Superheater and Reheater Protection
- ▶ Turbine Warming
- ▶ Minimizing Boiler Thermal Stresses
- ▶ Balance of Plant Thermal Stresses
 - SCR
 - ESP



INSTITUTE OF
CLEAN
AIR
COMPANIES

Measurements during SSM

CEMS issues

- ▶ Diluent Gas Measurements
 - Use of diluent cap (assuming a maximum value of O₂ at 14% or of CO₂ at 5%) to reduce potential errors in calculated emission rates when the excess air is high during startup.
- ▶ Flue Gas Flow
 - Stack flow measurement device must be selected to properly measure along the entire range of flows encountered during a startup or shutdown
- ▶ Calibrations
 - To validate a CEMS for measurements during startup and shutdown, consideration should be given to conducting RATAs for at least three different loads for the facility to insure that the CEMS can be relied on
- ▶ Moisture
 - Varying moisture levels must be investigated to identify the full range encountered during a startup or a shutdown period

Special considerations for Hg: CEMS and sorbent traps

- ▶ Spikes in mercury emissions have been observed as the boiler and flue gas heat up during the startup period
- ▶ If emissions spikes are known, it is important to characterize them
 - So that trap vendors can supply traps that have the appropriate spike concentrations
 - So that Hg CEMS vendors can supply span or calibration information to meet QA/QC needs



INSTITUTE OF
CLEAN
AIR
COMPANIES

APC Equipment

| APC Equipment | Warm Startup | Cold Startup |
|--------------------------------|---|---|
| SCR | Require minimum temperature (independent of load or duration) prior to ammonia injection. | Require minimum temperature (independent of load or duration) prior to ammonia injection, but should be inline no later than first fire of Hg containing fuel. |
| Wet FGD | No minimum requirements prior to startup | No minimum requirements prior to startup. |
| Spray dryer/baghouse | Require minimum temperature and flue gas flow prior to lime slurry spray. Some emission reductions can be maintained by the baghouse dustcake prior to slurry injection. | Require minimum temperature and flue gas flow prior to slurry spray. Some emissions can be maintained with baghouse prior to slurry injection. |
| CDS/baghouse | Require minimum flue gas flow prior to lime injection and require minimum temperature prior to water spray. Some emission reductions can be maintained by the baghouse dustcake prior to additional lime and water injection. | Require minimum flue gas flow prior to lime injection and require minimum temperature prior to water spray. Some emission reductions can be maintained by the baghouse dustcake prior to additional lime and water injection. |
| DSI or carbon injection system | Require minimum flue gas flow prior to sorbent injection. | Require minimum flue gas flow prior to sorbent injection. |
| | Sodium sorbent systems require minimum temperature. Conveying air should flow through lances to prevent plugging by fly ash. | Sodium sorbent systems require minimum temperature. Conveying air should flow through lances to prevent plugging by fly ash. |
| Baghouse | Do not pulse off all the ash before shutdown so there is a protective layer existing for the following startup. | Do not pulse off all the ash before shutdown so there is a protective layer existing for the following startup. |
| ESP | Energize when flue gas temperature >250°F. | Energize when flue gas temperature >250°F. |



**INSTITUTE OF
CLEAN
AIR
COMPANIES**

APC Equipment

| APC Equipment | Normal Shutdown |
|--------------------------------|---|
| SCR | Discontinue ammonia feed at minimum temperature. |
| SNCR | Discontinue ammonia feed at minimum temperature. |
| Wet FGD | System can remain in service during shutdown. The number of recycle pumps in service should be limited to minimize blow back into inlet ductwork at reduced flow. |
| Spray dryer/baghouse | Discontinue lime slurry feed at minimum temperature and flue gas flow. |
| CDS/baghouse | Discontinue water feed at minimum temperature and discontinue lime feed at minimum flue gas flow. |
| DSI or carbon injection system | Discontinue sorbent feed at minimum flue gas flow. Discontinue sodium sorbent feeding system at minimum temperature. |
| Baghouse | System can remain in service during shutdown. May have to place compartments out of service based on flow and or temperature dependent on manufacturers recommendations. Do not pulse off all the ash before shutdown so there is a protective layer existing for the following startup |
| ESP | System can remain in service during shutdown until flue gas temperature is reduced to 250 °F. |

Questions



INSTITUTE OF
CLEAN
AIR
COMPANIES