Proposed Amended Rule 1153.1

Emissions of Oxides of Nitrogen from Commercial Food Ovens

Working Group Meeting #6
February 2, 2023

Join Zoom Webinar Meeting

https://scaqmd.zoom.us/j/99936500985

Teleconference Dial-In: 1-669-900-6833

Webinar Meeting ID: 999 3650 0985

Agenda

- Summary of WGM #5
- Public Hearing Update
- Status and Progress of Rule
- 2022 Air Quality Management Plan
- BARCT Re-Assessment
- Next Steps

Summary of WGM #5

- Working Group Meeting #5 held on October 6, 2022
- Discussed preliminary draft rule language including:
  - Rule restructuring
  - New requirements added for clarity
  - Compliance flexibility options
  - New definitions and expanded equipment applicability
  - New provisions to address RECLAIM facilities

Public Hearing Update

- Public Hearing was scheduled for December 2022
- Postponed until May 2023

- Newsletter informing stakeholders of the delay was sent out via email on November 10, 2022

Rule Development Progress

- Conducted Five Working Group Meetings
- Completed initial BARCT assessment and Cost-effectiveness analysis
- Proposed BARCT limit of 30 ppm for most food oven categories
- Released Preliminary Draft Rule on September 16, 2022
- Held Public Workshop on October 6, 2022
- Postponed Public Hearing until May 2023

2022 Air Quality Management Plan (AQMP)

On December 2, 2022, the South Coast AQMD Governing Board adopted the 2022 AQMP

- Lays a path for improving air quality and meeting federal air pollution standards by the year 2037

Highlights

- Reduces approximately 70% of smog-forming emissions beyond existing regulations by 2037
- Provides substantial health benefits, saving the region $19 billion in health costs
- Provides higher benefits for environmental justice communities
- Lays out actions needed by the federal government to reduce emissions from sources that are under federal regulatory
- Requires zero-emission technologies across all sectors
- Establishes new cost-effectiveness threshold of $325,000 per ton of NOx reduced

NOx Cost-Effectiveness Threshold

- **$50,000 Threshold:**
  - Established as the NOx cost-effectiveness threshold when 2016 AQMP was adopted
  - Threshold was used for landing rules adopted prior to the 2022 AQMP

$50,000 per ton of NOx Reduced

2022 AQMP

- Prioritizes zero-emission technology
- Utilizes a health-based approach to determine cost-effectiveness
- Uses public health monetized benefit value for reducing pollution
- Approach was used by CARB and U.S. EPA

- **New Threshold based on:**
  - U.S. EPA established national monetized benefit value of $307,636 per ton of NOx reduced
  - 2016 AQMP determined monetized benefit value of $342,000 per ton of NOx reduced

$325,000 per ton of NOx Reduced

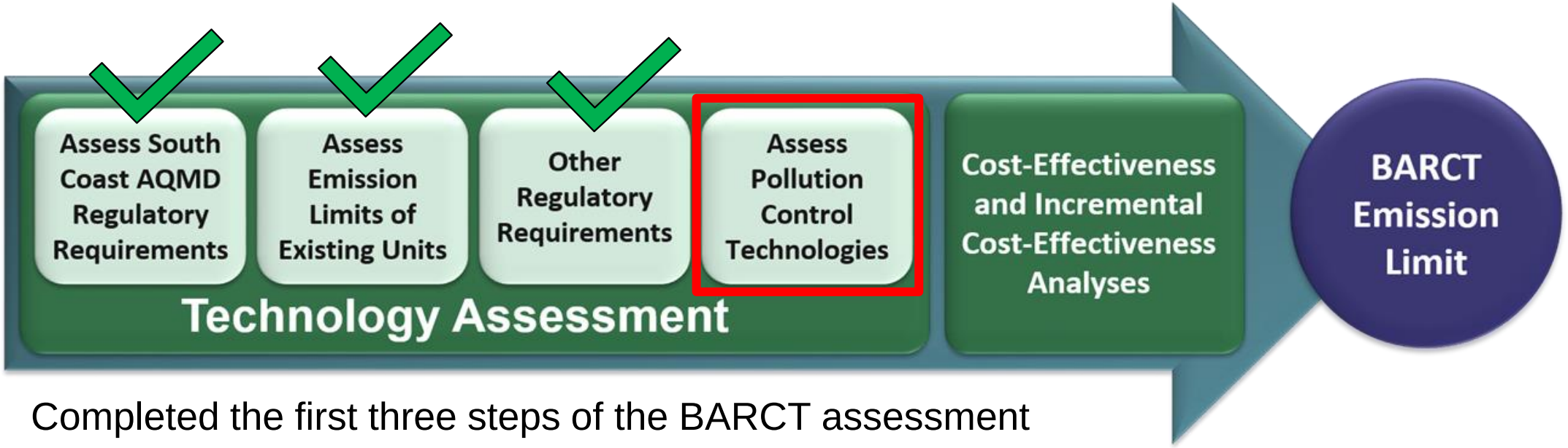
2022 AQMP Impacts on PAR 1153.1

Staff re-assessed the prior BARCT technology assessment with an emphasis on zero-emission technologies for all oven categories to meet control measure emission targets

Cost-effectiveness will be assessed using 2022 AQMP updated cost-effectiveness threshold

BARCT Re-Assessment

Best Available Retrofit Control Technology Assessment



- Completed the first three steps of the BARCT assessment
- Assessed pollution control technologies and cost-effectiveness, but will re-assess using new cost-effectiveness threshold and with an emphasis on zero-emission technology
- Control Technologies will be evaluated with consideration for emerging technologies
  - For example, technologies that are commercially available but not widely in use
- Potential technology transfer will also be evaluated for ovens not subject to Rule 1153.1
- Retrofit as well as oven replacement will be considered

