

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

Report by Pasadena CAC Plants *2020 Data and Trends* *Full Presentation* *FINAL 11.03.2021*

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Parts of the Emissions Report

Orientation Packet: Background information on why the CAC does emissions reports and on both emission inventories. Acronyms used in emission reporting. Sources of air pollution and how the data is collected.

Handouts: Intro with contents, how to read the report, plant changes. TCEQ Emissions Inventory (EI) section then EPA Toxics Release Inventory section have background about the inventory and a worksheet for each covered pollutant). Each pollutant worksheet has the size of plant, trends chart, plant-by-plant data for 2016-2020, totals, percentage change over 5 years, significant reasons for change. Color-coded to show significant increases and decreases in pounds and percentages. Plants exempt from reporting inventories are listed on each spreadsheet.

Highlights Page: Lists pollutants covered in the spreadsheets, pounds released in 2020 and the percentage they changed from 2019 to 2020 (**red** = increase, **green** = decrease). Lists the number of plants reporting each inventory.

“Full” Presentation: contains all the information in the format that has been used in our traditional face-to-face meetings; including main reasons for increases and decreases.

Emissions, Air Quality, & Health

- ❖ 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 Review Emissions Reports?

If you measure it, you manage it

- 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

How We Decided Which Plants to include on the 2020 “Changes” Slides?

- ❑ We looked at the top increases and decreases from 2019 by pounds for each pollutant.
- ❑ For some pollutants, only one increase or decrease is listed because of the order of magnitude difference in values. For example, LyondellBasell Refinery had an 854,001 lb. decrease in SO_x and the next closest decrease was Albemarle with 110 lb.
- ❑ Plants were asked to supply reasons for changes of $\pm 10\%$ or $\pm 5,000$ lbs. Some plants voluntarily supplied reasons for changes that were below the values stated above.

TCEQ Air Emissions Inventory (EI) Trends in PCAC Plants

Change in PCAC Plants TCEQ Air Emissions Inventory

	2019-2020	2016-2020
Total PCAC Air Emission Inventory	- 12%	- 24%
Nitrogen Oxides (NOx)	- 14%	- 8%
Volatile Organic Compounds (VOCs)	- 6%	- 16%
Highly Reactive VOCs (HRVOCs)	- 1%	- 28%
Carbon Monoxide (CO)	- 1%	- 13%
Total Suspended Particulates (TSP)	- 10%	- 20%
Particulate Matter (PM 2.5)	- 13%	- 16%
Sulfur Oxides (SOx)	- 25%	- 52%
Routine Permitted Emissions	- 10%	- 16%
Maintenance Emissions	+ 78%	- 87%
Upset Emissions	- 81%	- 93%

