Proposed Rule 1165 Control of Emissions from Incinerators

Working Group Meeting #2
March 14, 2024

Zoom Meeting Information

URL: https://scaqmd.zoom.us/j/96068287409
Webinar Meeting ID: 960 6828 7409
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Agenda

- Summary of Working Group Meeting 1
- SERRF Facility Update
- BARCT Assessment
- Proposed Rule Concepts
- Next Steps

Summary of Working Group Meeting #1

Summary of Working Group Meeting #1

- Background on necessity of Proposed Rule (PR) 1165 to meet both NAAQS and U.S. EPA Good Neighbor Plan
- Overview of BARCT assessment for rule development
- Equipment layout and emissions performance for SERRF facility
- Preliminary two-phase rule limit approach
  - U.S. EPA Good Neighbor Plan: 105-110 ppm NOx[1]; implementation by 2026
  - BARCT Assessment: Lower limit implemented at a later time

[1] NOx limits are corrected to 7% O2. https://www.epa.gov/system/files/documents/2023-03/Final%20Non-EGU%20Sectors%20TSD.pdf.

SERRF Facility Update

Recent History for SERRF

1988
SERRF begins operation for a planned 30-years operating life

2019 and 2020
Capital expenditures incurred to extend life of the facility to 2024

Jan 2023
Covanta begins operating the facility

Feb 6, 2024
Long Beach City Council votes to decommission the facility

Future Plans for SERRF

Long Beach City council also voted in Feb 2024 to construct a new facility to process green waste and organics planned to be constructed from 2025-2030

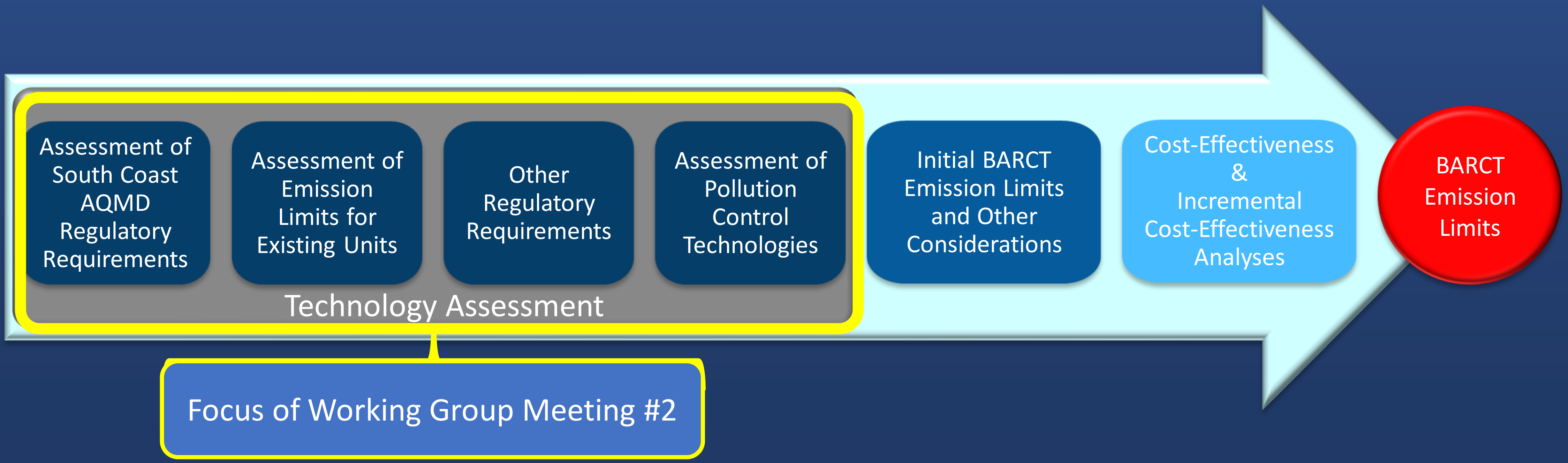
Staff will continue to undergo a BARCT analysis to identify cost-effective pollution control technologies and create a rule for municipal solid waste (MSW) incinerators

Staff will fulfill its obligation to reduce NOx emission levels to be compliant with U.S. EPA Good Neighbor Plan

BARCT Assessment

BARCT Assessment Process

- Best Available Retrofit Control Technology (BARCT) Assessment is conducted for each class and category of equipment
- Technology assessment will review both current regulations and control technologies



BARCT Assessment Process

Assessment of South Coast AQMD Regulatory Requirements

- No source-specific rule exists for municipal solid waste incinerators
- SERRF facility subject to various South Coast AQMD rules applicable to all equipment types and industries
- Regulation 4 rules represent the highest limits allowed in the South Coast Air Basin
- A waste incineration rule is still required as Regulation 4 rules are generally not considered in a BARCT analysis

Table 1. South Coast AQMD Regulation 4 Rules

Rule	Rule Title	Last Amended/Adopted	Pollutant	Emission Limit[1,2]
404	Particulate Matter – Concentration	1986	PM	450 mg/m^3 0.196 gr/ft^3
405	Solid Particulate Matter – Weight	1986	PM	0.23 kg per 907 kg waste processed
407	Liquid and Gaseous Air Contaminants	1982	CO; SO2	CO: 2,000 ppm; SO2: 500 ppm
409	Combustion Contaminants	1981	Combustion Contaminants	**0.1 gr/ft^3 @ 12% CO2**
475	Electric Power Generating Equipment	1978	Combustion Contaminants	11 lbs/hr **0.01 gr/ft^3**
476	Steam Generating Equipment	1976	Combustion Contaminants; NOx	11 lbs/hr; **0.01 gr/ft^3** **175 ppm NOx @ 7% O2**

