

# TCEQ Emissions Inventory (EI) & EPA Toxics Release Inventory (TRI)

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## Report by Pasadena CAC Plants *2018 Data and Trends*

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ENTERPRISE PRODUCTS

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# Emissions, Air Quality, & Health

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- ❖ Emissions come from many sources, including industry.
- ❖ Minimizing emissions improves air quality, which is good for health and the environment.
- ❖ Tonight's report: air emissions from PCAC plants
- ❖ Other meetings focus on health data and health research.

# Why Do Emissions Reports?

*If you measure it, you manage it*

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- Learn what PCAC plants release
  - Including pollutants contributing to ozone formation
- Help public learn about chemicals in the community
- Tool for helping PCAC hold plants accountable
  - By looking at industry trends and specific plants
  - By sharing questions, concerns and suggestions
- Plants may learn from their own reports and others

# Data from Two Inventories

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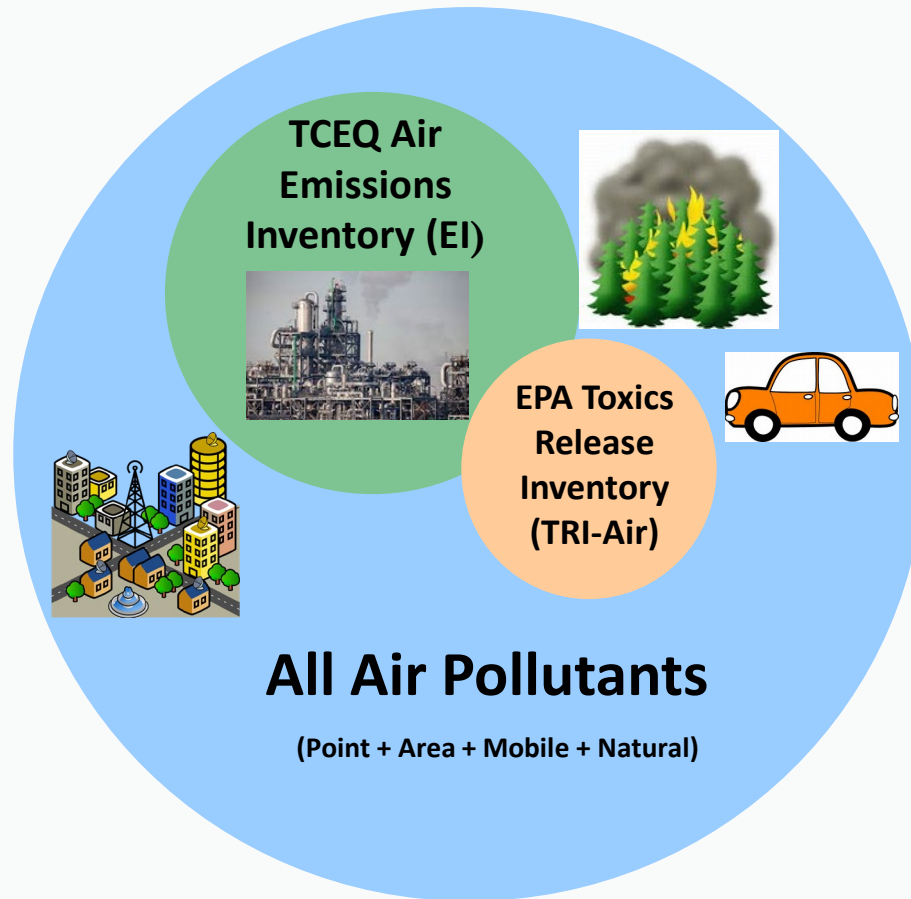
## **TCEQ Air Emissions Inventory (EI)**

- Reported by major sources annually to Texas Commission on Environmental Quality (TCEQ)
- Just air -- all air releases of covered pollutants

## **EPA Toxics Release Inventory (TRI)**

- Reported annually to Environmental Protection Agency (EPA) by plants in certain kinds of business if plant has chemicals on TRI list above a set amount.
- Releases to environment (air, land, water) and transfers off the plant site for further waste treatment or disposal, and more.
- PCAC report includes only TRI Releases to Air

# Industry Reporting of Air Emissions



EI and TRI  
Overlap

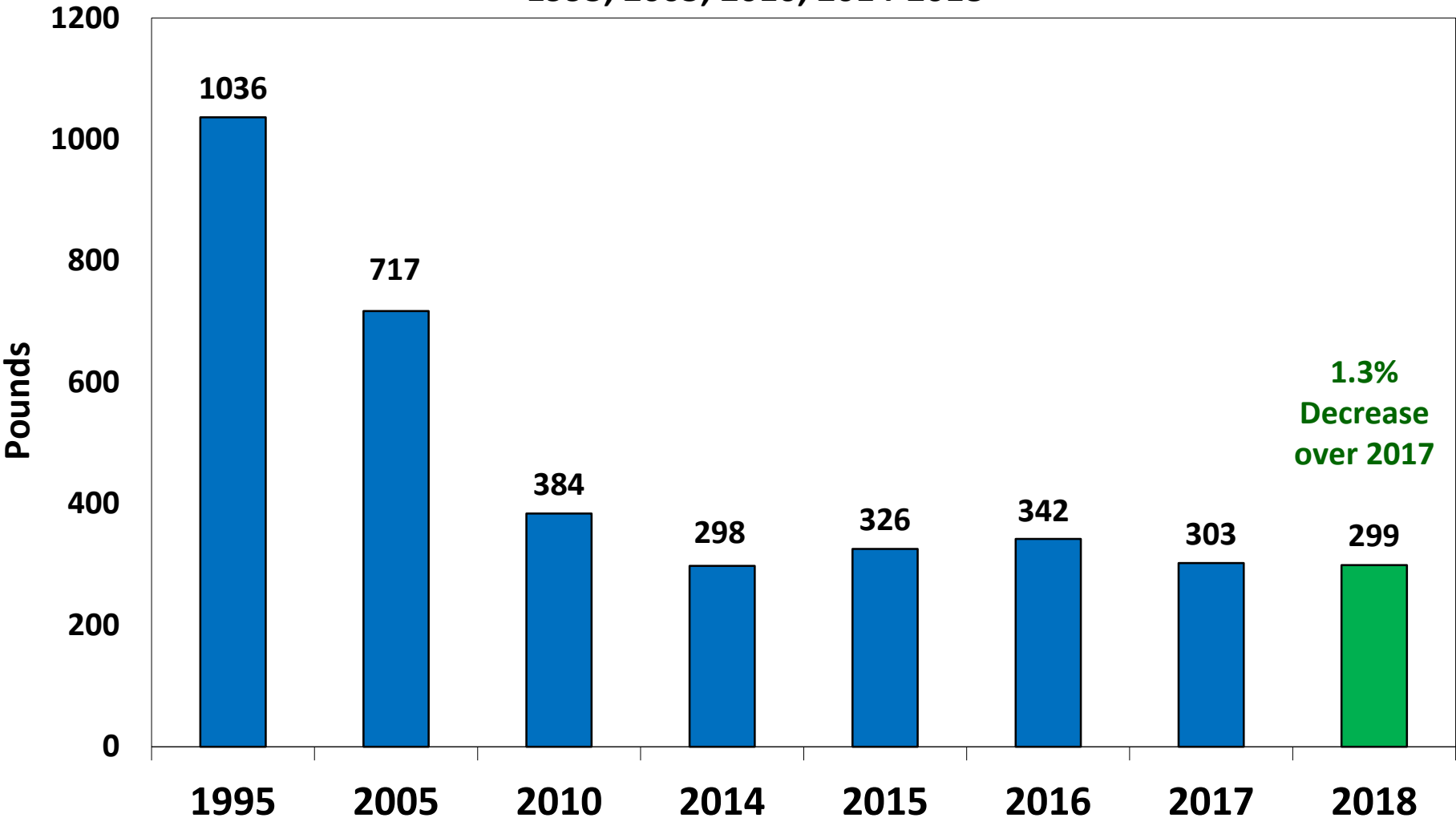
***Not to scale***

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# TCEQ Air Emissions Inventory (EI) Trends in PCAC Plants

