

PROPOSED RULE 1118.1 Control of Emissions From Non- Refinery Flares

Working Group #7

South Coast Air Quality Management District

Diamond Bar, California

July 25, 2018

Progress Since Last Meeting

- Last Working Group Meeting – June 12th
- Met with key stakeholders:
 - ✓ Bulk terminal representatives
 - ✓ Flare manufacturer
 - ✓ Outer continental shelf (OCS) platform representatives
 - ✓ Oil and gas representatives
- Received two comment letters from OCS representatives

Updated Flare Definition

FLARE means a combustion device that oxidizes combustible gases or vapors, **where the combustible gases or vapors being destroyed are routed directly into the burner without energy recovery.**

- Staff generating notification of rulemaking
 - ✓ Will send to all facilities with pollution control combustion devices
 - ✓ Ensure all potential facilities subject to PR1118.1 are aware of rulemaking

Goals of Proposed Rule 1118.1

Maximize
Emission
Reductions

Minimize
routine
flaring

Encourage
beneficial use

Initial Rule Concept – March 8/April 4, 2018 WGs

- Initial proposal
 - ✓ Replace older flares (≥ 20 years) with 0.025/MMBtu flares
 - ✓ Allow to keep existing flare, if it meets beneficial use targets
 - ✓ Estimated **33 flare replacements** by 2023 with **~0.1 tpd NOx reduction**
- Stakeholder feedback:
 - ✓ Difficult to commit to specific beneficial use
 - ✓ Not cost-effective
 - ✓ Low emission reduction
- Stakeholder suggestions:
 - ✓ Replace open flares and focus on routine flaring
 - ✓ Replace flares that operate 100% of the time
 - ✓ Provide opportunity to maintain occasional flaring
 - ✓ Consider whether cost effective to replace flare

Revised Rule Concept – *June 12, 2018 WG*

- Working Group Meeting #6
 - ✓ Staff proposed establishing a threshold to trigger flare replacement or minimization
 - ✓ Allow continued use of existing flares if not operating routinely
- Post meeting efforts
 - ✓ Evaluated possible thresholds based on NOx emissions, throughput, and percent flare size capacity
 - ✓ Developed range of thresholds for each affected industry
 - ✓ Proposing cost-effective threshold that maximizes NOx emission reductions

Benefit of Threshold Approach

Allows owner/operator to determine their NOx reduction measures – flare replacement or increase beneficial use

Allows for a combination of alternatives to meet thresholds

Targets routine flaring to maximize emission reductions

	Flares Affected	Estimated Emission Reductions (tpd)
Initial proposal	33	0.1
Current Concept	36	0.3

Flare Data by Industry Type

Flare Data Update

- Throughput data (three-year average 2015 - 2017) gathered from:
 - ✓ Annual emission reports (AER)
 - ✓ Rule 1150.1 annual reports for landfills
- Flare NOx limits and size capacity from:
 - ✓ Permits
 - ✓ Applications
 - ✓ Stakeholder input
- Current available data presented in graphs for each affected industry highlighting throughput, NOx emissions, flare size and percent capacity