[1] Each air pollution control system (including each baghouse) has a 25 mg/dscm particulate matter emission limit not correlated to a South Coast AQMD rule

[2] Some emission limit values are converted to equivalent units or correction factors for the sake of comparison

Objective

Other Regulatory Requirements

Objective is to assess existing units on four different levels (local, state, national, and international) for various purposes

Action 1

Evaluate permit limits of other air districts and facility equipment across the country

Action 2

Specify current BARCT for incinerators within the South Coast AQMD

Action 3

Use data to assess potential BARCT NOx and PM emission limits with respect to other established limits

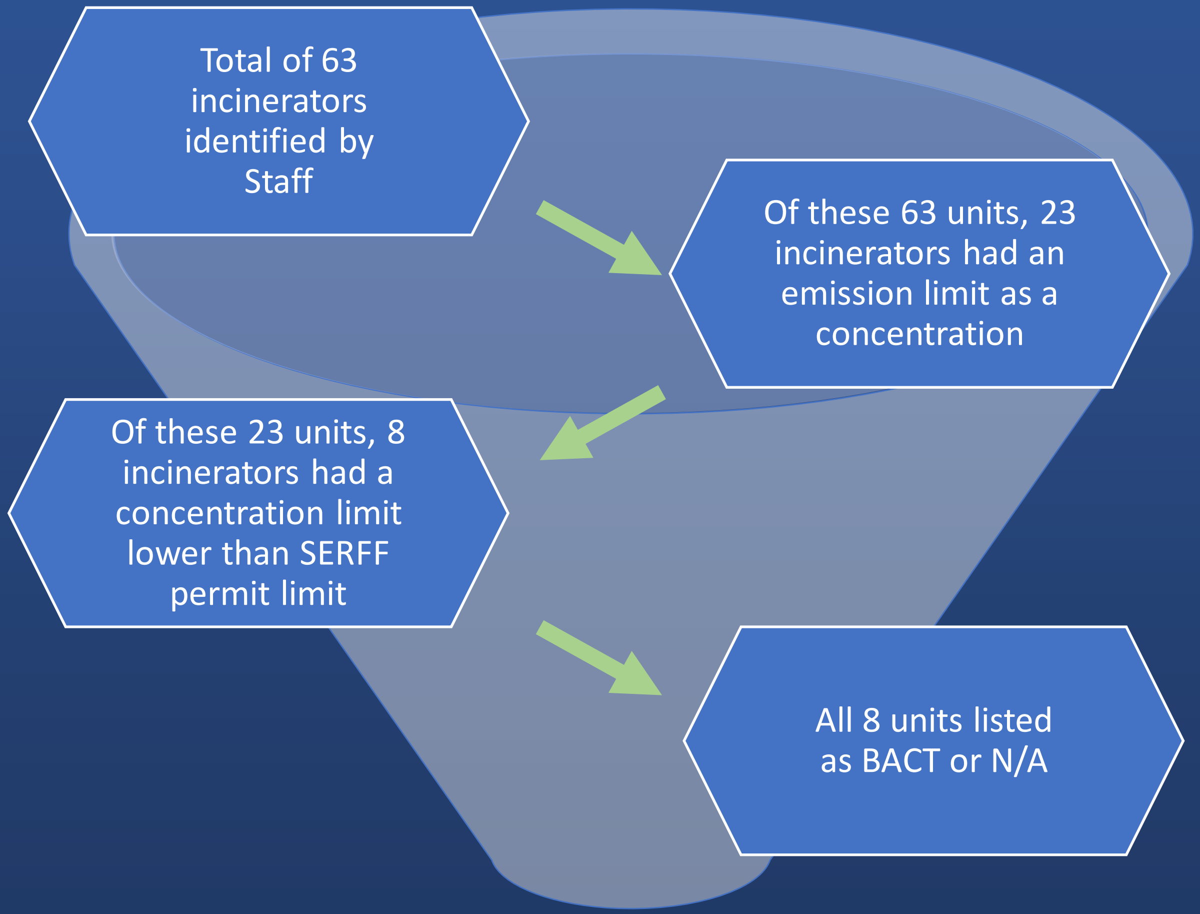
- Staff reviewed other Best Available Control Technology (**BACT**) regulations for informative purposes
  - BACT regulations applicable to new installations and not existing sources
- PR 1165 is applicable to existing facilities and undertakes a Best Available Retrofit Control Technology (**BARCT**) analysis
  - Only other BARCT regulations will be considered in this comparative analysis to inform the PR 1165 initial BARCT emission limit

Other Regulatory Requirements

BACT - NOx

Staff Assessment of Emission Limits for Existing Units – National: U.S. EPA Database

- U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC)[1] reviewed to determine other incineration emission limits across the nation
- Majority of units had a NOx emission limit in terms of efficiency (lbs NOx/MMBtu, lbs NOx/hr, or lbs NOx/tons of waste charged)
- Total of 63 units identified, with 8 units listed a comparable NOx concentration limit lower than SERRF limit
- Some BACT limits higher than U.S. EPA Good Neighbor Plan limit and many facilities will need to retrofit



[1] U.S. EPA. Clean Air Technology Center - RACT/BACT/LAER Clearinghouse. https://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en.

