Rule 1110.2
Working Group Meeting No. 2

Emissions from Gaseous- and Liquid- fueled Engines

September 27, 2018

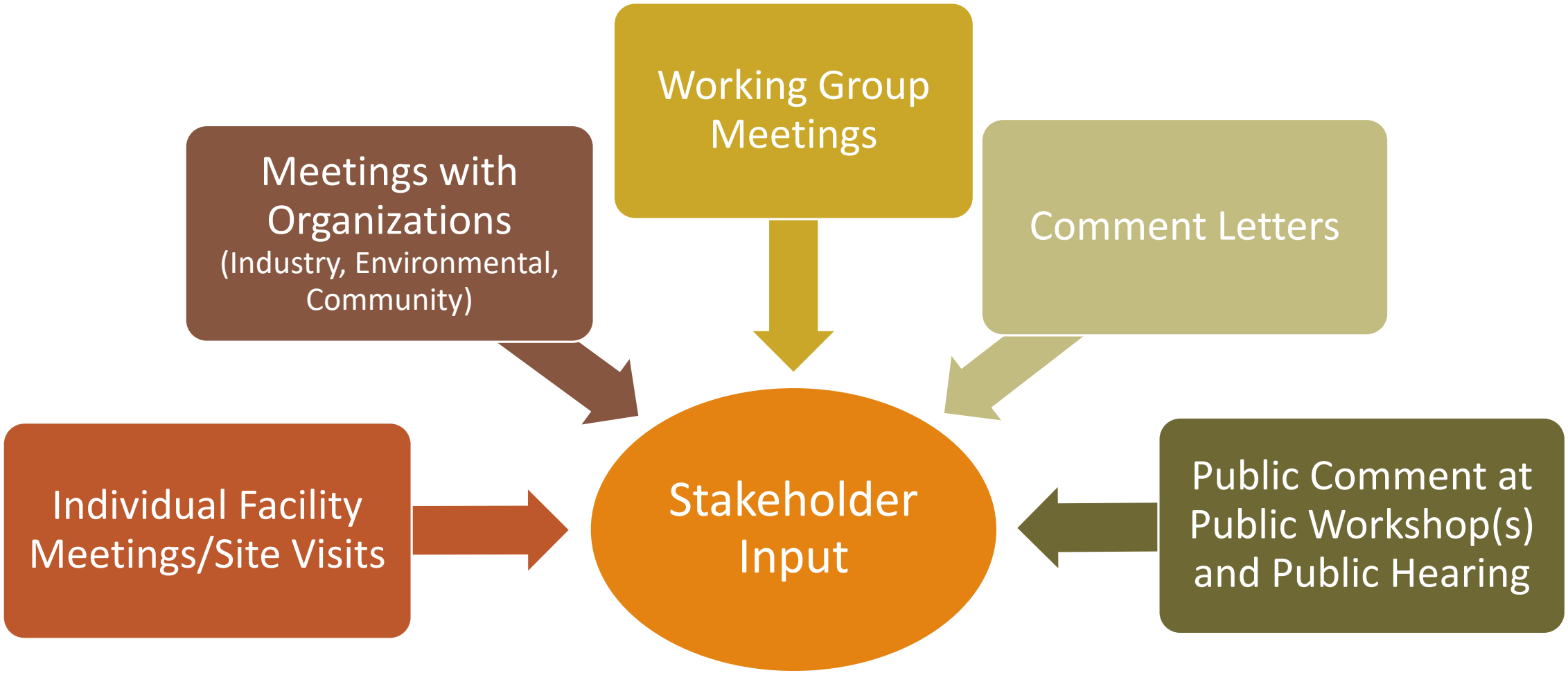
Agenda

- Summary of Working Group Meeting #1
- Status of rule development
- Rules affecting engines
- Revised universe and equipment
- Best Available Retrofit Control Technology (BARCT) assessment
- Survey questionnaire
- Next steps and proposed schedule

Summary of Working Group Meeting #1

- Background on RECLAIM transition
- Applicability of PAR 1110.2
- BARCT overview
- Regulatory history of SCAQMD Rule 1110.2
- Initial evaluation of affected universe

Status of Rule Development



Status of Rule Development

- Continued evaluation of existing engines at RECLAIM facilities
- Reviewed other jurisdictions' regulatory limits
- Initiated contact for technology assessment
- Scheduling site visits with affected facilities
- Developing survey questionnaire to assess equipment and operations

Rules Affecting Engines

RECLAIM internal combustion engines are affected by two rules:

- Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines
- Rule 1470 – Requirements for Stationary, Diesel-Fueled Internal Combustion and Other Compression Ignition Engines

Let's compare the two rules

Rules Affecting Engines

Applicability

Rule 1110.2	Rule 1470
• All stationary and portable engines with a rated brake horsepower greater than 50 bhp • Spark-ignited and compression-ignited engines • Limits NOx, CO, and VOC	• Stationary compression ignition engines with a rated brake horsepower greater than 50 bhp • Diesel fueled • Limits diesel PM

Emissions Standards for New Rule 1470 Engines

New stationary prime diesel-fueled CI engines that have a rated brake horsepower of > 50 bhp

Diesel PM Standard

- All new stationary prime diesel-fueled CI engines (> 50 bhp) shall either emit diesel PM at a rate ≤ 0.01 g/bhp-hr; or
- Shall meet the diesel PM standard specified in the Off-Road Compression Ignition Engine Standards for off-road engines per Title 13, CCR, Section 2423, whichever is more stringent

