Potential Amendments to District Rule 4352
(Solid Fuel Fired Boilers, Steam Generators,
and Process Heaters)

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San Joaquin Valley Air Pollution Control District

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Valley’s Air Quality Challenges

• Valley’s challenges in meeting federal air quality standards unmatched due to unique geography, meteorology, and topography
• Valley designated as “Extreme” non-attainment of the 8-hour Ozone NAAQS; “Serious” non-attainment of federal standards for fine particulate matter (PM2.5)
  – Substantial emission reductions needed to achieve federal standards – need to go beyond already strict control limits
• Combustion is a significant source of NOx emissions, primary precursor to ozone and PM2.5 formation
  – Comprehensive strategy in 2018 PM2.5 Plan includes commitment to reduce emissions from mobile sources and a number of stationary source categories, including solid fuel fired boilers, steam generators, & process heaters
Health Benefits of Reducing Emissions in the Valley

- Exposure to PM2.5 and Ozone linked to a variety of health issues, including (but not limited to):
  - Asthma, chronic bronchitis, irregular heartbeat, and respiratory/cardiovascular hospitalizations
- District implements control measures to lower direct and precursor emissions throughout the Valley
  - NOx emissions are key precursor to formation of ammonium nitrate, which is large portion of total PM2.5 during winter
  - NOx is also chemical precursor to formation of Ozone
- Proposed rule amendment will support goal of attaining health-based federal ambient air quality standards for both PM2.5 and Ozone, and help to protect public health
Rule 4352 Overview

- Rule 4352 applies to any boiler, steam generator, or process heater fired on solid fuel
  - **Boilers** are external combustion equipment used to produce hot water or steam
  - **Process heaters** are combustion equipment that transfer heat from combustion gases to liquid or gas process streams
  - **Steam generators** are external combustion equipment that convert water to steam
Where do Solid Fuel Fired Boilers, Steam Generators, and Process Heaters Operate?

• Solid fuel fired boilers, steam generators, and process heaters are primarily used for power generation
• Units subject to Rule 4352 may be fired on a variety of solid fuels:
  – Municipal solid waste
  – Biomass
  – Coal
  – Petroleum coke
• Units currently operating in the Valley are fired on municipal solid waste or biomass

Image credit: Covanta Holding Corporation
NOx from Solid Fuel Fired Boilers, Process Heaters and Steam Generators in the Valley

All NOx Sources in the Valley
(Mobile, Stationary, & Area Sources)

- Other NOx Sources: 98.3%
- Solid Fuel Fired Boilers: 1.7%

NOx Emissions from Stationary Sources

- Other Stationary Sources: 87.9%
- Solid Fuel Fired Boilers: 12.1%
Current Rule 4352 Requirements

• Rule requirements approved as meeting Most Stringent Measures (MSM) by U.S. EPA in July, 2020
• Rule 4352 establishes specific NOx and CO limits for categories of solid fuel fired boiler/steam generator/process heater units
  – Municipal Solid Waste (165 ppmv NOx at 12% CO₂, 400 ppmv CO at 3% O₂)
  – Biomass (90 ppmv NOx at 3% O₂, 400 ppmv CO at 3% O₂)
  – NOx and CO emission limits are based on a block 24-hour average
  – Monitoring and recordkeeping requirements
• NOx from solid fuel fired boilers controlled by up to ~75% through current rule requirements
Particulate Matter Control Technologies

• Electrostatic Precipitators (ESP)
  – Removes particulates from a gas stream by using electrical energy to charge particles either positively or negatively and attracted to collector plates

• Baghouses
  – Removes particulates from a gas stream by using fabric filters to collect and separate particles from industrial exhaust streams
NOx Control Technologies

• Selective Non-Catalytic Reduction (SNCR) Systems
  – Reduces NOx emissions through injection of ammonia type reagent into furnace/exhaust stream

• Selective Catalytic Reduction (SCR) Systems
  – Targeted to reduce NOx emissions through injection of ammonia type reagent into furnace in the presence of a catalyst

SOx Control Technologies

• Dry Sorbent Injection Systems
  – Powdered alkaline sorbent, such as hydrated lime, is injected into exhaust duct and reacts with acid gases to reduce SOx

• Wet Scrubber Systems
  – Wet solution containing a reagent, chemical reactions reduce emissions of SOx
Evaluation of Additional Emission Reduction Opportunities

• Per 2018 PM2.5 Plan, District pursuing the following potential opportunities to reduce NOx emissions for municipal waste-fired units to the extent that additional NOx controls are technologically and economically feasible:
  – Lowering NOx limit for units fired on Municipal Solid Waste from 165 ppmv @ 12% CO₂ to 110 ppmv @ 12% CO₂ over 24-hr period and 90 ppmv @ 12% CO₂ over annual period
  – Evaluating feasibility of even lower NOx limits

• District also evaluating feasibility of lower NOx emission limits for other solid fuel fired units and establishing PM10 and SOx limits
Control Technologies Under Evaluation