BACT - NOx
Staff Assessment of Emission Limits for Existing Units – National: U.S. EPA Database

Other Regulatory Requirements

BACT limits not directly considered
Use of selective catalytic reduction (SCR) may result in lower NOx emissions

Table 2. BACT Incineration NOx Concentration Limits for Units Nationwide

State	Facility	NOx Limit[1]	NOx Control Technology
California	SERRF	225 ppm @ 3% O2 (175 ppm @ 7% O2) (32 ppm @ 12% CO2)	SNCR
Florida	Hillsborough County Resource Recovery Facility	90 ppmvd	SNCR
Puerto Rico	Energy Answers Arecibo Puerto Rico Renewable Energy Project	45 ppm @ 7% O2[2]	SCR
Florida	Palm Beach Renewable Energy Park	50 ppm @ 7% O2	SCR
Florida	Lee County Waste-to-Energy Facility	110 ppmvd @ 7 % O2	SNCR
Illinois	Robbins Resource Recovery	130 ppmvd @ 7% O2[2]	Thermal DeNOx
North Carolina	Gaston County MSW Disposal Facility	150 ppmvd @ 7% O2	Westinghouse Combustor Technology
Virginia	Harrisonburg Resource Recovery	160 ppm @ 7% O2	N/A
New Jersey	American Ref-Fuel Company of Essex County	174 ppmvd @ 7% O2	SNCR

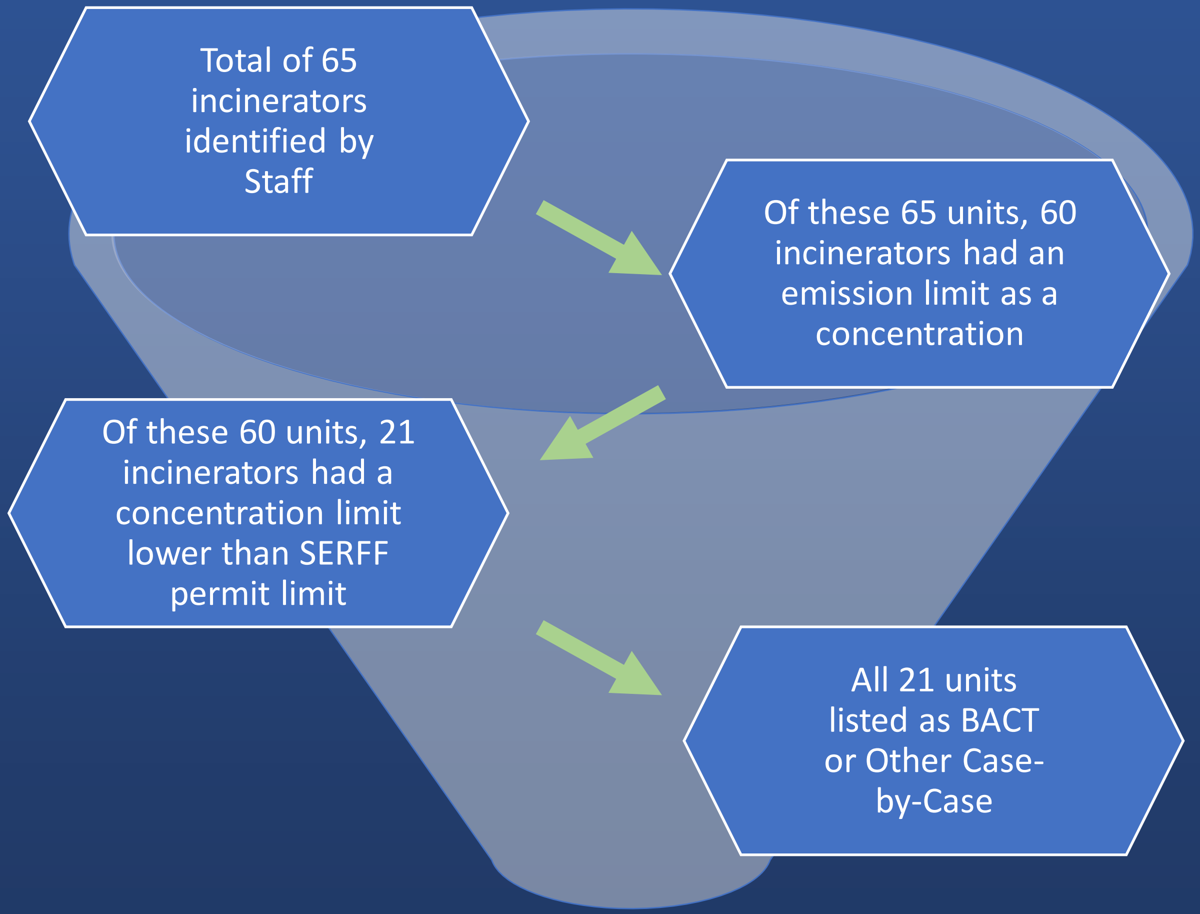
[1] U.S. EPA did not always specify incineration combustor type nor – for some units – a correction factor
[2] Based on refuse-derived fuel (RDF) which can consist of municipal, industrial, and commercial waste and is a more uniform fuel source than MSW

BACT - PM

Staff Assessment of Emission Limits for Existing Units – National: U.S. EPA Database

Other Regulatory Requirements

- U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC)[1] reviewed to determine other incineration emission limits across the nation
- Majority of units had a particulate matter (PM) emission limit in terms of efficiency
  (lbs PM/MMBtu, lbs PM/hr, or lbs PM/tons of waste charged)
- Total of 65 units identified, with 21 units listed a comparable PM concentration limit lower than SERRF limit
- Similar PM control technology utilized with lower PM limits



[1] U.S. EPA. Clean Air Technology Center - RACT/BACT/LAER Clearinghouse. https://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en.

