PROPOSED AMENDED RULES 1146, 1146.1, 1146.2 & PROPOSED RULE 1100
WORKING GROUP #7

OCTOBER 16, 2018
SCAQMD
DIAMOND BAR, CA

Agenda

- Public Comments
- Cost Effectiveness Analysis
- BARCT Analysis for Landfill/Digester Gas Fired Units
- Updates on Rule Language
- Schedule
- Contacts
PUBLIC COMMENTS

Public Comments

- Comment letters received by due date of October 4, 2018
  - Ramboll
  - Southern California Alliance of Publicly Owned Treatment Works (SCAP)
  - Boiler Dynamics, Inc.
  - Southern California Gas Company
  - Western States Petroleum Association

- Key Comments
  - Programmatic CEQA
  - NSR issues
  - 7 ppm burner availability
  - Unexpected burner replacement due to breakdowns
  - Cost-effectiveness
  - Dual fuel units
  - Emissions for atmospheric units
Public Comments – Programmatic CEQA

Comment: Some industry representatives stated that a program level CEQA analysis should be conducted and individual rulemaking is piecemealing of the project

Response:
- CMB-05 was revised in the Revised Draft 2016 AQMP to include language on consideration of sunsetting the RECLAIM program
- Socioeconomic and environmental impacts of the entire RECLAIM transition project (CMB-05) were analyzed in the 2016 AQMP and associated March 2017 Final Program Environmental Impact Report (PEIR)
- No additional program-level analysis is required and further analysis will be tiered off of the 2016 AQMP PEIR

Public Comments – New Source Review

Comment: Some industry representatives and stakeholders stated RECLAIM transition rules such as PAR 1146 series and PR 1100 should not proceed without resolution of new source review (NSR) issues

Response:
- State law (AB 617) requires implementation of Best Available Retrofit Control Requirements for facilities in the state greenhouse gas cap and trade program by December 31, 2023
- RECLAIM facilities can begin implementing BARCT requirements while in RECLAIM
- Rule 2002 provides an option for facilities to remain in RECLAIM for a limited time until future provisions in Regulation XIII pertaining to NSR are adopted
- Staff is continuing to working on NSR issues with EPA and the RECLAIM Working Group
Public Comments – Availability of 7 ppm Burners

Comment: Stakeholders expressed concern about the market availability of 7 ppm burner retrofits

Response:
- Staff has been in contact with five equipment vendors throughout the rulemaking process
  - Three vendors have expressed that 7 ppm retrofits are feasible
- 980 units (between 5 to 300 MMBtu/hr) located in SJVAPCD are able to comply with 7 ppm limit without use of the mitigation fee option
- >1,000 source test results from both SCAQMD and SJVAPCD support the feasibility of 7 ppm BARCT

Public Comments – Unexpected Burner Replacement Due To Breakdowns

Comment:
- Multiple representatives stated that burners in compliance with current limits may fail ahead of the 15 year compliance deadline and trigger permitting requirements for a new 7 ppm burner
- Proposed amended rule should allow burners with identical replacements to retain current emission limits until the 15 year compliance deadline

Response:
- Objective of the rule provision is to allow burner (currently in compliance) to operate through it's useful life and for facility to bear the cost of a new burner only upon burner replacement
- Burners that fail ahead of the 15 years will need to be replaced to meet new emission limits
- Spontaneous burner failure is rare and routine maintenance should be able to diagnose potential issues ahead of time for planning purposes
Public Comments – Dual Fuel Units

Comment: Some stakeholders commented dual fuel boilers using digester gas and natural gas will have difficulty meeting 7 ppm NOx limit when using natural gas only

Response:
- Dual fuel units located in SJVAPCD have been required to meet 7 ppm NOx when fired with only natural gas
- Units in SJVAPCD are permitted at 7 ppm or below when firing only on natural gas for both new and retrofits
- Units in SJVAPCD are complying with rule limits through emission control technology in lieu of mitigation fee option

Public Comments – Atmospheric Units

Comment:
- Existing NOx emission limit for Atmospheric units is 12 ppm
- One stakeholder stated the emission limit for Atmospheric units:
  - Should have been subject to meet 9 ppm already since current technology can achieve 9 ppm
  - Should also be subject to proposed 7 ppm from current 12 ppm