HC, NOx, NMHC + NOx, and CO Standards

- All new stationary prime diesel-fueled CI engines (> 50 bhp) shall meet the applicable emission standards specified in SCAQMD Rule 1110.2 – Emissions From Gaseous and Liquid-Fueled Engines

Emissions Standards for In-use Rule 1470 Engines

In-use stationary prime diesel-fueled CI engines that have a rated brake horsepower of > 50 bhp

<u>Diesel PM Standard</u>

- Option 1: Reduce the diesel PM emission rate by at least 85 percent, by weight, from the baseline level; or
- Option 2: Emit diesel PM at a rate ≤ 0.01 g/bhp-hr

<u>HC, NOx, NMHC + NOx, and CO Standards</u>

- Meet the applicable HC, NOx, NMHC+NOx, and CO emission standards specified in SCAQMD Rule 1110.2

Emissions Standards for Rule 1470 Engines

Conclusions

- Rule 1470 establishes diesel PM emission limits for new and in-use diesel engines
- All new and in-use stationary prime diesel-fueled CI engines shall meet applicable emission standards specified in Rule 1110.2 for NOx, VOC, and CO

Emissions Standards for Rule 1110.2 Engines

Pollutant	Rule 1110.2 (ppmv)
PM	Emission limits per Rule 1470
NOx[1]	11
VOC[2]	30
CO[1]	250

[1] Parts per million by volume, corrected to 15% oxygen on a dry basis and averaged over 15 minutes

[2] Parts per million, measured as carbon, corrected to 15% oxygen on a dry basis and averaged over the sampling period required by the test method

Distribution of RECLAIM Engines by Use

Category	No. of Engines
Rule 1110.2	
• Emergency	78
• Covered by Proposed Rule 1109.1	4
• Prime engines	87
Total	**169**

Currently, emergency engines are exempt from Rule 1110.2 emissions limits

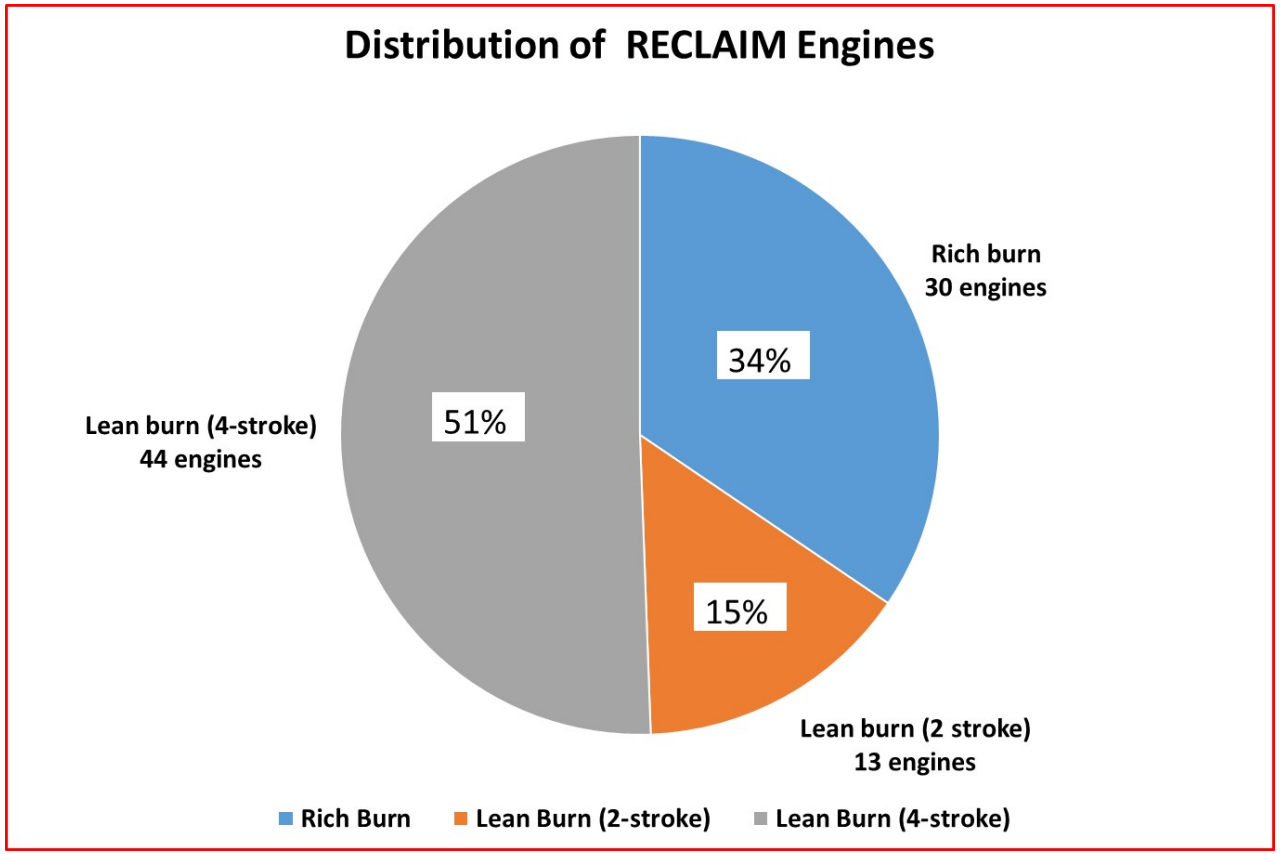
The focus of the amendment will be on the Rule 1110.2 prime engines