BACT - PM

Staff Assessment of Emission Limits for Existing Units – National: U.S. EPA Database

Other Regulatory Requirements

BACT limits not directly considered

Permits issued between 2003-2010 for Florida and 2014 for Puerto Rico facilities with lower PM limits (age may be a factor in baghouse performance)

Table 3. BACT Incineration PM Emission Limits for Units Nationwide

State	Facility	PM Limit[1]	PM Control Technology
California	SERRF	Permit: 0.01 gr/scf @ 7% O2 Stack Test: 0.0018 gr/scf @ 7% O2	Baghouse
Puerto Rico	Energy Answers Arecibo Puerto Rico Renewable Energy Project	(gr/scf @ 7% O2)[2] FPM: 0.004 FPM10: 0.01 FPM2.5: 0.0096	Baghouse
Florida	Palm Beach Renewable Energy Park	PM10: 0.005 gr/scf @ 7% O2	Baghouse
Florida	Hillsborough County Resource Recovery Facility	FPM10: 0.005 gr/scf @ 7% O2	Baghouse
Florida	Lee County Waste-to-Energy Facility	FPM10: 0.009 gr/scf @ 7% O2	Baghouse
Virginia	City of Harrisonburg Resource Recovery Facility	24 mg/dscm @ 7% O2 (~0.01 gr/scf @ 7% O2)	Baghouse
Virginia	Harrisonburg Resource Recovery	24 mg/dscm @ 7% O2 (~0.01 gr/scf @ 7% O2)	Baghouse

[1] Only limits corrected to 7% O2 are shown; remaining 15 units are corrected to 12% CO2 and are not shown with lowest limit at 0.01 gr/dscf @ 12% O2 and SERRF's PM limit at 0.10 gr/dscf @ 12% CO2

[2] Based on refuse-derived fuel (RDF) which can consist of municipal, industrial, and commercial waste and is a more uniform fuel source than MSW; RDF has most of metal content removed and thus lower PM emissions relative to MSW

[3] Other U.S. EPA database reviewed for State Implementation Plan (SIP) submittal. https://www.epa.gov/sites/default/files/2019-02/documents/10.18.08_26.11.08_control_of_incinerators.pdf.

BARCT
Staff Assessment of Emission Limits for Existing Units

Other Regulatory Requirements

Other California air districts and U.S. EPA database reviewed for NOx and PM emission limits for existing incinerators

Lower NOx and PM limits for existing facilities show potential for lower limits

Table 4. BARCT Incineration Emission Limits for Units Nationwide

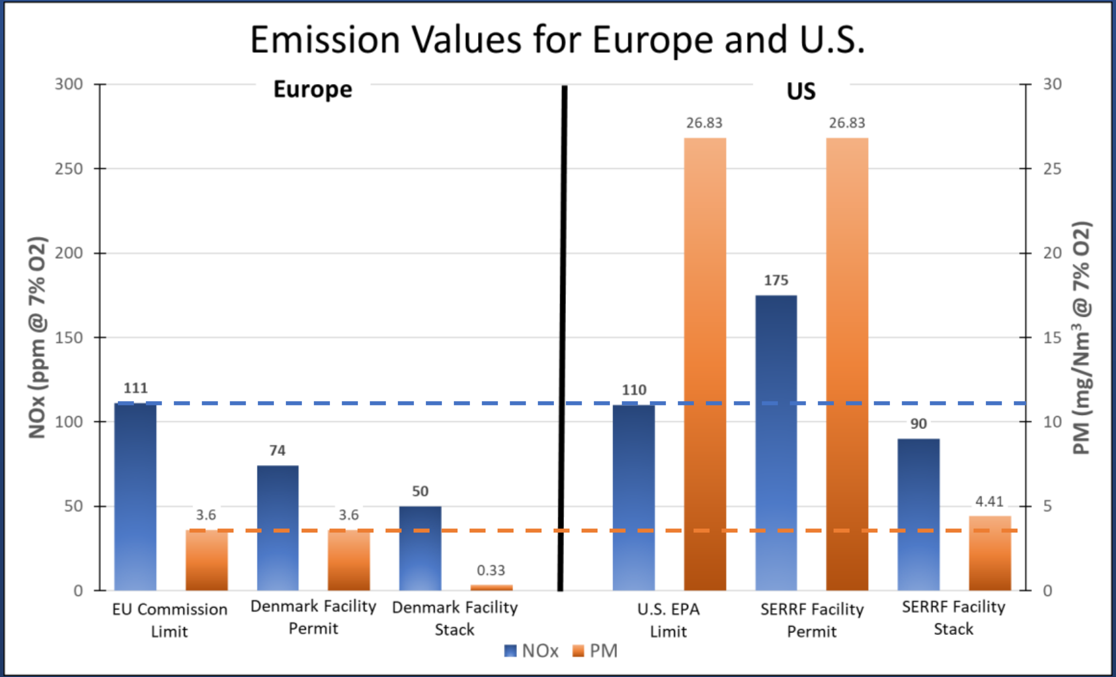
Regulatory Entity	Applicable Rule	Facility	NOx Limit	PM Limit
South Coast AQMD	N/A	SERRF	225 ppm @ 3% O2 (175 ppm @ 7% O2) (32 ppm @ 12% CO2)	0.01 gr/ft^3 @ 7% O2 (0.10 gr/ft^3 @ 12% CO2)
Placer County AQMD	206 – Incineration Burning	N/A	50 ppmv @ 12% CO2 (1-hr average)	0.015 gr/ft^3 @ 12% CO2
San Joaquin Valley APCD	4203 – Particulate Matter Emissions from Incineration of Combustible Refuse	N/A	N/A	> 100 lbs waste burned per hour: 0.1 gr/ft^3 @ 12 % CO2
San Luis Obispo County APCD	503 – Incinerator Burning	N/A	N/A	0.08 gr/ft^3 @ 7% O2
Virginia State Air Pollution Board[1,2]	9 VAC 5 Chapter 40	Covanta Alexandria (Virginia, USA)	110 ppmv @ 7% O2 (24-hour average) 90 ppmv @ 7% O2 (1-hr average)	0.14 gr/ft^3 @ 12% CO2
Virginia State Air Pollution Board[1,2]	9 VAC 5 Chapter 40	Covanta Fairfax (Virginia, USA)	110 ppmv @ 7% O2 (24-hour average) 90 ppmv @ 7% O2 (1-hr average)	0.14 gr/ft^3 @ 12% CO2
Maryland Department of Environment	Chapter 26. Subtitle 11.08	N/A	105 ppmv @ 7% O2 (30-day rolling average) 140 ppmv @ 7% O2 (24-hour block average)	0.10 gr/dscf^3