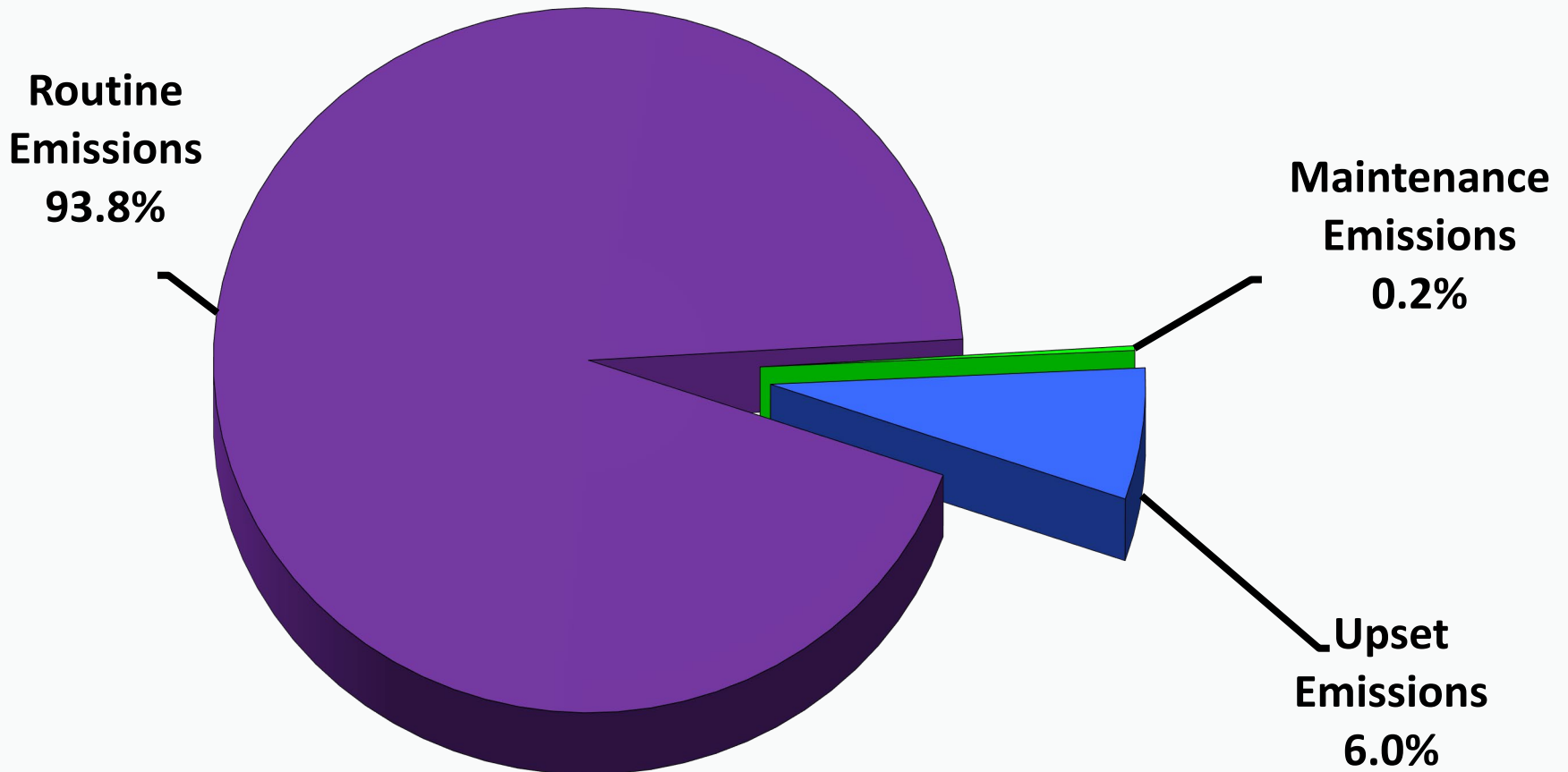
# Pounds of EI per Million Pounds of Products for PCAC Plants

1995, 2005, 2010, 2014-2018



**1995→2018 : 71% Reduction in EI Emissions per Million Pounds of Product**  
**Since 1995, PCAC plants have produced 50-57 billion pounds of product each year.**

# 2018 Full Emissions Inventory *by Cause*





# Criteria Air Pollutants in EI

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4 of the criteria air pollutants- subject to National Ambient Air Quality Standards (NAAQS)

- Oxides of Nitrogen (NO<sub>x</sub>)- ozone precursor
- Oxides of Sulfur (SO<sub>x</sub>)
- Carbon Monoxide (CO)
- Total Suspended Particulates (TSP)/PM 2.5

Volatile Organic Compounds (VOCs)- ozone precursors subject to other rules

- Highly Reactive VOCs (HRVOCs), a subset of VOCs, contribute more to ozone formation

