Agenda

- Welcome
- Survey Responses from Refinery Sector
- Survey Responses from Non-Refinery Sector
- 2023 Emissions and Emission Reductions
- Schedule
Survey Responses
Reﬁnery Sector

Note: In this presentation, the concentrations are reported as corrected to 15% O2 for turbines/duct burners and ICEs. For other equipment categories, the concentrations are reported as corrected to 3% O2.
Survey Responses – Refinery Control Installed After 2005

• Expected: 50 SCRs Installed by 2011

• 6 SCRs Actually Installed, 4 met 2005 BARCT

  ✓ 1 SCR for 3 heaters, 78 mmbtu/hr, 2.7 ppmv NOx
  ✓ 1 SCR for 1 heater, 85 mmbtu/hr, 3.5 ppmv NOx
  ✓ 1 SCR for FCCU: 85% reduction guaranteed, 15.7 ppmv
  ✓ 1 SCR for 1 heater, 41.3 mmbtu/hr, 4.1 ppmv NOx
  – 1 SCR for 1 boiler, 352 mmbtu/hr, 6 ppmv NOx
  – 1 SCR for 1 boiler, 304 mmbtu/hr, 8.5 ppmv NOx
Survey Responses - Refinery Control Installed After 2005

• Low NOx Burners
  – Crude Heater, 35 mmbtu/hr, 10 ppmv NOx
  – Crude Heater, 40 mmbtu/hr, 14.45 ppmv NOx
  – Crude Heater, 85 mmbtu/hr, 15 ppmv NOx

• New SRU/TG with ULNB/Scrubber, 4 ppmv

• New Boiler 245 mmbtu/hr/SCR, 5.4 ppmv

• New Turbines/Duct Burners/SCR, 2.5 ppmv
Survey Responses - Refinery FCCUs/CO Boilers

• 2005 BARCT = 85% Reduction
• Current Performance
  – 3 FCCUs w SCRs: 1.2 ppmv, 5.6 ppmv, 14.8 ppmv
  – FCCU w Scrubber: 12.9 ppmv
  – 2 FCCUs w Less or No Control: 21 ppmv, 29 - 43 ppmv
• 2013 BARCT Under Consideration: 5 ppmv
• Next Step: Cost Analysis with SCR, Scrubber, LoTOx, NOx Reducing Additives
Survey Responses - Refinery Boilers/Heaters

- 2005 BARCT: 5 ppmv - 12 ppmv

- Current Performance
  - 4 Heaters w SCR, 88 – 200 mmbtu/hr, 1.6 ppmv
  - 3 Heaters w SCRs, 78 – 650 mmbtu/hr, 2.3 ppmv – 2.7 ppmv
  - 2 Heaters w SCRs, 40 – 63 mmbtu/hr, 5 ppmv

- 2013 BARCT Under Consideration
  - 2 ppmv for >110 mmbtu/hr Boilers/Heaters
  - 5 ppmv for 20-110 mmbtu/hr Heaters
  - 9 ppmv for <20 mmbtu/hr Heaters

- Next Step: Cost Analysis SCR, ULNB, Sharing
  (5 ppmv w SCR cost-effective for 75 mmbtu/hr under Rule 1146)
Survey Responses - Refinery Turbines/Duct Burners

• 2000 BARCT: 62.275 lb/mmcf Refinery Gas
• 2005 BARCT: No New Level
• Current Performance
  – 2 Turbines w SCRs, \textit{1.67 ppmv}
  – 10 Turbines/Duct Burners w SCRs, \textit{2.5 – 3.5 ppmv}
  – 9 Turbines/Duct Burners w SCRs, 4 ppmv – 6 ppmv
• 2013 BARCT Under Consideration: \textit{2.5 ppmv}
• Next Step: Cost Analysis with SCR
Survey Responses - Refinery Sulfur Recovery/Tail Gas/Incinerators

- 2000 BARCT: Reported Value (RV)
- 2005 BARCT: No New Level

Current Performance
- 1 New SRU/TGU: 4 ppmv w ULNB/Scrubber
- 17 Existing SRU/TGUs: 7 ppmv – 55 ppmv

- 2013 BARCT Under Consideration: 80% Red
- Next Step: Cost Analysis with ULNB, Scrubber, or Equivalent Control for Concurrent Reduction of NOx and SOx
Survey Responses - Refinery Coke Calciner

• 2005 BARCT: 0.036 lb/mmbtu (30 ppmv)
• Current Performance: 64.95 ppmv
• 2013 BARCT Under Consideration: 80% Red
• Next Step: Cost Analysis with Low Temperature SCR, Dry/Wet Scrubber, Multi-Pollutant Control for Concurrent Reduction of NOx, SOx and PM
Survey Responses - Refinery GHG Concurrent Reduction

- Estimate of **0.82 tpd** NOx Reduction
- 50%-60% Reductions Occurred Before 2010
- CARB Review to Be Completed - Late 2013
- Draft Report: Energy Efficiency and Co-Benefits Assessment of Large Industrial Sources - Refinery Sector