Pounds of TCEQ EI per Million Pounds of Product for PCAC Plants

1995, 2005, 2010, 2016-2020

Pounds

1200

1000

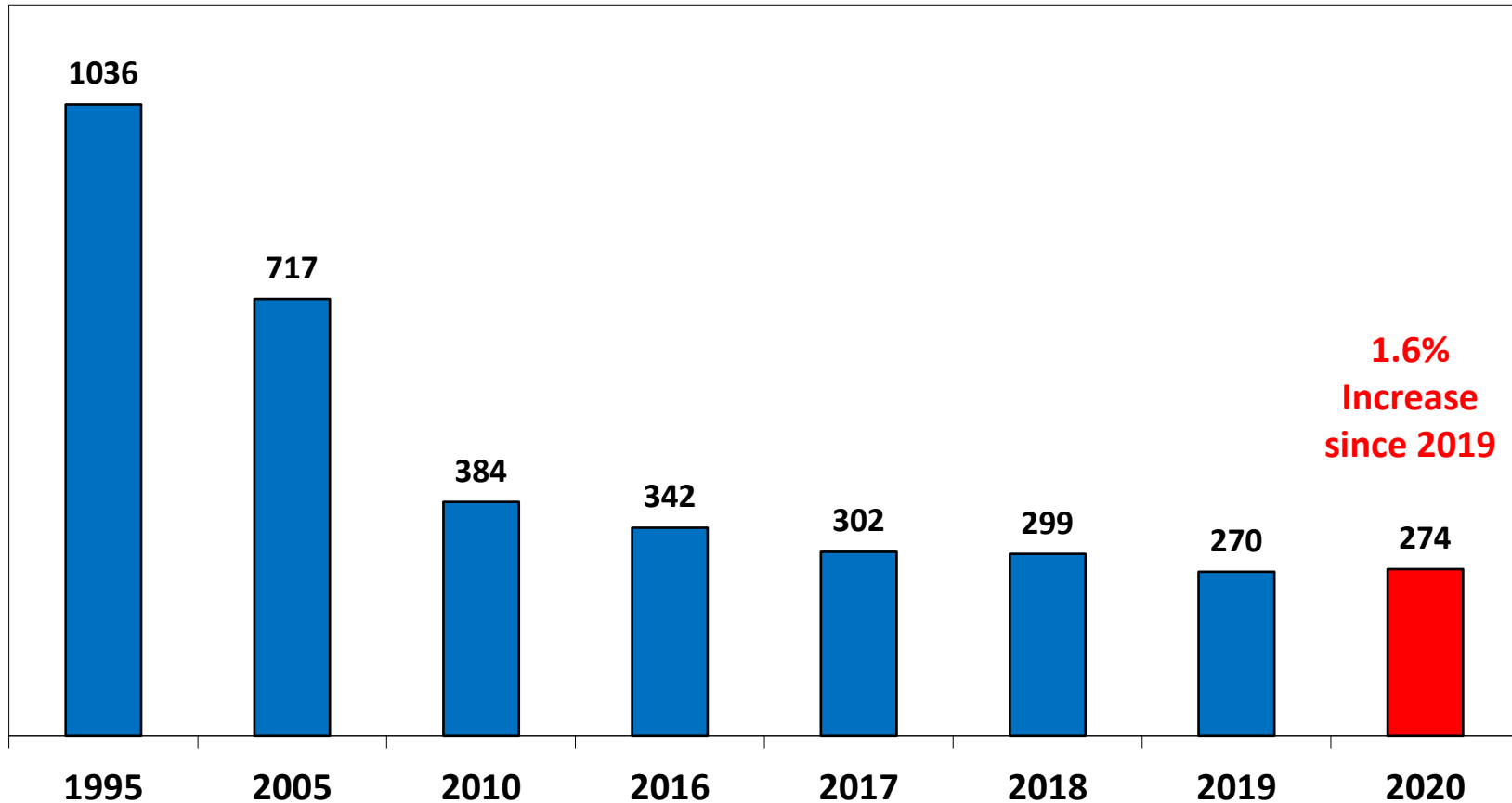
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