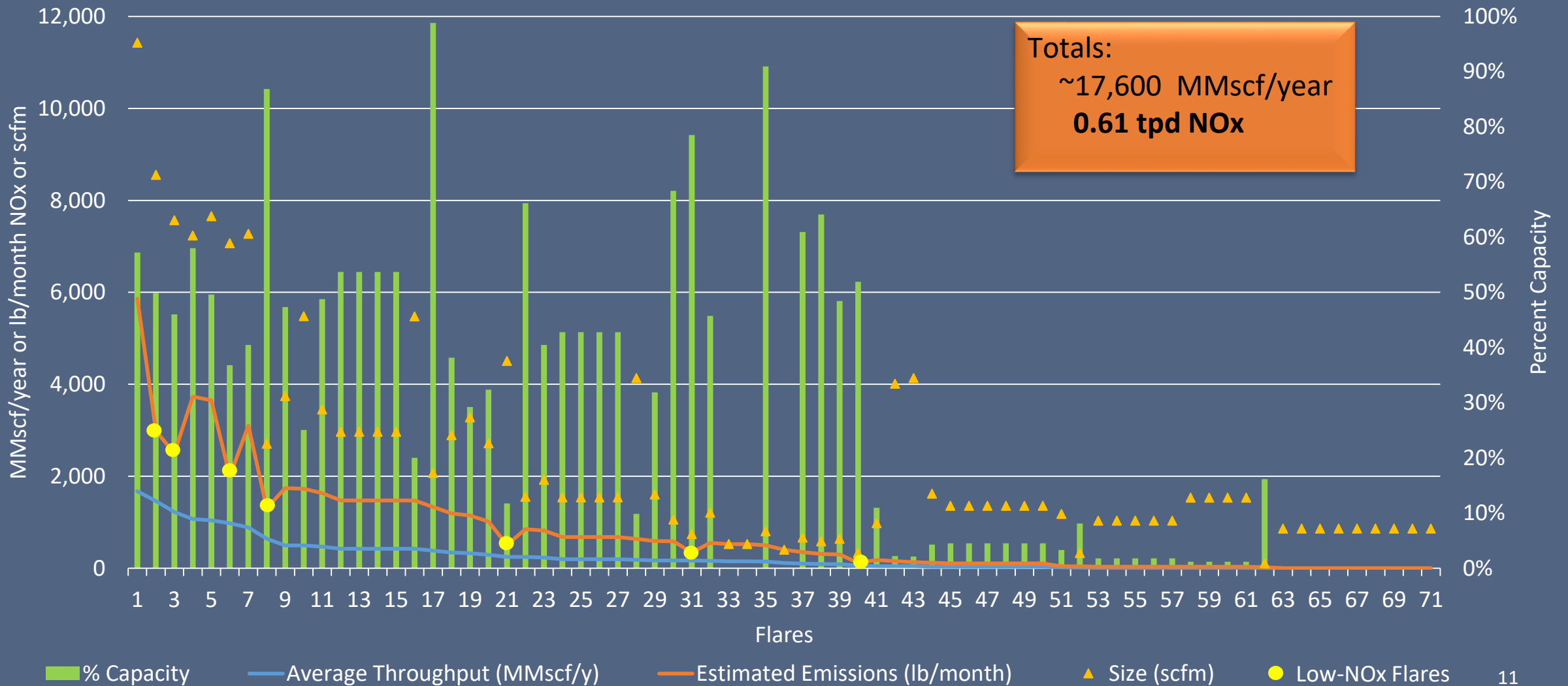


Gaps in Data

- Data gaps:
 - ✓ NOx limit on permit - default to 0.06 lbs/MMBtu
 - ✓ Throughput – zero throughput on graphs
 - ✓ Size capacity – zero percent capacity or size on graphs
- Landfill data most complete
- Seeking additional data from stakeholders
- Open to sharing individual facility information with facility
 - ✓ Throughput is considered confidential so unable to circulate full dataset to all stakeholders

Industry	Total Flares	# of Missing Data Points	
		Thru put	Size
Oil and Gas	49	3	14
Landfills	154	6	2
Wastewater	65	5	10
Other	17	8	3

Open Landfills

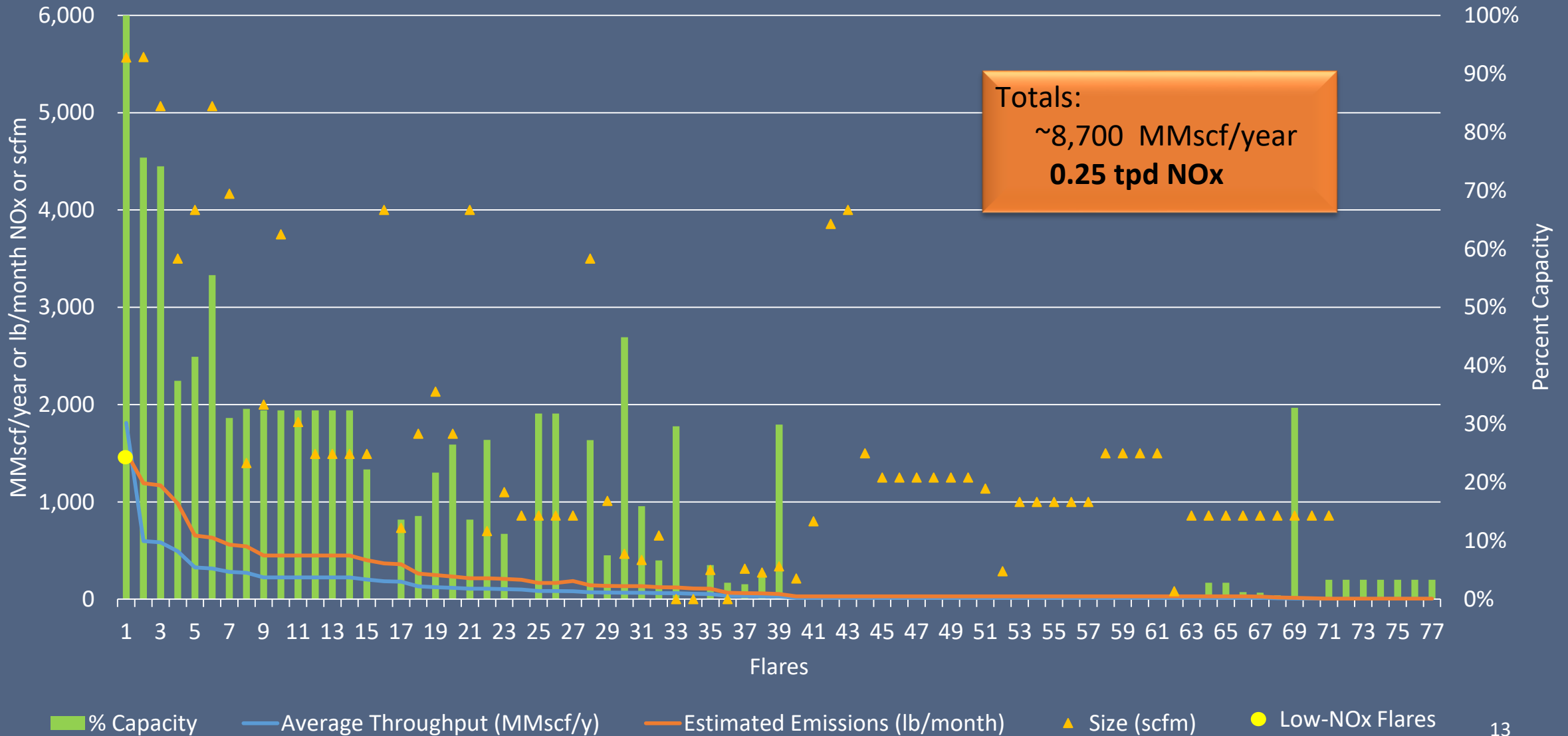


Open Landfill Findings

- Highest volume and highest NOx emissions of all affected industries
- Most complete dataset
 - ✓ Missing 4% flare size, 0% throughput
- Dip in emission levels reflect the benefit achieved from low-NOx units
- Gas handling is an ongoing, integral part of landfill operations and a majority of routine flaring not at maximum capacity
- Known alternative gas handling opportunities including energy production, transportation fuel, etc.



