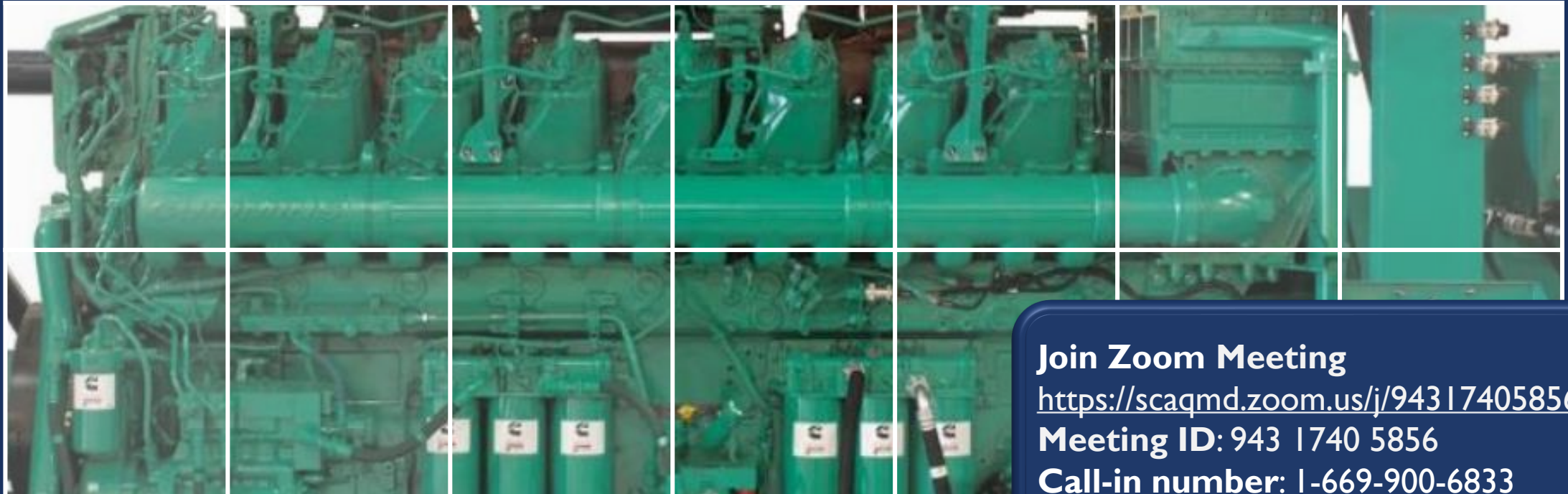


SCIENTIFIC REVIEW COMMITTEE **PROPOSED LAER DETERMINATION FOR** **TIER 4 FINAL STATIONARY, EMERGENCY** **ICE \geq 1,000 BHP**

NOVEMBER 03, 2021




Join Zoom Meeting

<https://scaqmd.zoom.us/j/94317405856>

Meeting ID: 943 1740 5856

Call-in number: 1-669-900-6833

AGENDA

- 
- Background on Emergency ICEs
 - South Coast AQMD Minor Source BACT and Major Source LAER
 - South Coast AQMD Achieved In Practice LAER
 - Scientific Review Committee Concerns
 - Achieved in Practice Tier 4 Emergency ICE $\geq 1,000$ BHP
 - BAAQMD and SMAQMD BACT Determinations
 - South Coast AQMD Current and Proposed LAER / Next Steps

BACKGROUND ON EMERGENCY ICEs

- Emergency stationary internal combustion engine (ICE) is one of the most permitted equipment by the South Coast AQMD
- Over 12,500 permitted Emergency ICEs
 - Generators, Fire Pumps, Water Pumps, Compressors, and Blowers
 - Approximately 65,000 total active permits in South Coast jurisdiction
- Facilities using emergency ICEs are wide-ranging, covering almost all industries within the South Coast AQMD's jurisdiction
- Emergency ICEs are mainly used to provide electrical power in times of emergency, including loss of power and natural disasters
- Other applications include fire protection and flood control