Response:
- Combustion chambers of atmospheric units are exposed to the atmosphere which raises the concerns for fugitive CO in ultra low NOx applications
- Atmospheric units located in SJVAPCD are currently limited to 12 ppm
- Source test results reviewed were not able to provide sufficient data to support establishment of 9 ppm NOx emission limit
- Staff has reached out to commenter for source test results indicating 7 ppm is achievable
Public Comments – Source Test Reports

- **Comment:**
  - Some stakeholders have stated source test reports of ultra-low NOx burner installations outside the District need validation by AQMD Source Testing Division
  - Copies of the reports need to be made available to the public for transparency

- **Response:**
  - Source test reports obtained from outside of SCAQMD were conducted using EPA approved test methods
  - CARB Method 100, used by SJVAPCD, is considered equivalent to SCAQMD Method 100.1
  - Information can be requested with public records request

Public Comments – Cost-Effectiveness

- **Comments:**
  - Multiple stakeholders expressed concerns about the cost-effectiveness analysis and requested additional details regarding the cost assumptions used in the analysis
  - One commenter requested to incorporate the annual permit to operate fee for SCR retrofits as an additional operating cost

- **Response:**
  - Staff has presented assumptions and methodologies that were incorporated in the cost effectiveness analysis during Working Group #5 on August 2nd, 2018
  - The latest cost estimates have been updated with recurring permitting costs for SCR retrofits based on stakeholders input
  - Additional cost information is included later in this presentation
COST-EFFECTIVENESS
NATURAL GAS FIRED UNITS

Cost Information

Control technology cost consists of two main components:
- Capital Cost
- Annual Operating Cost

Source of information:
- Vendor discussions
  - 5 equipment/installation vendors
  - 2 ammonia suppliers
- U.S. EPA SCR Cost Manual*

*Available at: https://www3.epa.gov/ttn/ecas/docs/SCRCostManualchapter7thEdition_2016.pdf
Cost Assumptions

- Costs obtained from vendors based on equipment size and control technology (9 ppm for ultra-low NOx burner retrofits and 5 ppm for SCR retrofits)
- No major changes to existing units (such as structural or foundation changes)
- Equipment & installation costs vary among vendors
  - Cost-effectiveness analysis based on average cost with outliers

![ULNB Graph]

**Additional cost – 7 ppm Ultra-low NOx burners**

- Capital cost for 7 ppm ultra-low NOx burner (ULNB) retrofits estimated by adding an additional cost to the 9 ppm ULNB burner retrofits
  - Accounts for additional controls needed (such as variable frequency drive and O₂ trim)
  - Additional cost for 7 ppm ULNB retrofit varies by equipment size (MMBtu/hr):

<table>
<thead>
<tr>
<th>Equipment Size</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146.1 (2 – 5)</td>
<td>$3,000</td>
</tr>
<tr>
<td>1146 Group III (5 – 20)</td>
<td>$10,000</td>
</tr>
<tr>
<td>1146 Group II (20 – 75)</td>
<td>$21,000</td>
</tr>
</tbody>
</table>

![SCR Graph]
Capital Cost (Equipment + Installation + Permitting)

- Capital cost included in the cost-effectiveness analysis for ultra-low NOx burner retrofits based on:
  - 7 ppm (55% units are fire-tube boilers)
  - 9 ppm (45% units are non fire-tube boilers)
  - 12 ppm (atmospheric units and thermal fluid heaters)

### ULNB

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Permitting</th>
<th>Installation</th>
<th>Equipment</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmospheric Units</td>
<td>$4,950</td>
<td>$16,900</td>
<td>$25,800</td>
<td>$47,650</td>
</tr>
<tr>
<td>Thermal Fluid Heaters</td>
<td>$4,950</td>
<td>$20,900</td>
<td>$35,200</td>
<td>$57,050</td>
</tr>
<tr>
<td>1146.2 (Less than 2)</td>
<td>$0</td>
<td>$17,800</td>
<td>$14,400</td>
<td>$32,200</td>
</tr>
<tr>
<td>1146.1 (2 - 5)</td>
<td>$3,570</td>
<td>$26,300</td>
<td>$31,000</td>
<td>$60,870</td>
</tr>
<tr>
<td>1146 Group III (5 - 20)</td>
<td>$5,650</td>
<td>$50,500</td>
<td>$77,400</td>
<td>$133,550</td>
</tr>
</tbody>
</table>