Closed Landfills

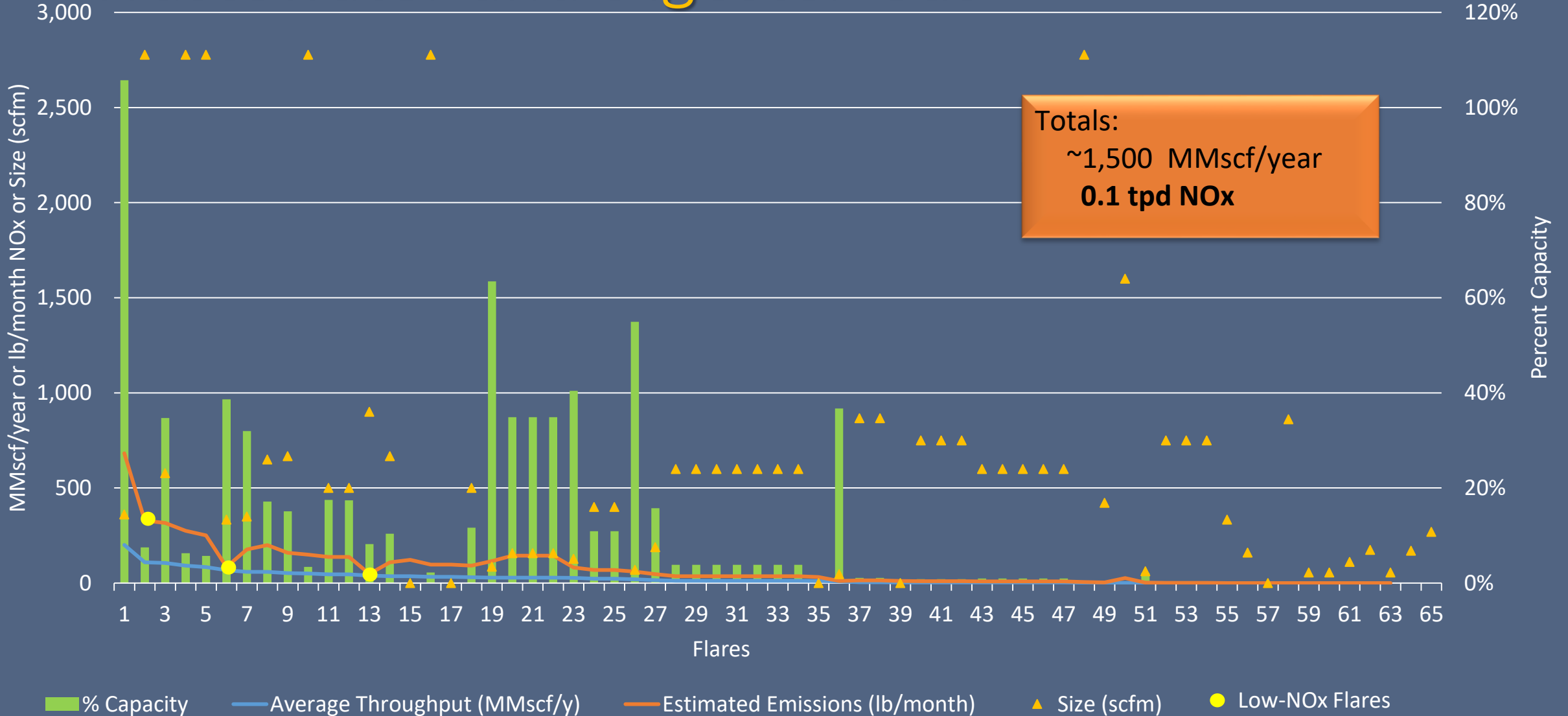


Closed Landfill Findings

- Second highest volume and NOx emissions
- Volume of gas produced at closed landfills decreases over time
- Nearly complete dataset
 - ✓ Missing 4% flare size, 2% throughput
- Only one of 83 closed landfills generates more than proposed 1,000 MMscf/year exemption – flare already meets proposed NOx limit
- Currently no closed landfills need to take action to comply with proposal
- Future closed landfills could exceed the exemption and need to take action



