Assembly Bill 617: BARCT – Gas Turbines & Duct Burners

Community Advisory Council
Santa Barbara County
Air Pollution Control District

Our Mission: To protect the people and the environment of Santa Barbara County from the effects of air pollution.

Aeron Arlin Genet
Executive Director / APCO

Tim Mitro, Air Quality Engineer
November 2, 2023

@OurAirSBC
Presentation Topics

1) **Background Information**
   - Assembly Bill 617 – Best Available Retrofit Control Technology (BARCT)
   - Las Flores Canyon Oil & Gas Plant
   - Equipment Diagrams and Terminology

2) **BARCT Analysis for Gas Turbines and Associated Duct Burners**
   - Emission Standards and Control Technologies
   - Cost-Effectiveness
   - Implementation of BARCT
Background: Assembly Bill (AB) 617

- Enacted in 2017 for Community Air Protection.

- AB 617 BARCT only applies to large industrial facilities subject to Cap-and-Trade.
  - Six industrial facilities within Santa Barbara County.
  - >25,000 metric tons/yr of GHGs as of 1/1/2017.
  - Requires maximum emission reduction achievable, taking into account environmental and economic impacts.

[Map showing locations of industrial facilities within Santa Barbara County]
<table>
<thead>
<tr>
<th>#</th>
<th>Equipment Category</th>
<th>Status</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Boilers, Steam Generators, and Process Heaters (5 MMBtu/hr and greater)</td>
<td>Completed June 2019</td>
<td>Amended Rule 342</td>
</tr>
<tr>
<td>2)</td>
<td>Boilers, Steam Generators, and Process Heaters (2 - 5 MMBtu/hr)</td>
<td>Completed June 2019</td>
<td>Amended Rule 361</td>
</tr>
<tr>
<td>3)</td>
<td>Particulate Matter Control Devices</td>
<td>Completed June 2022</td>
<td>Incorporated into Permit</td>
</tr>
<tr>
<td>4)</td>
<td>Reciprocating Internal Combustion Engines</td>
<td>Completed March 2023</td>
<td>Incorporated into Permit</td>
</tr>
<tr>
<td>5)</td>
<td>Miscellaneous Combustion Units</td>
<td>Completed October 2023</td>
<td>Incorporated into Permit</td>
</tr>
<tr>
<td>6)</td>
<td>Stationary Gas Turbines and Associated Duct Burners</td>
<td>Focus of CAC Meeting</td>
<td></td>
</tr>
</tbody>
</table>
Las Flores Canyon Oil & Gas Plant

- 49 megawatt (MW) Combined-cycle, Cogeneration Power Plant;
  - Gas Turbine rated at 465 MMBtu/hr, and
  - Duct Burner rated at 345 MMBtu/hr.


- Evaluated for Best Available Control Technology (BACT) during initial permitting.
  - Selective Catalytic Reduction (SCR) and steam injection used to reduce NOx.

- Equipment is shut-in and maintained in a preserved state due to the 2015 rupture of the Plains All American Pipeline.
Stationary Gas Turbine

3 Major Components

Compressor - Combustor - Power Turbine
Combined-cycle, Cogeneration Plant

Heat Recovery Steam Generator

Simple-cycle:
Gas Turbine

Combined-cycle:
Gas Turbine + Steam Turbine

Cogeneration:
Uses waste heat for other processes
**BARCT Standards - Gas Turbines**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agencies</th>
<th>BARCT - NOx (ppmv)</th>
<th>Typical Control Technology</th>
</tr>
</thead>
</table>
| 1992      | CARB                               | 9                  | 1) Steam Injection  
2) SCR                                                        |
| Mid 2000s | Bay Area AQMD  
San Joaquin Valley APCD | 3 - 5              | 1) Steam Injection or  
Dry Low NOx Combustors  
2) SCR                                                        |
| 2019      | South Coast AQMD  
Ventura County APCD | **Combined-cycle:** 2.0  
**Simple-cycle:** 2.5 | 1) Steam Injection or  
Dry Low NOx Combustors  
2) SCR                                                        |