### SCR

<table>
<thead>
<tr>
<th>Group</th>
<th>Permitting</th>
<th>Installation</th>
<th>Equipment</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146 Group II (20 - 75)</td>
<td>$8,370</td>
<td>$144,000</td>
<td>$412,300</td>
<td>$564,670</td>
</tr>
<tr>
<td>1146 Group I (75+)</td>
<td>$8,960</td>
<td>$260,000</td>
<td>$1,149,400</td>
<td>$1,428,360</td>
</tr>
</tbody>
</table>
### Additional Electricity Cost

- Recurring annual cost for the additional energy consumption above that already required for the existing operation
- No additional electricity cost for ultra-low NOx burner retrofits
- U.S. EPA SCR Cost Manual* used to estimate the additional energy cost
- Annual electricity cost based on:
  - SCR power consumption (kW)
  - Annual electricity cost ($0.13 per kW-hr)
  - 50% operating capacity


<table>
<thead>
<tr>
<th>Category (MMBtu/hr)</th>
<th>Additional Electricity Cost</th>
<th>FGR Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146 Group II (20 - 75)</td>
<td>$11,900</td>
<td>-$3,000</td>
</tr>
<tr>
<td>1146 Group I (75+)</td>
<td>$51,800</td>
<td>-$14,700</td>
</tr>
</tbody>
</table>

### Electrical Savings – FGR Reduction w/ SCR

- SCR retrofits could lower the need for Flue Gas Recirculation (FGR)
- Savings assumed to be the difference in electrical cost from the reduction of electricity utilized for FGR assuming:
  - Decrease from 30% FGR down to 15% FGR utilization
  - Annual electricity cost ($0.13 per kW-hr)
  - 50% Operating capacity


<table>
<thead>
<tr>
<th>Category (MMBtu/hr)</th>
<th>Non-Compliant Units</th>
<th>Number of Units w/ FGR</th>
<th>Assumed Reduction in Electrical Use* (KW)</th>
<th>Total Savings ($)</th>
<th>Group savings per unit ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146 Group I (75+)</td>
<td>52</td>
<td>47</td>
<td>15</td>
<td>$158,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>1146 Group II (20 – 75)</td>
<td>3</td>
<td>3</td>
<td>67</td>
<td>$44,000</td>
<td>$14,700</td>
</tr>
</tbody>
</table>
Ammonia and Catalyst Cost – SCR

Recurring annual cost for ammonia and catalyst estimated using:
- U.S. EPA SCR Cost Manual* & vendor prices
- Annual consumption estimated according to heat input capacity, NOx emissions reduction from 30 ppm to 5 ppm, and 50% operating capacity

### Ammonia
- Consumption rate (lb/hr)
- Aqueous NH3 price ($2.50/lb NH3)

### Catalyst
- Catalyst volume (ft³)
- Catalyst cost ($259/ft³)
- Replacement frequency (9 yrs)


<table>
<thead>
<tr>
<th>Category (MMBtu/hr)</th>
<th>Ammonia Cost</th>
<th>Catalyst Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146 Group II (20 - 75)</td>
<td>$5,400</td>
<td>$3,200</td>
</tr>
<tr>
<td>1146 Group I (75+)</td>
<td>$23,100</td>
<td>$13,900</td>
</tr>
</tbody>
</table>

Annual Operating Permit Renewal Fee – SCR

- Cost effectiveness analysis includes the annual operating permit renewal fee for Selective Catalytic Reduction (SCR) retrofits
- SCR equipment fee listed in Rule 301 (Permitting and Associated Fees) under Schedule C in Table 1A
  - Assumed cost for Title V facilities = $1,825.70 per year
Additional Operation & Maintenance Cost

- Recurring annual cost for operation & maintenance (O&M) labor and materials not already part of existing operations
  - Additional O&M cost for SCR retrofits only
  - No additional O&M cost for ultra-low NOx burner retrofits since contracts already in place to maintain existing burner and potentially less maintenance and fewer repairs for a retrofit burner
- U.S. EPA SCR Cost Manual* used to estimate the O&M cost for SCR retrofits
  - Cost assumed to be 0.5% of capital cost (equipment + installation cost only)
  - Emissions monitoring considered separately