Wastewater and Digester Gas

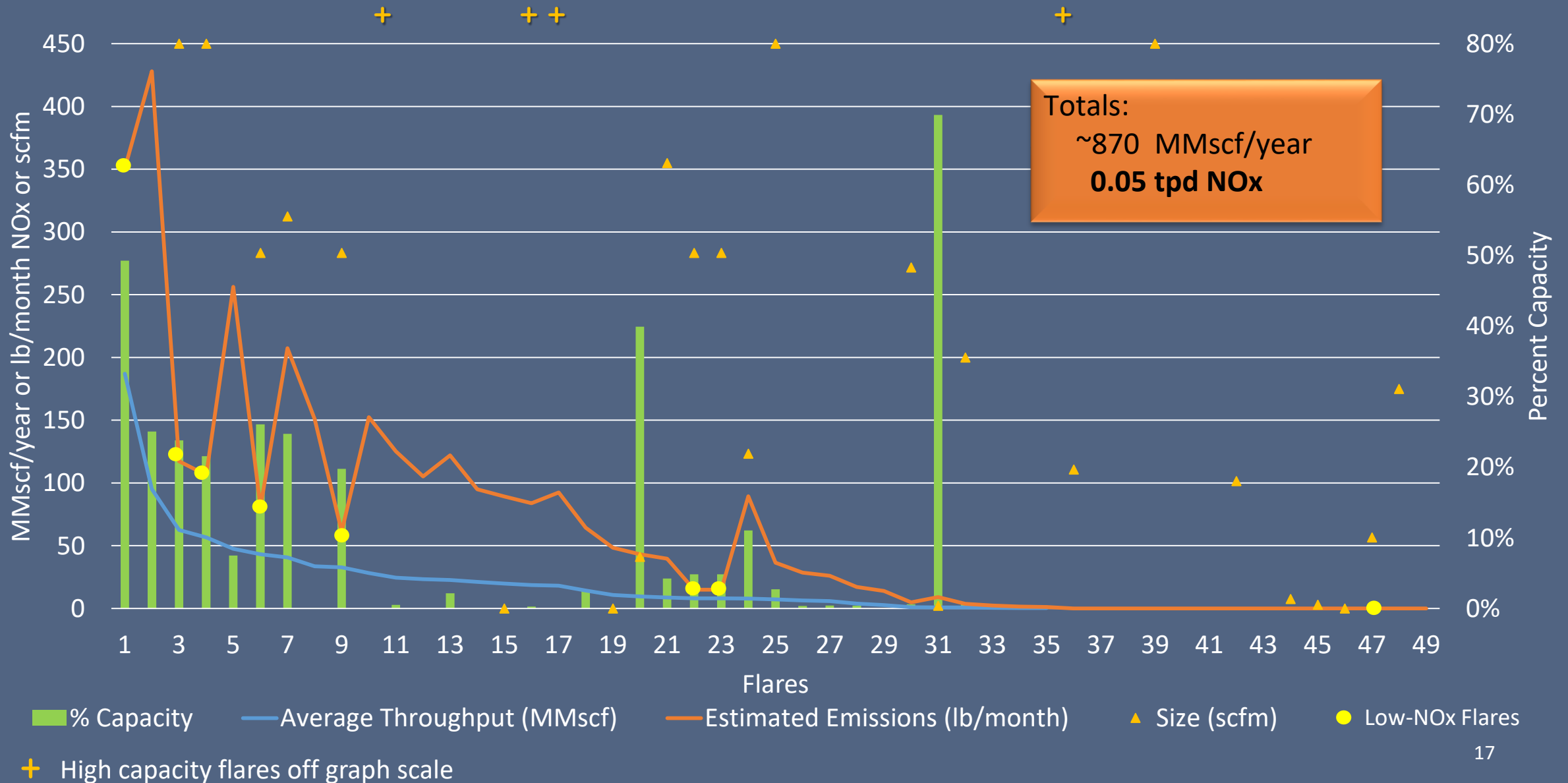


Wastewater and Digester Gas Findings

- Much lower volume, NOx emissions, and capacity
- Missing more data points
 - ✓ Missing 8% flare size, 15% throughput
- Less routine flaring
- Dip in emission levels reflect the benefit achieved from low-NOx units
- Future food waste diversion requirements to anaerobic digestion may lead to increase flaring



