

Proposed Rule 1179.1

NOx Emission Reductions from Combustion Equipment at Publicly Owned Treatment Works Facilities

Working Group Meeting #2

August 13, 2019

Conference call #: 1-866-705-2554

Passcode: 104774

Agenda

- Summary of Previous Working Group meeting
- Public Comments
- Applicability
- BARCT Assessment



Summary of Last Working Group Meeting

- Challenges
 - Digester gas operations, food waste processing, financial implications
- Rule Development Process
- Proposed Applicability
 - Boilers and turbines located at POTWs that fire either natural gas and/or digester gas
 - Other equipment covered by a rule with a recent or near future BARCT assessment
- Equipment Inventory
 - Types, sizes, fuel
- BARCT Assessment
 - Emission limits for existing units
- Emissions Summary

Comments Made at Working Group Meeting #1

○ Applicability

- Include all biogas equipment in one rule
- Include engines in applicability

○ Emissions Summary

- Include fuel usage context in the discussion of emissions from combustion sources

Applicability

Overall Approach

- Proposing only to address biogas equipment located at POTWs and landfills
 - Including all biogas equipment (i.e. turbines at food distribution facilities) would remove focus from an industry specific rule
- Proposing two rules to address biogas equipment at POTWs (1179.1) and landfills (1150.3)
 - Different industries with distinct process characteristics (gas quality, supply)
- Rule development for POTWs and landfills will be in tandem
 - Working group meetings will be held back to back
 - Approximately same timeframe for rule development (BARCT assessment, rule language, etc.)

PR 1179.1 Assessment of Applicable Equipment

- Four equipment categories were assessed for applicability
 - Engines
 - Boilers
 - Turbines
 - Miscellaneous combustion equipment

Applicability Assessment - Engines

- Stakeholders have suggested including biogas engine provisions in Proposed Rule (PR) 1179.1 for the purpose of having all POTW provisions in one rule
- Recent amendments to Rule 1110.2 specifically addressed biogas engines
 - 42 engines at POTWs with digester gas combustion equipment are regulated under Rule 1110.2
 - Rule 1110.2 lowered the NOx limit for biogas engines in 2012 with a compliance date in 2017
 - A new BARCT assessment is not needed for engines located at POTWs
 - Most engines are complying with Rule 1110.2 provisions and limits
 - Variances for two facilities representing 7 engines

Applicability Assessment – Engines *(continued)*

- Staff is still discussing if engines should be incorporated into PR 1179.1
- Applications for new permits will be required
 - Fees
 - Increased permitting timeline
- If engines are included in PR 1179.1
 - Rule 1110.2 along with Proposed Amended Rule 1110.2 for biogas engines will be copied into PR 1179.1
 - No emission limits will change

Applicability - Boilers

- All boilers at POTWs will be subject to PR 1179.1
- A BARCT assessment will be conducted for boilers firing digester gas
- A BARCT assessment will not be conducted for natural gas boilers
 - Recent rulemaking for Rule 1146 series addressed natural gas boilers
- PR 1179.1 will apply to small boilers < 2 mmbtu/hr fueled by digester gas
 - A BARCT assessment will be conducted for these boilers
 - Natural gas boilers < 2 mmbtu/hr will be subject to Rule 1146.2
- Staff proposes that provisions and limits for natural gas boilers will be copied into PR 1179.1

Applicability - Turbines

- All turbines will be subject to PR 1179.1
- A BARCT assessment will be conducted for turbines using digester gas
- A BARCT assessment for natural gas turbines will be not be conducted
 - Recent rulemaking for Rule 1134 addressed natural gas turbines
- Staff proposes that applicable provisions and limits for natural gas turbines will be copied into PR 1179.1

Applicability - Miscellaneous Combustion Equipment

○ Microturbines

- There is no current rule for microturbines
- A BARCT assessment for natural gas and digester gas microturbines is needed
- Staff proposes to include all microturbines located at a POTW in applicability

○ Dryers

- 2 dryers are subject to Rule 1147
- A BARCT assessment for dryers will be conducted for Proposed Amended Rule 1147
- Staff proposes to not include dryers in applicability