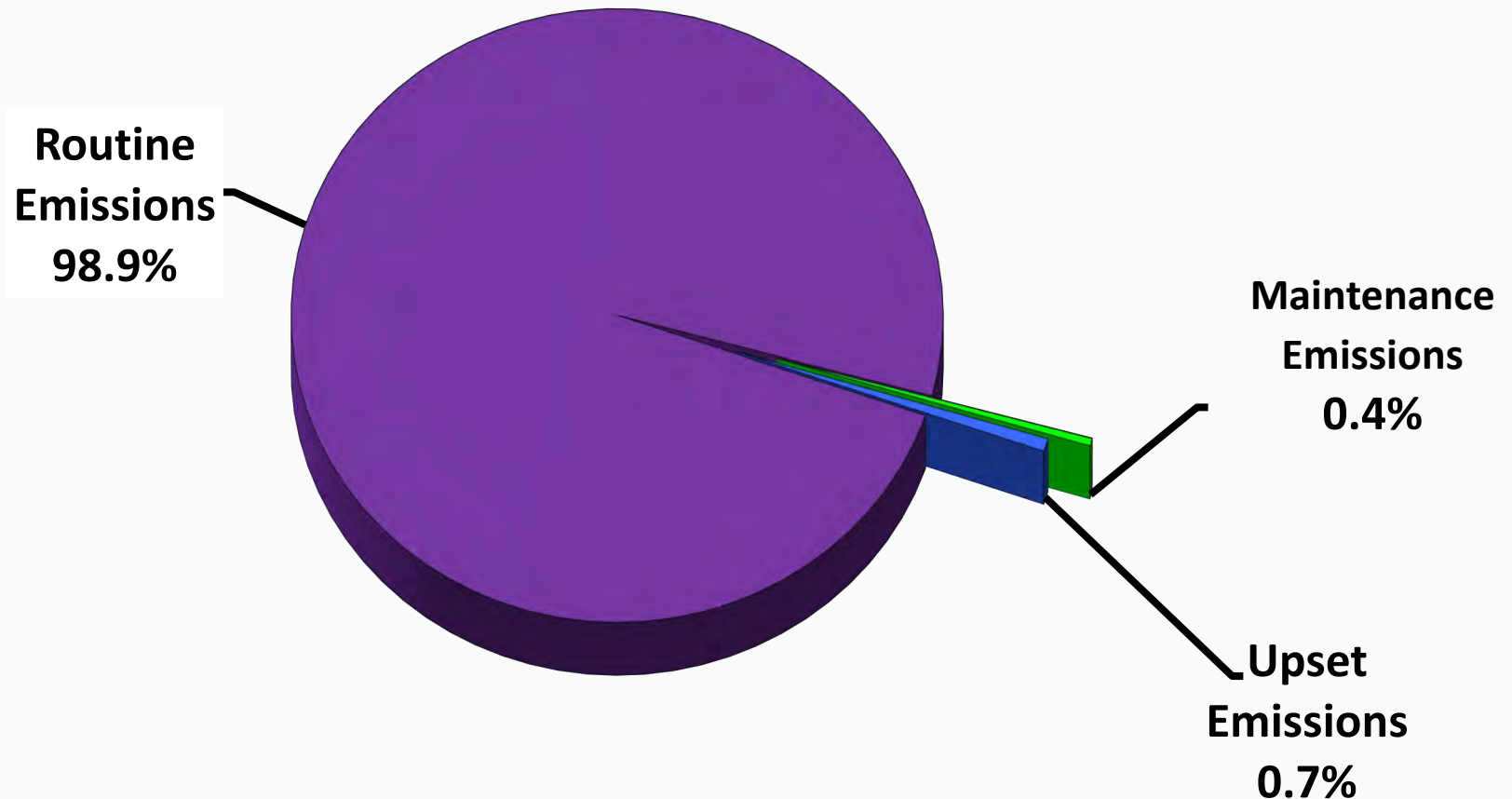
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1995→2020 : 74% Reduction in EI Emissions per Million Pounds of Product

