PROPOSED AMENDED RULE 1135
Emissions of Oxides of Nitrogen from Electric Power Generating Systems

Working Group Meeting #1
January 24, 2018
Background

■ 2016 Air Quality Management Plan
  - Control Measure CMB-05 called for further NOx reductions from an assessment of the RECLAIM program, including:
    ■ A 5 ton per day NOx reduction to be achieved no later than 2025; and
    ■ Sunsetting the RECLAIM program and transitioning to a command-and-control regulatory structure that requires Best Available Retrofit Control Technology (BARCT) level controls

■ 2017 – AB 617
  - Expedited BARCT schedule for largest emitters
  - Implementation schedule to be developed by 1/1/2019
  - Full BARCT implementation by 12/31/2023
Regulatory Background for EGFs

- 1989 – Adoption of Rule 1135
  - Applicable to electric power generating systems

- 1993 – Adoption of RECLAIM
  - Most Electricity Generating Facilities (EGFs) entered into RECLAIM

- 2001 – Adoption of Rule 2009 – Compliance Plan for Power Producing Facilities
  - Required installation of Best Available Retrofit Control Technology (BARCT) through compliance plans
Rule 2009

- Adopted in 2001 in response to California energy issues and required RECLAIM EGFs to install pollution controls to help stabilize RTC prices

- Key Requirement
  - Submittal of a compliance plan demonstrating that all RECLAIM NOx emitting equipment (excluding Rule 219 equipment) achieve BARCT emission levels

- A case-by-case technical and cost-effectiveness evaluation was performed for to determine BARCT
  - Permit information shows that BARCT for the majority of equipment under Rule 2009 ranges from 5 to 9 ppm
    - The weighted average for all utility boilers, including those higher than 9 ppm, after the Rule 2009 retrofits is 7 ppm
    - 7 ppm was selected to represent the average emission rate for the entire source category in calculating RECLAIM annual emissions

- Overall Result
  - EGFs in RECLAIM have installed BARCT controls, committed to repower or retire equipment, or replaced equipment with more efficient equipment
  - Some units were not able to attain 7 ppm due to space constraints for SCR installations
    - Units which could not cost effectively control to a low ppm concentration were given permit limits at a higher concentration
## Electricity Generating Facilities

- Currently, 29 RECLAIM EGFs

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<tr>
<th>FID</th>
<th>NAME</th>
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<tbody>
<tr>
<td>4477</td>
<td>SO CAL EDISON CO</td>
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<td>14502</td>
<td>CITY OF VERNON, VERNON GAS &amp; ELECTRIC</td>
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<td>25638</td>
<td>BURBANK CITY, BURBANK WATER &amp; POWER</td>
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<td>153992</td>
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<td>164204</td>
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<td>172077</td>
<td>CITY OF COLTON</td>
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<td>182561</td>
<td>COLTON POWER, LP</td>
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<td>182563</td>
<td>COLTON POWER, LP</td>
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<td>800074</td>
<td>LA CITY, DWP HAYNES GENERATING STATION</td>
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<td>800075</td>
<td>LA CITY, DWP SCATTERGOOD GENERATING STN</td>
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<td>800168</td>
<td>PASADENA CITY, DWP</td>
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<td>800170</td>
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<tr>
<td>800193</td>
<td>LA CITY, DWP VALLEY GENERATING STATION</td>
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Electricity Generating Facilities (continued)

- Currently, 1 EGF that did not opt into RECLAIM and is subject to Rule 1135

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<td>800327</td>
<td>GLENDALE CITY, GLENDALE WATER &amp; POWER</td>
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- Currently, 4 smaller EGFs, outside of RECLAIM
  - *Excludes co-generating facilities*

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<td>149620</td>
<td>SOUTHERN CALIFORNIA EDISON, RANCHO CUCAMONGA</td>
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<td>51003</td>
<td>SOUTHERN CALIFORNIA EDISON, ONTARIO</td>
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<td>17104</td>
<td>SOUTHERN CALIFORNIA EDISON, NORWALK</td>
</tr>
<tr>
<td>51475</td>
<td>SOUTHERN CALIFORNIA EDISON, STANTON</td>
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Equipment at EGFs

- Approximately 150 pieces of equipment
  - 6 non-emergency internal combustion engines
    - 1 facility
  - 27 boilers
    - 10 facilities
  - 119 turbines/duct burners
    - 32 facilities
Non-Emergency Internal Combustion Engines

![Bar Chart]

- **Equipment Size (HP):** 3900, 2200, 2150, 1950, 1575, 1500
- **Permit Emission Limit (PPM):** 0, 50, 100, 150, 200, 250, 300
- **Pieces of Equipment:**
  - 92 at 92 PPM
  - 5 at 280 PPM
Non-Emergency Internal Combustion Engines

- 6 diesel units
  - Sizes: 1,500 – 3,900 HP
  - NOx Permit Emission Limits: 2.13
    - 6.5 LBS/NET MWH (~92 – 280 ppm)
Utility Boilers
Boilers