- Selective Non-Catalytic Reduction
- Selective Catalytic Reduction
- Gore De-NOx Filter Bags
- Covanta LN™
- Combination of controls
Cost Assessment of Further Control Technology

• Sources for cost
  – Actual costs provided by facilities, engineering estimates, and control technology vendors & manufacturers
  – Various sources for the cost of electricity, fuel, and replacement parts
  – Cost factors from EPA's Office of Air Quality Planning and Standards

• Staff held virtual meetings with facilities, vendors, manufacturers, and other stakeholders to gather cost figures
Selective Catalytic Reduction (SCR)
- Reduces NOx emissions through injection of ammonia type reagent
- Total Capital Cost: $10M - $34M
- Operation & Maintenance Cost: $1.7M - $2M annually
Gore De-NOx Filtration System

- Gore De-NOx Filtration System
  - Reduces NOx emissions through use of filter bags with ammonia catalyst
  - Total Capital Cost: $5.5M - $7.8M
  - Operation & Maintenance Cost: $900K - $6.6M annually
Covanta LN™

- Proprietary staged combustion air system for municipal waste combustors
- Achieves further NOx control
- Total Capital Cost: ~$12M
- Operation & Maintenance Cost: ~$840K
Cost-Effectiveness (CE) Analysis

• Cost-Effectiveness is cost (capital and annual) over emission reductions for the life of the equipment ($/ton)

• Two major cost elements
  – Capital Costs (Equipment, Infrastructure, Engineering, Installation, Tax, Freight)
  – Annual Costs (Operation & Maintenance)

• Emission reductions based on current emission levels (baseline) to proposed emission limit
Proposed Amendments to Rule 4352: Requirements for Municipal Solid Waste Facilities

• Proposing to lower existing NOx limits
  – Current NOx limit 165 ppm with SNCR as current control technology
  – Proposed lower NOx limit: 90 ppmv @ 12% CO₂ on a 12-month rolling average and 110 ppmv @ 12% CO₂ on a block 24-hour average

• Proposing to establish PM10 emission limits
  – Permit limits at 0.053 lbs/MMBtu
  – Proposed limit of 0.04 lbs/MMBtu or 0.02 gr/dscf @ 12% CO₂

• Proposing to establish SOx emission limits
  – Permit limits at 0.09 lbs/MMBtu
  – Proposed limit of 0.03 lbs/MMBtu or 12 ppmv @ 12% CO₂ on a 12-month rolling average and 0.064 lbs/MMBtu or 25 ppmv @ 12% CO₂ on a block 24-hour avg

• Full compliance to be required by January 1, 2024
Proposed Amendments to Rule 4352: Further Requirements for Biomass Facilities

- Proposing to lower existing NOx limits
  - Current NOx rule limits for Biomass: 90 ppmv NOx
  - Proposed lower NOx limit: 65 ppmv @ 3% O₂ on a block 24-hour average
- Proposing to establish PM10 limits
  - Proposed PM10 limit: 0.03 lbs/MMBtu
- Proposing to establish SOx limits
  - Proposed SOx limit: 0.02 lbs/MMBtu on a rolling 30-day average, and 0.035 lbs/MMBtu on a block 24-hour average
- Full compliance to be required by January 1, 2024
Proposed Amendments to Rule 4352: Exemptions

• Currently facilities with potential to emit less than 10 tons of NOx or VOC are exempt from Rule 4352 requirements
• District is evaluating potential changes to current exemption provisions
## Estimated Emission Reductions

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<th>Fuel Type</th>
<th>NOx Emission Reductions (tons/day)</th>
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<tr>
<td>Municipal Solid Waste</td>
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<tr>
<td>Biomass</td>
<td>0.316</td>
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<td><strong>TOTAL</strong></td>
<td><strong>0.711</strong></td>
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<tr>
<th>Fuel Type</th>
<th>PM10 Emission Reductions (tons/day)</th>
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<td>Municipal Solid Waste</td>
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<td>Biomass</td>
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<td><strong>TOTAL</strong></td>
<td><strong>0.280</strong></td>
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<table>
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<th>Fuel Type</th>
<th>SOx Emission Reductions (tons/day)</th>
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<tr>
<td>Municipal Solid Waste</td>
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<td>Biomass</td>
<td>0.213</td>
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<td><strong>TOTAL</strong></td>
<td><strong>0.270</strong></td>
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Next Steps

• Requesting comments on rule concepts by November 11, 2021 for incorporation into final draft rule
  – Comments welcomed through public hearing date
  – Governing Board Meeting anticipated December 16, 2021
• Continued analysis of costs, cost-effectiveness of various controls, and feasibility of control requirements
• Socioeconomic Impact Analysis being finalized by third-party consultant to evaluate the regional economic impacts of proposed amendments
• Ongoing public engagement process
Next Steps: Public Engagement Process for Rule 4352 Amendment

- Public Workshops
- Publication of proposed rule package to the District web
- Public comment period
- Governing Board Public Hearing

Public Participation and Comment Invited throughout Process
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