Oil and Gas Production

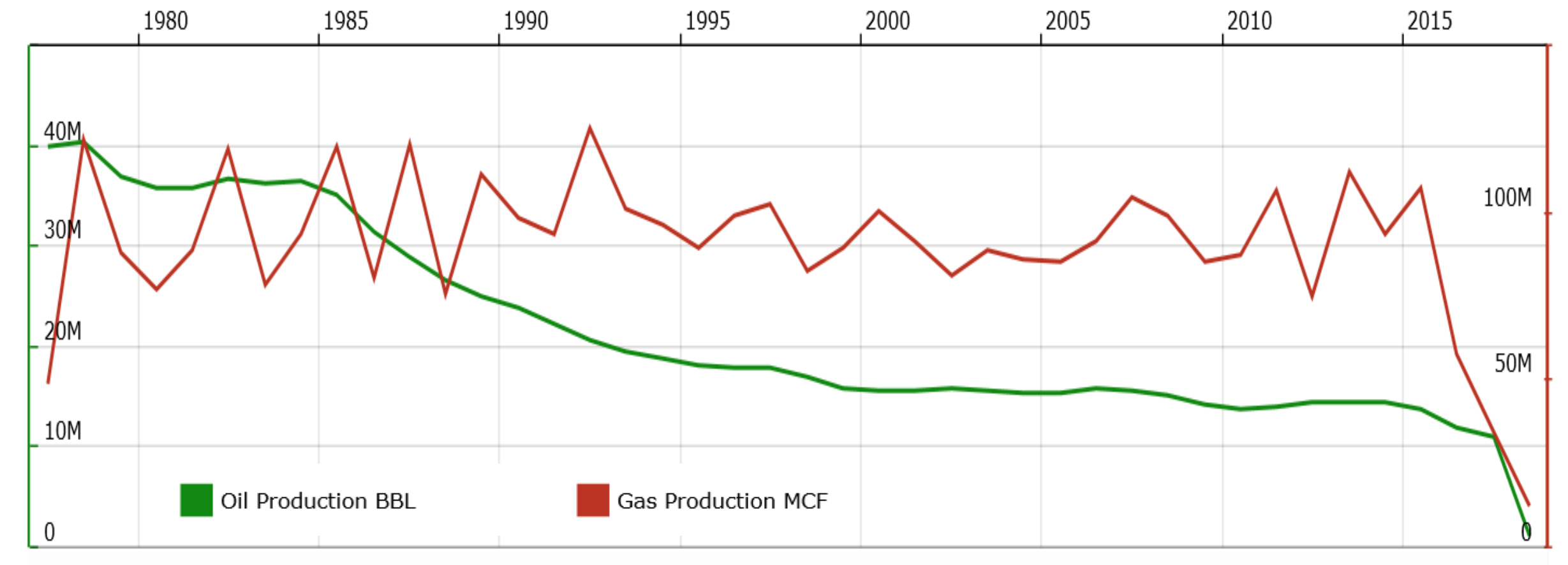


Oil and Gas Production Findings

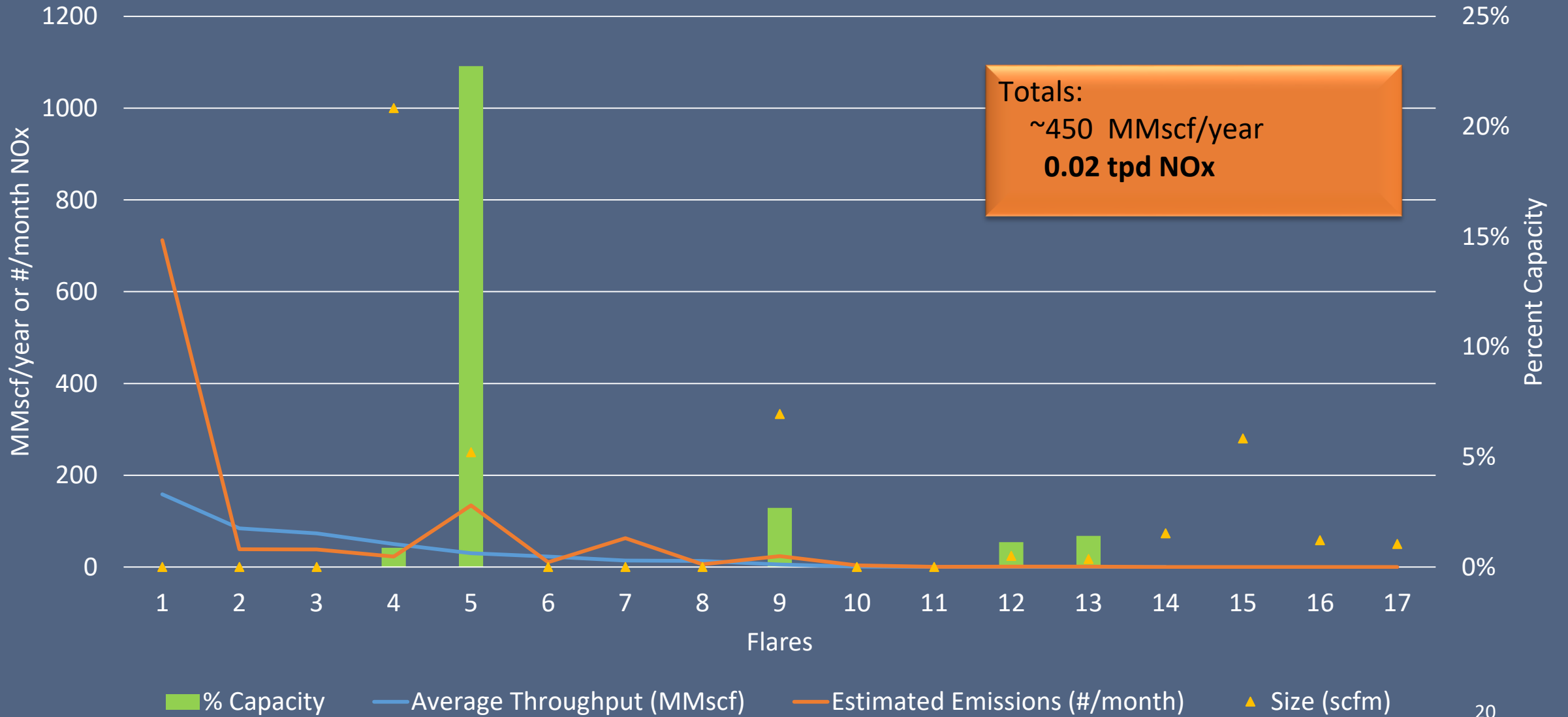
- Much lower volume, NOx emissions, and capacity
- Missing more data points
 - ✓ Missing 6% flare size, 28% throughput
- Dip in emission levels reflect the benefit achieved from low-NOx units
- Cost-effective opportunities for beneficial use due to gas quality
- Oil and gas production currently low in SCAQMD, **flaring may increase if oil production increases**