- 27 units
  - 24 natural gas fired
  - 3 landfill gas fired
- Sizes: 70 – 4753 MMBtu/HR
- NOx Permit Emission Limits: 5 – 90 ppm
- Outliers
  - 3 landfill gas fired units
    - 527 MMBtu/HR boiler with 25 PPM emission limit
    - 260 MMBtu/HR boiler with 28 PPM emission limit
    - 492 MMBtu/HR boiler with 49 PPM emission limit
  - 646 MMBtu/HR boiler with 30 PPM emission limit
    - De-commissioned
  - 514 MMBtu/HR boiler with 90 PPM emission limit
    - Limited to 600 hours of operation per year
Simple Cycle Gas Turbines

[Bar chart showing equipment size (MMBTU/HR) on the x-axis and permit emission limit (PPM) on the y-axis. The chart includes data points for pieces of equipment.]

[Bar chart showing permit emission limit (PPM) on the x-axis and pieces of equipment on the y-axis. The chart includes data points for specific emission limits.]
Simple Cycle Gas Turbines

- 73 units
- Sizes: 69 – 959 MMBtu/HR
- NOx Permit Emission Limits: 2.3 – 24 ppm
- 2 outliers
  - 2 units – 69.12 MMBtu/HR with 24 PPM emission limit, permitted in 1990, low use
EGF Combined Cycle Gas Turbines/Duct Burners

The graph shows the permit emission limits (PPM) for different equipment sizes (MMBTU/HR) categorized into Combined Cycle Turbines and Duct Burners. The x-axis represents the permit emission limit (PPM), while the y-axis lists the equipment sizes.

Combined Cycle Turbines are represented by blue bars, and Duct Burners are represented by red bars. The graph highlights the number of pieces of equipment at various emission limits.
Combined Cycle Gas Turbines/Duct Burners

- 46 units
  - 32 combined cycle gas turbines
  - 14 combined with duct burners
- Sizes: 81 – 2597 MMBtu/HR
- NOx Permit Emission Limits: 2 – 9 ppm
- 4 outliers
  - 1 unit – 442 MMBtu/HR with 9 PPM emission limit, 15 minute rolling average
  - 3 units – 335 MMBtu/HR with 9 PPM emission limit, Rule 1134 emission limit
BARCT for Non-Emergency Internal Combustion Engines

- Existing Rule 1110.2 Limits (2011)
  - *New Non-Emergency Electrical Generators*
    - 0.07 LBS/NET MWH, 15 minute average (~3 ppm at 15% O$_2$)
  - *Existing Non-Emergency Electrical Generators*
    - 11 ppm @ 15% O$_2$, 15 minute average

- Currently, no EGF units meet these limits
  - *Permit emission limits range from ~92 – 280 ppm*
BARCT for Boilers

- **2005 BARCT Limit**
  - 7 PPM at 3% $O_2$
  - 92% at 2005 BARCT limit

- **2005 Rule 2009 Compliance Plans**
  - 46% at 5 PPM at 3% $O_2$

- **2015 BARCT Requirement for Refineries**
  - 2 ppm at 3% $O_2$
  - Currently, no EGF units meet this limit
Regulatory Limits for Simple Cycle Gas Turbines

■ 2004 SCAQMD LAER (major sources)
  - 3.5 ppm @ 15% $O_2$, 3-hour rolling average

■ 2016 BACT Guidelines Part D (minor source)
  - Gas Turbines, Natural Gas Fired, ≥ 3 MWe and < 50 MWe
    ■ [2.5 ppm @ 15% $O_2$] x [efficiency (%)/34%]
  - Gas Turbines, Natural Gas Fired, ≥ 50 MWe
    ■ 2.5 ppm @ 15% $O_2$, 1-hour rolling avg; OR
    ■ [2.0 ppm @ 15% $O_2$, 3-hour rolling avg.] x [efficiency (%)/34%]

■ Current EGF Units
  - 2 units at 2.3 ppm @ 15% $O_2$
  - 57% at 2.5 ppm @ 15% $O_2$
Regulatory Limits for Combined Cycle Gas Turbines/Duct Burners