Focus of PAR 1110.2

- Rule development to focus on prime engines located at RECLAIM facilities that were previously exempt from Rule 1110.2 requirements
- Prime engines are those not used as emergency, stand-by engines
- Emission standards for NOx/VOC/CO do not apply to engines permitted to operate 200 hours or less per year (e.g., engines covered under Rule 1470)
- PM standards for diesel engines are contained in Rule 1470 and are not part of the PAR 1110.2 analysis

Revised Universe and Equipment

- Previous universe of engines: 98 engines
- Analysis of previous universe found:
  - 8 engines removed from service and
  - 3 additional engines soon to be removed
  - 87 remaining engines
- 16 of the 87 engines located at offshore oil production facilities
- 18 of the 87 engines operate less than 11 ppmv[1] NOx
- Total number of facilities affected: 24 (87 engines)

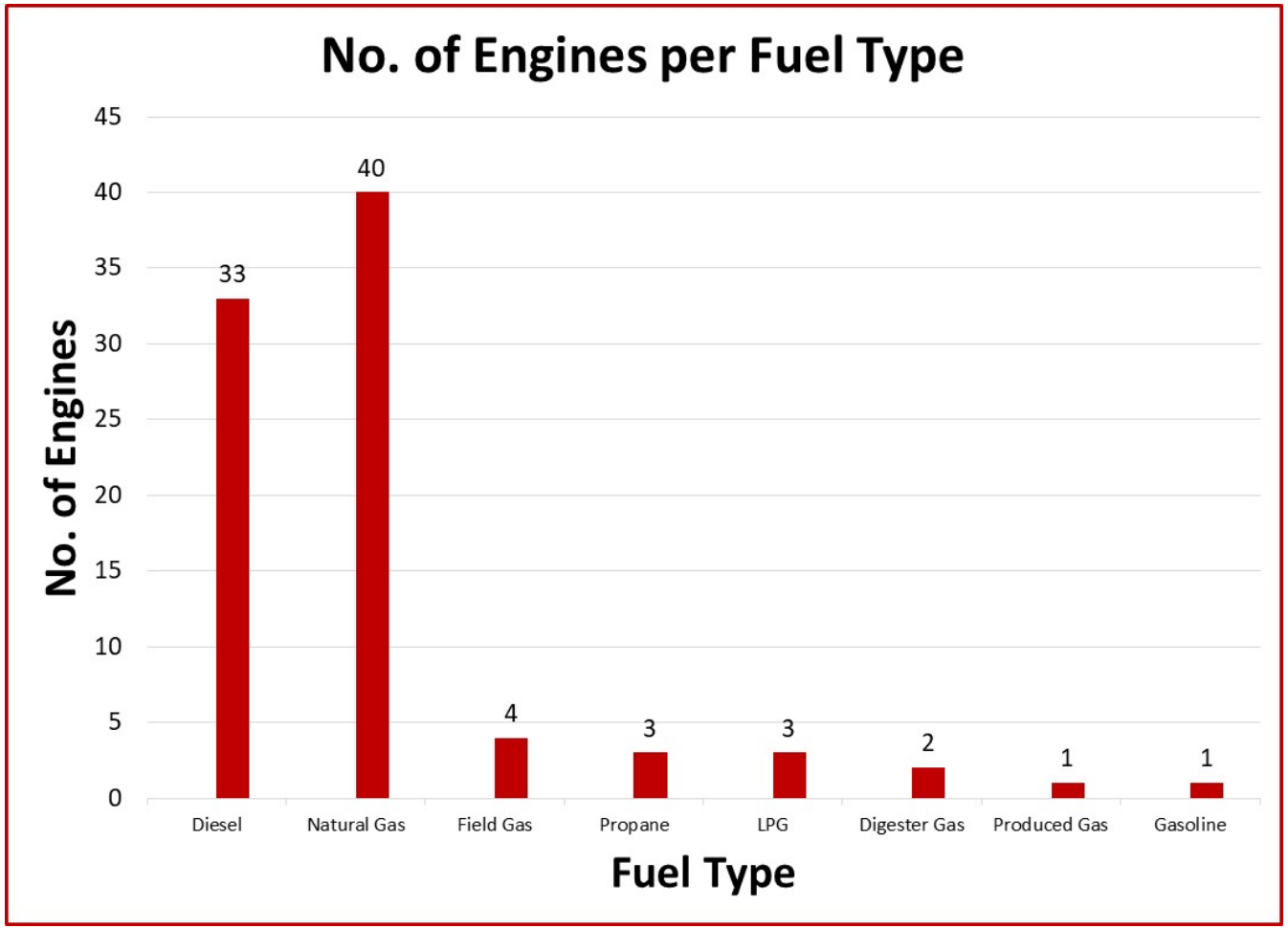


[1] Parts per million by volume, corrected to 15% oxygen on a dry basis and averaged over 15 minutes