<table>
<thead>
<tr>
<th>Category (MMBtu/hr)</th>
<th>Additional O&amp;M Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146 Group II (20 - 75)</td>
<td>$2,760</td>
</tr>
<tr>
<td>1146 Group I (75+)</td>
<td>$7,033</td>
</tr>
</tbody>
</table>

*Available at: https://www3.epa.gov/ttn/eca/docs/SCRCostManualchapter7thEdition_2016.pdf

Additional Monitoring Cost

- Recurring annual cost for additional monitoring, reporting, and recordkeeping (MRR) not already required
- Existing RECLAIM MRR requirements comparable with landing rule requirements (except for reporting)
- Additional monitoring cost for SCR ammonia slip test only
- Annual ammonia source test based on average cost obtained from vendors

<table>
<thead>
<tr>
<th>Category (MMBtu/hr)</th>
<th>Additional Monitoring cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146 Group II (20 - 75)</td>
<td>$3,333</td>
</tr>
<tr>
<td>1146 Group I (75+)</td>
<td>$3,333</td>
</tr>
</tbody>
</table>
Potential Monitoring/Reporting Savings

- Reporting requirements

<table>
<thead>
<tr>
<th>Rule 1146</th>
<th>RECLAIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every 6-months (Rule 218) for units &gt;40 MMBtu/hr</td>
<td>Daily, monthly, and quarterly electronic reporting</td>
</tr>
<tr>
<td>Paper submittal of quarterly certifications and annual permit emissions reports</td>
<td></td>
</tr>
</tbody>
</table>

- Savings based on estimated annual staffing cost needed to fulfill RECLAIM reporting requirements
  - Potential savings approximately $40,000 and $2,000 per piece of major and non-major sources, respectively
  - Savings not included in cost-effectiveness analysis
    - At this time no change is being proposed for reporting requirements for Title V facilities
    - Minimal savings for non-Title V facilities

Determination of Cost-Effectiveness

- Cost effectiveness is measured in terms of the control equipment cost in dollars per ton of air pollutant reduced

\[
\text{Cost Effectiveness} = \frac{\text{Present worth value}}{\text{Emissions reductions over equipment life}}
\]

- Present worth value of the control equipment is the capital cost plus the annual operating cost over the life of the equipment

\[
\text{Present worth value} = \text{Capital cost} + (\text{Annual operating cost} \times \text{Present worth factor})
\]

- Cost effectiveness calculated using the Discount Cash Flow (DCF) method and 4% interest rate
### Cost-Effectiveness

<table>
<thead>
<tr>
<th>Category (MMBtu/hr)</th>
<th>Recommended Emission Limit</th>
<th>Present Worth Value per unit</th>
<th>Number of Units</th>
<th>Reductions* (tpy)</th>
<th>Control Technology useful life</th>
<th>Cost-effectiveness ($/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1146 Group I (75+)</td>
<td>5 ppm (existing limit)</td>
<td>$2,765,000</td>
<td>3</td>
<td>16</td>
<td>SCR – 25 yrs</td>
<td>$21,000</td>
</tr>
<tr>
<td></td>
<td>5 ppm</td>
<td>$960,000</td>
<td>52</td>
<td>56</td>
<td>SCR – 25 yrs</td>
<td>$36,000</td>
</tr>
<tr>
<td></td>
<td>7 ppm</td>
<td>$21,000</td>
<td>13</td>
<td>1.72</td>
<td>ULNB – 15 yrs</td>
<td>$11,000</td>
</tr>
<tr>
<td>1146 Group II (20 – 75)</td>
<td>7 ppm for fire-tube boilers (9 ppm for others)</td>
<td>$134,000</td>
<td>69</td>
<td>22.6</td>
<td>ULNB – 15 yrs</td>
<td>$28,000</td>
</tr>
<tr>
<td></td>
<td>7 ppm</td>
<td>$10,000</td>
<td>15</td>
<td>1.88</td>
<td>ULNB – 15 yrs</td>
<td>&lt;$10,000</td>
</tr>
<tr>
<td>1146.1 (2 – 5)</td>
<td>Same as above</td>
<td>$61,000</td>
<td>19</td>
<td>2.18</td>
<td>ULNB – 15 yrs</td>
<td>$36,000</td>
</tr>
<tr>
<td></td>
<td>30 ppm (existing limit)</td>
<td>$3,000</td>
<td>1</td>
<td>0.19</td>
<td>ULNB – 15 yrs</td>
<td>&lt;$10,000</td>
</tr>
</tbody>
</table>