SOUTH COAST AQMD

MINOR SOURCE BACT AND MAJOR SOURCE LAER

Achieved in Practice (AIP) Best Available Control Technology (BACT)/ Lowest Achievable Emission Rate (LAER) can be demonstrated by:

- Commercial availability - at least one vendor in U.S.
- Reliability
 - Major Source – 6 months operation
 - Minor Source – 12 months operation
- Effectiveness - performance test

For minor source

- Updates to Part D includes public review and South Coast AQMD Board approval
- Cost Effectiveness (H&SC 40440.11)

SOUTH COAST AQMD MINOR SOURCE BACT AND MAJOR SOURCE LAER (cont'd)

- LAER for Major Sources is determined on a case-by-case basis at the time the permit is issued
- BACT for Minor Sources is determined on a case-by-case basis at the time an application is deemed complete

As part of the permit processing, BACT/LAER is only applied to new, modified or relocated equipment that results in emission increases. It will not require replacement nor retrofit of the existing permitted equipment.

SOUTH COAST AQMD ACHIEVED IN PRACTICE LAER

Regulatory Documents: An emission limit or control technology may be considered AIP for a category or class of source if it exists in any of the following regulatory documents or programs:

- South Coast AQMD BACT Guidelines
- CAPCOA BACT Clearinghouse
- USEPA RACT/BACT/LAER Clearinghouse
- Other districts' and states' BACT Guidelines
- BACT/LAER requirements in New Source Review permits issued by South Coast AQMD or other agencies

LAER based on AIP is the most stringent emission limit or control technology for a class or category of source.

SOUTH COAST AQMD ACHIEVED IN PRACTICE LAER (cont'd)

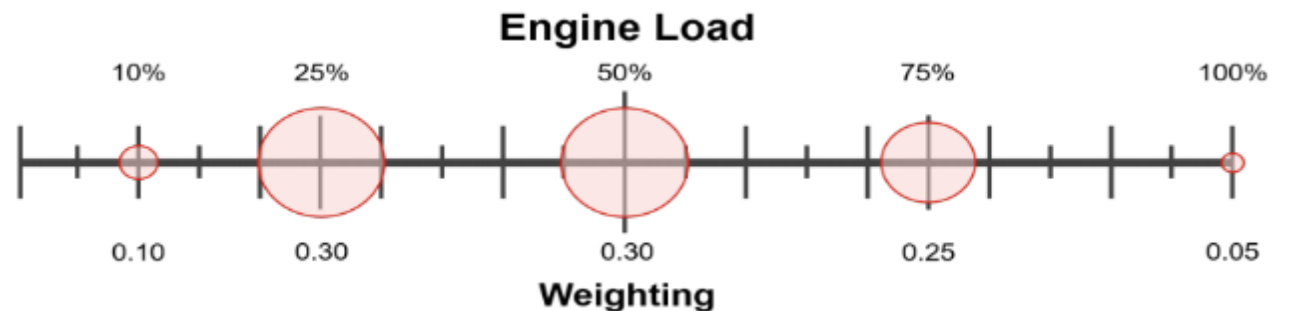
New Technologies/Emission Levels: New technologies and innovations of existing technologies may also be considered as AIP if it meets all the following criteria:

- **Commercial Availability:** At least one vendor must offer this equipment for regular or full-scale operation in the U.S.
- **Reliability:** All control technologies must have been installed and operated reliably for at least six months.
- **Effectiveness:** The control technology must be verified to perform effectively over the range of operation expected for that type of equipment.

Consistent with EPA Guidelines in determining LAER

SCIENTIFIC REVIEW COMMITTEE CONCERNS

- Exhaust Aftertreatment:
 - Each engine is usually equipped with Selective Catalytic Reduction (SCR) Catalyst and catalyzed Diesel Particulate Filter (DPF) controls to meet with emission requirements of EPA Tier 4 Final Certified engines
- Certification limitations/Inducements/Diesel Exhaust Fluid (DEF) Storage
 - Certified Engine: Equipment includes inducement shutdowns
 - Compliant Engine: Inducement shutdowns not included, with an option to install a larger DEF (urea) tank (DEF tank size variations)
- Emission Testing:
 - Emissions levels are evaluated on a 5-mode, weighted test cycle average Per ISO 8178 D2 cycle