Since 1995, PCAC plants have produced 47-57 billion pounds of product each year.

2020 TCEQ EI Emissions *by Cause* for PCAC Plants



Criteria Air Pollutants in EI

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

- Nitrogen Oxides (NO_x)- ozone precursor
- Sulfur Oxides (SO_x)
- Carbon Monoxide (CO)
- Total Suspended Particulates (TSP)/PM 2.5

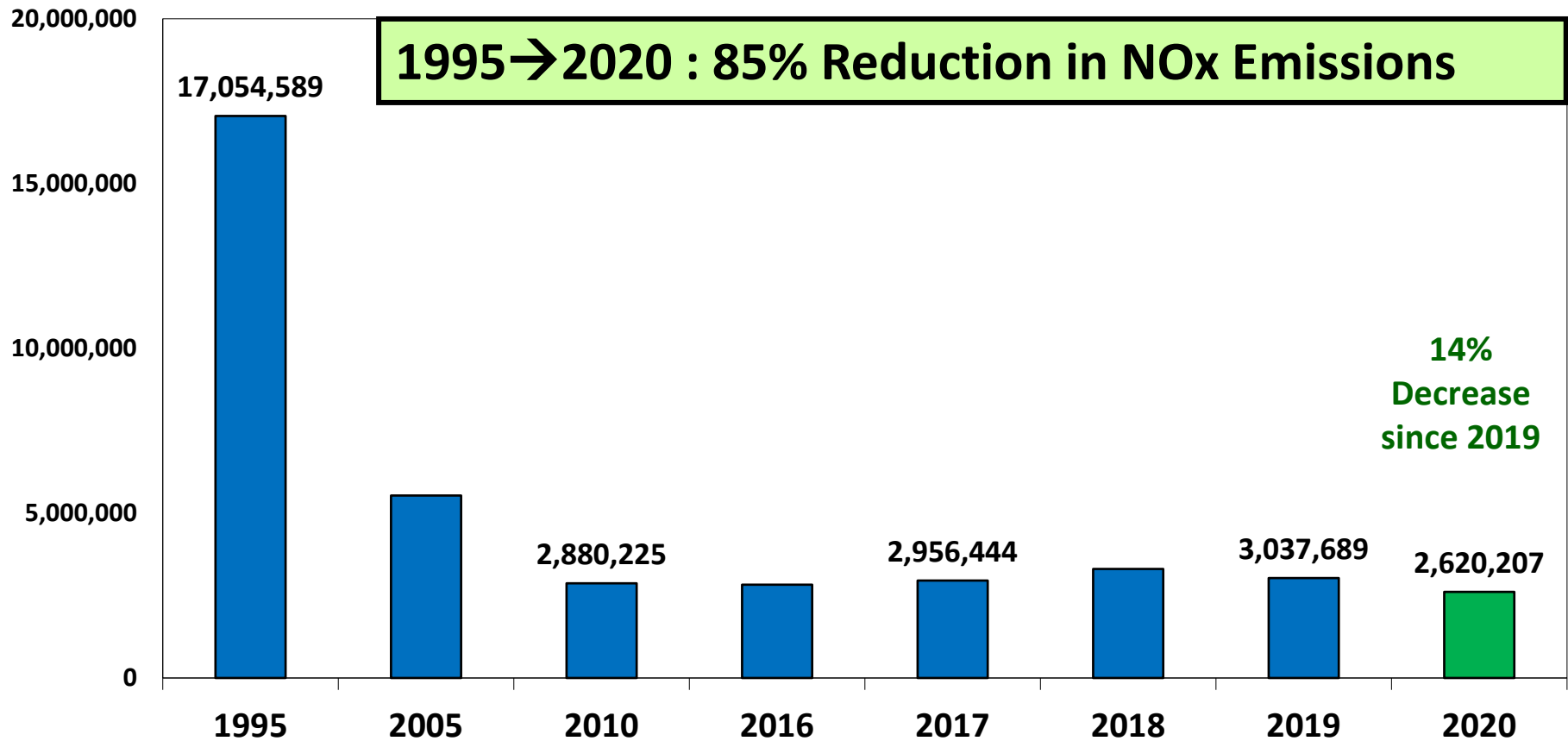
Volatile Organic Compounds (VOCs)- ozone precursors subject to other rules

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

Nitrogen Oxides (NOx) TCEQ Air Emissions Inventory for PCAC Plants

1995, 2005, 2010, 2016-2020

Pounds



Biggest change from 2019 was decrease at Chevron Pasadena Refinery:
Temporary Decrease in Operating Hours/Rates

Nitrogen Oxides (NOx)

2020 Changes

Increases

Sekisui (+6,143 lbs.)

- *Temporary:* High usage of temporary diesel engines in 2020
(15% Change)

Enterprise Products(+4,638 lbs.)

- Experienced an increase in 2020 due to increased boiler operations and flaring activities
(107% Change)

Nitrogen Oxides (NO_x)

2020 Changes

Decreases

Chevron Pasadena Refinery (-244,756 lbs.)

- *Temporary:* Decrease primarily due to reduced operating hours/rates (25% Change)

LyondellBasell Refinery (-155,332 lbs.)