Applicability - Miscellaneous Combustion Equipment *(continued)*

○ Flares

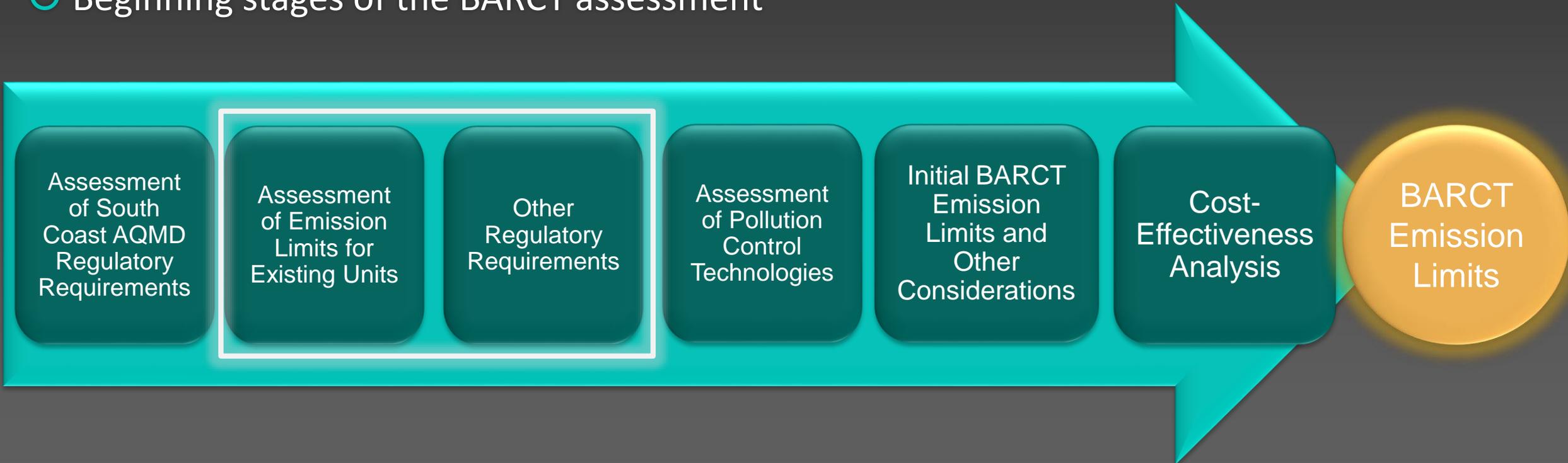
- Recent rulemaking of Rule 1118.1 addressed flares located at POTWs and is currently ongoing
- Staff proposes that flares are not included in applicability

○ Other miscellaneous combustion equipment

- Afterburners, regenerative thermal oxidizers, emergency engines
 - These equipment do not use digester gas and are not specific to POTWs
- Equipment subject to Rule 1147 will have a BARCT assessment conducted during the Proposed Amended Rule 1147 series rulemaking
- Staff proposes that this equipment not be included in applicability