[1] 9 VAC 5 Chapter 40 does not include NOx emission limit; Unit permits list a NOx emission limit
[2] 9 VAC 5 Chapter 40 does include PM emission limit; Unit permits does not list a PM emission limit

Staff Assessment of Emission Limits for Existing Units – International

Other Regulatory Requirements

- European Commission's Industrial Emissions Directive 2010/75/EU for BAT (Best Available Technology)[1] specifies a range of emission limits for several pollutants for new and **existing** installations
- Staff engaged with one MSW incineration facility located in Denmark
  - Facility is a **new** installation and **not** comparable to SERRF
  - Shown for informational purposes
  - Utilizes ESP for PM control, followed by SCR for NOx control
- Emissions comparison
  - NOx limits equivalent between EU and US EPA
  - PM limits far more restrictive for EU than for US EPA
- SERRF shows stack test[2] compliance with US regulations



[1] Food and Agriculture Organization of the United Nations. https://www.fao.org/faolex/results/details/en/c/LEX-FAOC109066.
[2] A stack test is only a "snapshot" of emissions. U.S. EPA regulations require 24-hour and 30-day averaging period CEMS measurements.

BARCT
Other Regulatory Requirements – Summary

Other Regulatory Requirements

Table 5. BARCT Incineration Limits Summary

Level	Lowest NOx Limit	Lowest PM Limit
SERRF	225 ppm @ 3% O2 (175 ppm @ 7% O2) (32 ppm @ 12% CO2)	0.01 gr/ft^3 @ 7% O2
Local	N/A	N/A
State: California Air Districts	50 ppmv @ 12% CO2 (1-hr average)	0.08 gr/ft^3 @ 7% O2
National: U.S. EPA Database	90 ppmv @ 7% O2 (1-hr average)	0.01 gr/ft^3 @ 7% O2
International (EU Limits)	111 ppm @ 7% O2	3.6 mg/Nm^3 (0.002 gr/ft^3 @ 7% O2)

For Existing Units

Lower NOx permit limits inside the US

Lower PM permit limits outside the US

NOx Control Technologies - SNCR

Assessment of Pollution Control Technologies

Currently used at SERRF for NOx control since operation began in 1988

Injection of ammonia or urea into flue stream to reduce NOx to N2 and H2O **without** the presence of a catalyst

Ammonia injected at a 2:1 – 4:1 ratio of NH3:NOx (can cause higher ammonia slip than SCR)

Flue temperature must be 1,500-2,100 °F to ensure proper chemical reaction

NOx reduction efficiencies can range from 25-50%

Relative to SCR, is cheaper and simpler to install and maintain

Covanta operates a patented SNCR Low-NOx (LN™) technology at select facilities

Can retrofit onto existing "standard" SNCRs to increase NOx and ammonia performance

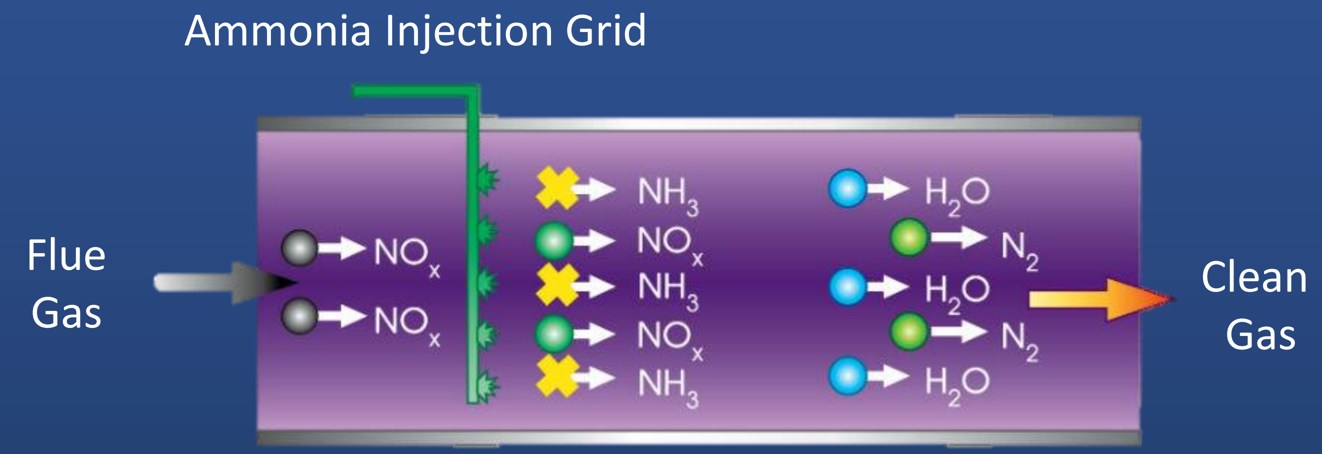


Image source: Integrated Flow Solutions. *Power Plant NOx Reduction – SCR vs SNCR Technology Which is better? https://ifsolutions.com/power-plant-nox-reduction-scr-vs-sncr/.*