# Oxides of Nitrogen (NOx)

1995, 2005, 2010, 2014-2018 Air Emissions Inventory

Pounds

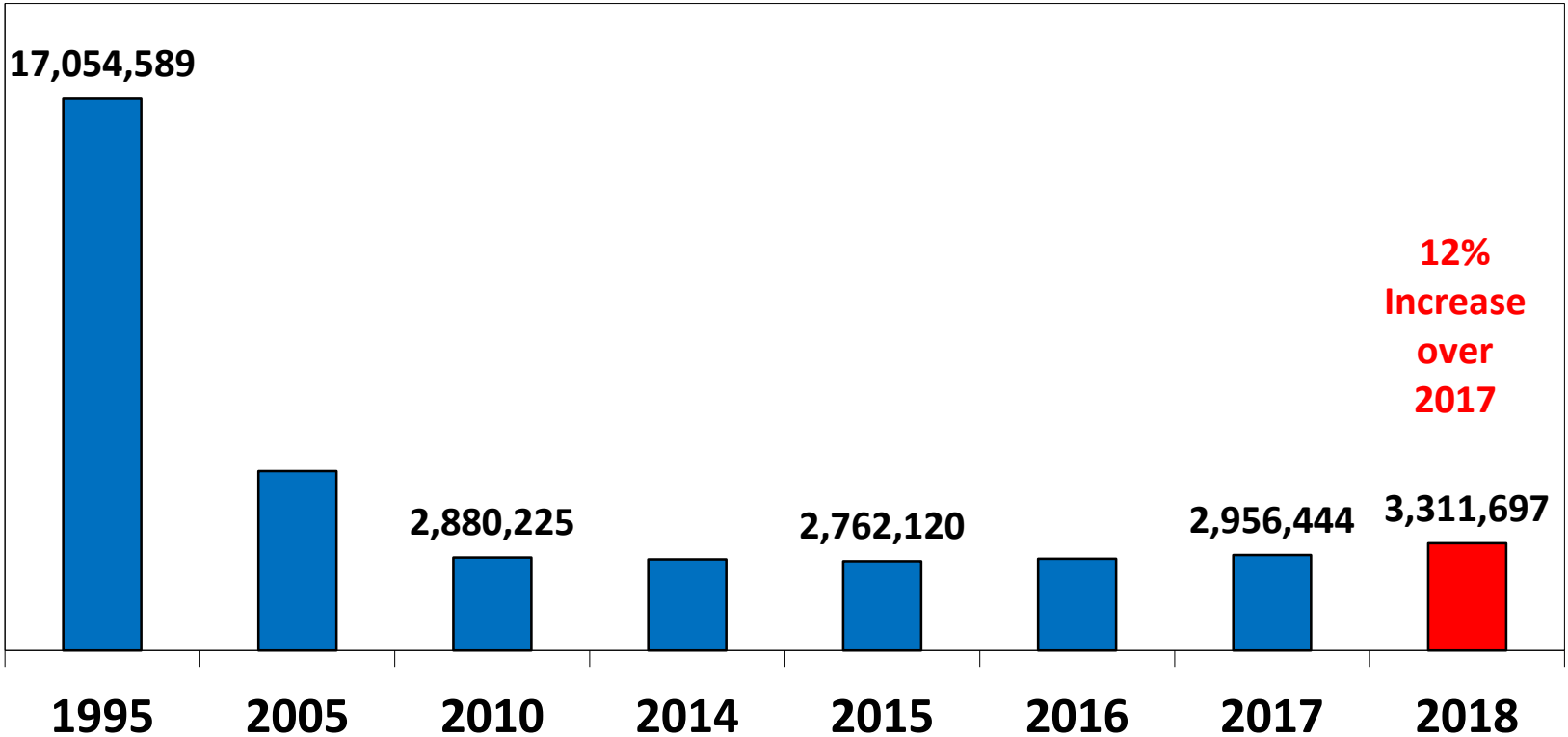
20,000,000

15,000,000

10,000,000

5,000,000

0



**1995 → 2018 : 83% Reduction in NOx Emissions**

# Oxides of Nitrogen (NOx)

## 2018 Significant Changes

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### Increases

#### Pasadena Refining (+308,981 lbs.)

- Annual Operating Hours increased in 2018. [A major maintenance turnaround occurred in 2017, as well as Hurricane Harvey. These events reduced operating rates/hours for multiple process units in the refinery during 2017.]

#### BASF (+5,760 lbs.)

- Plant operated for the full year

# Oxides of Nitrogen (NO<sub>x</sub>)

## 2018 Significant Changes

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### Decreases

**Kinder Morgan Liquids Terminal (-21,857 lbs.)**

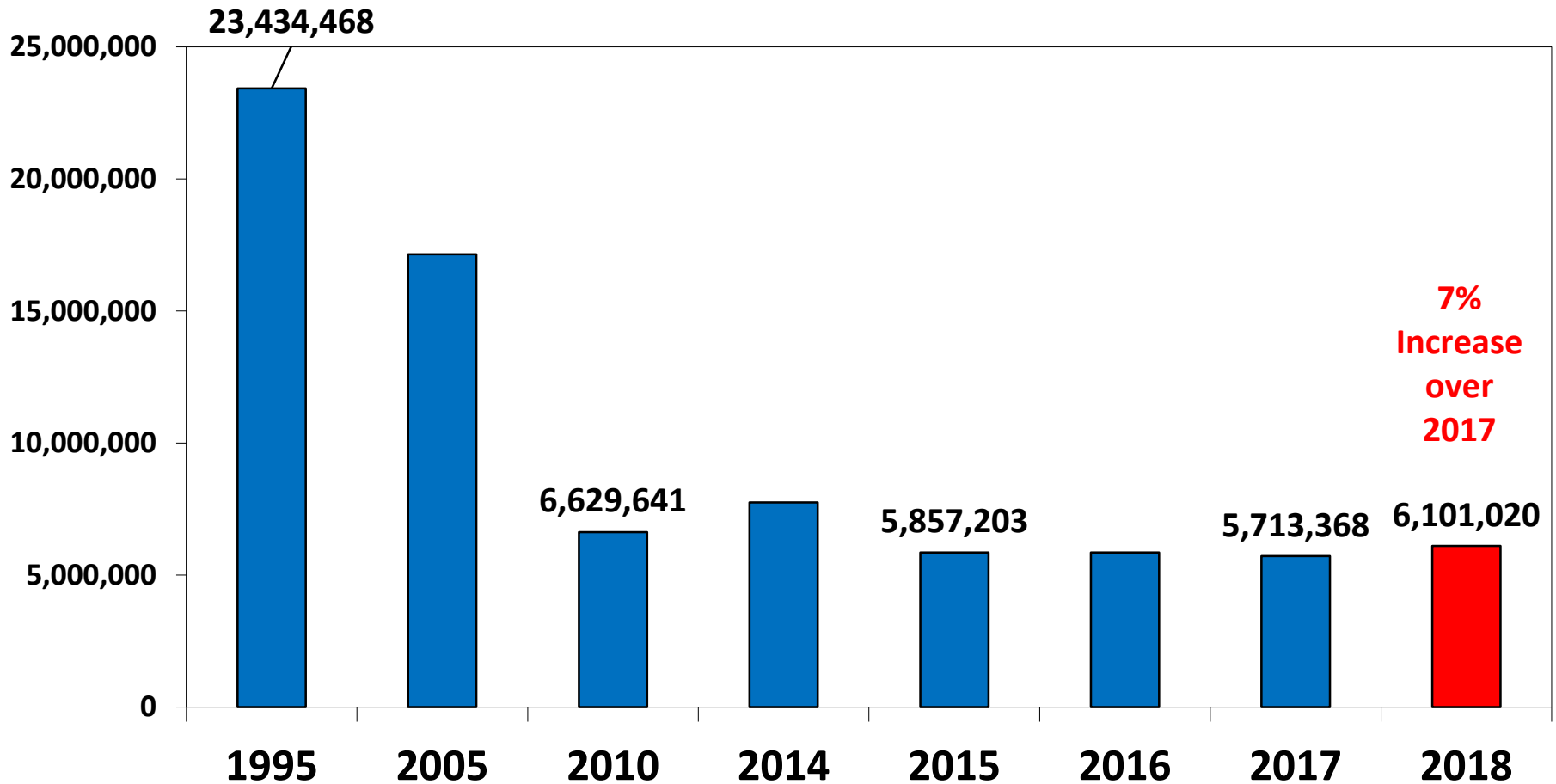
- NO<sub>x</sub> emission factor (EF) representations were updated based on the latest Vapor Combustion Unit (VCU) stack test results and engine manufacturer's specifications.

**Gulf Coast Authority (-10,134 lbs.)**

- Operating hours of equipment decreased from project related work.

# All Volatile Organic Compounds (VOCs) 1995, 2005, 2010, 2014-2018 Air Emissions Inventory

Pounds



**1995 → 2018 : 74% Reduction in All VOC Emissions**

# All Volatile Organic Compounds (VOCs) 2018 Significant Changes

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## Increases

Pasadena Refining (+531,477 lbs.)

- Primarily from an emission event in 2018
- Some impact also from increased annual operating hours in 2018

BASF (+26,179 lbs.)