BARCT Assessment

- Beginning stages of the BARCT assessment

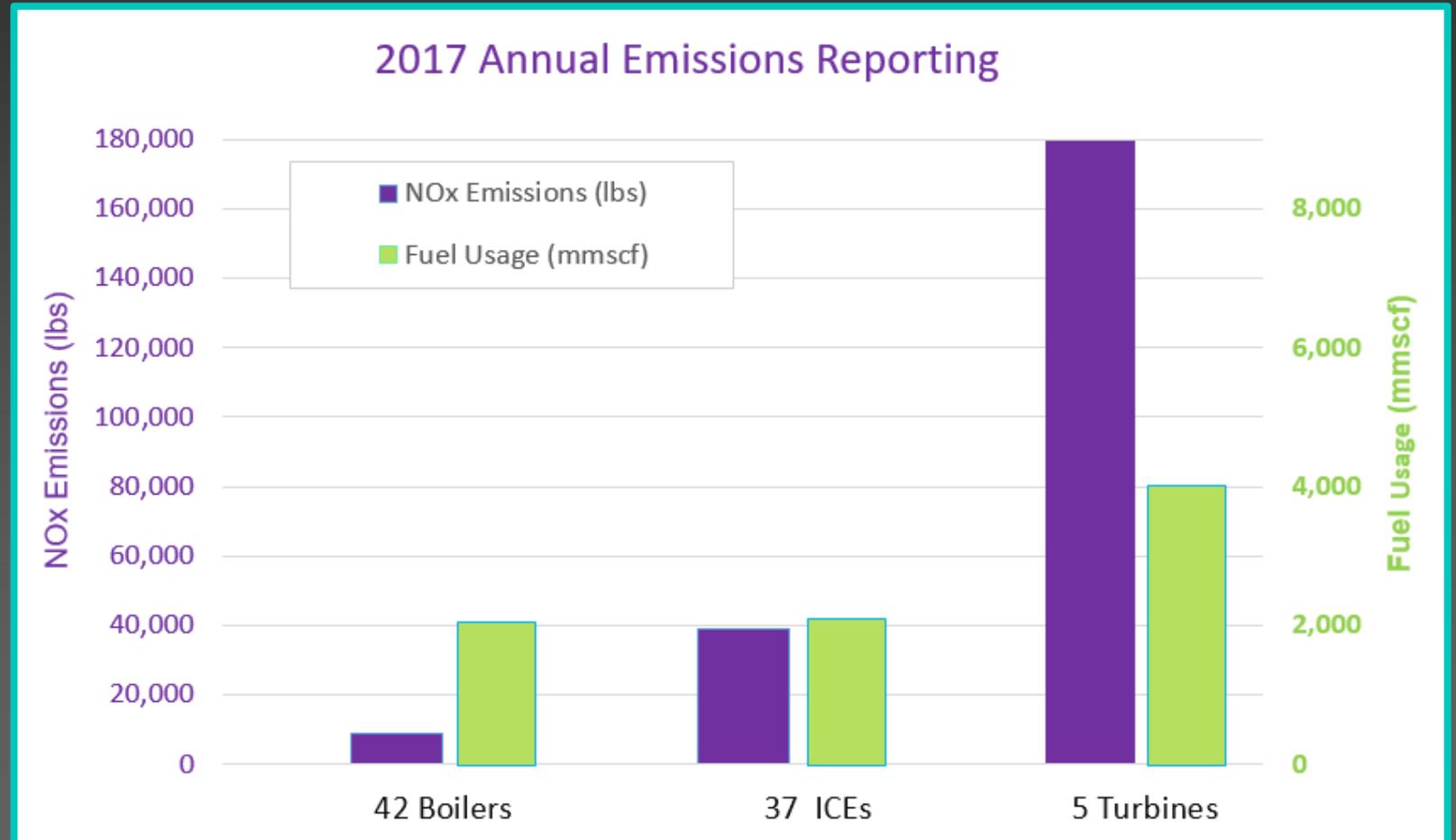


Emission and Limit Assessment

- Emissions summary – what are the major sources of emissions at POTWs?
- Permit limits vs rule limits – are these limits being met?
- Source tests – what limits can be met?
- Other agency limits
 - What are the limits?
 - Are there any units in practice achieving these limits?
- Control technologies will be discussed in next Working Group meeting

Emissions and Fuel Usage Summary

- Turbines are the highest emitting equipment category
- Turbines consume about twice as much fuel as boilers or engines, however, emissions are more than three times boilers or engines