SOUTH COAST AQMD ACHIEVED IN PRACTICE TIER 4 EMERGENCY ICE \geq 1,000 BHP

- Current Major Source Universe: 262 diesel fuel emergency ICEs \geq 1,000 BHP
 - Located at 62 major source facilities out of approximately 350 total major source facilities
- Identified at least two identical emergency ICEs \geq 1,000 BHP permitted at Tier 4 Final emission standards at South Coast AQMD

Tier 4 Final – EPA Certified & Compliant – NO_x & PM Reduction

- Diesel Particulate Filter
- Selective Catalytic Reduction Catalyst
- Engine Manufacturers:
Caterpillar, Detroit Diesel, Cummins, General Motors, Mitsubishi, Kohler, Generac, Hamilton M.A.N., EMD, Alco, ...



SOUTH COAST AQMD

ACHIEVED IN PRACTICE TIER 4 EMERGENCY ICE \geq 1,000 BHP (cont'd)

- Part B, Section III BACT Guidelines: **Emerging Technologies**

- I.C. Engine, Emergency, Diesel Fueled (2/2/2018)

- Facility: Praxair Inc. (Linde Inc.)

- Equipment: Two Internal Combustion Engines, Stationary, Emergency Power, Diesel Fueled, 1,490 BHP

- Make and Model: Cummins, model QST30-G5

- Certified Tier 2 engine equipped with integrated aftertreatments to comply with EPA Tier 4 Requirements, DPF, with an electric heater, SCR

- Tier 4 Final permit condition limits

- In operation since 2016

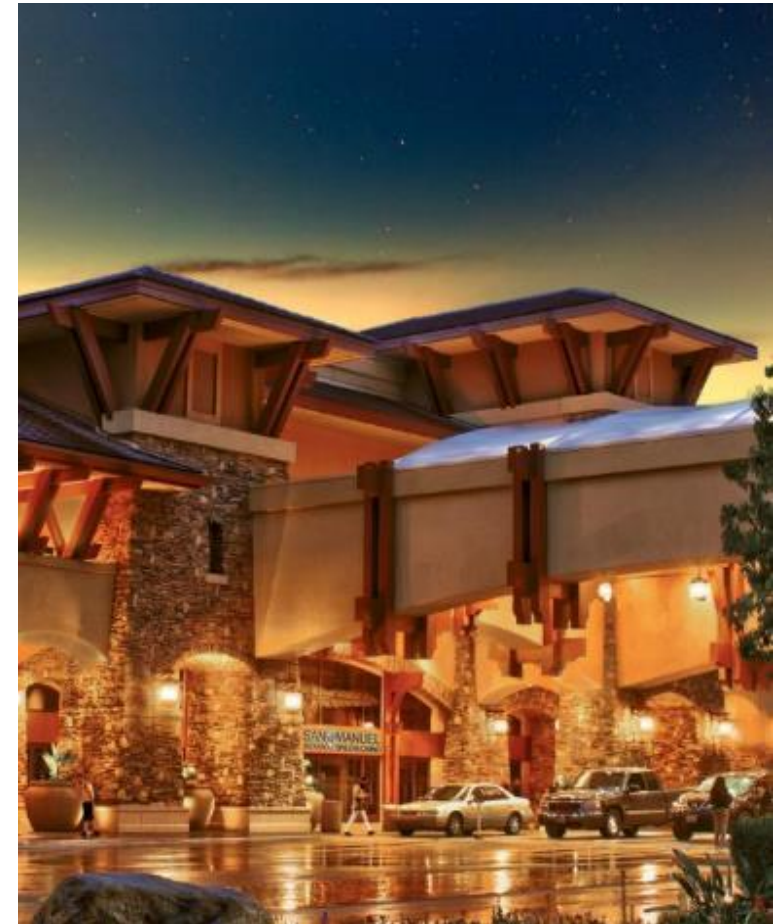


NO_x/NMHC/CO/PM
0.67/0.19/3.5/0.03 (gr/kW-hr)