NOx Control Technologies - SCR

Assessment of Pollution Control Technologies

Not widely used in the US (Only 3 installations identified)

Injection of ammonia or urea into flue stream to reduce NOx to N2 and H2O **with** the presence of a catalyst

Ammonia injected at a 0.9:1 – 1:1 ratio of NH3:NOx (less ammonia slip than SNCR)

Flue temperature must be 500-1,000 °F to ensure proper chemical reaction

NOx reduction efficiencies can range from 80-90%

Catalyst blocks must be replaced over time (additional expense)

Image source: Hitachi Zosen. *SCR (Selective Catalytic Reduction) NOx Removal System*. https://www.hitachizosen.co.jp/english/business/field/marine/denitration.html.

PM Control Technologies – Background

Assessment of Pollution Control Technologies

- Particulate matter (PM) is measured by both type and size
- Size designations are typically in three tiers, based on microns
  - PM30
  - PM10
  - PM2.5
- PM2.5 is of greatest concern due to its ability to infiltrate lungs
- PM2.5 can be further distinguished by filterable and condensable PM
  - Filterable PM is fraction of PM2.5 which can be condensed onto a filter bag
  - Condensable PM is fraction of PM2.5 which is matter in the gas phase that condenses upon cooling at ambient temperatures out of the stack (cannot be filtered/removed)
- Condensable fraction of PM2.5 can range from 10-50%
- Different PM control technologies may be more effective depending on mass fraction of condensable PM in inlet stream

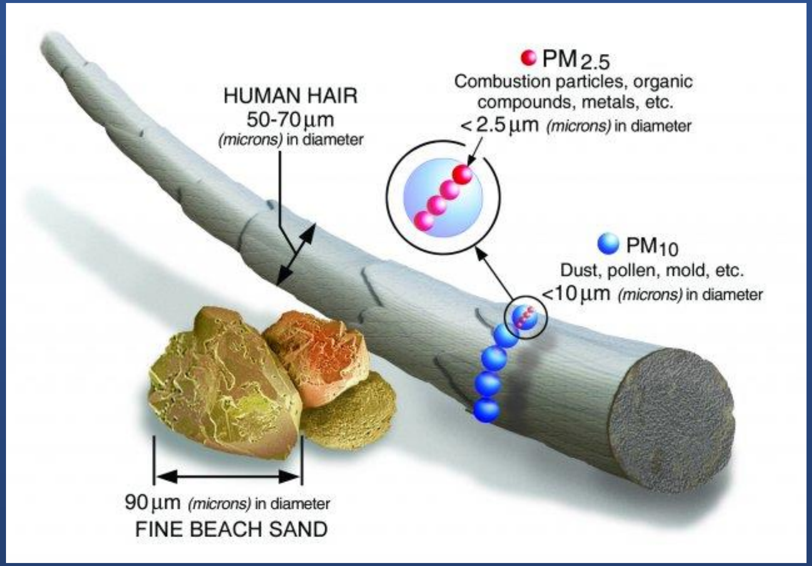
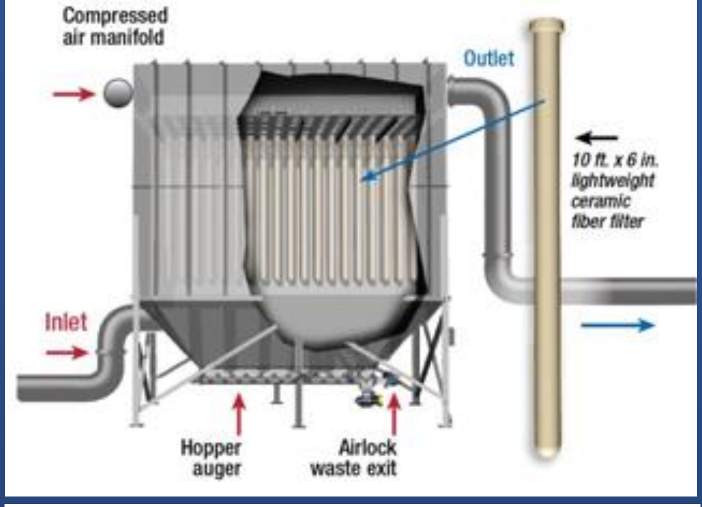


Image source: U.S. EPA. *What is PM, and how does it get into the air?* https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM.