Assessment of NOx Levels

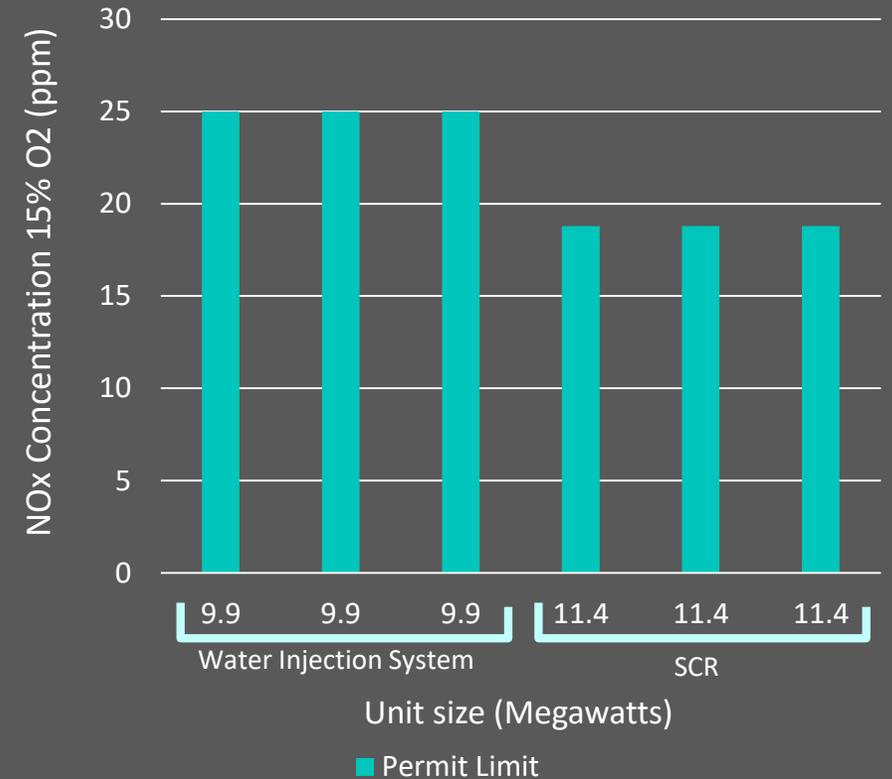
- Staff evaluated all permitted NOx concentration limits for turbines and boilers fueled by digester gas (will assess microturbines later)
 - All NOx limits for boilers were corrected to 3% O2
 - All NOx limits for turbines were corrected to 15% O2
- Staff reviewed source tests to identify tested emissions
 - Source tests represent a snapshot of emissions
- Staff compared NOx permit limit data with NOx source test results to assess compliance margin

Turbines

Permitted Limits - Turbines

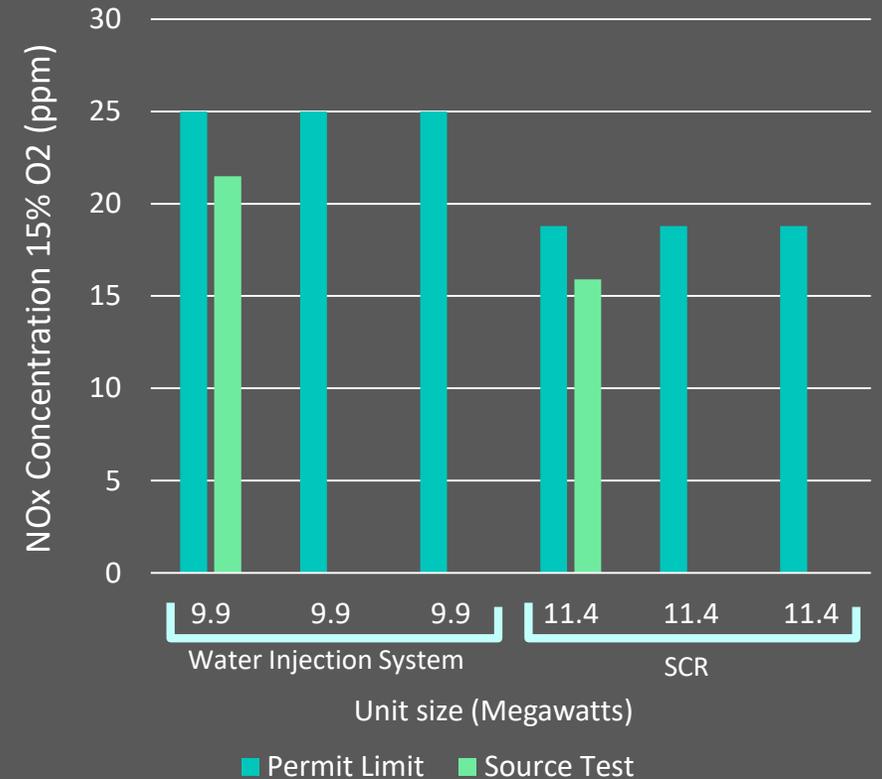
Assessment
of Emission
Limits for
Existing
Units