Tier 4 Final

SOUTH COAST AQMD - INDIAN TRIBAL ACHIEVED IN PRACTICE TIER 4 EMERGENCY ICE \geq 1,000 BHP

- San Manuel Entertainment Authority, Highland, CA
 - Equipment: Two IC Engines, Emergency, Diesel Fueled, 2,000 ekW (est. 1,500 HP)
 - Make and Model: Caterpillar, model no. 3516C
 - Equipped with SCR and complying with Tier 4 Final emission standards. Initial and subsequent performance tests are not required.
 - In operation since 2020
 - Source is located on tribal land of the San Manuel Band of Mission Indians and the source is subject to the requirements of the Tribal Minor New Source Review (NSR) Program



SOUTH COAST AQMD REGISTRATION/CERTIFICATION PROGRAM

- South Coast AQMD's Equipment Registration/Certification Program includes two manufacturers with commercially available Tier 4 Final, Diesel, Emergency ICEs \geq 1,000 BHP
 - Cummins (with Integrated Aftertreatment)
 - Kohler (with Integrated Aftertreatment)
- Title V facilities are not eligible to participate in the Certification/Registration Program
 - Must submit permit application for Title V permit



EPA TIER 4 FINAL EMISSION STANDARDS FOR ICE ≥ 75 HP (>560 kW)

In accordance with **40 CFR §1039.101**:

TABLE I—Tier 4 Final Exhaust Emission Standards for Engines over 560 kW

■ Nitrogen Oxides	0.5 g/bhp-hr (0.67 g/kW-hr)
■ Non-Methane Hydrocarbon	0.14 g/bhp-hr (0.19 g/kW-hr)
■ Carbon Monoxide	2.6 g/bhp-hr (3.5 g/kW-hr)
■ Particulate Matter	0.02 g/bhp-hr (0.03 g/kW-hr)

EPA-certified Tier 4 Final ICE requires Inducement System

kW	(HP)	2010	2011	2012	2013	2014	2015	2016	... →	2021
>560	(≥751)	(NO _x +NMHC)/CO/PM (6.4)/3.5/0.20 (gr/kW-hr)	NO _x /NMHC/CO/PM 0.67/0.40/3.5/0.10 (gr/kW-hr)				NO _x /NMHC/CO/PM 0.67/0.19/3.5/0.03 (gr/kW-hr)			
		Tier 2	Tier 4 Interim				Tier 4 Final			

BAY AREA AQMD BACT DETERMINATION

- BAAQMD established BACT for large diesel engines used for emergency standby power required to meet U.S. EPA's Tier 4 Final emissions standards
 - Applies to any new and open permit application for a diesel backup engine and fire pumps (non-direct drive) $\geq 1,000$ BHP that is deemed complete after January 1, 2020
- Source Test Requirements:

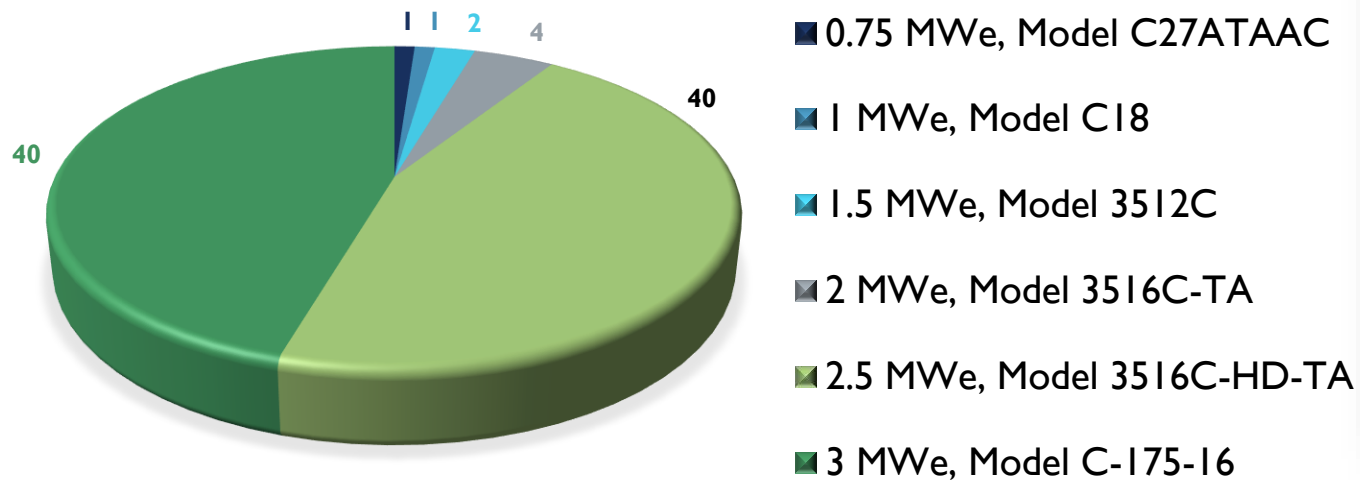
	Initial Source Testing	Follow-up Source Testing
EPA-Certified Tier 4 Engines	Not required	Not required
Tier 4-Compliant (EPA-Certified Tier 2 engines packaged by engine manufacturer with SCR and catalyzed DPF or oxidation catalyst and DPF)	Not required if a District-approved source test has been conducted, and an applicant installs the identical engine/abatement package	Required every 3 years thereafter
Existing EPA-Certified Tier 2 engine retrofitted with SCR, Catalyzed DPF or DPF	Required	Required every 3 years thereafter

BAY AREA AQMD BACT DETERMINATION

MICROSOFT MWH DATA CENTER – TIER 4 F EMERG. ICEs $\geq 1,000$ BHP

- Microsoft MWH (Oxford) Data Center, Quincy, Washington:
 - Diesel powered electric emergency generators (Total of 104 Engines Permitted)
 - Permits include condition to achieve Tier 4 emissions standards

**NO. OF INSTALLED ENGINES TO DATE
(CATERPILLAR)**



MICROSOFT MWH DATA CENTER

PERMIT CONDITIONS

- “Each engine shall be equipped with selective catalytic reduction (SCR) and catalyzed diesel particulate filter (DPF) controls to meet with emission requirements of EPA Tier 4 engines.”
- “The MWH Data Center shall source test engines as described in Approval Condition to show compliance with emission limits in Table I.”
- “For the five load tests, testing shall be performed at each of the five engine torque load levels described in Table 2 of Appendix B to Subpart E of 40 CFR Part 89, and data shall be reduced to a single-weighted average value using the weighting factors specified in Table 2.”
- “Every 60 months after initial source testing, Microsoft shall test at least one 2.5 MWe engine and one 3.0 MWe engine, including the engine with the most operating hours as long as it is a different engine from that which was tested during the previous 60 month interval testing.”

MICROSOFT MWH DATA CENTER EMISSION LIMITS & TESTING REQUIREMENTS

■ Table I. Emission Limits and Testing Requirements:

Pollutant	Load Test	Test Method ^(a)	Emission Limits	Compliance Test Frequency
PM	Five-load weighted avg.	EPA Method 5 or alternative method from 40 CFR 1065	0.03 g/kW-hr	See Approval Conditions 4.d.iv, 4.d.v, 4.d.vi.
NO _x	Five-load weighted avg.	EPA Method 7E, or alternative method from 40 CFR 1065	0.67 g/kW-hr	
CO	Five-load weighted avg.	EPA Method 10, or alternative method from 40 CFR 1065	3.5 g/kW-hr	
NMHC/ VOC	Five-load weighted avg.	EPA Method 25A and EPA Method 18; or alternative method from 40 CFR 1065	0.19 g/kW-hr	
Ammonia	100%-load (± 2%)	BAAQMD Method ST-1B or EPA Method 320 or EPA CTM-027; or alternative method suitable for use with 40 CFR 1065	0.19 lb/hr (0.75 MWe)	
			0.50 lb/hr (1.5 MWe)	
			0.48 lb/hr (2.0 MWe)	
			0.61 lb/hr (2.5 MWe)	
			0.95 lb/hr (3.0 MWe)	

(a) In lieu of these requirements, Microsoft may propose an alternative test protocol to Ecology in writing for approval.