PM Control Technologies – Ceramic Catalytic Filters

Assessment of Pollution Control Technologies

- Utilizes catalyst-embedded ceramic technology to non-selectively remove multiple pollutants
- Can simultaneously remove PM as well as NOx (up to 90% NOx removal efficiency)
- Injection of additional dry sorbent can also remove acid gases
- Impregnated catalyst protected from poisoning via outer filter material



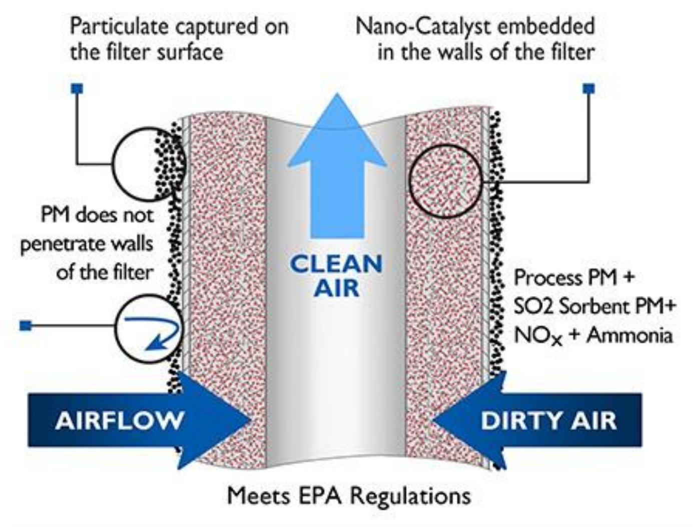


Image sources:
Lin, Che-Cheng. "Using a Ceramic Catalytic Filter System to Control Industrial Discharge of Particulate Matter, SOx and NOx". Oregon State University. https://gradschool.oregonstate.edu/sites/gradschool.oregonstate.edu/files/lin_psm_executive_summary.pdf.
Tri-Mer Corporation. *High Temperature Filters for Hot Gas Filtration*. https://tri-mer.com/hot-gas-treatment/high-temperature-filter.html

PM Control Technologies – HEPA & ULPA Baghouses

Assessment of Pollution Control Technologies

- Currently SERRF equipped with baghouses arranged in 3 separate trains – one for each of the 3 boilers
  - Each train has 10 compartments and is of reverse air cleaning type (73,400 ft^2 of filter area)
- Baghouses are fabric filter dust collectors used in various industries to remove particulate emissions
- Designed to house multiple bags or filters arranged vertically in rows
- An induced fan blows dust-laden air over the filters which capture the dust, leaving cleaned air to pass through
- Various types depending on the targeted contaminant, the type of system (bag, cartridge, or cyclone) and the type of cleaning system (pulse-jet, shaker, and reverse-air)

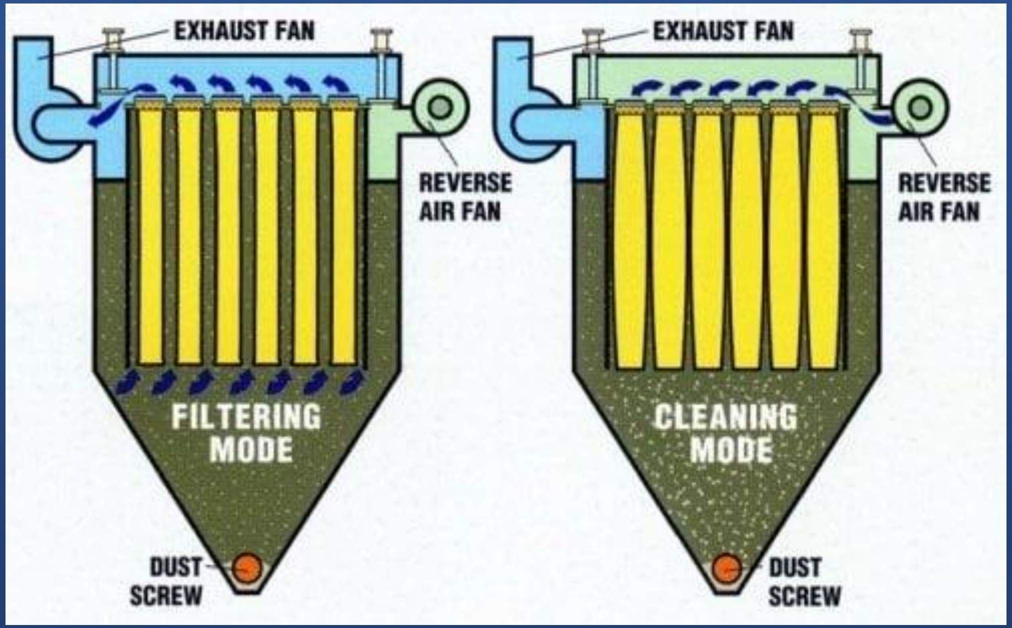


Image source: Micronics. *Baghouse Filter Basics*. https://www.micronicsinc.com/filtration-news/baghouse-filter-basics/.

PM Control Technologies – ESP

Assessment of Pollution Control Technologies

- Electrostatic precipitators (ESP) use electricity to charge particles to remove them from a gas stream
- Electrodes are charged with 20,000 – 100,000 volts, ionizing the gas between them and creating an area known as "corona"
- Particulate matter passes through the corona and is imparted a negative charge, which are then collected to positively-charged collector plates
- Varying types of ESP, notably dry ESPs vs. wet ESPs ("WESP")
  - Dry ESPs use vibrating wrappers or sonic horns to clean collector plates
  - Wet ESPs utilize water to collect and clean collector plates
- PM reduction efficiencies can reach > 99%