* Estimated using emissions from RECLAIM units

Total cost for pollution control equipment: $143,000
Emissions reduction over equipment lifetime: 0.34

### Cost-Effectiveness (con’t)

- Cost-effectiveness for atmospheric units and thermal fluid heaters estimated on a per unit basis assuming:
  - Baseline emissions of 30 ppm
  - 20% operating capacity
  - Heat input capacities between 2 – 10 MMBtu/hr

<table>
<thead>
<tr>
<th>Category</th>
<th>Size (MMBtu/hr)</th>
<th>Recommended Emission Limit</th>
<th>Present Worth Value per unit</th>
<th>Reduction per unit (tpy)</th>
<th>Control Technology useful life</th>
<th>Cost-Effectiveness ($/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmospheric Units</td>
<td>≤10</td>
<td>12 ppm (existing limit)</td>
<td>$143,000</td>
<td>0.34</td>
<td>ULNB – 15 yrs</td>
<td>$29,000</td>
</tr>
<tr>
<td>Thermal Fluid Heaters</td>
<td>NA</td>
<td>12 ppm</td>
<td>$183,000</td>
<td>0.34</td>
<td>ULNB – 15 yrs</td>
<td>$36,000</td>
</tr>
</tbody>
</table>
Overview of Technology Assessment

- **Assessment of SCAQMD Regulatory Requirements**
  
  **Purpose:** Identify existing SCAQMD regulatory requirements for that particular source category

- **Assessment of Emission Limits for Existing Units**
  
  **Purpose:** Evaluate existing units to identify emission levels achieved based on permitted and actual levels

- **Other Regulatory Requirements**
  
  **Purpose:** Identify any other regulatory requirements with lower emission limits

- **Assessment of Pollution Control Technologies**
  
  **Purpose:** Identify pollution control technologies and potential emission reductions
SCAQMD Regulatory Requirements

- Limits apply for facilities with >90% average monthly biogas usage
  - Executive Officer may approve the burning of more than 10% natural gas under certain circumstances
- Units burning more than approved percent natural gas shall comply with weighted average NOx Limit

<table>
<thead>
<tr>
<th>Type</th>
<th>Rule 1146 &amp; 1146.1</th>
<th>Compliance Date</th>
<th>Implementation Period (Sept 2008 Amendment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digester Gas</td>
<td>15 ppm</td>
<td>January 1, 2015</td>
<td>7 years</td>
</tr>
<tr>
<td>Landfill Gas</td>
<td>25 ppm</td>
<td>January 1, 2015</td>
<td>7 years</td>
</tr>
</tbody>
</table>

Assessment of SCAQMD Regulatory Requirements

Permitted Limits

- Reviewed lowest permitted limits from SCAQMD, SJVAPCD, and SMAQMD permits

<table>
<thead>
<tr>
<th>Type of Fuel</th>
<th>Size (MMBtu/hr)</th>
<th>Permitted Limit</th>
<th>Control Technology</th>
<th>New or Retrofit</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digester Gas</td>
<td>99</td>
<td>5</td>
<td>SCR</td>
<td>New</td>
<td>SJVAPCD</td>
</tr>
<tr>
<td></td>
<td>62</td>
<td>15</td>
<td>ULNB</td>
<td>New</td>
<td>SCAQMD</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>15</td>
<td>ULNB</td>
<td>Retrofit</td>
<td>SCAQMD</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>9</td>
<td>ULNB</td>
<td>Retrofit</td>
<td>SJVAPCD</td>
</tr>
<tr>
<td>Landfill Gas</td>
<td>335</td>
<td>24</td>
<td>LNB</td>
<td>New (Year 1984)</td>
<td>SCAQMD</td>
</tr>
<tr>
<td></td>
<td>115</td>
<td>21</td>
<td>LNB</td>
<td>New (Year 1990)</td>
<td>SCAQMD</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>9</td>
<td>ULNB</td>
<td>Retrofit</td>
<td>SJVAPCD</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>15</td>
<td>LNB</td>
<td>Retrofit</td>
<td>SMAQMD</td>
</tr>
</tbody>
</table>
Source Test Records Analysis

- Source test reports from equipment located in SCAQMD were used to analyze actual emissions from permitted equipment.