Revised Universe and Equipment

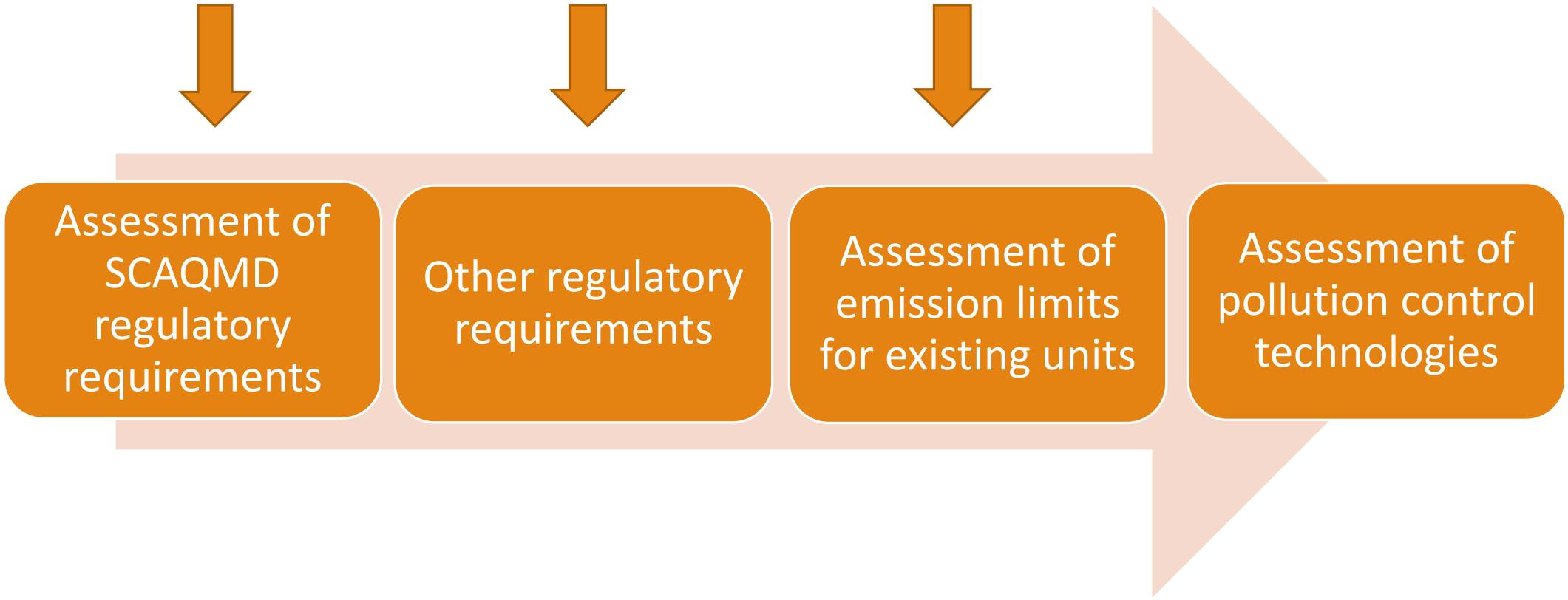
No. of Engines per Fuel Type	
Diesel	33
Natural Gas	40
Field Gas	4
Propane	3
LPG	3
Digester Gas	2
Produced Gas	1
Gasoline	1
Total	**87**

- Engine fuel type was collected from RECLAIM permits



BARCT Technology Assessment Approach

Focus will be on the first three steps of the process



Assessment of SCAQMD Regulatory Requirements

Assessment of SCAQMD regulatory requirements

Other regulatory requirements

Assessment of emission limits for existing units

Assessment of pollution control technologies

Assessment of SCAQMD Regulatory Requirements

Currently, SCAQMD Rule 1110.2 requires that all non-RECLAIM stationary, non-emergency internal combustion engines comply with the following emissions standards for any gaseous or liquid fuel:

- 11 ppmv NOx (@ 15% O2)
- 30 ppmv VOC (@ 15% O2)
- 250 ppmv CO (@ 15% O2)

Regulatory Comparison

Assessment of SCAQMD regulatory requirements

Other regulatory requirements

Assessment of emission limits for existing units

Assessment of pollution control technologies

Regulatory Comparison

How does the SCAQMD Rule 1110.2 compare with other similar regulations in other air districts?

Regulatory Comparison

Rules in other air districts differentiate engines by type, fuel, and application

- Engine Type
  - Two-Stroke and Four-Stroke
  - Rich-Burn and Lean-Burn
  - hp size
- Fuel Source
  - Natural Gas
  - LPG
  - Digester Gas
  - Diesel
- Application
  - Prime use
  - Emergency
  - Agriculture

Regulatory Comparison

Staff compared emission limits for similar equipment in other air districts

- In State – Antelope Valley AQMD; Bay Area AQMD; Mojave Desert APCD; Santa Barbara APCD; San Diego APCD; San Joaquin Valley APCD; San Luis Obispo APCD; and Ventura County APCD
- Out of State – New Jersey, New York, and Texas

Regulatory Comparison

Lowest NOx Emission Limits in Other Jurisdictions		
Jurisdiction	Type of Engine	Limit (ppmv[1])
Antelope Valley AQMD	General, spark-ignited	36
Bay Area AQMD	Fossil-derived fuel, rich-burn	25
Mojave Desert APCD	Non-agriculture, rich-burn, spark-ignited engines	50
Santa Barbara APCD	Rich-burn, noncyclically-loaded spark ignition engines	50
San Diego APCD	Gaseous fuel or gasoline, rich-burn	25
San Joaquin Valley APCD	**Non-exempted ICEs**	**11**
San Luis Obispo APCD	Spark-ignited, rich-burn	50
Ventura County APCD	General, rich-burn	25
New Jersey	Non-exempted ICEs	70
New York	Natural gas, >200 hp	116
Texas ICE Standards (Dallas-Fort Worth Non-attainment Area)	Non-exempted ICEs	39