- 6 combined cycle turbines
- All use digester gas
- No rule that applies to turbines located at POTWs
- 3 turbines are permitted at 25 ppmv
- 3 turbines are permitted at 18.8 ppmv



Source Test Results - Turbines

- Two source tests
- Source test values for two turbines range from 16 to 22 ppm
- Unit with SCR had the lowest source test
- Source test results are about 15% below the permitted limit for both units



Limits at Other Air Districts

Air District	Size	Fuel	Fuel description	Limit (ppmv)	Compliance Date
Bay Area	5 – 150 mmbtu/hr	Waste gas	Mixture of hydrogen, gaseous hydrocarbons and other diluent gases generated by sewage treatment...	50	2010
	> 150-250 mmbtu/hr			15	
Sacramento	≥ 10 MW (no SCR)	Gaseous fuel	Any fuel which is a gas at standard conditions	15	1997
	≥ 10 MW (w/ SCR)			9	1997
San Joaquin Valley	> 10 MW combined cycle	Gas fuel	Any of the following fuels or fuels containing any of the following fuels: natural gas, LPG, propane, digester and landfill gas	5 (standard)*	2004
				3 (enhanced)*	2004

*Enhanced and Standard refer to compliance timeframes

Permitted and Source Test Results for Other Districts – Turbines *(continued)*

Type	Size	Control Technology	Rule Limit (ppmv @ 15% O ₂)	Source Test Result (ppmv @ 15% O ₂ - average load)	Fuel	District
Combined cycle	3.38 MW	Selective catalytic reduction Water injection	5	2.5 – 3.7	DG	San Joaquin Valley
Combined cycle	3.38 MW	Selective catalytic reduction Water injection	5	2.5 – 3.9	DG	San Joaquin Valley
Combined cycle	500 mmbtu/hr	Selective catalytic reduction	9	Permitted at 2.5	DG/NG	Sacramento
Simple cycle	500 mmbtu/hr	Selective catalytic reduction	9	Permitted at 2.5	DG/NG	Sacramento
Combined cycle	2,200 mmbtu/hr	Selective catalytic reduction Dry low NOx combustion	9	Permitted at 2.0	DG/NG	Sacramento
Combined cycle	2,200 mmbtu/hr	Selective catalytic reduction Dry low NOx combustion	9	Permitted at 2.0	DG/NG	Sacramento

DG = Digester Gas NG = Natural Gas

Summary of Source Test Results from (Other Districts) – Turbines

- Bay Area air district does not have any turbines located at a POTW
- Sacramento air district has four turbines fueled by either natural gas or a blend of natural gas and digester gas
- San Joaquin Valley air district has permitted two turbines that are fueled by 100% digester gas and is located at a POTW
 - Both meet the rule limit of 5 ppmv, 10 ppmv NH₃
 - More information is needed from facilities and manufacturers to determine the feasibility of achieving lower limits, including gas cleanup

Summary – Turbines

- There is no rule limit for turbines located at POTWs
- The turbines in South Coast AQMD are permitted at 18.8 ppmv and 25 ppmv with source test results ranging from 15 ppmv to 22 ppmv
- Sacramento and San Joaquin Valley air districts have limits for digester gas fired turbines that are more stringent than South Coast AQMD
- Only San Joaquin Valley has permitted turbines located at a POTW that fire 100% digester gas
 - These turbines met the rule limit of 5 ppmv for several years with SCR and water injection
- Gathering information to determine the feasibility of achieving lower limits, including gas cleanup