[www.arb.ca.gov/cc/energyaudits/publicreports.htm](http://www.arb.ca.gov/cc/energyaudits/publicreports.htm)
Survey Responses
Non-Refinery Sector

Note: In this presentation, the concentrations are reported as corrected to 15% O2 for turbines/duct burners and ICEs. For other equipment categories, the concentrations are reported as corrected to 3% O2.
Survey Responses – Non-Refinery Gas Turbines/Duct Burners (Power Plant)

- Current Performance: 2 ppmv (Per Rule 2005/2009)
- 2013 BARCT Under Consideration: No Further Control
Survey Responses – Non-Refinery Gas Turbines (Non-Power Plant)

• 2005 BARCT: No New Level

• Current Performance
  – 3 Turbines at less than 10 ppmv
  – 4 Turbines between 20-25 ppmv
  – 10 Turbines between 50-100 ppmv
  – 3 Turbines above 100 ppmv

• 2013 BARCT Under Consideration: 2 ppmv

• Next Step: Cost Analysis with SCR
Survey Responses – Non-Refinery Utility Boilers

• 2005 BARCT: 0.008 lb/mmbtu (7 ppmv)
• Current Performance: 5 to 7 ppmv (Per Rule 2009)
• 2013 BARCT Under Consideration: 2 ppmv @ 3% O₂ (Boilers w SCR) or 2 ppmv @15% O₂ (Gas Turbines w SCR)
• Next Step: Feasibility and Cost Effectiveness with SCR or Change to Gas Turbines (Repowering facilities will be taken into account)
Survey Responses – Non-Refinery Industrial Boilers

- 2005 BARCT: 9 – 12 ppmv
- Current Performance: 9 -12 ppmv
- 2013 BARCT Under Consideration: 5 ppmv
- Next Step: Cost Analysis with Ultra Low NOx Burners (ULNB) and SCR
  (5 ppm w/SCR cost effective for 75 MMBTU/hr under Rule 1146)
Survey Responses – Non-Refinery Furnaces

• 2005 BARCT: 30 ppmv – 45 ppmv

• Current Performance
  – 2 units with SCR (1 unit at 15 ppmv)
  – 5 units w/out SCR (70-100 ppmv)

• 2013 BARCT Under Consideration: 80% Reduction

• Next Step: Cost Analysis with SCR or Scrubber
Survey Responses – Non-Refinery Glass Melting Furnaces

- 2000 BARCT: 1.2 – 5.6 lbs/tons glass pulled
- 2005 BARCT: No New Level
- Current Performance
  - 3 glass melting furnaces
  - 2 are for container glass production
  - ~300-500 ppmv
- 2013 BARCT Under Consideration: 80% Reduction
- Next Step: Cost Analysis with SCR, Scrubbing or Equivalent Control for Concurrent Reduction of NOx and SOx
Survey Responses – Non-Refinery Cement Kilns

• 2000 BARCT: 2.73 lb/ton clinker
• 2005 BARCT: No New Level
• Current Performance: 2.73 lb/ton clinker
• 2013 BARCT Under Consideration: 0.5 lb/ton clinker (80% Reduction)
• Next Step: Feasibility and cost effectiveness with SNCR, SCR, Scrubbing or Equivalent Control for Concurrent Reduction of NOx and SOx
Survey Responses – Non-Refinery ICEs (Non-Power Plant)

• 2005 BARCT: No New Level

• Current Performance
  – < 11 ppmv with NSCR for rich burn ICEs
  – 40-150 ppmv for lean burn ICEs
  – 200-300 ppmv for diesel fired ICEs

• 2013 BARCT Under Consideration: 11 ppmv

• Next Step: Feasibility and cost effectiveness with SCR
Survey Responses – Non-Refinery ICEs (Power Plant)

• 2005 BARCT: No New Level
• Current Performance: 24-200 ppmv
• 2013 BARCT Under Consideration: 11 ppmv
• Next Step: Feasibility and cost effectiveness with SCR
Emissions and Emission Reductions
Methodology

• 2011 Audited Emissions = 20 tpd
• 2011 Emissions at 2005 BARCT
  \[= \sum(2011 \text{ Activity} \times 2005 \text{ BARCT})\]
• 2011 Emissions at 2013 BARCT
  \[= \sum(2011 \text{ Activity} \times 2013 \text{ BARCT})\]
• 2023 Emissions at 2013 BARCT
  \[= \sum(2011 \text{ Emissions at 2013 BARCT} \times GF)\]
• Detail Results on Spreadsheets
• RTC Reductions and Percent Shave = TBD
Emission Reductions from Remaining 240+ Facilities

- ICEs Subject to Rule 1110.2 = 0.1 tpd
- Other Boilers/Heaters = Under Consideration
Schedule

• Next Working Group Meeting: November
• Public Workshop: 75 Days from Public Hearing
• Public Hearing: 1st Quarter 2014