BAAQMD ACHIEVED IN PRACTICE TIER 4 FINAL CERTIFIED EMERGENCY ICE $\geq 1,000$ BHP PERMITS



- San Jose/Santa Clara Water Pollution Control
 - Four 4,376 BHP engines, Caterpillar, model C175 equipped with SCR, diesel oxidation catalyst, and DPF
 - In operation since 10/11/2016
- GSW Arena LLC.
 - Two 2,220 BHP and two 1,490 BHP engines equipped with SCR and catalyzed DPF
 - In operation since 5/8/2019

SACRAMENTO METROPOLITAN AQMD

- On June 4, 2021, SMAQMD established
 - Tier 4 Final BACT for Stationary, Standby, Diesel-fueled ICE $\geq 1,000$ BHP
 - Major and Minor Sources



Primarily based on BACT analysis AIP technology from BAAQMD

- Microsoft MWH Data Center, Quincy, Washington
- Multiple 0.75 MWe to 3 MWe Tier 4-Compliant engines equipped with SCR and catalyzed DPF

SOUTH COAST AQMD

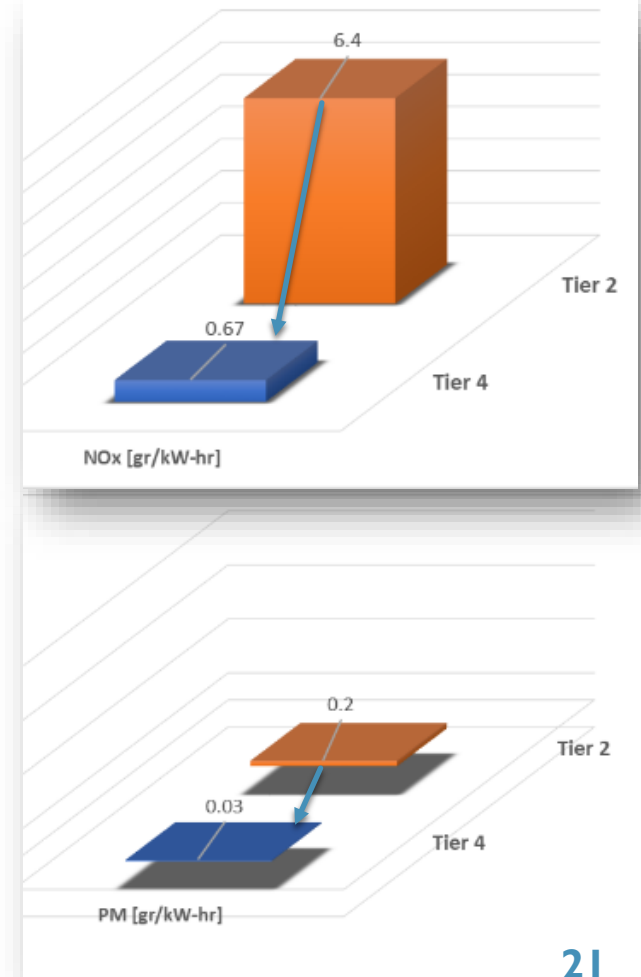
PART B BACT GUIDELINES

	Section I (Current LAER)	Section III (Other Technologies)
Equipment Category	I.C. Engine, Emerg., Compression Ignition	I.C. Engine, Emerg., Compression Ignition
Make and Model	Cummins, QSK50-G4	Cummins, QST30-G5
Capacity, BHP	2,220	1,490
Primary Fuel	Diesel	Diesel
Control Technology	DPF	SCR and DPF
Startup Date	2011	2015
Emissions	Emission Limits, gr/BHP-hr	
NO _x +VOC	4.8	0.5+0.14 (0.64)
CO	2.6	2.6
PM	0.15	0.02
	Meets applicable Tier 2 BACT limits	Complies with EPA Tier 4 Requirements