Boilers

Boiler Equipment Data

Assessment
of Emission
Limits for
Existing
Units

Type	Size (mmbtu/hr)	Permit/Rule Limit	Control Technology	Source Test Result* (ppmv @ 3% O ₂ – average load)	Test Date
Digester	21	15	Low NOx burner (retrofit)	3.5	2015
Dual fuel	6.3	15	Low NOx burner	4.2	2019
Dual fuel	3	15	Low NOx burner	5.2	2017
Digester	22	15	Low NOx burner (retrofit)	5.5	2015
Dual fuel	62	15	Low NOx burner	5.9	2014
Dual fuel	10.5	15	Low NOx burner	6.3	2019
Dual Fuel	4.63	15	Low NOx burner	6.6	2013
Dual fuel	5.25	15	Low NOx burner	6.8	2019
Dual Fuel	9.95	15	Low NOx burner	6.9	2019
Dual fuel	5.25	15	Low NOx burner	7.3	2019
Dual fuel	10.2	15	Low NOx burner	8	2016
Dual fuel	5.4	15	Ultra Low NOx burner	9.2	2016
Dual fuel	10.5	15	Low NOx burner	9.3	2016
Dual fuel	4.5	15	Low NOx burner	9.2	2018
Dual fuel	4.5	15	Low NOx burner	9.5	2018
Dual fuel	9	15	Cleaver-Brooks Profire burner	9.8	2019
Digester	22	15	Low NOx burner (retrofit)	11.4	2014
Dual fuel	10.5	15	Low NOx burner	11.7	2019

*Unit firing 100% digester gas

Permitted Limits - Boilers

Assessment
of Emission
Limits for
Existing
Units

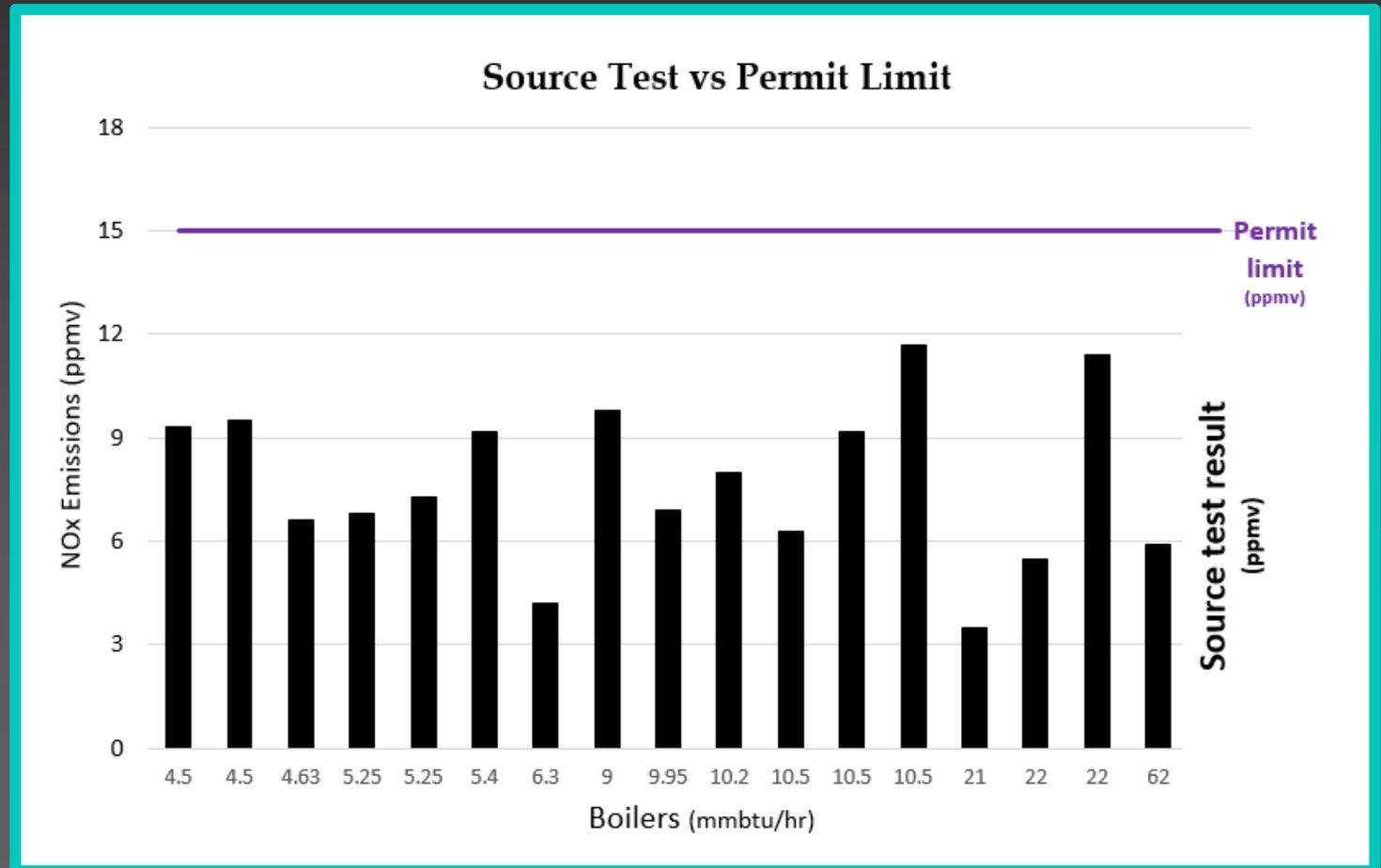
- All digester gas and dual fuel boilers are permitted at 15 ppmv
 - Rule 1146 series specifies a 15 ppmv NO_x limit for any boiler > 2 mmbtu/hr that fires digester gas
- All digester gas and dual fuel boilers are meeting their permitted limits