Replacement Versus Retrofit

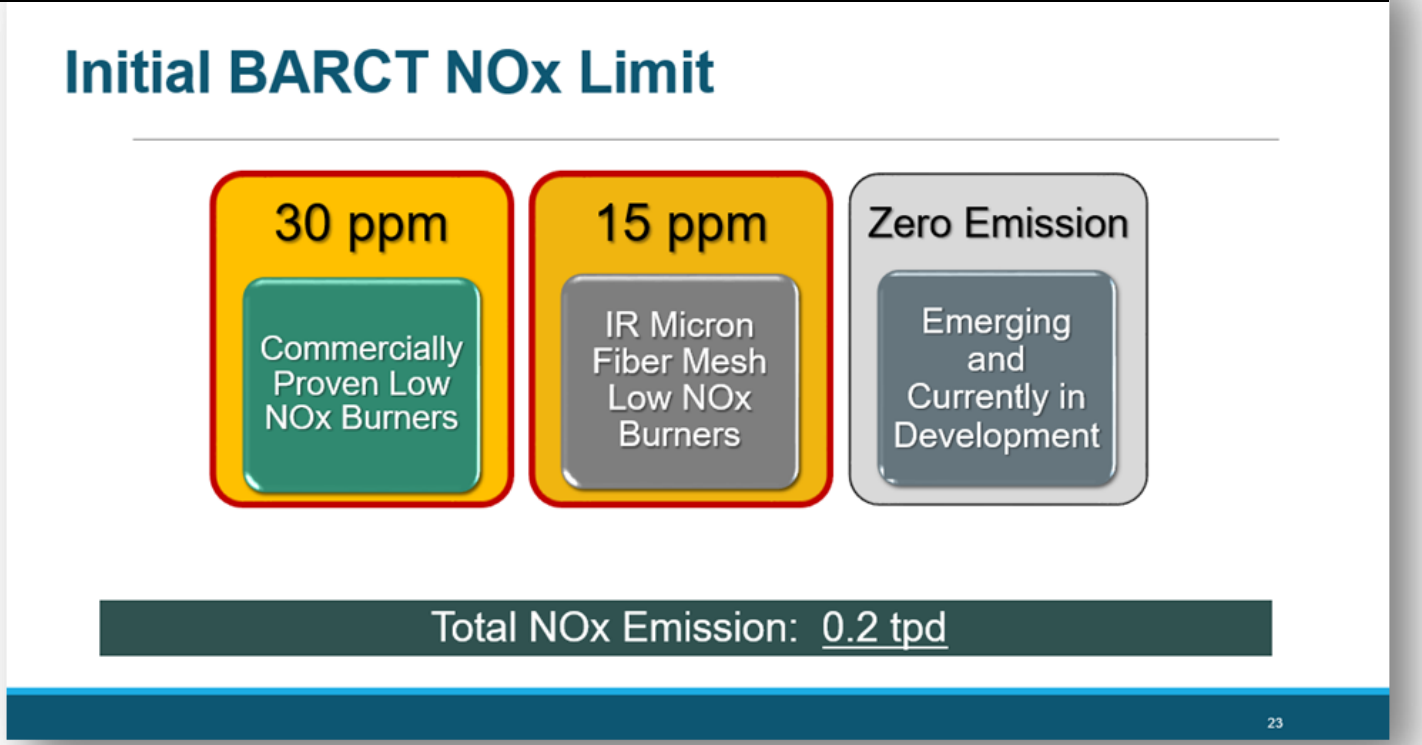
BARCT

- Converting gas equipment to zero-emission will likely require equipment replacement
- The statutory definition of “best available retrofit control technology” does not preclude replacing existing equipment with new cleaner equipment
- Health & Safety Code §40406 provides: *“As used in this chapter, ‘best available retrofit control technology’ means an emission limitation that is based on the maximum degree of emission reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source”*
- BARCT is an emission limitation and is not limited to a particular technology, whether add-on or replacement. This definition does not preclude replacement technologies

Prior BARCT Assessment

- Staff presented the prior BARCT assessment on 8/31/2022 during Working Group Meeting #4
  - Recommended 30 ppm and 15 ppm NOx limits
    - Technically feasible and cost-effective based on $50,000 threshold
- Staff acknowledged zero-emission technology was emerging but recommended waiting for technology to mature
  - Based on 2022 AQMP's focus on zero-emission technology and the newly adopted cost-effectiveness threshold, staff will re-assess NOx limits that represent BARCT

Slide from Working Group Meeting #4: Staff's Prior Initial BARCT Assessment



Assess Pollution Control Technologies

BARCT Re-Assessment Pollution Control Technology

Further Pollution Control Technology Assessment

Assess Pollution Control Technologies

- After staff released the initial BARCT proposal, additional vendors reached out regarding zero-emission options for commercial food ovens
- Delay of Public Hearing afforded staff additional time to further evaluate zero-emission technology
  - Researched facilities that are currently using electric food ovens
    - Units do not require permits and are therefore harder to identify
  - Met with additional facilities and vendors to discuss commercially availability of zero-emission equipment
- Staff identified additional zero-emission commercial ovens

Types of Commercial Food Ovens

Assess Pollution Control Technologies

- Staff identified two main types of commercial food ovens:
  - **Tunnel Ovens**
    - Large continuous conveyor type of ovens
    - High volume of product throughput
    - Higher equipment costs
    - Mostly used in large bakeries
  - **Batch Ovens**
    - Rack type or multi deck
    - Manual product input and removal
    - Lower product throughput
    - Lower equipment cost compared to tunnel type
    - Most cooking ovens, drying ovens, and smokehouses are batch ovens

Zero-Emission Commercial Ovens

Assess Pollution Control Technologies

Manufacturer	Equipment Type(s)	Power Type(s)	Equipment Category	Food Product	Status of Technology	Considerations
AMF Bakery Systems	Tunnel Ovens	Electric, Hybrid, Hydrogen	Bakery Ovens	Soft bread and buns, flat breads, cookies, pizza, biscuits, soft breads, pastries, cakes, muffins & more	Commercially Available	Large electrical input required
WP Bakery Group	Rack Ovens, Deck Ovens	Electric	Bakery Ovens	Rolls, pastries, baguettes, bread loaves		
BABBCO	Tunnel Ovens	Electric, Hybrid	Bakery Ovens	Pizza, flat bread, artisan bread, bagels, cake, muffins, pastries, granola, baked snacks, cookies, biscuits, crackers		

Zero-Emission Commercial Ovens *(cont.)*

Assess Pollution Control Technologies

Manufacturer	Equipment Type(s)	Power Type(s)	Equipment Category	Food Product	Status of Technology	Considerations
Ozstar Machinery	Roasters	Electric	Nut Roasters	Nuts (22lbs)	Commercially Available	Small applications (22 lbs Capacity)
Bellwether	Roasters	Electric	Coffee Roasters	Coffee (6 lbs)		Small applications (6 lbs Capacity)
Friedrich Metal Products	Roasters, Smokers	Electric	Meat Roasters, Smokehouses, Other Food Ovens	Chicken, ribs, whole turkeys, pork roasts, fish		Currently in use

Zero-Emission Commercial Ovens *(cont.)*

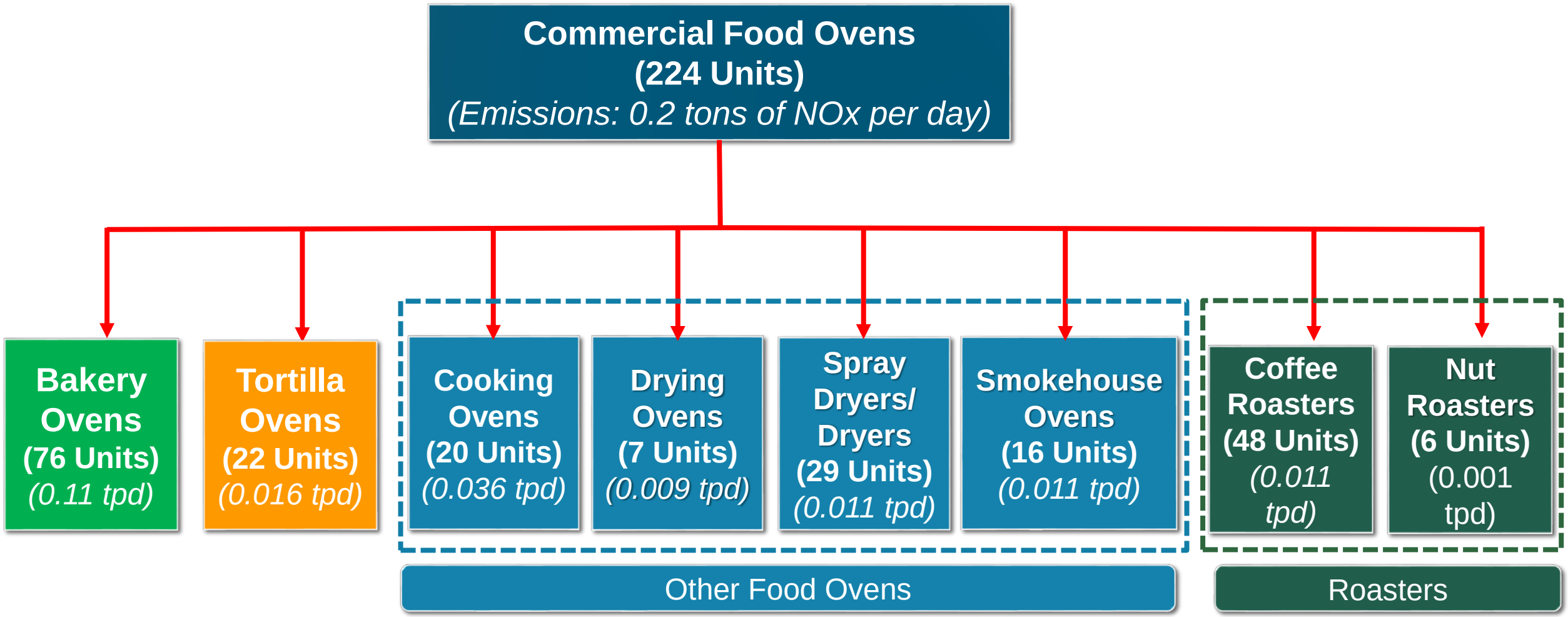
Assess Pollution Control Technologies

Manufacturer	Equipment Type(s)	Power Type(s)	Equipment Category	Food Product	Status of Technology	Considerations
Maurer-Atmos	Smokehouses, Ovens	Electric	Smokehouses, Other Food Ovens	Meat products	Commercially Available	Currently in use
Coastline Equipment, Inc.	Baking Oven	Electric	Baking oven	Panko breadcrumbs, tempura batter		Currently in use