- Staff proposes BARCT to be 2.0 ppm NOx for Combined-cycle units within Santa Barbara County.
### NOx Control Technologies

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Emissions</th>
<th>Total Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFC - Permit Limits</td>
<td>7 - 8 ppmv NOx</td>
<td>≈ 95%</td>
</tr>
<tr>
<td>LFC - Typical Values</td>
<td>4 - 5 ppmv NOx</td>
<td>≈ 97%</td>
</tr>
<tr>
<td>BARCT</td>
<td>2.0 ppmv NOx</td>
<td>≈ 98%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology</th>
<th>Description</th>
<th>Technology Control Range</th>
<th>Currently Used at LFC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steam Injection</strong></td>
<td>• Steam is injected into the gas turbine.</td>
<td>60 - 80%</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>• Lowers the combustion temperature.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Selective Catalytic Reduction (SCR):</strong></td>
<td>• Ammonia is injected into the exhaust.</td>
<td>80 - 95+%</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>• Reduces NOx $\rightarrow$ $N_2$ &amp; $H_2O$ vapor.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SCR Modelling Examples

Poor Ammonia Distribution

Good Ammonia Distribution
## Cost-Effectiveness

<table>
<thead>
<tr>
<th></th>
<th>Scenario #1 \nSCR upgrades + Increase Steam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emission Limit:</strong></td>
<td>2.0 ppmv NOx</td>
</tr>
<tr>
<td><strong>Capital and Installation Costs:</strong></td>
<td>$3.6 million</td>
</tr>
<tr>
<td><strong>Annual Operating Costs:</strong></td>
<td>$0.25 million/yr</td>
</tr>
<tr>
<td><strong>Utility Costs: (Increase Steam Injection)</strong></td>
<td>$0 - 0.50 million/yr</td>
</tr>
<tr>
<td><strong>Emission Reductions:</strong></td>
<td>19 tpy NOx</td>
</tr>
<tr>
<td><strong>Cost-Effectiveness:</strong></td>
<td>$30,000 - $56,000 per ton of NOx</td>
</tr>
</tbody>
</table>

*Assuming a 20 year project life and 6% interest.*
BARCT Implementation

- ExxonMobil submitted two permit applications to incorporate the BARCT emission standards directly into their operating permit.

  - The Authority to Construct (ATC) permit will allow modifications to the turbine system to implement the BARCT requirements.

  - The PTO-Modification/Part 70 Minor Modification will incorporate the BARCT emission standards into the Part 70 operating permit.

- Permits result in enforceable conditions no later than 12/31/2023.

- Equipment modifications required to be installed and implemented prior to the facility recommencing operations.
“AB 617 BARCT” vs “BACT”

<table>
<thead>
<tr>
<th>Facility</th>
<th>AB 617 BARCT</th>
<th>BACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing Equipment</td>
<td>New Equipment</td>
</tr>
<tr>
<td>Las Flores Canyon</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Remaining 5 AB 617 facilities</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>New Facility</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

- BARCT is an **emission standard** that is not limited to just “retrofits”.
  - A facility may need to fully replace the equipment to satisfy BARCT.

- BACT is evaluated for all new/modified projects per Reg VIII – NSR.
  - BACT is equal to or more stringent than BARCT.
Staff Assessment

- Creating a new rule for Gas Turbines is no longer necessary.
  - The BARCT Analysis will be presented to the District Board & forwarded to CARB.
BARCT Timeline for Turbines

- **Dec 2018:** BARCT Schedule adopted by District Board
- **Aug 2022:** Draft BARCT analysis sent to ExxonMobil for review
- **Oct 2023:** Permit applications submitted by ExxonMobil
- **Nov 2023:** CAC Meeting to receive update on BARCT Analysis
- **Dec 2023:** District works on and issues the permits
- **Jan 2024:**
  1) District Board Hearing to receive BARCT Analysis
  2) Forward Analysis to CARB
Contact Information

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