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<th>Year</th>
<th>Regulation</th>
<th>Limit</th>
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<tr>
<td>2003</td>
<td>Federal LAER</td>
<td>Combined Cycle Gas Turbine</td>
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<td>1.5 ppm @ 15% O&lt;sub&gt;2&lt;/sub&gt; (can be up to 2.0 up for to 10% of operation, based on 12-mo. rolling avg.)</td>
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<tr>
<td>2004</td>
<td>SCAQMD LAER (major sources)</td>
<td>Combined Cycle Gas Turbine</td>
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<td>2.0 ppm @ 15% O&lt;sub&gt;2&lt;/sub&gt;, 1-hour rolling average</td>
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<tr>
<td>2015</td>
<td>BARCT Limit SCAQMD Rule 2002</td>
<td>Non-EGF Turbine</td>
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<tr>
<td></td>
<td></td>
<td>2 ppm</td>
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<tr>
<td>2016</td>
<td>BACT Guidelines Part D (minor source)</td>
<td>Gas Turbines, Natural Gas Fired ≥ 3 MWe and &lt; 50 MWe</td>
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<tr>
<td></td>
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<td>[2.5 ppm @ 15% O&lt;sub&gt;2&lt;/sub&gt; x [efficiency (%)/34%]]</td>
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<tr>
<td>2016</td>
<td>BACT Guidelines Part D (minor source)</td>
<td>Gas Turbines, Natural Gas Fired ≥ 50 MWe</td>
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<td>2.5 ppm @ 15% O&lt;sub&gt;2&lt;/sub&gt;, 1-hour rolling avg; OR [2.0 ppm @ 15 % O&lt;sub&gt;2&lt;/sub&gt;, 3-hour rolling avg.] x [efficiency (%)/34%]</td>
</tr>
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- Currently, 76% EGF units at 2.0 ppm
Initial Concepts – NOx Limits

- Establish New NOx Limits
  - Units
    - Existing 1135: lbs/net MWH and lb/day
    - PAR 1135: ppm
  - Varying limits and averaging times, dependent on:
    - Size (power output in MW)
    - Simple or combined cycle unit
Initial Concepts – NOx Limit Recommendations

■ Non-Emergency Internal Combustion Engines
  - *Current Rule 1110.2 Limits (2011)*
    ■ New Non-Emergency Electrical Generators: 0.07 LBS/NET MWH (~3 ppm at 15% O₂)
    ■ Existing Non-Emergency Electrical Generators: 11 ppm @ 15% O₂
  - *PAR 1135 Recommendation*
    ■ Existing Units: 11 ppm @ 15% O₂

■ Utility Boilers
  - 2015 BARCT Requirement for Refineries: 2 ppm at 3% O₂
  - *PAR 1135 Recommendation*
    ■ 2 ppm at 3% O₂

■ Gas Turbines
  - 2015 BARCT Requirement for non-EGFs: 2 ppm at 15% O₂
  - *PAR 1135 Recommendation*
    ■ Simple Cycle Gas Turbines: 2.5 ppm at 15% O₂
    ■ Combined Cycle Gas Turbines and Duct Burners: 2 ppm at 15% O₂
Initial Concepts – Implementation Timeline

- NOx to newly established BARCT limits
  - X% of equipment each year
  - (i.e. 25% in 2020, 50% in 2021, 75% by 2022, 100% by 2023)

- Consideration for once through cooling facility repowering schedules
## Monitoring, Reporting, and Recordkeeping (MRR)

<table>
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<tr>
<th>Requirement</th>
<th>Current Rule 1135</th>
<th>RECLAIM</th>
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<tbody>
<tr>
<td>Continuous Emission Monitoring System (CEMS) Plan</td>
<td>✓</td>
<td>✓</td>
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</table>
| CEMS and Remote Terminal Unit (RTU)              | - CEMS data gathered once per minute (90% valid data)  
- Missing data procedures for up to 72 hours in any one calendar month  
- Each RTU requires a backup data gathering and storage system | - CEMS data gathered once every 15 minutes  
- Missing data procedures required for each invalid hour  
- Requires RTU and strip chart recorder or electronic recorder |
| Relative Accuracy Requirements                   | - Volumetric flow measurement system, <20%  
- Emission rate measurement, <20%  
- Accuracy Test Audit (RATA), once a quarter | - Volumetric flow measurement system, <15%  
- Emission rate measurement, <20%  
- Nitrogen oxide gas analyzer, <20% |
| Source Tests                                     | None              | Annual or semi-annual certification of Relative Accuracy Test Audits (RATA) including source testing |
| Reporting                                        | - RTU constitutes reporting requirements | - Monthly Emissions Reports  
- Annual Permit Emissions Program (APEP)  
- RTU to electronically report daily mass emissions of NOx and status codes |
Initial Concepts – MRR

■ Option 1: Facilities maintain their current MRR approach until adoption of Proposed Rule 113 – Monitoring, Reporting, and Recordkeeping (MRR) Requirements for NOx and SOx Sources
  – RECLAIM MRR approach for RECLAIM EGFs
  – Rule 1135 MRR approach for Rule 1135 facility
  – Facility permit MRR approach for others

■ Option 2: PAR 1135 has interim MRR requirements until adoption of Proposed Rule 113
Potential Issues

- Achieving equivalency outside of RECLAIM
- Specialty equipment (engines at Catalina)
- Equipment needed for peak power generation
  - Emission limits during startup and shutdowns
- Equipment needed in emergencies
Schedule

- Additional Working Groups: TBD
- Public Workshop: 3rd Quarter 2018
- Stationary Source Committee: September 21, 2018
- Set Hearing: October 5, 2018
- Public Hearing: November 2, 2018
Contacts

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