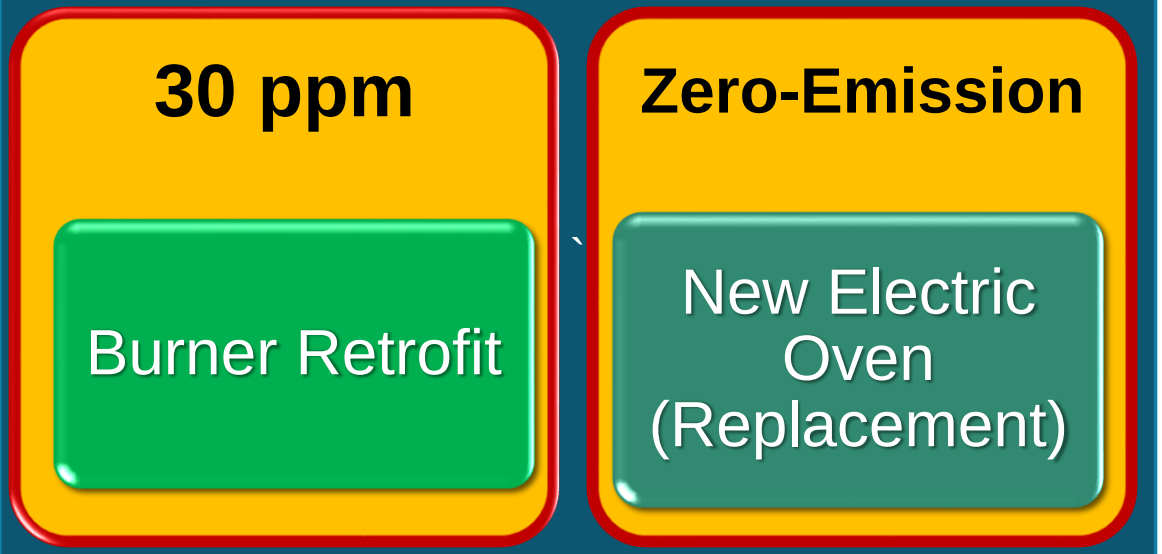
BARCT Re-Assessment

INITIAL NOx LIMITS FOR EACH COMMERCIAL FOOD OVEN CATEGORY

Overview of Commercial Food Oven Categories

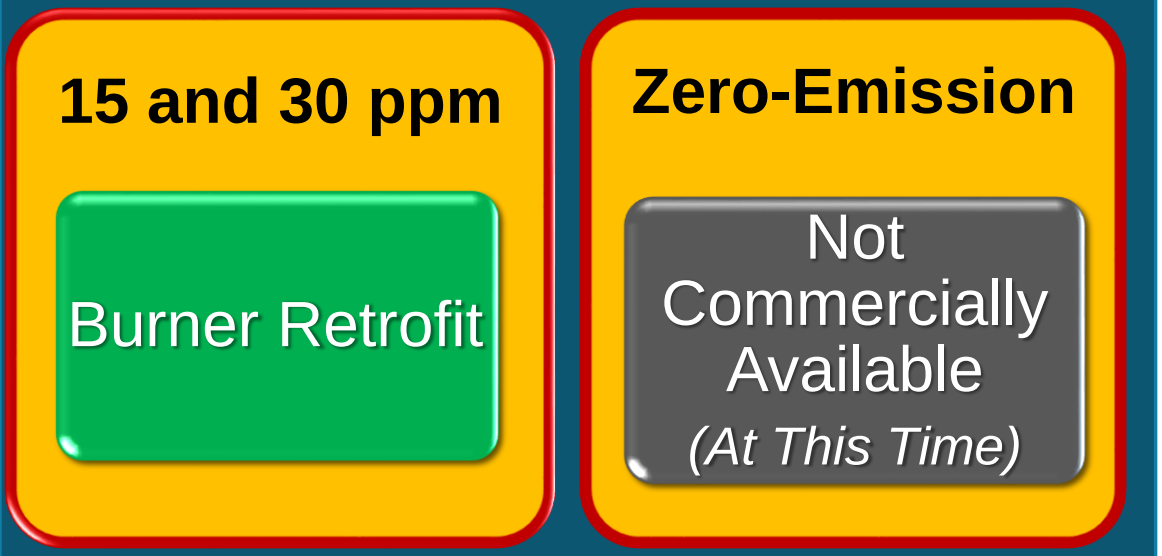


Initial NOx Limits identified as BARCT for Bakery Ovens



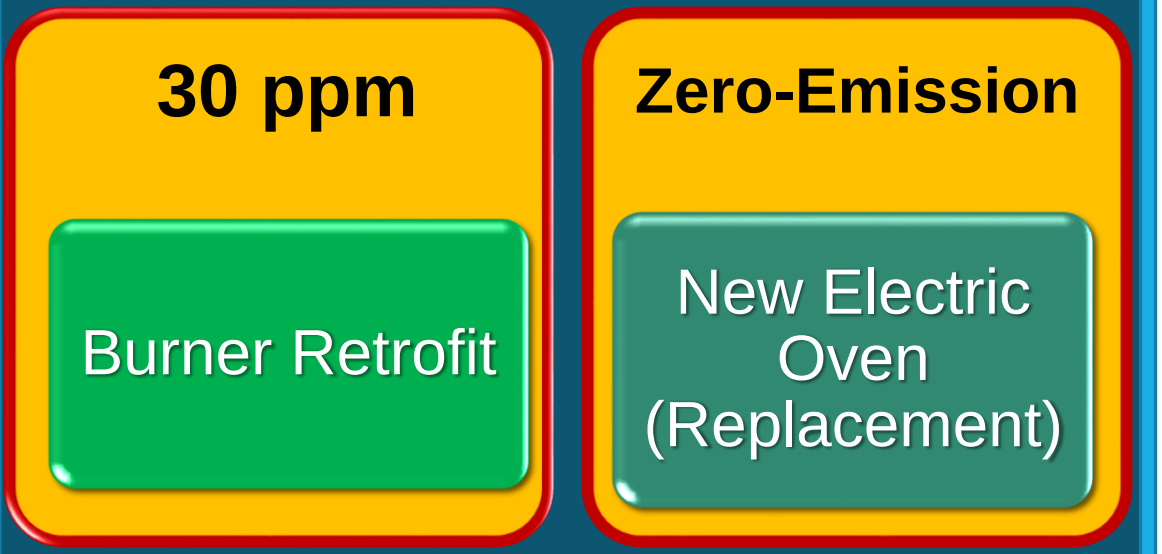
- Most are tunnel ovens, some are batch ovens
  - Heat input from 1 to 14 MMBtu/hr
- Prior assessment demonstrated 30 ppm to be technically feasible and cost-effective
  - Based on burner retrofit
- Zero-emission electric bakery ovens are commercially available from several manufacturers
  - Can be adapted to meet customer needs
  - May require electrical upgrade to accommodate higher electrical input requirements
  - One electric tunnel oven currently in operation in South Coast AQMD
    - Electrical input of 705 kW (~2.4 MMBtu/hr)
- BABBCO offers an electric tunnel oven and hybrid tunnel options
  - Offer an electric test oven to address product quality concerns
  - Working with industry on case studies to address concerns