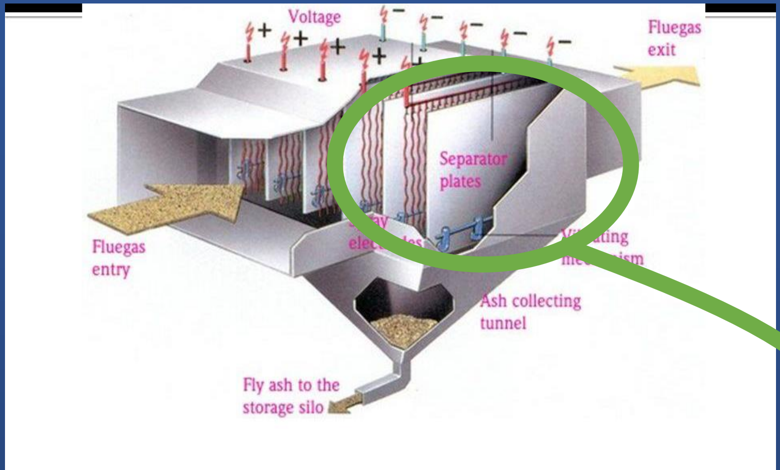


Image source: Control Air Pollution. *Important Facts about Electrostatic Precipitators and their Uses*. https://controlairpollution.wordpress.com/category/electrostatic-precipitator/.

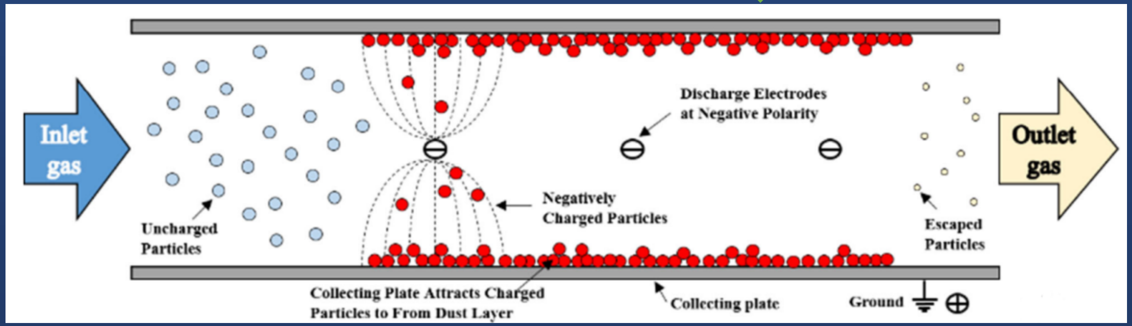
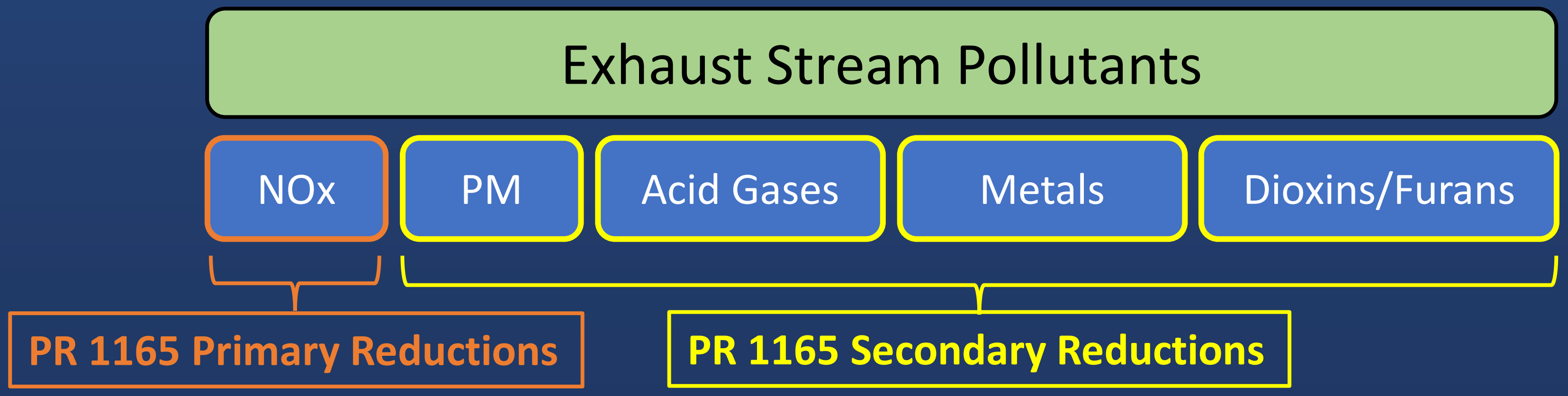


Image source: Gao, W.; et al. "A Numerical Investigation of the Effect of Dust Layer on Particle Migration in an Electrostatic Precipitator". https://aaqr.org/articles/aaqr-19-11-oa-0609.

Pollution Control Technology Evaluation

Assessment of Pollution Control Technologies

- Various pollutants are present in the inlet stream due to varying composition of MSW feed
- Cost-effectiveness analysis will consider only NOx pollution control technologies
- Some pollution control technologies may include secondary emission reduction benefits (e.g. particulate matter and metal emissions)
- Secondary emission reductions will be considered in overall BARCT analysis



Next Steps

Next Steps

Conduct Cost-Effectiveness

- Gather cost and feasibility information from vendors for emission control technologies
- Priority of NOx and PM emission reductions

Assess Initial Rule Concepts

- Multiple limits
  - Meet U.S. EPA NOx limit by 2026
  - Meet BARCT NOX limit by X year
- Compliance averaging periods
- Multiple pollutant emission limits

Public Process Timeline

- Public Workshop: Q2 2024
- Set Hearing: Q3 2024
- Public Hearing: Q4 2024

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Proposed Rules Page

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