- Plant operated for the full year

# All Volatile Organic Compounds (VOCs) 2018 Significant Changes

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## Decreases

### Chevron Phillips (-140,101 lbs.)

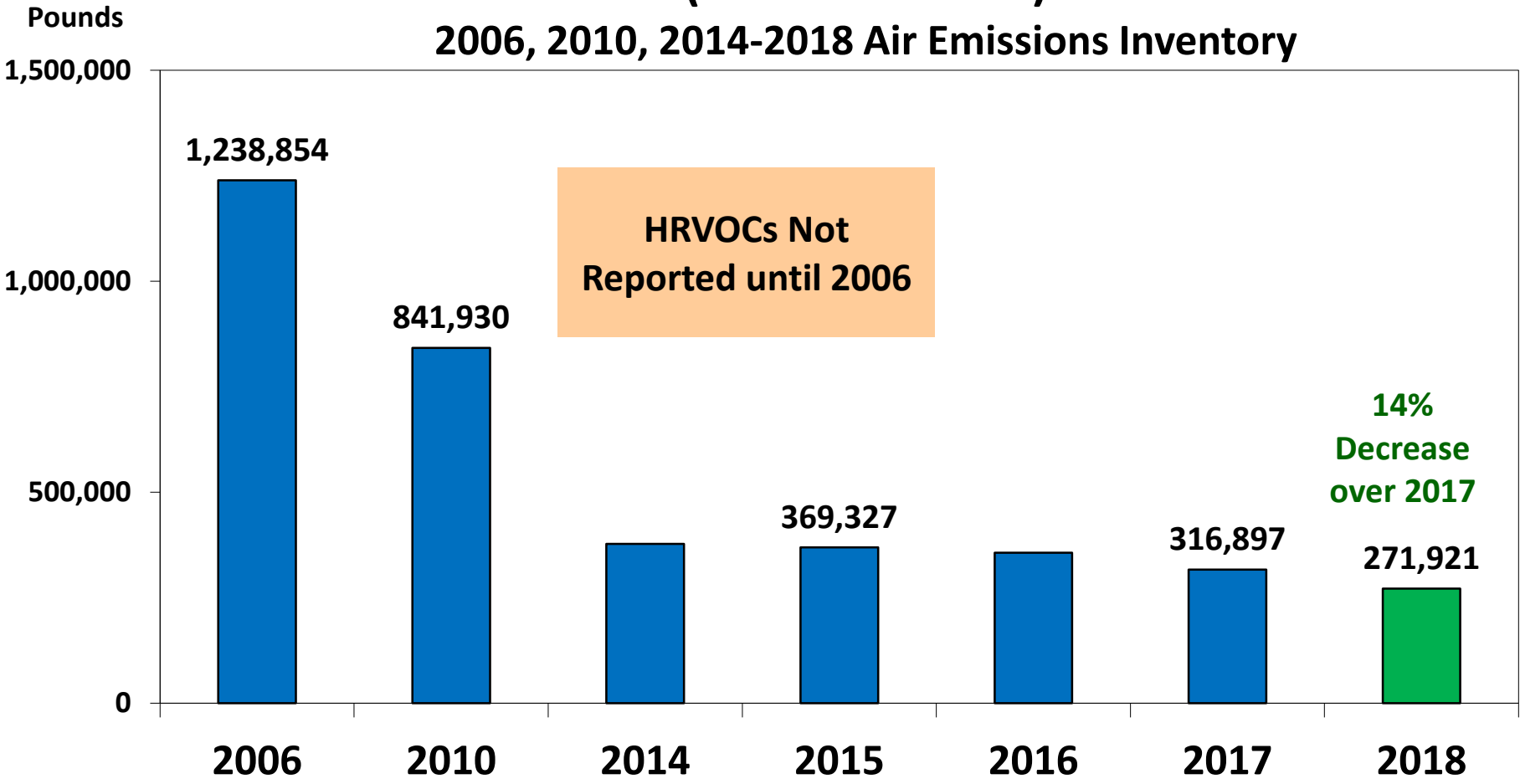
- Expect improved fugitives leak detection and repair (LDAR) performance to continue. Vent control project emission reductions are sustainable.

### Gulf Coast Authority (-8,330 lbs.)

- Temporary- decreased VOCs in waste water from industrial users.

# Highly Reactive Volatile Organic Compounds (HRVOCs) (subset of VOCs)

2006, 2010, 2014-2018 Air Emissions Inventory



**2006 → 2018 : 78% Reduction in HRVOC Emissions**



# Highly Reactive Volatile Organic Compounds (HRVOCs) (subset of VOCs) 2018 Significant Changes

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## Increases

LyondellBasell Refinery (+7,647 lbs.)

- Normal year to year variation in cooling towers, fugitives, and flares; made correction to prior year number

BASF (+4,317 lbs.)

- Plant operated for the full year

# Highly Reactive Volatile Organic Compounds (HRVOCs) (subset of VOCs) 2018 Significant Changes

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## Decreases

### Pasadena Refining (-45,705 lbs.)

- Decrease of emission events involving HRVOCs. Fewer HRVOC compounds sent to the flares. Monitoring data showed decrease of fugitive leaks containing HRVOC compounds.

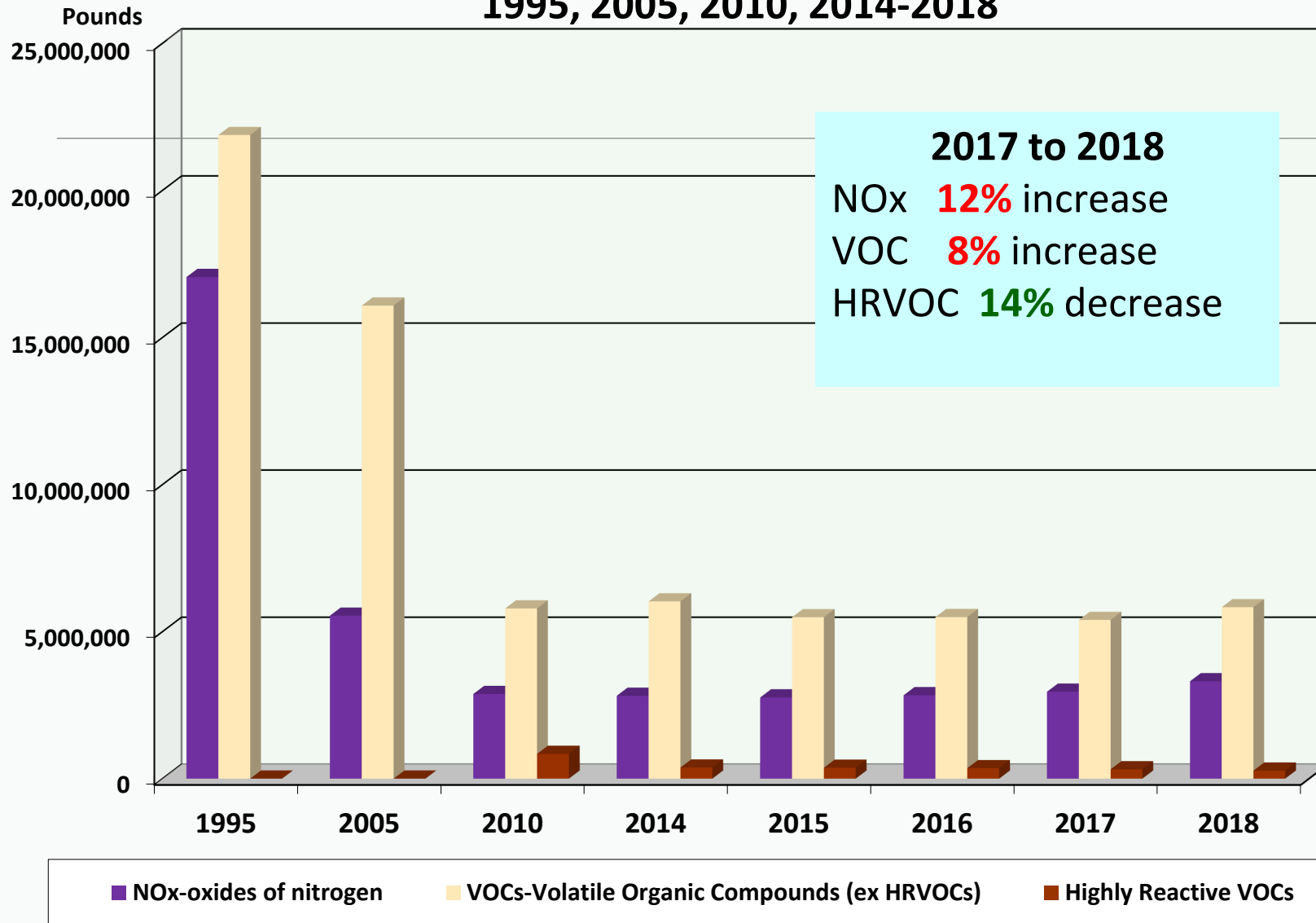
### Albemarle (-5,000 lbs.)