Initial NOx Limits identified as BARCT for Tortilla Ovens



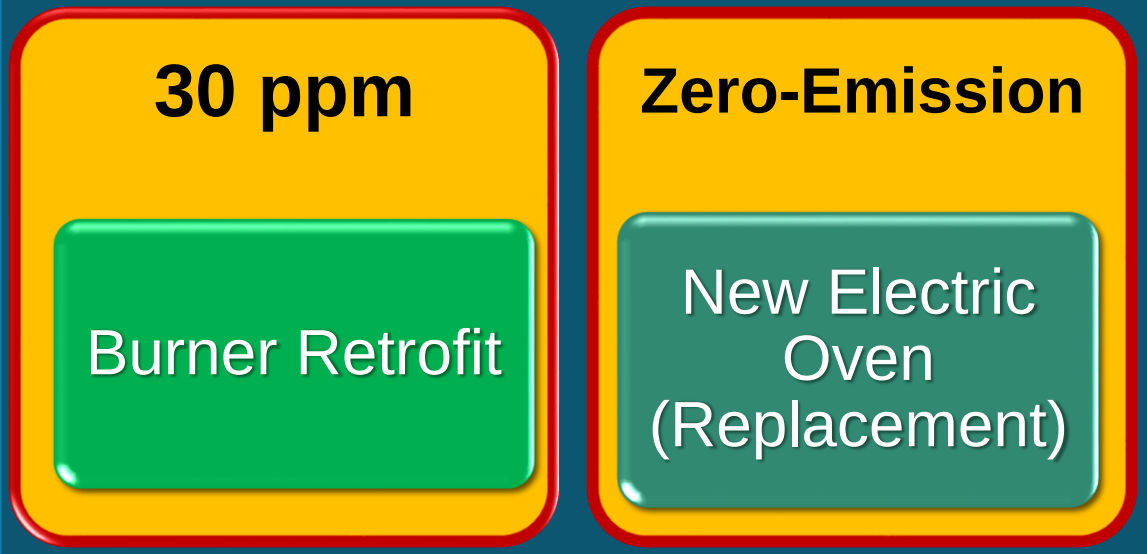
- Tortilla ovens are all tunnel ovens
  - Heat input from 0.3 to 6 MMBtu/hr
- Prior assessment demonstrated 30 ppm (ribbon burners) and 15 ppm (infrared (IR) burners) to be technically feasible and cost effective
- Staff did not identify any zero-emission/ electric tortilla ovens suitable for commercial production
  - Identified smaller electric units for restaurants and home use
    - Low production, not suitable for commercial industrial applications at this time
    - Potential for future scale-up for commercial production
- Burner replacement to achieve 15 and 30 ppm is the only feasible option identified at this time

Initial NOx Limits identified as BARCT for Cooking Ovens



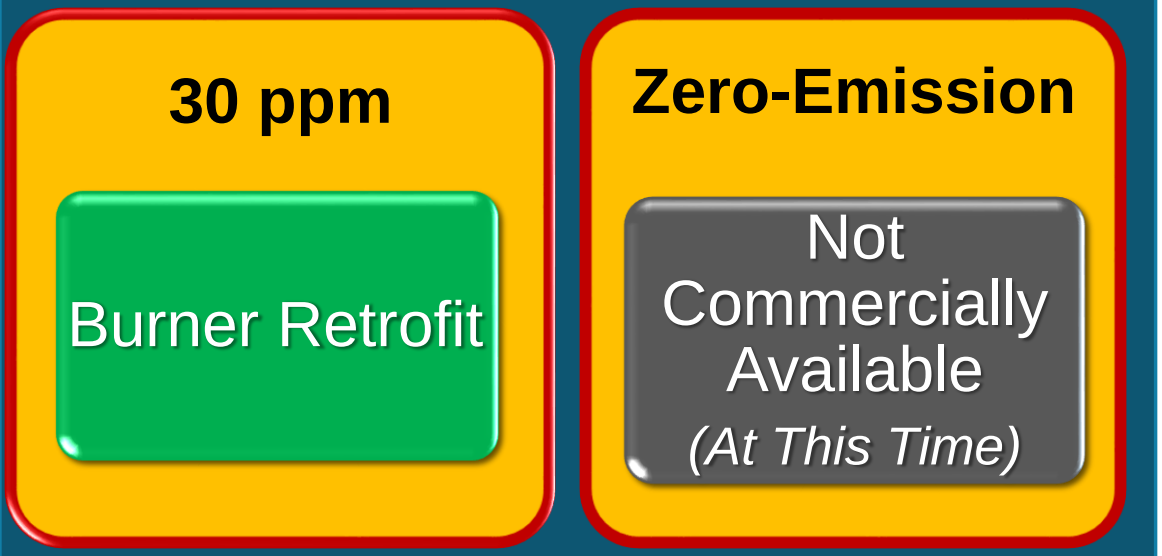
- Used to cook meats and food products
- Most units are batch type ovens
  - Heat input from 0.325 to 5 MMBtu/hr
- Prior assessment demonstrated 30 ppm to be feasible and cost-effective
  - Based on burner replacement
- Staff identified several electric options available from different manufacturers
  - Commercially available
  - Electrical upgrade may be required at facility

Initial NOx Limits identified as BARCT for Drying Ovens



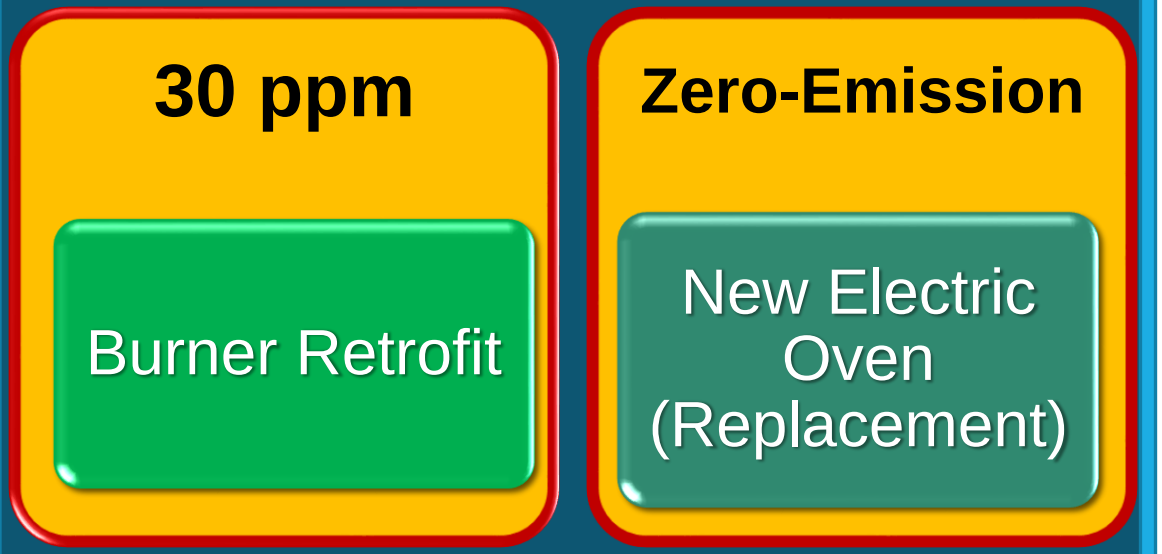
- Used to dry or cure food products by removing moisture content from food
- Most are batch type ovens
  - Heat Input from 0.4 to 5 MMBtu/hr
- Prior assessment demonstrated 30 ppm to be technically feasible and cost-effective
  - Based on burner replacement
- Drying ovens are used across multiple industries for a wide range of applications
  - Evaluated zero-emission electric ovens outside of Rule 1153.1 such as curing ovens as potential technology transfer
  - Similar operating temperatures and processes
  - Used to reduce moisture levels in non-food products
- Several electric options are commercially available and can be built to facility's specification
  - May require electrical upgrades