<table>
<thead>
<tr>
<th>Total units surveyed from RECLAIM and Non-RECLAIM</th>
<th>Unit Size</th>
<th>Current Rule limit</th>
<th>Emissions Reported By Source Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Total Surveyed: 13</td>
<td></td>
<td></td>
<td>Between 5.0-10.0 PPM</td>
</tr>
<tr>
<td>• Digester: 10</td>
<td></td>
<td></td>
<td>5 Units</td>
</tr>
<tr>
<td>• Landfill: 3</td>
<td></td>
<td></td>
<td>Between 16.0-20.0 PPM</td>
</tr>
<tr>
<td></td>
<td>Digester Gas Fired</td>
<td>Current Limit: 15 PPM</td>
<td>5 Units</td>
</tr>
<tr>
<td></td>
<td>Landfill Gas Fired</td>
<td>Current Limit: 25 PPM</td>
<td>Between 20.0-25.0 PPM</td>
</tr>
<tr>
<td></td>
<td>3 to 62 MMBtu/hr</td>
<td></td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>115 to 335 MMBtu/hr</td>
<td></td>
<td>2 Units</td>
</tr>
</tbody>
</table>

Summary of Assessment

- Landfill Gas Fired
  - Units located in SMAQMD and SJVAPCD have been retrofitted units to meet ≤15 ppm
  - All SCAQMD units are permitted below current limits (25 ppm) in Rule 1146/1146.1
  - Continuous Emissions Monitoring Systems (CEMS)
  - All three landfill gas fired units located in SCAQMD are equipped with CEMS
  - Evaluated one out of three landfill gas fired units
  - Monthly average (year 2017) between 16 to 18 ppm

- Digester Gas Fired
  - Units in SJVAPCD have been retrofitted to meet 15 ppm or less
Other Considerations

- **Landfill Gas Fired Units:**
  - Emissions from three landfill fired units (~0.47 tpd) are comparable to emissions from all 259 RECLAIM units (~0.42 tpd)
  - All landfill fired units are located on inactive landfills
    - Two landfills became inactive in 1996 and 2013
    - Gas quality has degraded over time; therefore life of the units may be in question
  - All landfill units located are still operating with original burners permitted between 1984 to 1990
  - One facility is under a power purchase agreement expiring by 2024

- **Digester Gas Fired Units**
  - Emission limit in SCAQMD, after adjusting for the 50% gas mix allowance in SJVAPCD, is about 12 ppm
  - Not cost effective (>50,000/ton) to require immediate retrofit given the previous compliance date of January 1, 2015

Summary of Technical Assessment

- Assessment of SCAQMD Requirements
- Assessment of Emission Limits for Existing Units
- Analysis of Source Test Results
- Analysis of CEMS Data
- Additional Considerations
- **Recommendations**
  - **Digester Gas Fired:** 15 ppm (Current)
  - **Landfill Gas Fired:** 20 ppm
Emission Reductions

- Emission reduction estimates are calculated with three active landfill units.
- Based on staff recommendations of 20 ppm, total emission reduction is 0.07 tpd by January 1, 2022.

Cost-effectiveness – Landfill gas fired units

- Conservative assumption using the cost of a 9 ppm ULNB since the recommended NOx emission limit for landfill gas fired units is 20 ppm.
- Capital cost has been updated to include cost for a performance study and contingency expenses.

<table>
<thead>
<tr>
<th>Category</th>
<th>Size MMBTU/hr</th>
<th>Recommended Emission Limit</th>
<th>Number of Units</th>
<th>Equipment(^a)</th>
<th>Installation(^a)</th>
<th>Permitting</th>
<th>Performance Study</th>
<th>Contingency Expenses</th>
<th>Present Worth Value per unit</th>
<th>Reduction per unit (tpy)</th>
<th>Cost-Effectiveness(^a) ($/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill Gas Fired Units</td>
<td>115</td>
<td>20 ppm</td>
<td>1</td>
<td>$667,000</td>
<td>$229,000</td>
<td>$17,833</td>
<td>$200,000</td>
<td>$896,000</td>
<td>$2,009,000</td>
<td>1.7</td>
<td>$35,000</td>
</tr>
<tr>
<td></td>
<td>335</td>
<td></td>
<td>2</td>
<td>$1,925,000</td>
<td>$625,000</td>
<td>$17,833</td>
<td>$200,000</td>
<td>$2,549,000</td>
<td>$5,316,000</td>
<td>22.7</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Assumed 15 years useful life for ultra-low NOx burner
\(^a\) Equipment (burner retrofit) and installation cost was linearly extrapolated using the vendor cost for 9 ppm ultra-low NOx burners.
RULE LANGUAGE UPDATES