Los Angeles County Oil and Gas Production by year



Other Flaring



Other Flaring Findings

- Very low volume (1.5% of total)
- Least complete dataset
 - ✓ Missing 47% flare size, 18% throughput
- 17 known units including tank degassing, terminal unloading, industrial, etc.
- All but one with low percent capacity usage
- Low NOx units may not be feasible for portion of universe
- More feedback and data needed from stakeholders



Threshold Development

Developing Proposed Thresholds

- Evaluated data and graphs to identify routine flaring operations
- Decided capacity was best metric to determine routine flaring
 - ✓ Different thresholds for different industry
 - ✓ Driven by potential NOx emission reductions and costs
- Identified the number of affected flares based on the threshold
 - ✓ Excluded those qualified for proposed exemption
 - Less than 30 lbs NOx per month
 - Less than 200 hours per year
 - Less than 1,000 MMscf/year at closed landfills
- Calculated cost effectiveness for proposed thresholds
 - ✓ Based on average capital and operation and maintenance (O&M) costs
 - ✓ Established different percent thresholds for each sector

Capacity Threshold Ranges

Oil and Gas

Percent Capacity	# flares	Emission Reductions (tpd)
5	5	0.012
10	4	0.009
20	3	0.008
30	1	0.0005

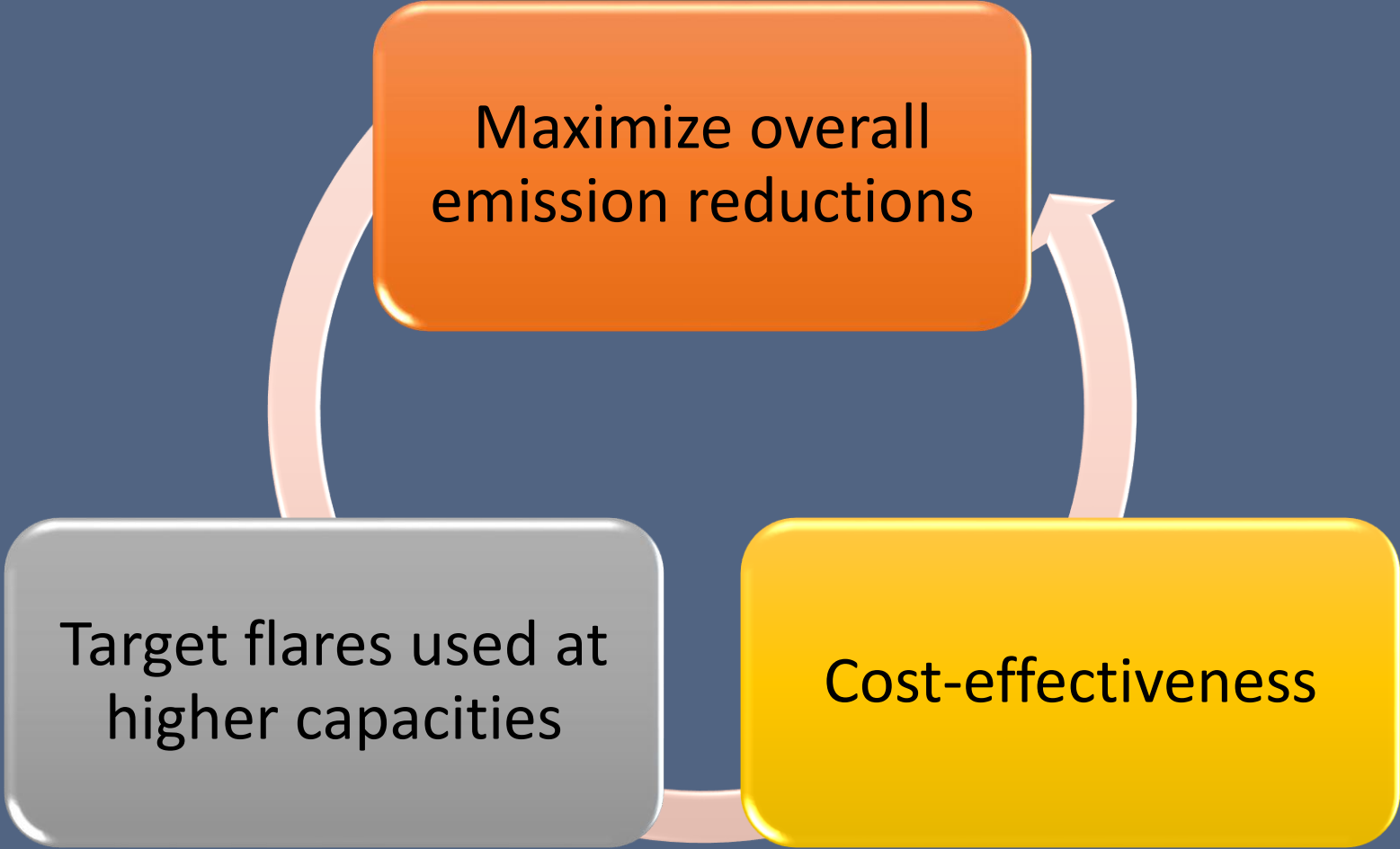
Landfills

Percent Capacity	# flares	Emission Reductions (tpd)
20	29	0.28
30	26	0.25
40	21	0.21
50	12	0.13
60	6	0.03