Initial NOx Limits identified as BARCT for Spray Dryers/Dryers



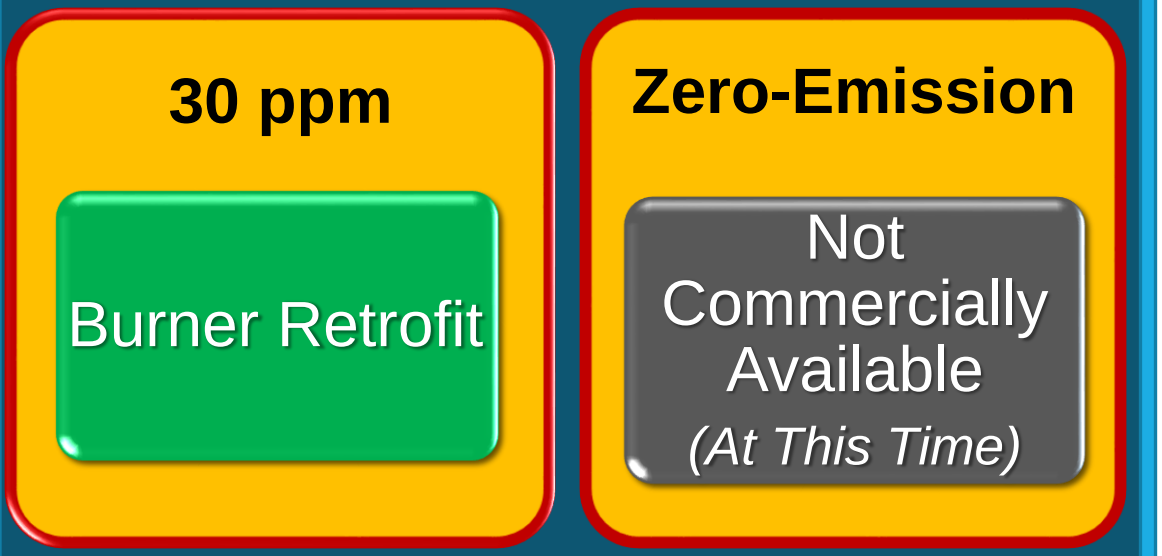
- Used to produce food flavoring
- Atomized liquid feed is sprayed into heated drying chamber
- 25 units use steam as the heat source
  - Steam is generated from boiler (Subject to Rule 1146)
  - Boiler potentially produce more NOx than air heater type dryers
- 5 units use air heaters
  - Prior assessment demonstrated 30 ppm to be technically feasible and cost-effective
    - Based on burner replacement
- Staff did not identify any zero-emission/ electric spray dryer/dryer system
- Burner replacement to achieve 30 ppm is the only feasible option identified at this time

Initial NOx Limits identified as BARCT for Smokehouse Ovens



- Used to smoke and dry meat or seafood products
- Most units are batch oven type
  - Heat Input from 0.4 to 2.5 MMBtu/hr
- Prior assessment demonstrated 30 ppm to be technically feasible and cost-effective
  - Based on burner replacement
- Four electric smokehouse ovens are currently in use at South Coast AQMD facilities
  - Some use a combination of steam and electricity as heat source
- Zero-emission ovens are commercially available with options for external or internal electric smoke generators
  - May require electrical upgrade to accommodate new ovens

Initial NOx Limits identified as BARCT for Roasters



- Used to roast nuts and coffee
- Units are batch oven type
  - Heat input from 0.09 to 6.5 MMBtu/hr
  - Most units emit one pound per day or less
  - 42 Units are exempt
- Burner replacement at 30 ppm is a feasible and previously determined to be cost-effective
- Staff did not identify any large zero-emission commercial roaster for industrial operations
- Large commercial operations are drum type roasters
  - Capacity to roast up to 2,000 lbs per hour
  - Most are gaseous fueled (propane or natural gas)
- Identified small electric batch roasters used in retail applications with following capacities:
  - Six pounds of coffee per batch, three batches per hour
  - 10 to 20 pounds of nuts per hour (varies on nut type)
  - Potential for future scale up for commercial/industrial production
- Burner replacement to achieve 30 ppm is currently only feasible control option for category

Initial BARCT Re-Assessment Summary

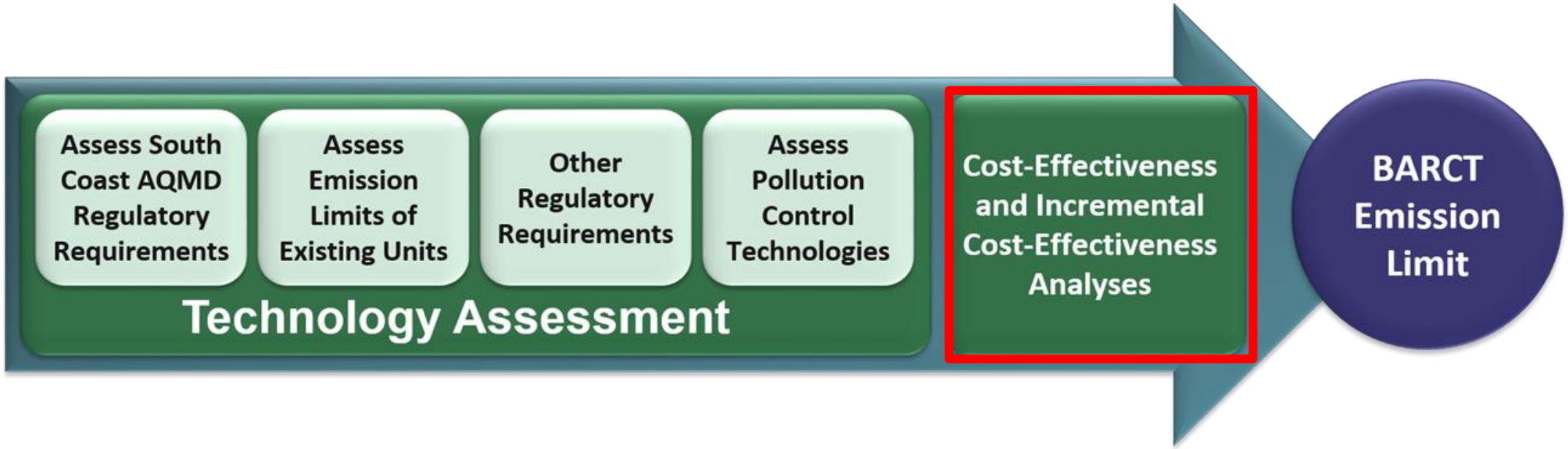
	Rule 1153.1	Existing Units	Other Regulatory Agencies	Technology Assessment	Initial BARCT NOx Limit	Proposed BARCT NOx Limit
Bakery Ovens	40 and 60 ppm	0 - 45 ppm	40 and 60 ppm	0 to 30 ppm	30 and 0 ppm	*Need to conduct cost-effectiveness and incremental cost-effectiveness*
Tortilla Ovens	40 and 60 ppm	8.4 – 52 ppm	40 and 60 ppm	15 to 30ppm	15 and 30 ppm	• 15 ppm (IR burners only) • 30 ppm (Ribbon/IR)
Cooking Ovens	40 and 60 ppm	25 - 30 ppm	40 and 60 ppm	0 to 30 ppm	30 and 0 ppm	*Need to conduct cost-effectiveness and incremental cost-effectiveness*
Drying Ovens	40 and 60 ppm	30 – 40 ppm	40 and 60 ppm	0 to 30 ppm	30 and 0 ppm	*Need to conduct cost-effectiveness and incremental cost-effectiveness*

Initial BARCT Re-Assessment Summary *(cont.)*

	Rule 1153.1	Existing Units	Other Regulatory Agencies	Technology Assessment	Initial BARCT NOx Limit	Proposed BARCT NOx Limit
Spray Dryers & Dryers	40 and 60 ppm	0* - 26 ppm	40 and 60 ppm	0 to 30 ppm	30 ppm	30 ppm
Smokehouse Ovens	40 and 60 ppm	0** – 52 ppm	40 and 60 ppm	0 to 30ppm	30 and 0 ppm	*Need to conduct cost-effectiveness and incremental cost-effectiveness*
Coffee and Nut Roasters	40 and 60 ppm	25 - 37 ppm	40 and 60 ppm	30 ppm	30 ppm	30 ppm