Background

- Preliminary draft rule language provided with the 75-day package (released on September 18, 2018)
- Presentation will discuss rule language updates under consideration
- Draft rule language will be released with the 30-day package on or before November 7, 2018
### Rule Language Update – PAR 1146

- **NOx limit for landfill fired gas unit** will be changed to 20 ppm with compliance date of Jan 1, 2022
- **Limit for digester gas fired units** not changing

#### Rule Reference

<table>
<thead>
<tr>
<th>Rule Reference</th>
<th>Category</th>
<th>Limit (@ 3% O₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c)(1)(A)</td>
<td>All Units Fired on Gaseous Fuels</td>
<td>30 ppm or 0.036 lbs/10⁶ Btu for natural gas fired units</td>
</tr>
<tr>
<td>(c)(1)(B)</td>
<td>Any Units Fired on Non-gaseous Fuels</td>
<td>40 ppm</td>
</tr>
<tr>
<td>(c)(1)(C)</td>
<td>Any Units Fired on Landfill Gas</td>
<td>20 ppm</td>
</tr>
<tr>
<td>(c)(1)(D)</td>
<td>Any Units Fired on Digester Gas</td>
<td>15 ppm</td>
</tr>
<tr>
<td>(c)(1)(E)</td>
<td>Atmospheric Units</td>
<td>12 ppm or 0.015 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(F)</td>
<td>Group I Units</td>
<td>5 ppm or 0.0082 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(G)</td>
<td>Group II Units</td>
<td>5 ppm or 0.0082 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(H)</td>
<td>Group II Units (Fire-tube boilers)</td>
<td>7 ppm or 0.0085 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(I)</td>
<td>Group II Units (All others with an existing NOx limit ≤ 12 ppm or &gt; 5 ppm)</td>
<td>9 ppm or 0.011 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(J)</td>
<td>Group III Units (Fire-tube boilers Only)</td>
<td>7 ppm or 0.0085 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(K)</td>
<td>Group III Units (Excluding fire-tube boilers)</td>
<td>9 ppm or 0.011 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(L)</td>
<td>Thermal Fluid Heaters</td>
<td>12 ppm or 0.015 lbs/10⁶ Btu</td>
</tr>
</tbody>
</table>

#### Updates under consideration

- **Ammonia emission limit compliance demonstrations**
  - Quarterly source testing for the first 12 months of operation, annually thereafter when four consecutive quarterly source tests demonstrate compliance; or
  - Ammonia CEMS under an approved SCAQMD protocol
Rule Language Update – PAR 1146.1

- NOx limit for landfill fired gas unit will be changed to 20 ppm with compliance date of Jan 1, 2022
- Limit for digester gas fired units not changing

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<td>30 ppm or 0.036 lbs/10⁶ Btu (natural gas fired units)</td>
</tr>
<tr>
<td>(c)(1)(B)</td>
<td>Any Units Fired on Landfill Gas</td>
<td>20 ppm</td>
</tr>
<tr>
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<td>Any Units Fired on Digester Gas</td>
<td>15 ppm</td>
</tr>
<tr>
<td>(c)(1)(D)</td>
<td>Atmospheric Units</td>
<td>12 ppm or 0.015 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(E)</td>
<td>Any Units Fired on Natural Gas, Excluding Fire-tube boilers, Atmospheric Units, and Thermal Fluid Heaters</td>
<td>9 ppm or 0.011 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(F)</td>
<td>Any fire-tube Boilers Fired on Natural Gas</td>
<td>7 ppm or 0.0085 lbs/10⁶ Btu</td>
</tr>
<tr>
<td>(c)(1)(G)</td>
<td>Thermal Fluid Heaters</td>
<td>12 ppm or 0.015 lbs/10⁶ Btu</td>
</tr>
</tbody>
</table>

Updated Schedule

- Oct 19, 2018  Stationary Source Committee
- Nov 2, 2018   Set Hearing
- Dec 7, 2018   Public Hearing
## Contacts

### General RECLAIM Questions

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