Wastewater and Digester Gas

Percent Capacity	# flares	Emission Reductions (tpd)
30	8	0.02
40	3	0.009
50	3	0.009
60	2	0.008
70	1	0.007

Capacity Threshold Considerations



Cost-Effectiveness

Cost-Effective Analysis

- Determined number of affected flares and emission reductions
- Used average capital and O&M costs provided by stakeholders
 - ✓ O&M costs ranged from 5-18 percent of capital costs
 - ✓ Stakeholder costs were substantially higher than vendor costs
- 2016 AQMP NO_x cost-effectiveness at \$50,000 per ton reduced

Cost-Effectiveness Calculation for PR1118.1



	# Flares
Oil and Gas	5
Landfills	29
Wastewater	1

	Red (tpd)
Oil and Gas	0.012
Landfills	0.28
Wastewater	0.007

Estimate cost of flare replacement based on:

- Industry (landfill, wastewater, oil and gas)

Flare Cost Estimates

Oil and Gas

Size (MMBtu/hr)	Capital Cost	Annual Cost
40	\$410,000	\$30,000
17	\$420,000	\$19,000
39	\$350,000	\$30,000
	\$1,000,000	\$50,000
Average:	\$545,000	\$32,250

Landfills

Size (MMBtu/hr)	Capital Cost	Annual Cost
75.6	\$758,339	\$122,000
167	\$1,400,000	\$220,000
120	\$2,600,000	\$460,000
40	\$622,910	\$70,725
Average:	\$927,083	\$218,181

Wastewater and Digester Gas

Size (MMBtu/hr)	Capital Cost	Annual Cost
27 x 3 Flares	\$666,667	
42.6 x 3 Flares	\$600,000	
39.3	\$1,500,000	
Average:	\$922,222	\$100,000¹

1. From working group discussion

Sample Cost Effective Calculation

Assumptions:

Service Life: 25 years

Interest rate: 4%

Present Value Factor (PVF): 15.62

$$PVF = \frac{(1 + r)^N - 1}{r * (1 + r)^N}$$

r = interest
 N = number of cycles

$$\text{Present Worth Value (PWV)} = \text{Initial Capital Investment} + (\text{Annual O\&M} \times PVF)$$

$$\text{Cost-Effectiveness} : \frac{PWV}{\text{Emission Reductions} \times \text{Years of Equipment Life}}$$

Cost-Effectiveness

Oil and Gas

5% Capacity

Unit Cost	\$545,000
Annual Maintenance	\$32,250
Interest	0.04
PVF	15.62
PWV	\$1,048,812
# units to replace	5
Service Life	25
total cost	\$5,244,060
Reduction (tpd)	0.012
Lifetime reduction	109.5
\$/ton	\$47,890.96

Landfills

20% Capacity

Unit Cost	\$927,083
Annual Maintenance	\$218,181
Interest	0.04
PVF	15.62
PWV	\$4,335,526
# units to replace	29
Service Life	25
total cost	\$125,730,262
Reduction (tpd)	0.28
Lifetime reduction	2,566
\$/ton	\$48,999.50

Wastewater and Digester Gas

70% Capacity

Unit Cost	\$922,222
Annual Maintenance	\$100,000
Interest	0.04
PVF	15.62
PWV	\$2,484,430
# units to replace	1
Service Life	25
total cost	\$2,484,430
Reduction (tpd)	0.007
Lifetime reduction	63.9
\$/ton	\$38,895.19

Capacity Threshold Ranges with Estimated Cost-Effectiveness

Oil and Gas

Percent Capacity	# flares	Emission Reductions (tpd)	Estimated C-E*
5	5	0.012	\$48,000
10	4	0.009	\$51,000
20	3	0.008	\$43,000
30	1	0.0005	\$230,000

Landfills

Percent Capacity	# flares	Emission Reductions (tpd)	Estimated C-E*
20	29	0.28	\$49,000
30	26	0.25	\$49,000
40	21	0.21	\$49,000
50	12	0.13	\$42,900
60	6	0.03	\$106,000

Wastewater and Digester Gas

Percent Capacity	# flares	Emission Reductions (tpd)	Estimated C-E*
30	8	0.02	\$121,000
40	3	0.009	\$91,000
50	3	0.009	\$91,000
60	2	0.008	\$68,000
70	1	0.007	\$39,000

*Cost-effectiveness

Proposed Thresholds

Industry	Potential Threshold	Affected Flares ¹	Estimated Reductions (tpd) ²
Oil and Gas	5%	5	0.012
Landfills ³	20%	29	0.281
Wastewater Treatment & Digester Gas	70%	1	0.007
Other Flaring ⁴	10%	1	0.001
	TOTAL	36	0.30