* Uses high pressure steam as heat source, no combustion

** Smokehouse oven is electric



BARCT Re-Assessment Cost-Effectiveness and Incremental Cost-Effectiveness

Cost-Effectiveness Calculation

- Cost-effectiveness is a measure that compares the costs of pollution reduction to amount of pollutant reduced
  - Measured in cost per ton of pollutant reduced
- South Coast AQMD typically uses the *Discounted Cash Flow Method* to calculate cost-effectiveness
  - **Cost-Effectiveness** = Present Worth Value/Emissions Reduced Over Equipment Life
  - **Present Worth Value** = Capital Cost + (Annual Operating Costs x *Present Worth Value Formula*)
  - **Present Worth Value Formula** = $\frac{1-\frac{1}{(1+r)^n}}{r}$
    - r = $\frac{(i-f)}{(1+f)}$
    - *i* = nominal interest rate
    - f = inflation rate
    - n = number of cycles

Incremental Cost-Effectiveness

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

$$I\text{-}CE\left(\$/_{tons\ NOx\ reduced}\right) = \frac{Incremental\ Difference\ in\ Cost\ (Present\ Worth\ Value)}{Incremental\ Difference\ in\ Emission\ Reductions\ (Lifetime\ Reductions)}$$

- Once BARCT assessment is complete and NOx limits are established, staff considers incrementally more stringent options
- Staff initially proposed 30 ppm for most oven categories
  - Staff will calculate incremental cost-effectiveness from 30 ppm to 0 ppm for categories where zero-emission was determined to be technically feasible

Cost Data for Zero-Emission Technology

- Staff reached to vendors and facilities for electric equipment cost quotes (capital cost)
  - Received Quotes were for different equipment categories
  - Some manufacturers offered both gas and electric versions of the food ovens
  - Provided cost quote was used to generate cost-curve for each oven type to estimate the capital cost of equipment
- Staff assumed:
  - Installation cost to be 25 percent of estimated capital cost
  - Electrical upgrades to accommodate the increase in electrical demand to be 10% of estimated capital cost
- Total Installation Cost (TIC) = Capital Cost + Installation Costs + Electrical Upgrade
  - TIC was used in cost-effectiveness calculation (discounted cash flow)

Cost Curve for Zero-Emission Technology

- Staff used the following equation based on natural gas to convert from rated heat input capacity (MMBtu/hr) to electrical input (kW):

$$kW = \frac{MMBtu}{hr} \times \frac{scf}{1050\ Btu} \times 0.293 \frac{kWh}{scf}$$

- Staff developed cost curve based on manufacturer cost quotes and facility costs
  - Quotes for ovens were in kW, converted from kW to MMBtu/hr to generate cost curve
  - Cost curve generated was used to obtain equation of a power curve fit
  - Equation will be used based on the Rule of Sixth-Tenths to estimate costs for similar equipment type
    - Equation used to estimate cost for the units where cost information is not available

Rule of Six-Tenths

- Also known as 0.6 power factor rule
- Ratio and proportioning method used to approximate cost based on known cost for similar equipment
- Equation is derived from cost estimates:
  - Facilities and vendor quotes
  - Costs are converted to a dollars per MMBtu/hr and plotted on a graph
  - Applying a power curve-fit to the plotted data will give the desired power factor equation
- New equation will be used to estimate costs

$$C_B = C_A \left(\frac{S_B}{S_A} \right)^N$$

C_B = approximate cost of equipment having size S_B (MMBtu/hr, hp, scfm, etc.)

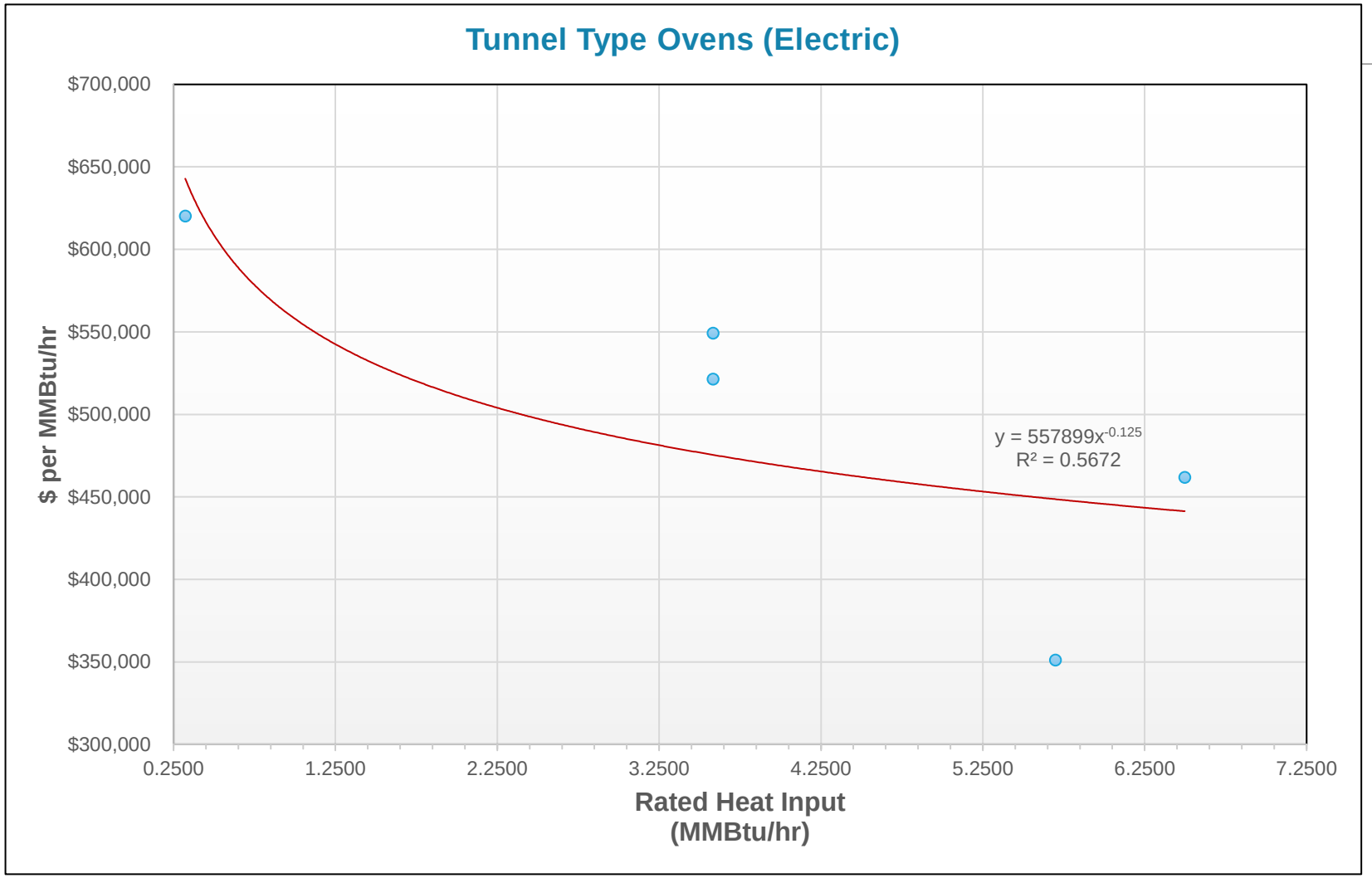
C_A = known cost($) of equipment having corresponding size S_A (same units as S_B)

(S_B/S_A) = ratio size factor

N = size exponent (varies 0.3 to >1.0, but average is 0.6)

Tunnel Type Oven Cost Curve

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses



Based on the power curve, burner cost is:

$$y = \$557{,}899\ (x)^{-0.125}$$

Where x, ratio size factor (S_B/S_A)

- Solving for y, will give a dollars per MMBtu/hr
- Multiplying by MMBtu/hr will give tunnel oven cost