[1] ppmv corrected to 15% oxygen, dry basis

Regulatory Comparison

San Joaquin Valley APCD – ICE Standards			
Rule 4702: Table 2 – Emission limits for a spark-ignited ICE rated at >50 bhp used exclusively in non-agricultural operations			
Engine Type	NOx (ppmv[1])	CO (ppmv[1])	VOC (ppmv[1])
1. Rich-burn			
a. Waste gas fueled	50	2000	250
b. Cyclic loaded, field gas fueled	50	2000	250
c. Limited use (operated <4,000 hrs per calendar year)	25	2000	250
d. Rich-burn engine not listed in 1a – 1c	11	2000	250
2. Lean-burn			
a. Two-stroke, gaseous fueled >50 bhp but <100 bhp	75	2000	750
b. Limited use (operated <4,000 hrs per calendar year)	65	2000	750
c. Engine used for gas compression	65	2000	750
d. Waste gas fueled	65	2000	750
e. Lean-burn engine not listed in 2a – 2d	11	2000	750
[1] ppmv corrected to 15% oxygen, dry basis			

Let's take a closer look at SJV limits

Regulatory Comparison

Conclusions

- SCAQMD has the lowest NOx limits for stationary ICE equipment relative to other air districts except for two engine categories in the SJV APCD
- SCAQMD has the lowest emissions standards for CO and VOC relative to other air districts

Assessment of Emission Limits for Existing Units

Assessment of SCAQMD regulatory requirements

Other regulatory requirements

Assessment of emission limits for existing units

Assessment of pollution control technologies

Assessment of Emission Limits for Existing Units

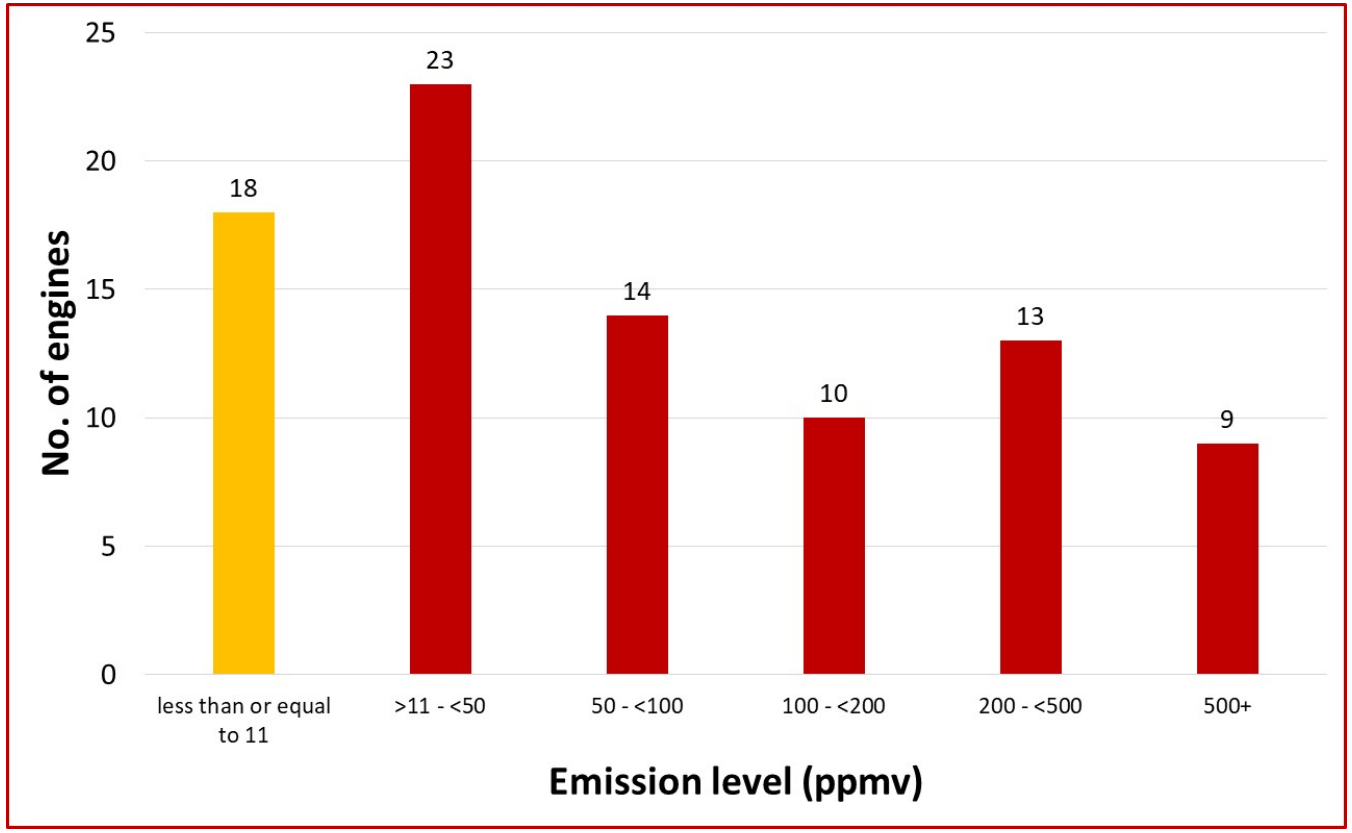
- The initial assessment of emission limits relied on permitted limits
- For major sources, data from Relative Accuracy Test Audits (RATA) was used
- More data will be collected via a survey to be sent to facilities affected by Rule 1110.2