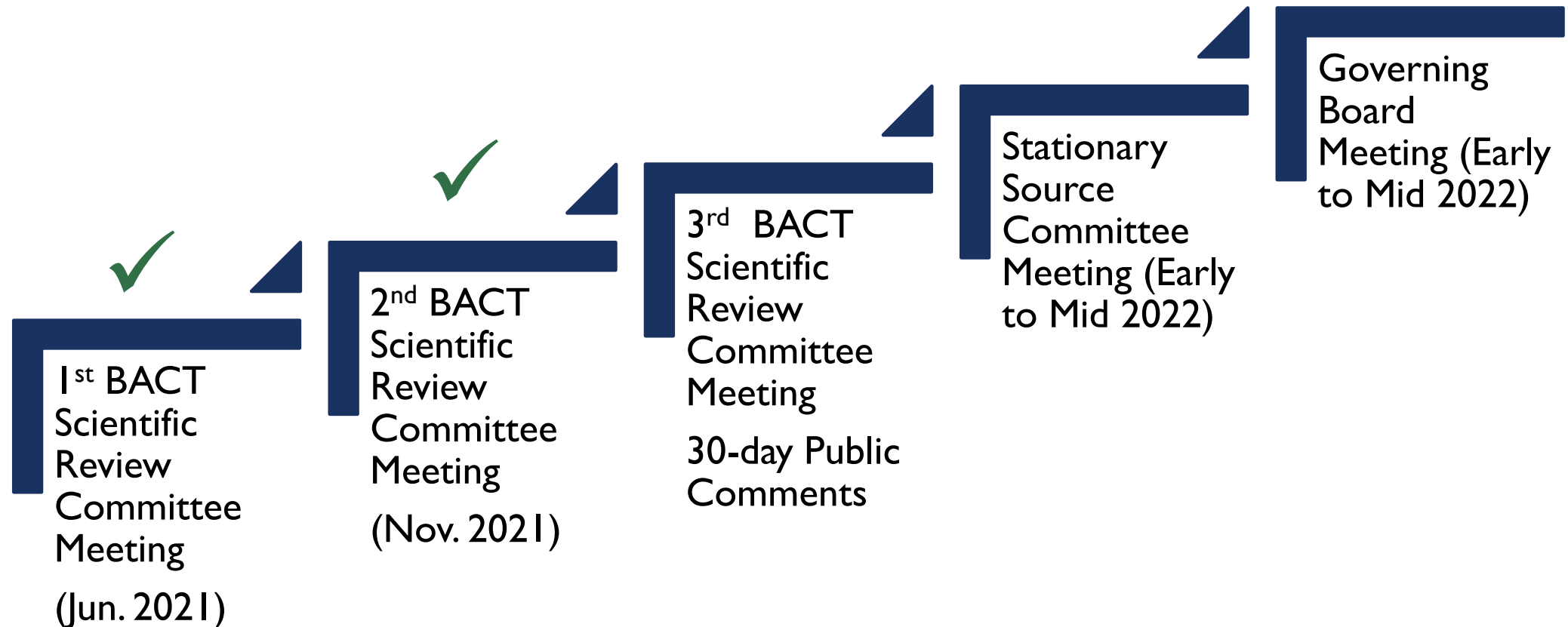
SOUTH COAST AQMD PROPOSED LAER DETERMINATION

Tier 4 Final Emission Standards for IC Engine-Compression Ignition $\geq 1,000$ BHP, Stationary Emergency including Non-Agricultural and non-direct drive fire Pump

- Applies to Major Sources (Title V) and compliance achieved through:
 - Tier 4 Final Compliant ICE; or
 - EPA-Certified Tier 4 Final ICE
- Source Test Requirements:
 - Tier 4 Final Compliant ICE: One-time Initial test 5-mode weighted avg. D2 cycle and follow up testing every 3 years is required
 - EPA-Certified Tier 4 Final ICE: No test required
- Included in the proposed BACT Guidelines



NEXT STEPS



PLEASE PROVIDE WRITTEN COMMENTS

CONTACTS



Bhaskar Chandan

Al Baez

Bahareh Farahani



(909) 396-3902

(909) 396-2516

(909) 396-2353



bchandan@aqmd.gov

abaez@aqmd.gov

bfarahani@aqmd.gov



www.aqmd.gov