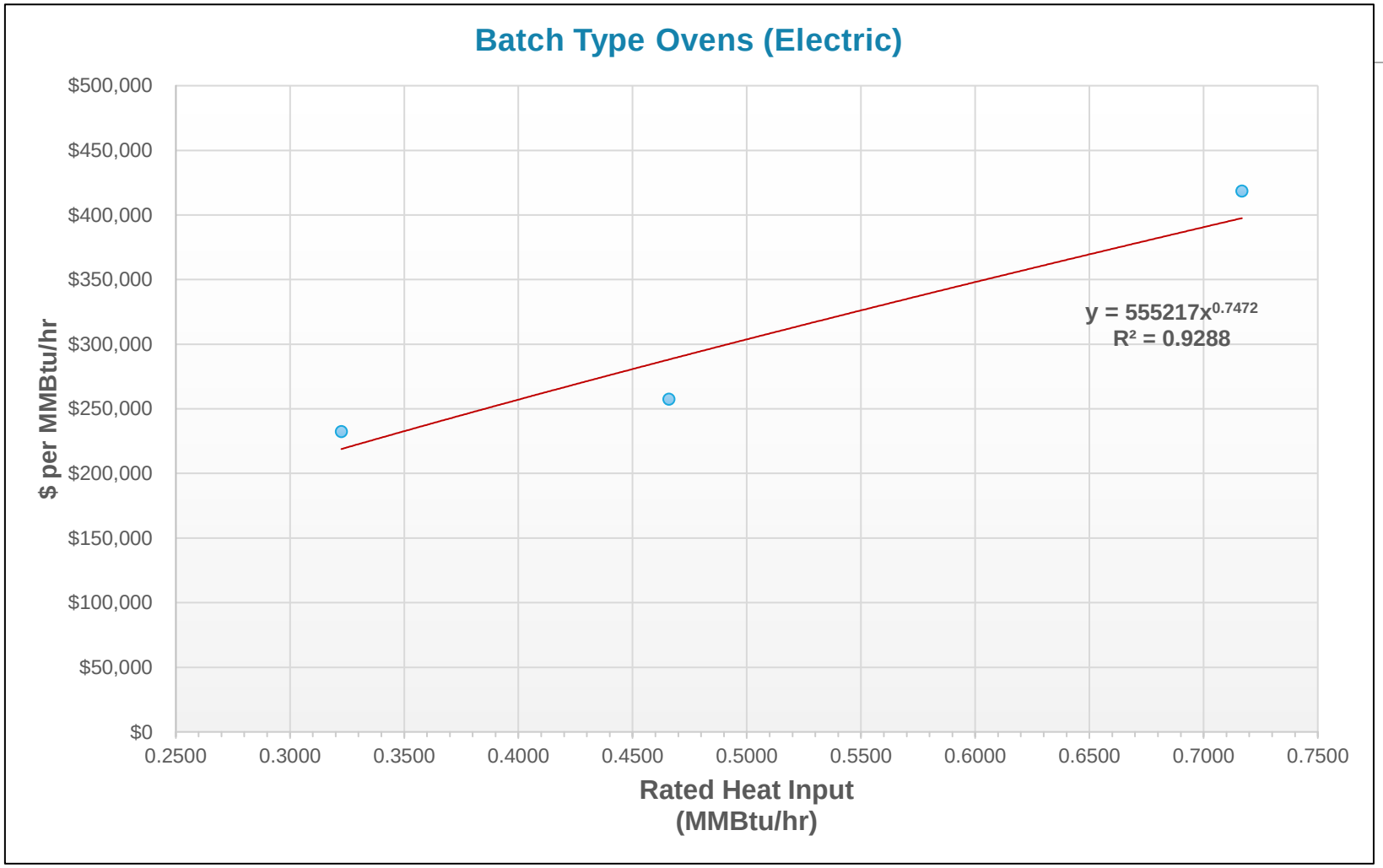
Example:

Heat Input: *3.5 MMBtu/hr (967 kW)*

$/MMBtu/hr: *$492,408*

Oven: *$1,918,873*

Batch Type Oven Cost Curve



Based on the power curve, burner cost is:

$$y = 27.188(x)^{0.7472}$$

Where x, ratio size factor (S_B/S_A)

- Solving for y, will give a dollars per MMBtu/hr
- Multiplying by MMBtu/hr will give batch oven cost

Example:

Heat Input: *1 MMBtu/hr (279 kW)*

$ per MMBtu/hr: *$313,810*

Oven Cost: *$313, 810*

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

Cost-Effectiveness of BARCT Limit

- Staff assumed a 25-year equipment life and $1,000 per year for operation and maintenance (O&M) cost
- Staff intends to maintain the proposal to require retrofit/replacement upon oven replacement
  - Cost effective assessment will consider incremental costs (e.g., the incremental cost for replacing a conventional combustion oven with an electric oven)
- Cost-Effectiveness analysis does not include:
  - In-use electric units or steam heated units
  - Units that were decommissioned or removed
  - Units that are exempt from the Rule 1153.1 limits

Bakery Ovens

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

Cost-Effectiveness	
30 ppm	Zero-Emission
$46,000	$120,000
Potential NOx Reductions	
0.008 tpd	0.1 tpd

Incremental Cost-Effectiveness
30 ppm to Zero-Emission
$127,000
Potential NOx Reductions
0.1 tpd

- Bakery ovens consist of large tunnel conveyor type and rack type ovens
  - Depending on oven type, tunnel oven or batch oven cost curve used to estimate cost
- Tunnel type and have higher cost
  - Total Installation Cost (TIC) for ovens ranged from $1.2 MM to $11MM
  - Electrical upgrade $41,000 to $890,000
- Batch bakery ovens
  - TIC ranged from $436,000 to $1 MM
  - Electrical upgrade $32,000 to $51,000
- Incremental costs estimated between $400,000 and $10.9 MM
- Cost-effectiveness below the $325,000 NOx threshold

Staff Recommendation:
Zero-emission NOx limit upon unit replacement

Tortilla Ovens

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

Cost-Effectiveness		
15 ppm (IR burners)	30 ppm	Zero-Emission
Currently Achieving	$19,000	Not Commercially Available
Potential NOx Reductions		
0 tpd	0.007 tpd	

Incremental Cost-Effectiveness
30 ppm to Zero-Emission
No zero-emission option, not conducted

- Staff did not identify any commercial zero-emission tortilla ovens at this time
- Ribbon and IR burners retrofit options are commercially available for category
- Incremental cost-effectiveness not calculated for category
- Maintain original BARCT proposal

Staff Recommendation:

- 15 ppm (IR burners only)
- 30 ppm (ribbon/IR burners) upon burner replacement

Cooking Ovens

Cost-Effectiveness	
30 ppm	Zero-Emission
Currently Achieving	$38,000
Potential NOx Reductions	
0	0.02 tpd

Incremental Cost-Effectiveness
30 ppm to Zero-Emission
$38,000
Potential NOx Reductions
0.02 tpd

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

- Batch oven cost curve used to estimate cost
- New subcategory of other food ovens category
  - Separated category for zero-emission assessment
  - All units currently performing at 30 ppm or less
  - 9 units exempt and emit less than one pound per day
- Total Installation Cost for ovens ranged from $319,000 to $636,000
  - Electrical upgrades estimated between $23,000 and $56,000
  - Incremental costs estimated between $316,000 and $555,000
- Since all units are currently performing at 30 ppm or less, cost-effectiveness and incremental cost-effectiveness is the same

Staff Recommendation:
Zero-emission NOx limit upon unit replacement

Drying Ovens

Cost-Effectiveness	
30 ppm	Zero-Emission
$36,000	$40,000
Potential NOx Reductions	
0.00002 tpd	0.009 tpd

Incremental Cost-Effectiveness
30 ppm to Zero-Emission
$36,000
Potential NOx Reductions
0.009 tpd

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

- Batch oven cost curve used to estimate cost
- New subcategory of other food ovens category
  - Separated category for zero-emission assessment
  - All but one unit currently performing at 30 ppm or less
- Total Installation Cost for ovens ranged from $341,000 to $636,000
  - Electrical upgrades estimated between $25,000 and $45,000
  - Incremental costs estimated between $339,000 and $545,000

Staff Recommendation:
Zero-emission NOx limit upon unit replacement

Spray Dryers/Dryers

Cost-Effectiveness	
30 ppm	Zero-Emission
$12,000	No zero-emission option identified
Potential NOx Reductions	
0.0006 tpd	