Assessment of Emission Limits for Existing Units

- 87 engines have been identified as part of the RECLAIM Rule 1110.2 Universe
- Evaluated existing universe for:
  - Current emission levels
  - Engine distribution by fuel
- Assessed engines already meeting current Rule 1110.2 NOx limits
- Data may change upon evaluation of surveys

Distribution of Engines per Emission Level

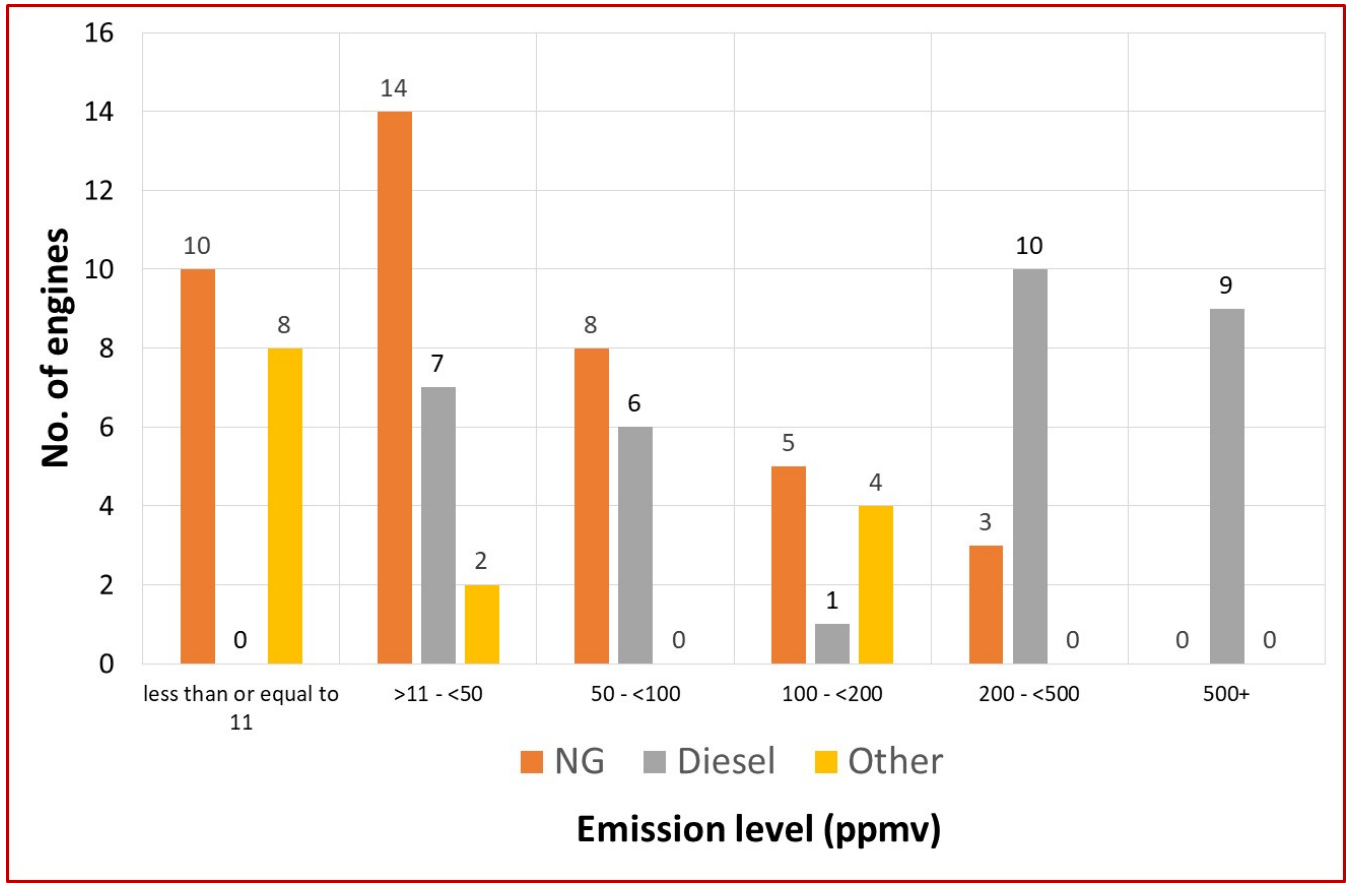
NOx Emissions level (ppmv)	No. of Engines
≤ 11	**18**
>11 - <50	23
50 - <100	14
100 - <200	10
200 - <500	13
500+	9
Total	**87**



- Emission level data was collected from RECLAIM permit limits
- For major sources without a permit limit, RATA test data was used
- ppmv @ 15% O2

Distribution of Engines per Emission Level and Fuel Type

NOx Emissions level (ppmv)	Total	Natural Gas	Diesel	Other
≤ 11	**18**	**10**	**0**	**8**
>11 - <50	23	14	7	2
50 - <100	14	8	6	0
100 - <200	10	5	1	4
200 - <500	13	3	10	0
500+	9	0	9	0
Total	**87**	**40**	**33**	**14**



- Emission level data was collected from RECLAIM permit limits
- For major sources without a permit limit, RATA test data was used
- ppmv @ 15% O2
- Other fuel types: gasoline, biogas, field gas, and process gas