- Variability in demand

# Summary of Contributors to Ozone Formation

NOx, VOCs (excluding HRVOCs) & HRVOCs

1995, 2005, 2010, 2014-2018

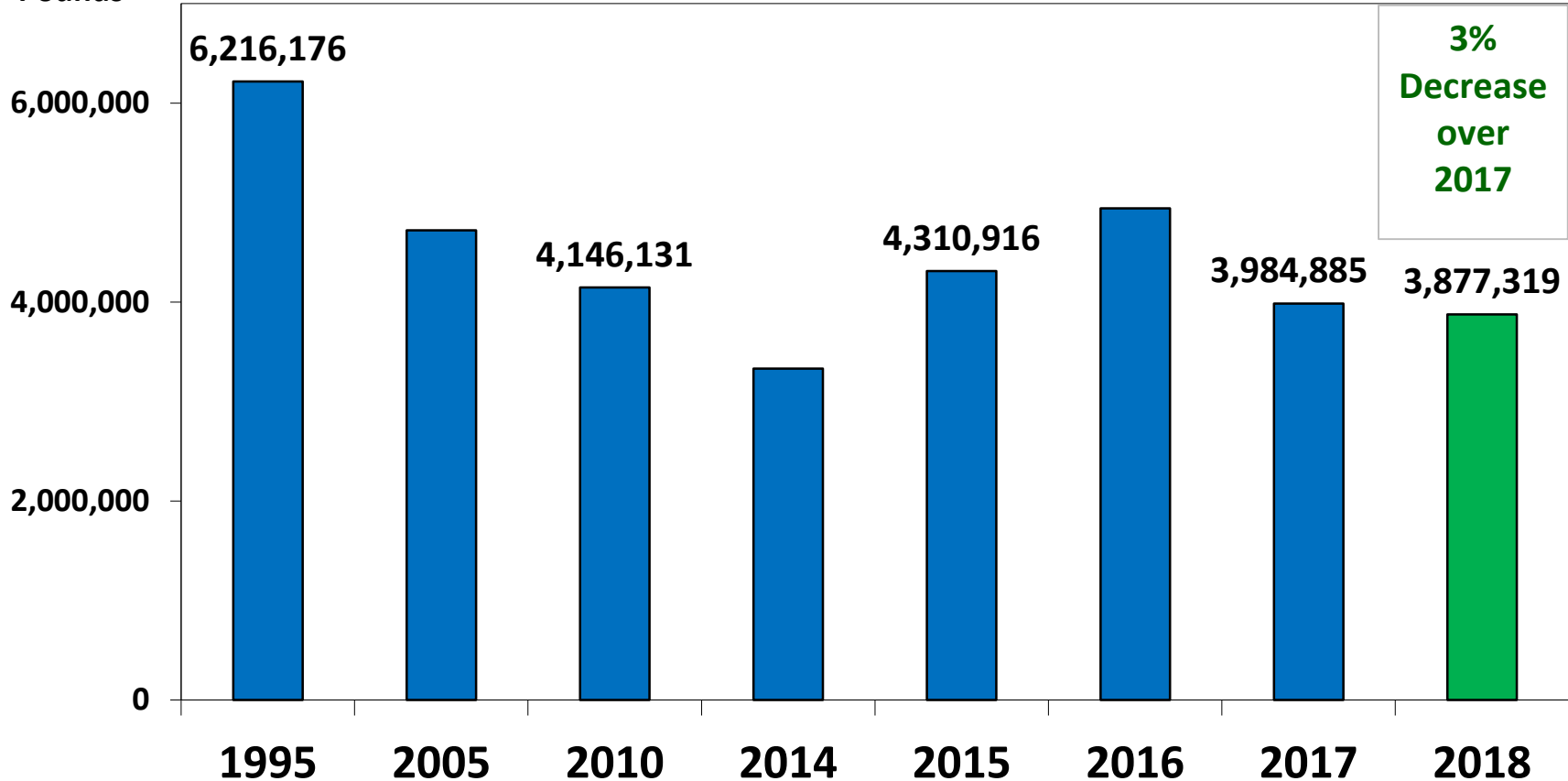


# Oxides of Sulfur (SOx)

1995, 2005, 2010, 2014-2018 Air Emissions

Inventory

Pounds



3%  
Decrease  
over  
2017

**1995→2018: 38% Reduction in SOx Emissions**

# Oxides of Sulfur (SO<sub>x</sub>)

## 2018 Significant Changes

### Increase

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#### Pasadena Refining (+180,461 lbs.)

- Annual operating hours increased in 2018 [A major maintenance turnaround occurred in 2017, as well as Hurricane Harvey. These events reduced operating rates/hours for multiple process units in the refinery during 2017.]

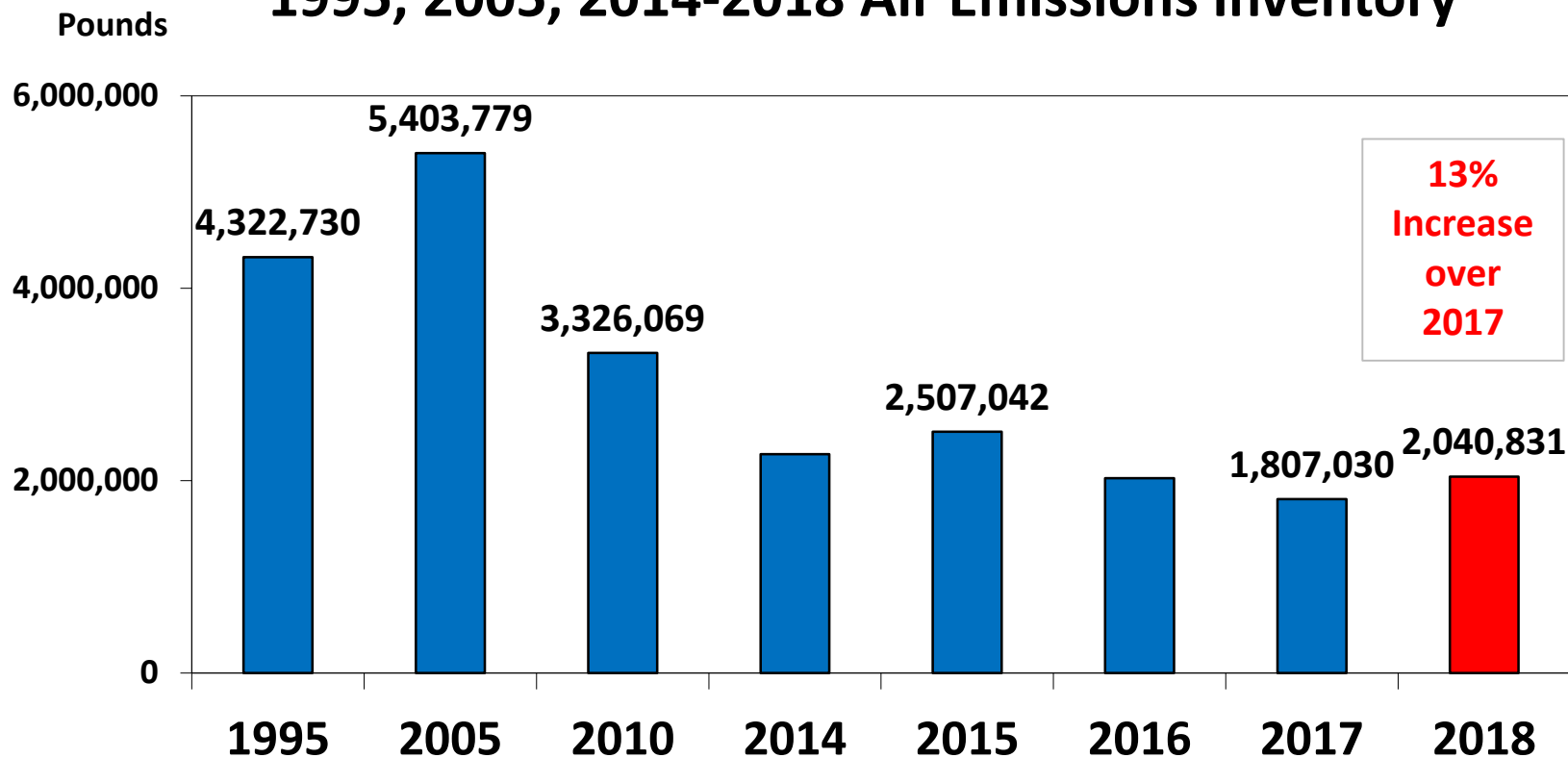
### Decrease

#### LyondellBasell Refinery (-260,178 lbs.)

- Primarily from fewer emissions from upsets

# Carbon Monoxide (CO)

## 1995, 2005, 2014-2018 Air Emissions Inventory



**1995 → 2018: 53% Reduction in CO Emissions**

# Carbon Monoxide (CO)

## 2018 Significant Changes

### Increases

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#### Pasadena Refining (+185,603 lbs.)