Incremental Cost-Effectiveness
30 ppm to Zero-Emission
No zero-emission option, not conducted

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

- New subcategory of other food ovens category
  - Separated category for zero-emission assessment
- All but one unit currently performing at 30 ppm or less
- Incremental cost-effectiveness not calculated for category
- Staff did not identify any commercially available zero-emission spray dryers/dryers at this time
- Maintain original BARCT proposal

Staff Recommendation:
30 ppm NOx limit upon burner replacement

Smokehouse Ovens

Cost-Effectiveness	
30 ppm	Zero-Emission
$20,000	$9,000
Potential NOx Reductions	
0.0010 tpd	0.011 tpd

Incremental Cost-Effectiveness
30 ppm to Zero-Emission
$8,000
Potential NOx Reductions
0.010 tpd

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

- Batch oven cost curve used to estimate cost
- New subcategory of other food ovens category
  - Separated category for zero-emission assessment
- Four units are currently electric units
- Five units currently at 30 ppm
- Six units currently exceed 30 ppm
- One unit exempt (operates 10 hours or less per day)
- Total Installation Cost for zero-emission ovens ranged from $341,000 to $534,000
  - Electrical upgrades estimated between $25,000 and $40,000
  - Incremental costs estimated between $337,000 and $379,000

Staff Recommendation:
Zero-emission NOx limit upon unit replacement

Coffee and Nut Roasters

Cost-Effectiveness	
30 ppm	Zero-Emission
$41,000	No zero-emission option identified
Potential NOx Reductions	
0.00032 tpd	

Incremental Cost-Effectiveness
30 ppm to Zero-Emission
No zero-emission option, not conducted

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

- Staff did not identify any commercial zero-emission roasters at this time
- Most units exempt because they are less than 325,000 Btu/hr
- Burner retrofit is only feasible option identified
- Incremental cost-effectiveness not calculated for category
- Maintain original BARCT proposal

Staff Recommendation:
30 ppm NOx limit upon burner replacement

Summary of Proposals

	Interim BARCT Limit	Proposed BARCT Limit	NOx Emission Reductions (tpd)
Bakery Ovens	30 ppm	0 ppm	0.1
Tortilla Ovens	--	15 and 30 ppm	0.007
Cooking Ovens, Drying Ovens, Smokehouse Ovens	30 ppm	0 ppm	0.01
Spray Dryers/Dryers	--	30 ppm	0.0006
Roasters	--	30 ppm	0.0003
		Total	**0.12**

Rule Concepts

Implementation Timelines and Rule Concepts

To address stranded assets, NOx limits will be required at end of unit's useful life*

- Upon unit or burner replacement

Consider establishing future effective date where proposed zero-emission technology is not widely available

If future effective limits are included, establish an interim 30 ppm NOx limits for units that are replaced prior to future effective date

- 30 ppm is technically feasible and cost effective

Allow staggered implementation schedule for facilities with multiple units*

Maintain one pound or less per day exemption at this time*

* Consistent with staff's prior proposal

Technology Check-In

- Propose a technology check-in prior to future effective date to assess:
  - Categories with proposed zero-emission limit
  - Categories where zero-emissions technology was not available
  - Consider off-ramp for near-zero technologies where zero-emission technology is deemed not feasible

Next Steps

Continue Stakeholder Meetings

↓

Release Preliminary Draft Staff Report and Rule Language

↓

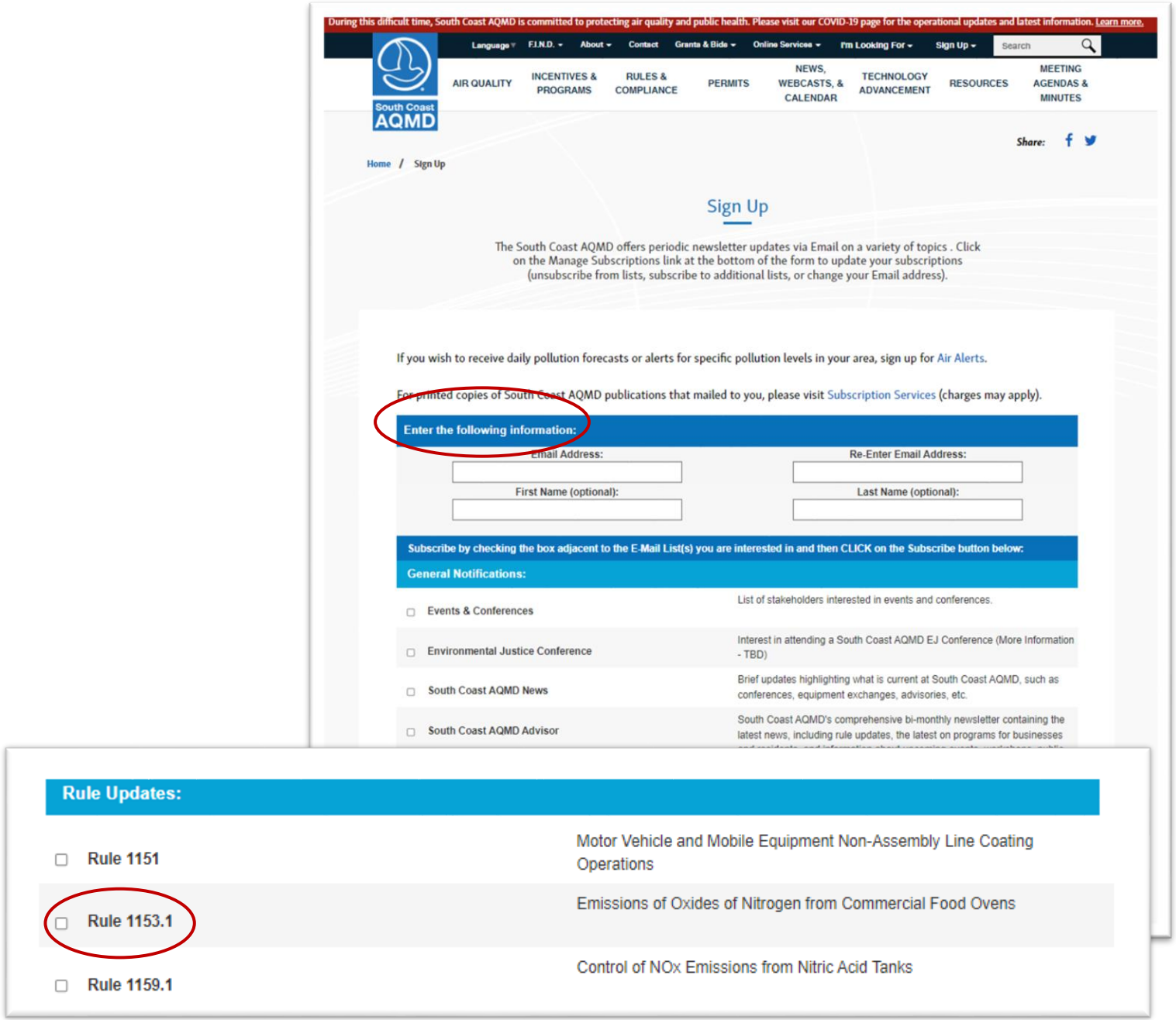
Public Workshop

↓

Public Hearing May 2023

Receiving PAR 1153.1 Updates

- To receive email updates, sign up at South Coast AQMD sign up page *http://www.aqmd.gov/sign-up*
- Enter email address and name
- Subscribe by scrolling down to “Rule Updates” and check the box for Rule 1153.1 and click on the subscribe button at bottom of page
- Future meeting notices, links to documents, and any updates will be sent via email



Staff Contacts

Michael Krause
Assistant DEO
mkrause@aqmd.gov
909.396.2706

Heather Farr
Planning and Rules Manager
hfarr@aqmd.gov
909.396.3672

Sarady Ka
Program Supervisor
ska@aqmd.gov
909.396.2331

Chris Bradley
Air Quality Specialist
cbradley@aqmd.gov
909.396.2185