Distribution of Engines per Size and Fuel Type

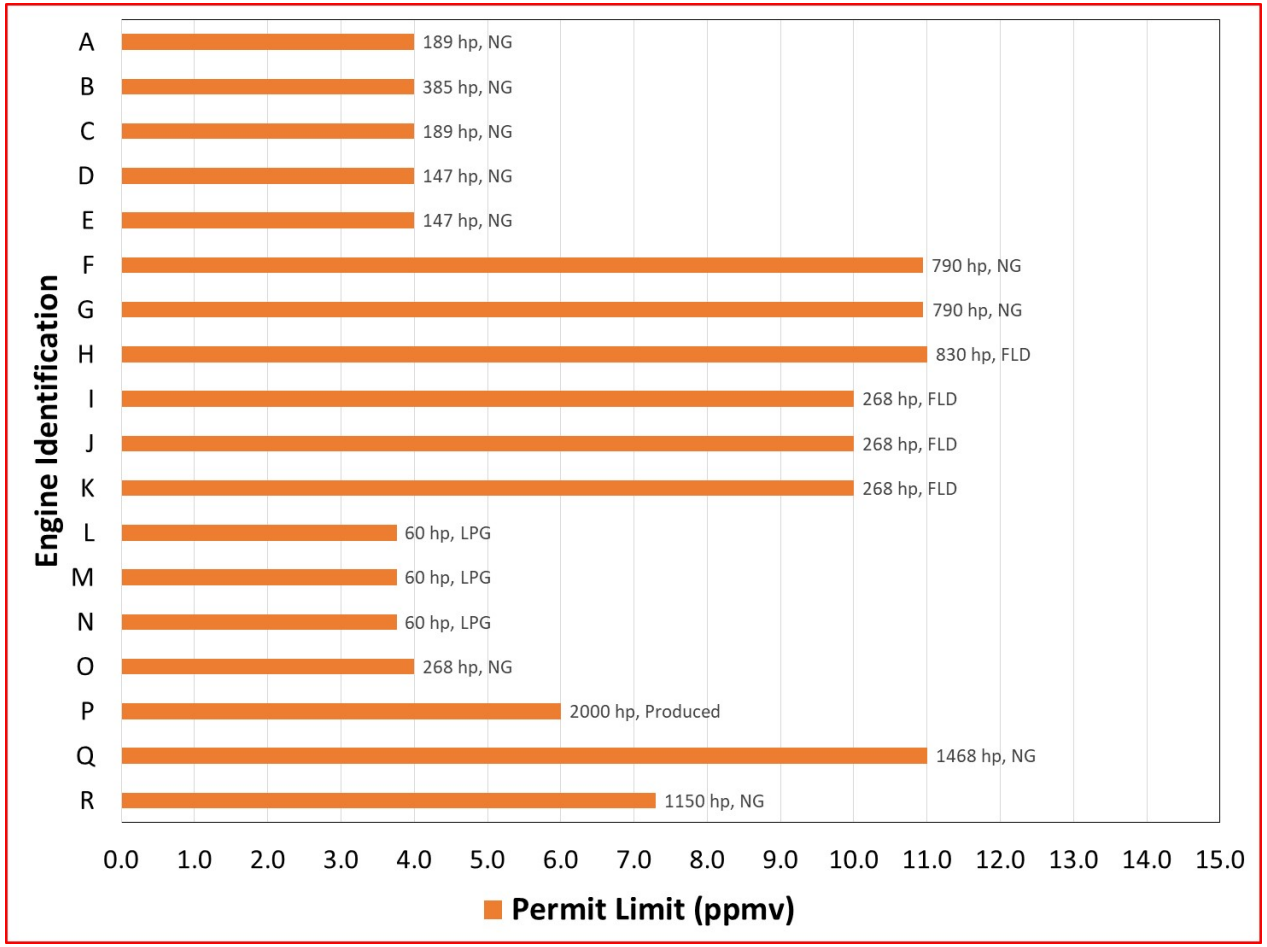
Let's review the 18 RECLAIM engines that currently meet the SCAQMD NOx limit of 11 ppmv

Engine Size (bhp)	Natural Gas	LPG	Produced Gas	Field Gas
<250	3	3	1	0
250 - <500	1	0	0	4
500 - <750	0	0	0	0
750 - <1000	3	0	0	0
1000 - <1250	1	0	0	0
>1250	2	0	0	0
Total	**10**	**3**	**1**	**4**

- Emission level data was collected from RECLAIM permit limits
- ppmv @ 15% O2

Distribution of Engines Meeting 11 ppmv NOx

- 18 engines currently permitted at or below 11 ppmv
- Vary by size and fuel type
- Non-diesel
- Non-retrofitted
- SCR / NSCR controls



- Emission level data was collected from RECLAIM permit limits
- ppmv @ 15% O2

Assessment of Emission Limits for Existing Units

Emerging technology –

- Recently installed diesel engines at a RECLAIM facility are permitted at 12.3 ppmv (@15% O_2) – awaiting testing results for actual emissions
- Source Test results from recently permitted Tier-4 diesel engines (limit at 22 ppmv) show operation at less than 5 ppmv NOx @ 15% O_2
  - One at 225 bhp
  - Two at 190 bhp

Assessment of Emission Limits for Existing Units

- As part of the analysis, staff will look at non-RECLAIM engines as well
- Will be looking for any advancements of technology that are achieving lower emission limits