- Annual operating hours increased in 2018 [A major maintenance turnaround occurred in 2017, as well as Hurricane Harvey. These events reduced operating rates/hours for multiple process units in the refinery during 2017.]

#### BASF (+83,338 lbs.)

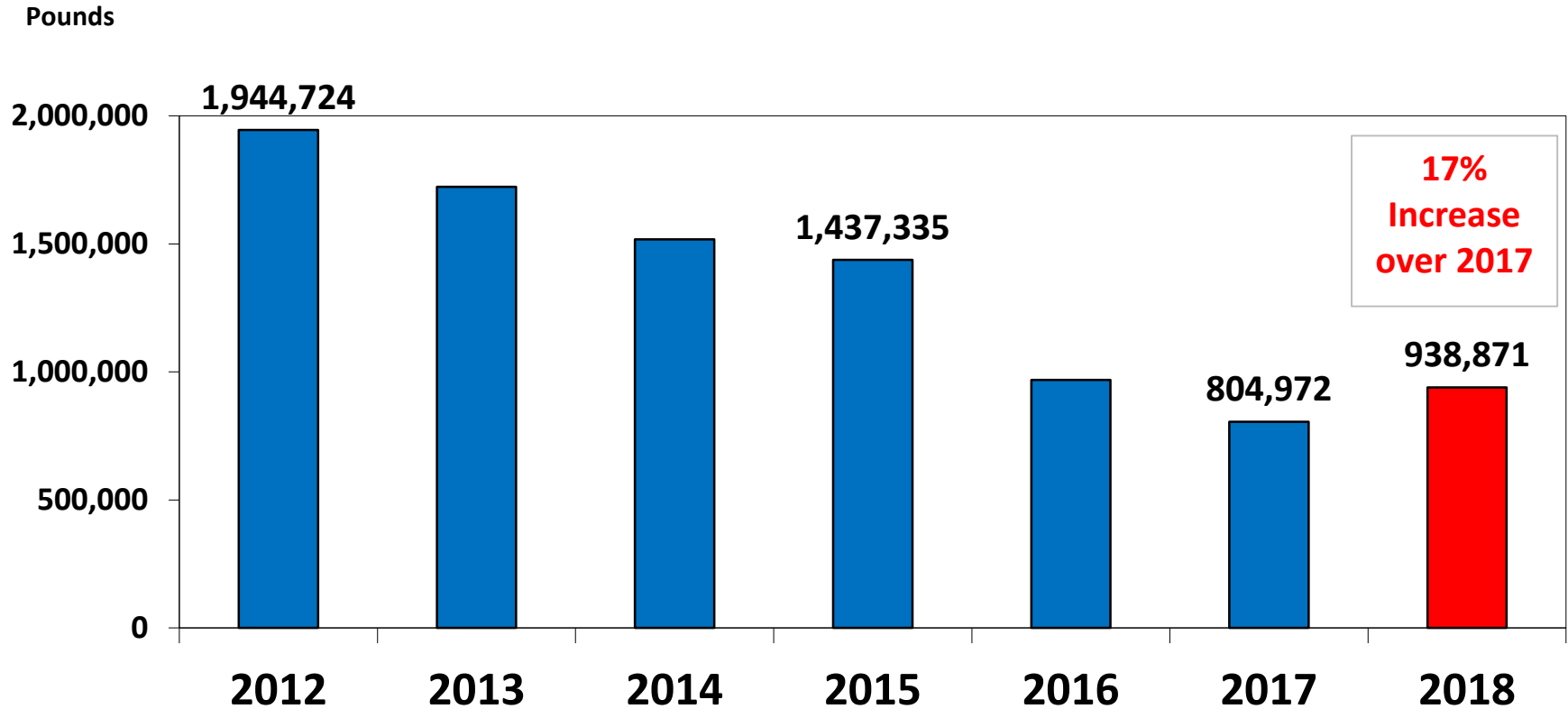
- Plant operated for the full year

### Decreases

#### Kinder Morgan Export Terminal (-43,536 lbs.)

- Natural gas usage in Vapor Combustion Units (VCU) reduced in 2018.

# Total Suspended Particulates (TSP) 2012-2018 Air Emissions Inventory



**2012→2018 : 52% Reduction in TSP Emissions**



# Total Suspended Particulates (TSP)

## 2018 Significant Changes

### Increases

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#### Pasadena Refining (+93,389 lbs.)

- Annual operating hours increased in 2018. [A major maintenance turnaround occurred in 2017, as well as Hurricane Harvey. These events reduced operating rates/hours for multiple process units in the refinery during 2017.]

#### LyondellBasell Refinery (+32,086 lbs.)

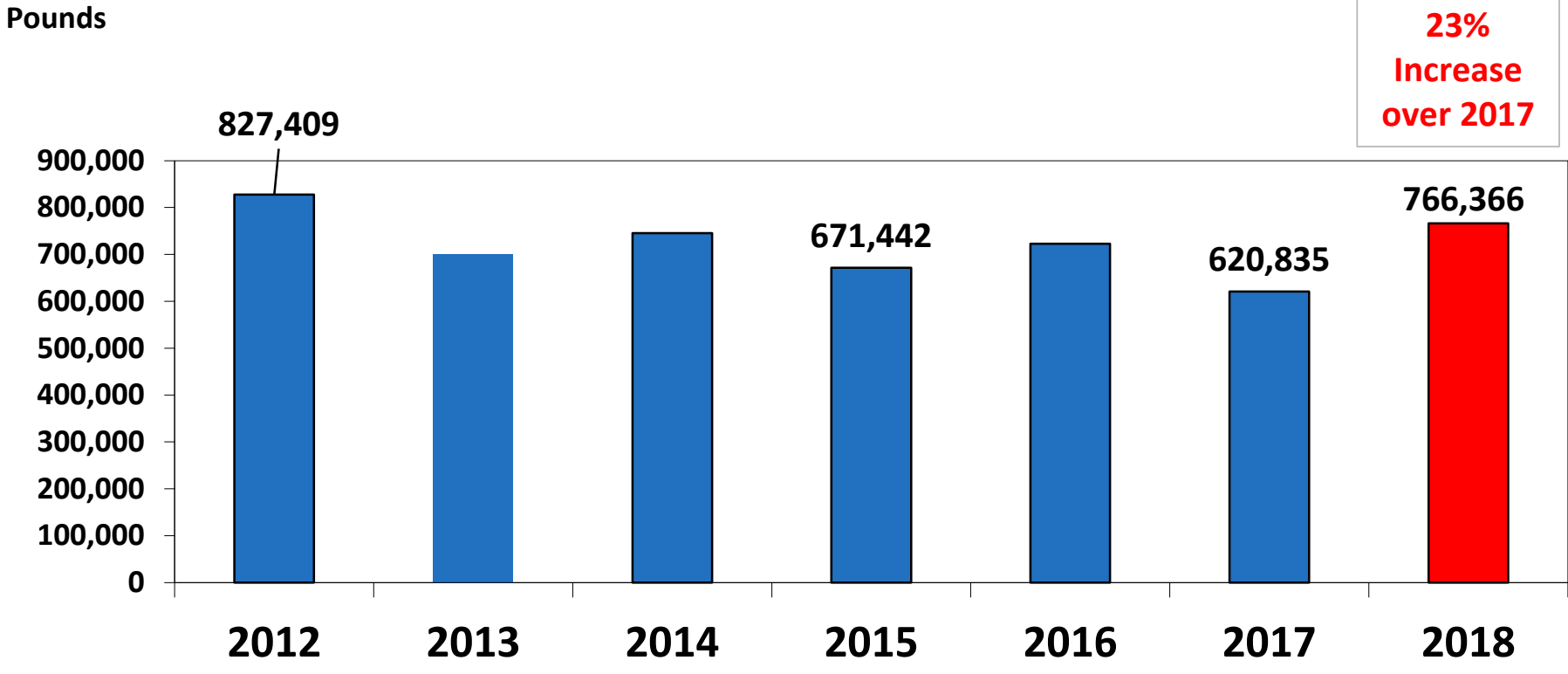
- FCCU (cat cracker) had turnaround in 2017; corrected prior year number

### Decreases

#### Chevron Phillips (-8,385 lbs.)

- Lower than expected solids content in cooling tower water

# Total Suspended Particulates Reported as PM 2.5 2012-2018 Air Emissions Inventory



**2012→2018: 7% Reduction in TSP 2.5 Emissions**

# PM 2.5 Portion of TSP

## 2018 Significant Changes

### Increases

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#### Pasadena Refining (+87,336 lbs.)

