Assembly Bill 617: BARCT Analysis - Reciprocating Internal Combustion Engines

Board of Directors
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.

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Executive Director / APCO

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Air Quality Engineer

March 16, 2023

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Background: Assembly Bill (AB) 617

- Enacted in 2017 for Community Air Protection.
- BARCT applies to large industrial facilities subject to Cap-and-Trade.
  - >25,000 metric tons/yr of GHGs as of 1/1/2017.
- Requires maximum emission reduction achievable, taking into account environmental and economic impacts.
Background: District Rule 333

- Rule 333 was initially adopted in 1991.
  - Applies to engines with a max rated horsepower of 50 or greater.
  - Requires periodic emission testing.

- “Non-cyclical” engines:
  - 50 ppm NOx emission standard. *(90% NOx control)*
  - Can comply by using a 3-way catalyst.

- “Cyclical” engines:
  - Operating load fluctuates over a 5-10 second cycle.
  - 300 ppm NOx emission standard. *(40% NOx control)*
  - Can comply by adjusting the air-fuel ratio.
PCEC - Orcutt Hill

- 27 large, prime engines remaining:
  - Manufacture Year: 1970s and 1980s
  - Original Max Horsepower: 130 - 200 hp
  - Derated Max Horsepower: 42 - 49.9 hp
BARCT Analysis

1) Engines need to comply with the BARCT standards regardless of derating.

2) Lower BARCT standards are achievable:
   - Based on South Coast AQMD Rule 1110.2 and San Joaquin Valley APCD Rule 4702;
   - 95-98% NOx control by using a larger catalyst and a more precise Air/Fuel Ratio Controller;

<table>
<thead>
<tr>
<th>Rich-burn, Spark-Ignited Engine</th>
<th>Uncontrolled NOx EF (ppmv)</th>
<th>Rule 333 NOx Limits (ppmv)</th>
<th>NOx BARCT (ppmv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-cyclical</td>
<td></td>
<td>50</td>
<td>11</td>
</tr>
<tr>
<td>Cyclical</td>
<td>500</td>
<td>300</td>
<td>11</td>
</tr>
<tr>
<td>Derated, Cyclical</td>
<td>N/A</td>
<td>25</td>
<td></td>
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</tbody>
</table>
Technology Trials

- PCEC initiated control technology trials on a few engines.
  - Installed catalysts and Air-Fuel Ratio Controllers.
  - NOx analyzer tests show that the lower limits are feasible.
- Decision to pursue controls on engines.

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## Cost-Effectiveness

<table>
<thead>
<tr>
<th></th>
<th>Per Engine Retrofit</th>
<th>Total (27 engines)</th>
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<tbody>
<tr>
<td><strong>Capital Costs:</strong></td>
<td></td>
<td></td>
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<tr>
<td>Catalyst and AFRC installation</td>
<td>$60,000</td>
<td>$1.62 million</td>
</tr>
<tr>
<td>Powerpole extensions for AFRC</td>
<td>$30,000</td>
<td></td>
</tr>
<tr>
<td><strong>On-Going Costs:</strong></td>
<td>$12,000/yr</td>
<td>$324,000/yr</td>
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<tr>
<td>Catalyst and O₂ Sensor Replacement</td>
<td>$4,000/yr</td>
<td></td>
</tr>
<tr>
<td>Biennial Source Testing</td>
<td>$4,000/yr</td>
<td></td>
</tr>
<tr>
<td>Quarterly NOx Analyzer Testing</td>
<td>$2,000/yr</td>
<td></td>
</tr>
<tr>
<td>Added Maintenance &amp; Recordkeeping</td>
<td>$2,000/yr</td>
<td></td>
</tr>
<tr>
<td><strong>Emission Reductions:</strong></td>
<td>2.6 - 2.7 tpy NOx</td>
<td>73 tpy NOx</td>
</tr>
<tr>
<td><strong>Cost-Effectiveness:</strong></td>
<td>$6,600 - $6,800 per ton of NOx</td>
<td>(15 year project life, 6% interest)</td>
</tr>
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BARCT Implementation

- PCEC submitted an Authority to Construct (ATC) application to incorporate BARCT directly into their operating permit.
  - ATC permit issued on March 8, 2023.
  - Control equipment installed no later than December 31, 2023.

- Amendments to District Rule 333 are no longer necessary to satisfy AB 617 BARCT requirements.
  - The BARCT analysis will continue to apply to the existing and new units at the six AB 617 industrial facilities.
BARCT Timeline for IC Engines

- December 2018: BARCT Schedule adopted by District Board
- 2019 - 2022: Technology Trials at PCEC
- October 2022: ATC application submitted by PCEC
- February 22, 2023: CAC Meeting to receive update on BARCT Analysis
- March 8, 2023: ATC Permit issued
- March 16, 2023: District Board Hearing to receive BARCT Analysis
  (Upon approval, forward BARCT Analysis to CARB)
- December 31, 2023: Implementation of BARCT
Recommendation

- Adopt the resolution, concluding that amendments to District Rule 333 are no longer necessary to satisfy the AB 617 BARCT requirements.