Survey Questionnaire

Information needed to evaluate existing units

Analysis of Permitted Emission Levels

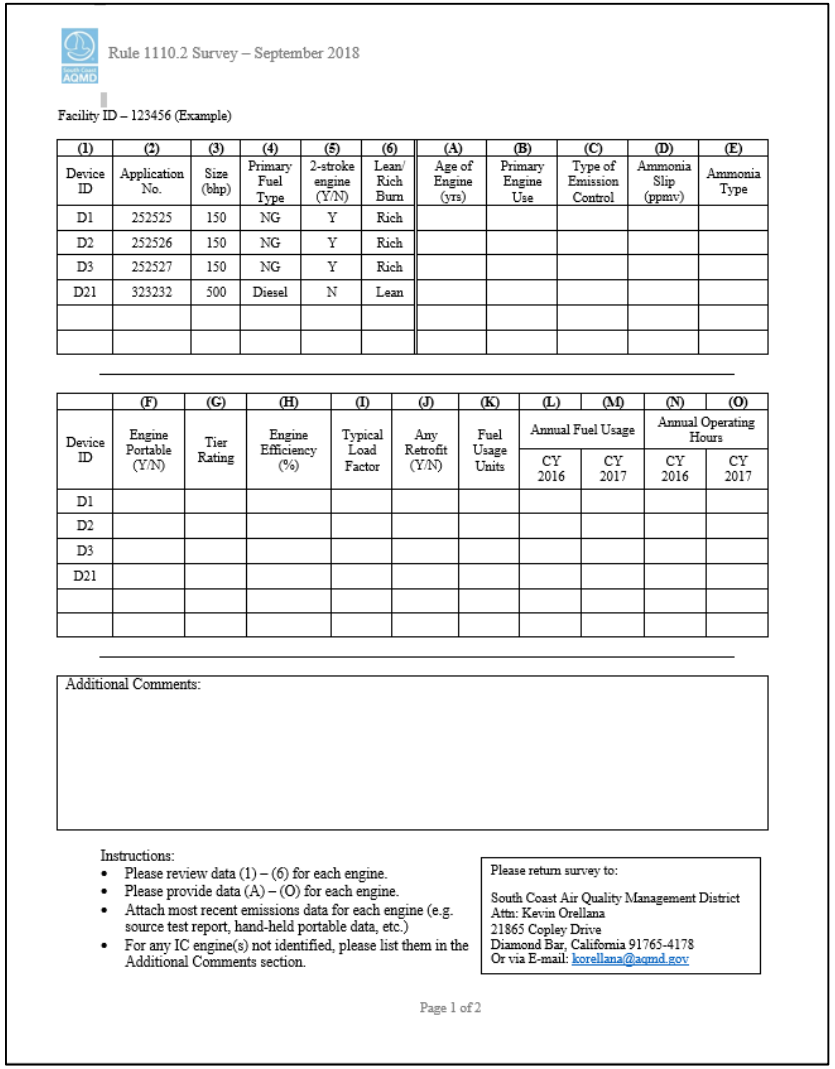
- Permitted emission limit
- Air pollution control technology
- Equipment type
- Fuel type
- Age of equipment
- Retrofit or replacement
- Operational history

Analysis of Actual Emissions Data

- Emission limit (source tests or CEMS data)
- Throughput data (Annual Emission Reports)

Survey Questionnaire

- Survey to be sent to all affected sources – RECLAIM and non-RECLAIM
- Data ensures existing equipment information is updated
- Opportunity for sources to add any missing equipment
- Deadline to submit surveys by October 28, 2018
- Follow-up with facilities on a case-by-case basis



Rule 1110.2 Survey – September 2018

Facility ID – 123456 (Example)

(1) Device ID	(2) Application No.	(3) Size (bhp)	(4) Primary Fuel Type	(5) 2-stroke engine (Y/N)	(6) Lean/ Rich Burn	(A) Age of Engine (yrs)	(B) Primary Engine Use	(C) Type of Emission Control	(D) Ammonia Slip (ppmv)	(E) Ammonia Type
D1	252525	150	NG	Y	Rich					
D2	252526	150	NG	Y	Rich					
D3	252527	150	NG	Y	Rich					
D21	323232	500	Diesel	N	Lean					

Device ID	(F) Engine Portable (Y/N)	(G) Tier Rating	(H) Engine Efficiency (%)	(I) Typical Load Factor	(J) Any Retrofit (Y/N)	(K) Fuel Usage Units	(L) Annual Fuel Usage CY 2016	(M) Annual Fuel Usage CY 2017	(N) Annual Operating Hours CY 2016	(O) Annual Operating Hours CY 2017
D1										
D2										
D3										
D21										

Additional Comments:

Instructions:
- Please review data (1) – (6) for each engine.
- Please provide data (A) – (O) for each engine.
- Attach most recent emissions data for each engine (e.g. source test report, hand-held portable data, etc.)
- For any IC engine(s) not identified, please list them in the Additional Comments section.

Please return survey to:

South Coast Air Quality Management District
Attn: Kevin Orellana
21865 Copley Drive
Diamond Bar, California 91765-4178
Or via E-mail: korellana@aqmd.gov

Page 1 of 2

Next Steps and Proposed Rule Schedule

Staff will continue with rule development process, which will include:

- Review of control technologies
- Site visits of affected facilities
- Meetings with facility representatives
- Survey distribution and evaluation by staff

Next Steps and Proposed Rule Schedule

Staff Contacts

Please contact the following SCAQMD staff with any questions or comments

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