- Annual operating hours increased in 2018. [A major maintenance turnaround occurred in 2017, as well as Hurricane Harvey. These events reduced operating rates/hours for multiple process units in the refinery during 2017.]

#### Albemarle (+33,100 lbs.)

- Updated calculation method

#### LyondellBasell Refinery (+32,901 lbs.)

- FCCU had turnaround in 2017

### Decrease

#### Air Products (-6,352 lbs.)

- Combination of less production and sale of boiler

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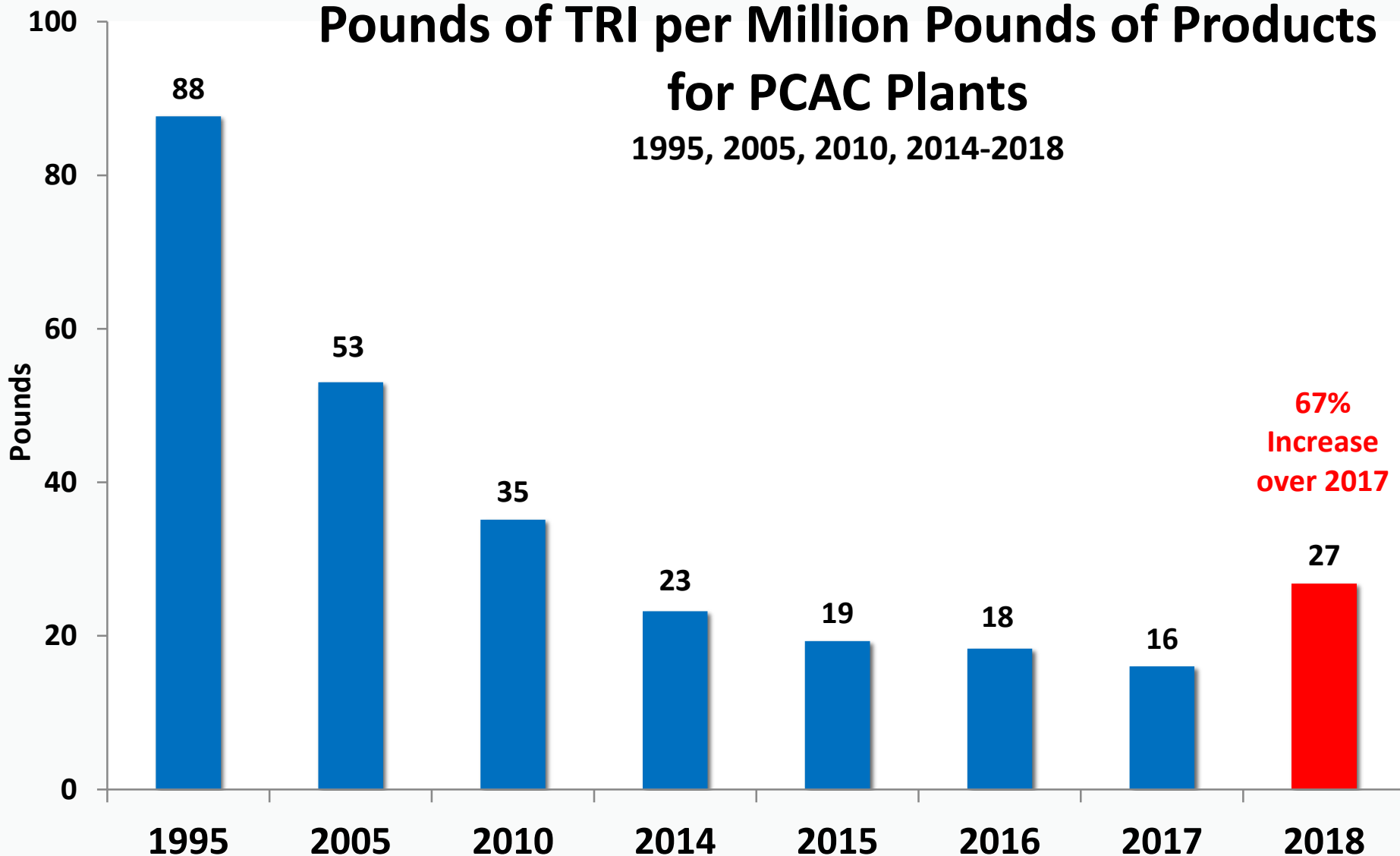
# Questions?

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# EPA Toxics Release Inventory (TRI) Trends for PCAC Plants