Emissions Achieved in Practice – Source Tested Boilers

Assessment
of Emission
Limits for
Existing
Units

- 18 source tested boilers with permit limits of 15 ppmv (tested w/ 100% digester gas)
 - All source tested under 12 ppmv
 - 11 source tested under 9 ppmv
 - Units range from 3 – 62 mmbtu/hr – showing good distribution of units
- Source tests for 11 digester gas boilers were unavailable



Limits at Other Air Districts

Air District	Size (mmbtu/hr)	Fuel	Fuel description	Limit (ppmv)	Compliance Date
Bay Area	> 2	Digester gas	Gas derived from the decomposition of organic matter in a digester	30	2015
Sacramento	≥ 1-5	Gaseous fuel	Any fuel which is a gas at standard conditions	30	2009
	≥ 5-20			15	
	>20			9	
San Joaquin Valley	≥ 2-5	Gaseous fuel	Any fuel which is a gas at standard conditions	30 12/9*	2010
	> 5	< 50% by volume, PUC quality gas	Specific to units at a wastewater treatment facility	9	2014

*atmospheric/non-atmospheric installed after 2010

Emissions Achieved in Practice – Other Air Districts

Other
Regulatory
Requirements

- Bay Area and Sacramento air districts do not have any boilers fueled by digester gas located at a POTW
- San Joaquin Valley air district has one boiler located at a POTW

Type	Size (mmbtu/hr)	Control Technology	Rule Limit	Source Test Result* (ppmv @ 3% O ₂ – average load)
Dual fuel	16.7	Low NOx burner	9	7.9

*Unit firing 100% digester gas

Summary – Boilers

Assessment
of Emission
Limits for
Existing Units

Other
Regulatory
Requirements

- All digester gas and dual fuel boilers >2mmbtu/hr are permitted at the Rule 1146 limits for digester gas – 15 ppmv
- All boilers are meeting the 15 ppmv limit
- Source tested boilers indicate that lower digester gas limits are achievable for digester gas and dual fuel boilers
- Limits as low as 7 ppmv
 - Size ranges from 3 - 62 mmbtu/hr
 - Retrofit and replacement control technology to be reviewed
- San Joaquin Valley and Sacramento districts have limits for boilers using digester gas that are more stringent than the current limits at South Coast AQMD
- Only the San Joaquin Valley district has a boiler that is firing on 100% digester gas and is located at a POTW
 - Boiler is subject to a 9 ppmv limit

Meeting Summary

- PR 1179.1 will address turbines, boilers, and microturbines
- Staff is still assessing if engines will be included in PR 1179.1
- Other air districts impose lower limits for boilers and turbines using digester gas
- Source tests demonstrate that lower limits for boilers and turbines are feasible
- Control technology needs to be further looked into to determine feasibility and cost

Next Steps



- Continue site visits
- BARCT assessment – technology assessment
- Draft rule language for applicability

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