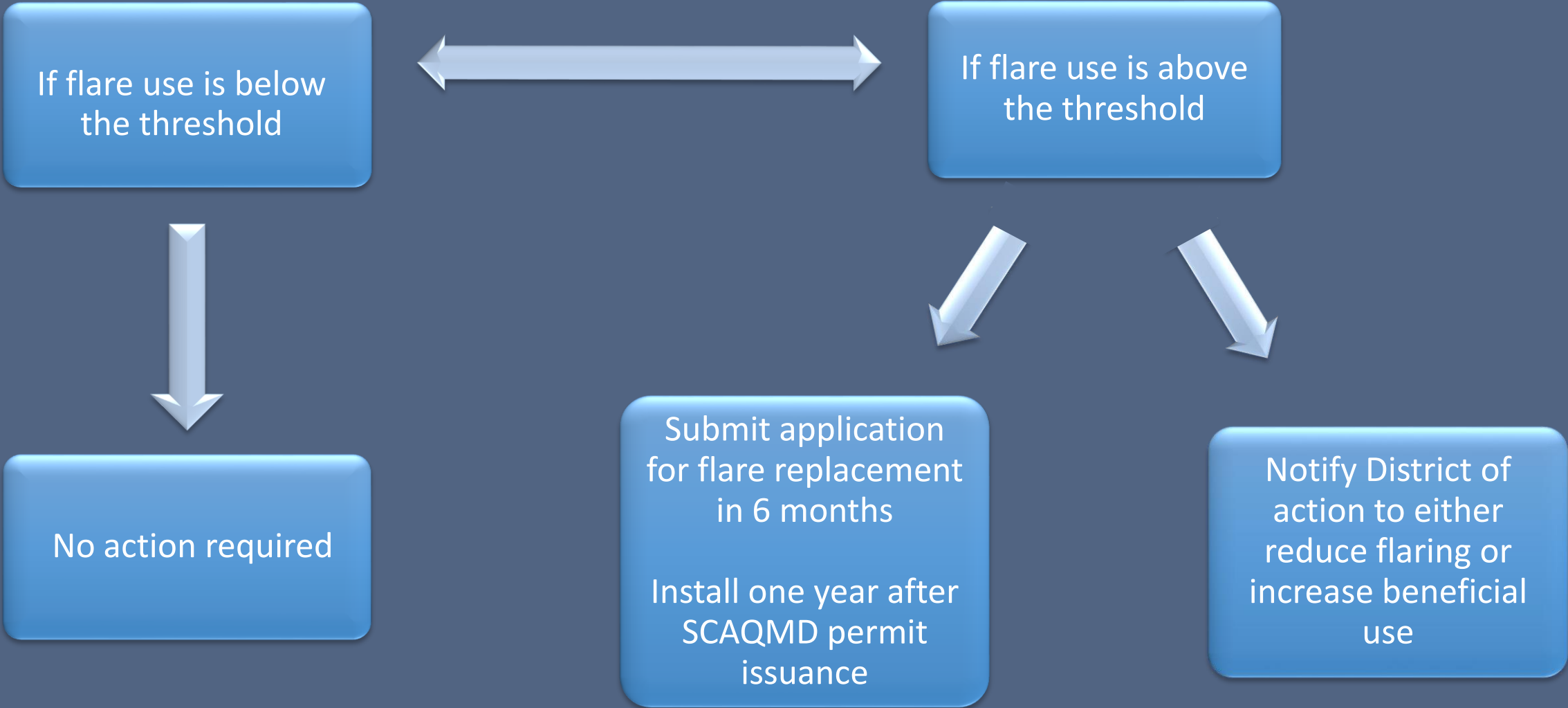
1. Does not include flares already meeting proposed limits or proposed exemptions
2. Emission reductions calculated from reported throughput at permit concentration limit to proposed NOx limits
3. Excludes exempt closed landfills with <1,000 MMscf/year of gas generated
4. Seeking further data

Proposed Requirements

- If flare use is below the threshold, no action required
- If flare use is above the threshold
 - ✓ Notify District of action to either reduce flaring or increase beneficial use or
 - ✓ Submit application for flare replacement (*meet limits below*) in six months and install one year after SCAQMD permit issuance

Industry	NOx Limit (lb/MMBtu)
Landfills/wastewater	0.025
Oil and gas	0.018
Other Flaring	0.025
<i>Tank degassing/Terminal unloading</i>	<i>0.060</i>

Proposed Requirements



Open Flares

- Only 11 known open flares (“candlestick”) used in all affected industries
- Restrictions for landfill use in Rule 1150.1
- Unable to source test to determine NOx emission rate
 - ✓ Default rate in AP-42 at 0.068 lbs/MMBtu
 - ✓ AER emissions rate reported 0.07 to 0.14 lbs/MMBtu

Number of Open Flares	NOx Emissions (tpd)	Annual Throughput (MMscf)
11	0.02	418



Proposed Open Flare Requirements

- Existing open flares and flares that emit greater than 0.060 lb/MMBtu
 - ✓ If annual flare use is greater than 5 percent capacity, action is required
 - Reduce flaring (production or beneficial use)
 - Replace flare to meet the proposed NOx limits
 - ✓ Submit application for flare replacement in six months, and installation required one year after SCAQMD permit issuance

Threshold Demonstration – Recordkeeping

- Demonstrate compliance with recordkeeping for each flare (or station)
- Used by Enforcement team to determine compliance
- Percent used based on flare throughput compared to rated capacity
- Units (MMscf or BTU) should be consistent
- Monitor and record weekly or monthly, and average calendar year
- If annual threshold exceeded, action required within six months

Sample Recordkeeping Table

Date	Weekly/ Monthly Usage	% Used
Annual Average		

Next Steps for Rule Development

Circulate draft rule language

Available for stakeholder meetings and data sharing

Establish next Working Group Meeting date

Release preliminary draft staff report

CEQA and Socioeconomic work

CONTACT INFORMATION



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