# Pounds of TRI per Million Pounds of Products for PCAC Plants

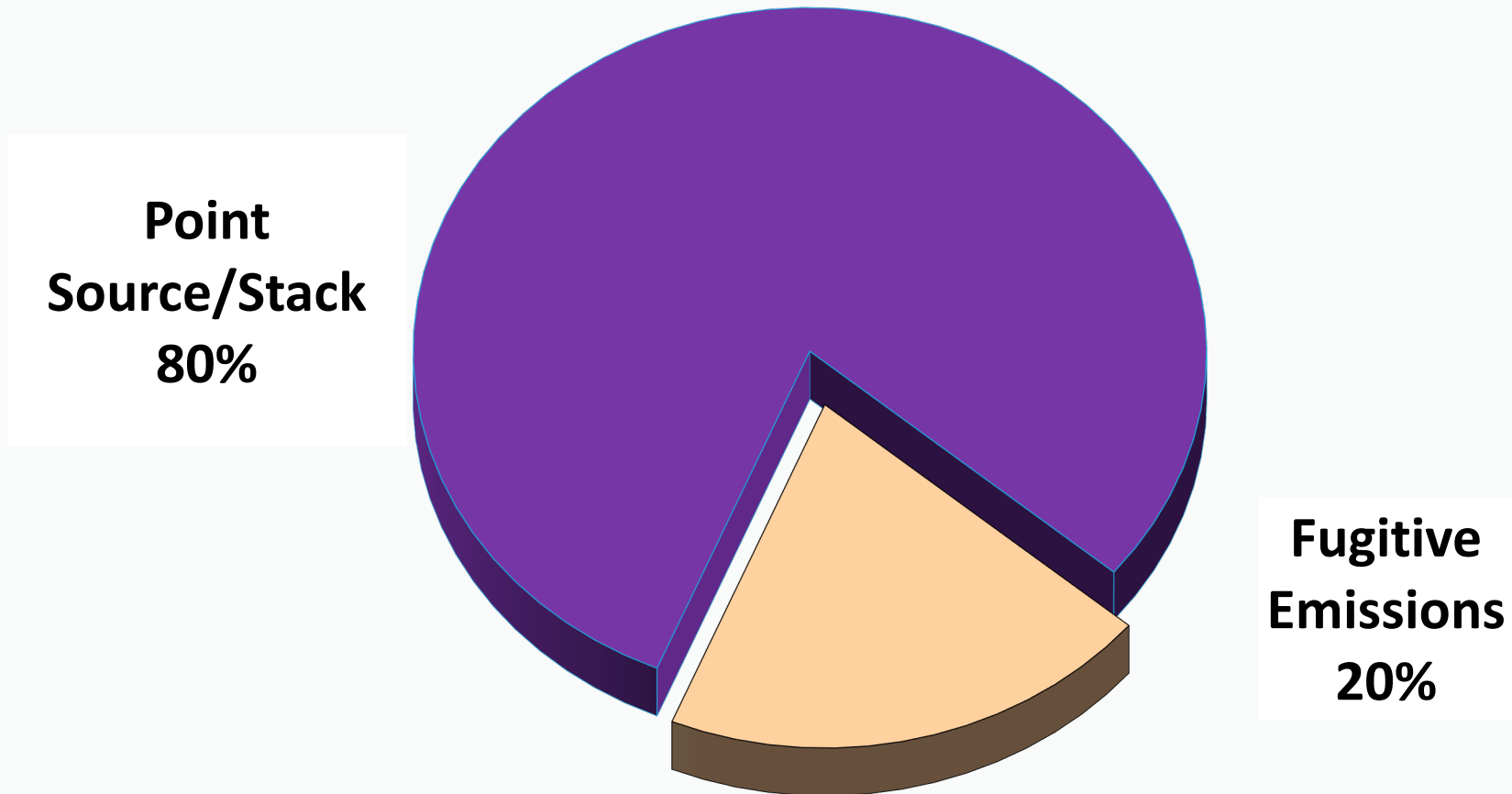
1995, 2005, 2010, 2014-2018



**1995→2018: 69% Reduction in Pounds of TRI Emissions per Million Pounds of Product**

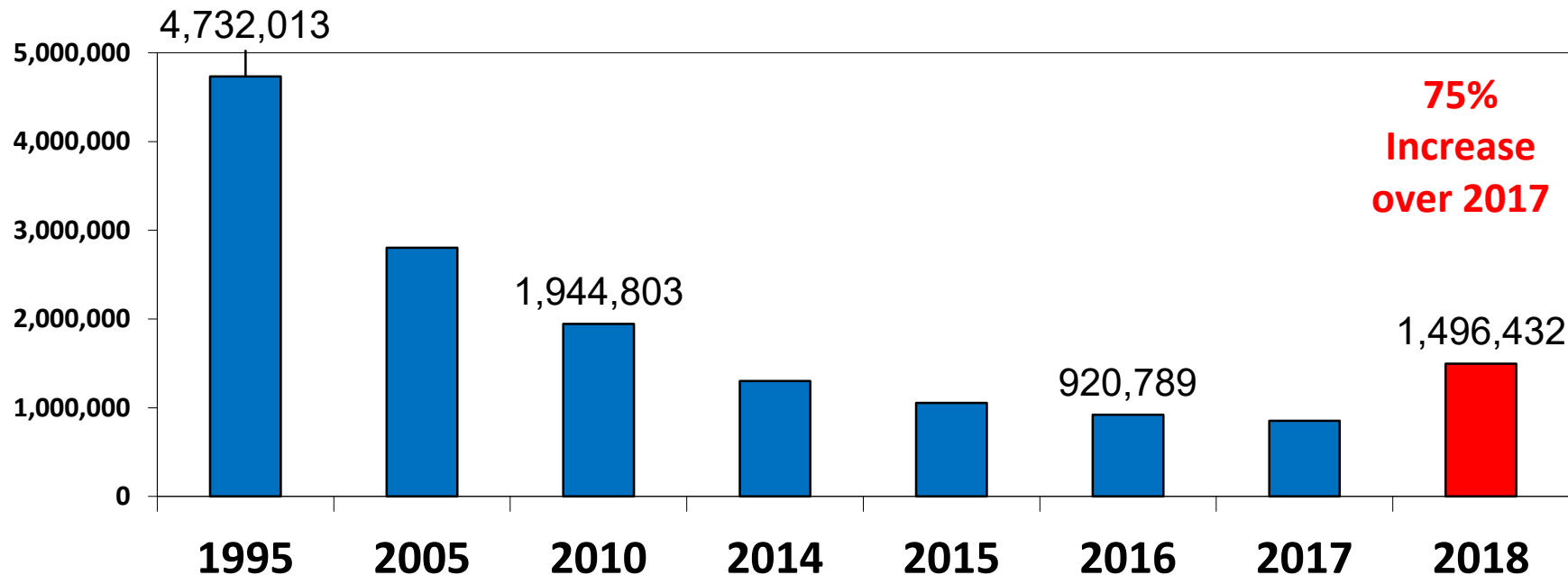
**Since 1995, PCAC plants have produced 50-57 billion pounds of product each year.**

# 2018 TRI Emissions by Source



# TRI Total Air Emissions 1995, 2005, 2010, 2014-2018

Pounds



**1995→2018: 68% Reduction in TRI Total Air Emissions**



# Total TRI Air Emissions

## 2018 Significant Changes

### Increases

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#### Pasadena Refining (+514,388 lbs.)

- **Fugitive:** LDAR monitoring data showed decrease of fugitive leaks containing TRI Compounds
- **Point Source/Stack:** Increase is primarily from an emission event that occurred in 2018 (temporary); Annual operating hours also increased in 2018 [A major maintenance turnaround occurred in 2017, as well as Hurricane Harvey. These events reduced operating rates/hours for multiple process units in the refinery during 2017.]

#### INEOS Phenol (+114,065 lbs.)

- **Point Source/Stack:** Heavy rain event, coupled with a leaking valve, led to a significant amount of water on top of the tanks' floating roofs. The rain water overcame the floating roofs and resulted in product on top of the roofs.

# Total TRI Air Emissions

## 2018 Significant Changes

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### Decreases

#### Chevron Phillips (-35,447 lbs.)

- **Fugitive:** Lower leak rates are sustainable process improvements. Eliminating unit upsets and additional repairs made during a planned unit turnaround.
- **Point Source/Stack:** Installation of control device reduced emissions.

# Comparison With Other CACs 2010 – 2017

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## BAYCAP (25 plants)

- TRI air - 26%
- NOx - 55%
- VOCs - 27%

## Pasadena CAC (18 plants)

- TRI air - 54%
- NOx + 3%
- VOCs - 15%

## Deer Park CAC (14 plants)

- TRI air - 11%
- NOx - 18%
- VOCs - 16%

## La Porte CAC (47 Reports)

- TRI air - 26%
- NOx - 7%
- VOCs - 13%

# 2017 State and County Comparisons

## VOCs

- Texas 178,000,000 lbs.
- Harris Co. 31,383,705 lbs.
- PCAC 6,101,020 lbs.

- **3%** of state VOC Emissions Inventory from PCAC plants
- **19%** of county VOC EI from PCAC plants

## NOx

- Texas 502,000,000 lbs.
- Harris Co. 29,026,390 lbs.
- PCAC 3,311,697 lbs.

- **0.7%** of state NOx Emissions Inventory from PCAC plants
- **11%** of county NOx EI from PCAC plants

*Of facilities that reported EI in 2017,  
1963 facilities in state, 249 facilities in county, 16 PCAC plants*

# 2018 A Year of More Ups Than Downs

## *All Categories are Down Over Time*

### **INCREASES**

NOx	+12%
VOCs	+ 7%
CO	+13%
TSP	+17%
PM 2.5	+23%
TRI to Air	+75%

### **DECREASES**

HRVOCs	-14%
SOx	- 3%

# If You Want to Know More

**TCEQ:** [www.tceq.Texas.gov](http://www.tceq.Texas.gov)

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## **EPA TRI Websites**

TRI Program Home page: [www.epa.gov/tri](http://www.epa.gov/tri)

TRI Explorer – by zip code, county, facility,  
chemical: [www.epa.gov/triexplorer](http://www.epa.gov/triexplorer)

**Houston Regional Monitoring:** <http://hrm.aecom.com/>