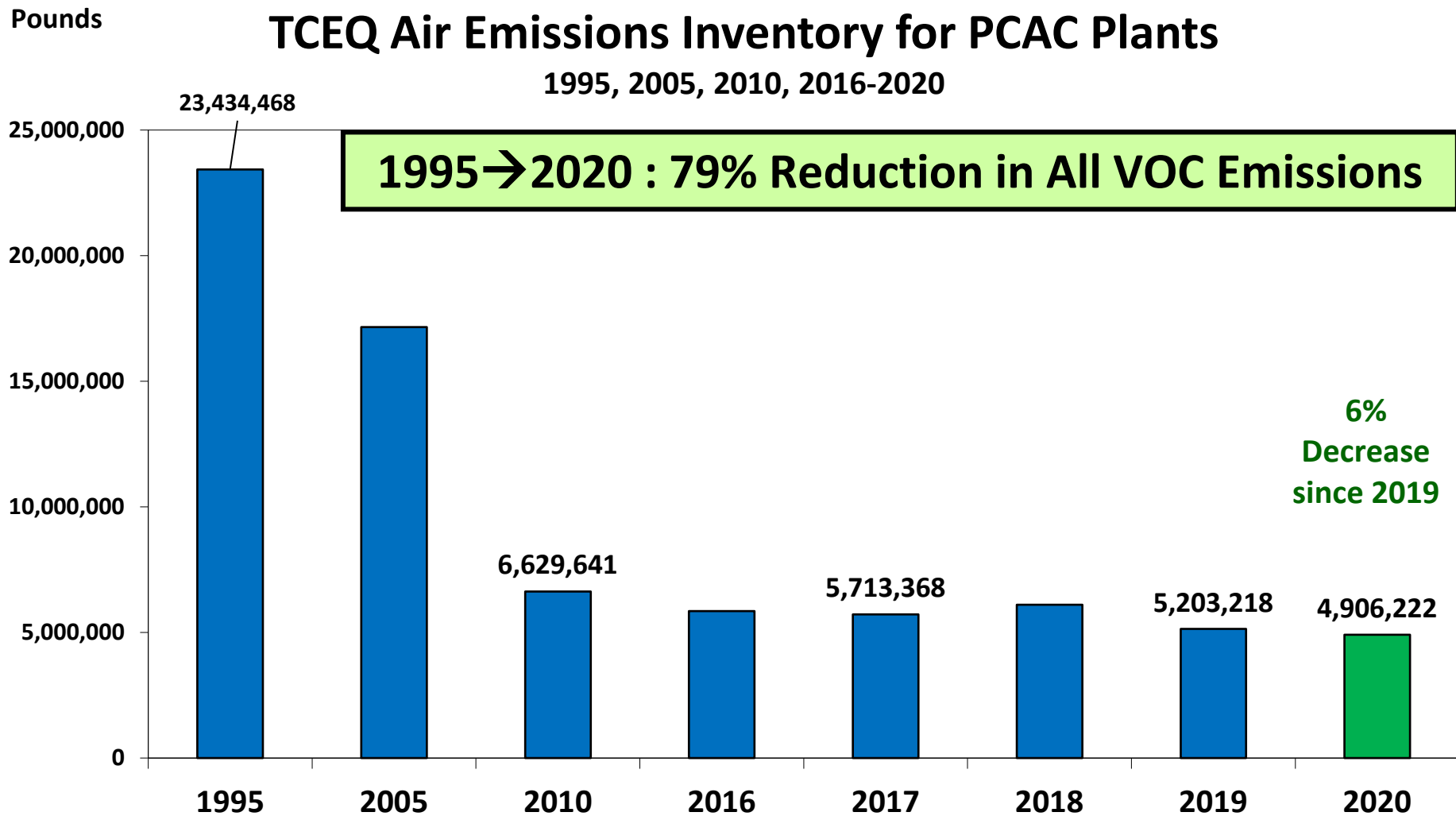
- Lower refinery rates and utilization of Fluid Catalytic Cracking Unit (FCCU) (10% Change)

Kinder Morgan Liquids Terminal (-8,262 lbs.)

- *Temporary:* Decreased customer demand so less use of Vapor Combustion Unit. (28% Change)

All Volatile Organic Compounds (VOCs) TCEQ Air Emissions Inventory for PCAC Plants

1995, 2005, 2010, 2016-2020



Biggest change from 2019 was decrease at Chevron Pasadena Refinery:

Reduction in fugitive VOC emissions based on LDAR measurements; improved emission estimation methods (sustainable); and reduced operating hours/rates (temporary)

All Volatile Organic Compounds (VOCs) 2020 Changes

Increases

Kinder Morgan Liquids Terminal (+125,490 lbs.)

- *Sustainable*: Discovery of unaccounted fugitive components (9% Change)

ITC (+28,234 lbs.)

- Expansion and start up of new facilities (44% Change)

Chevron Phillips (+22,783 lbs.)

- *Temporary*: Increased count of unmonitored Leak Detection and Repair (LDAR) connectors, which have a higher emission factor. (3% Change)

All Volatile Organic Compounds (VOCs) 2020 Changes

Decreases

Chevron Pasadena Refinery (-372,092 lbs.)

- reduction in fugitive VOC emissions based on LDAR measurements.
Sustainable: improved emission estimation methods.
Temporary: reduced operating hours/rates. (42% Change)

LyondellBasell Refinery (-92,959 lbs.)

- Lower refinery rates and tank thruputs (6% Change)

BASF (-13,323 lbs.)

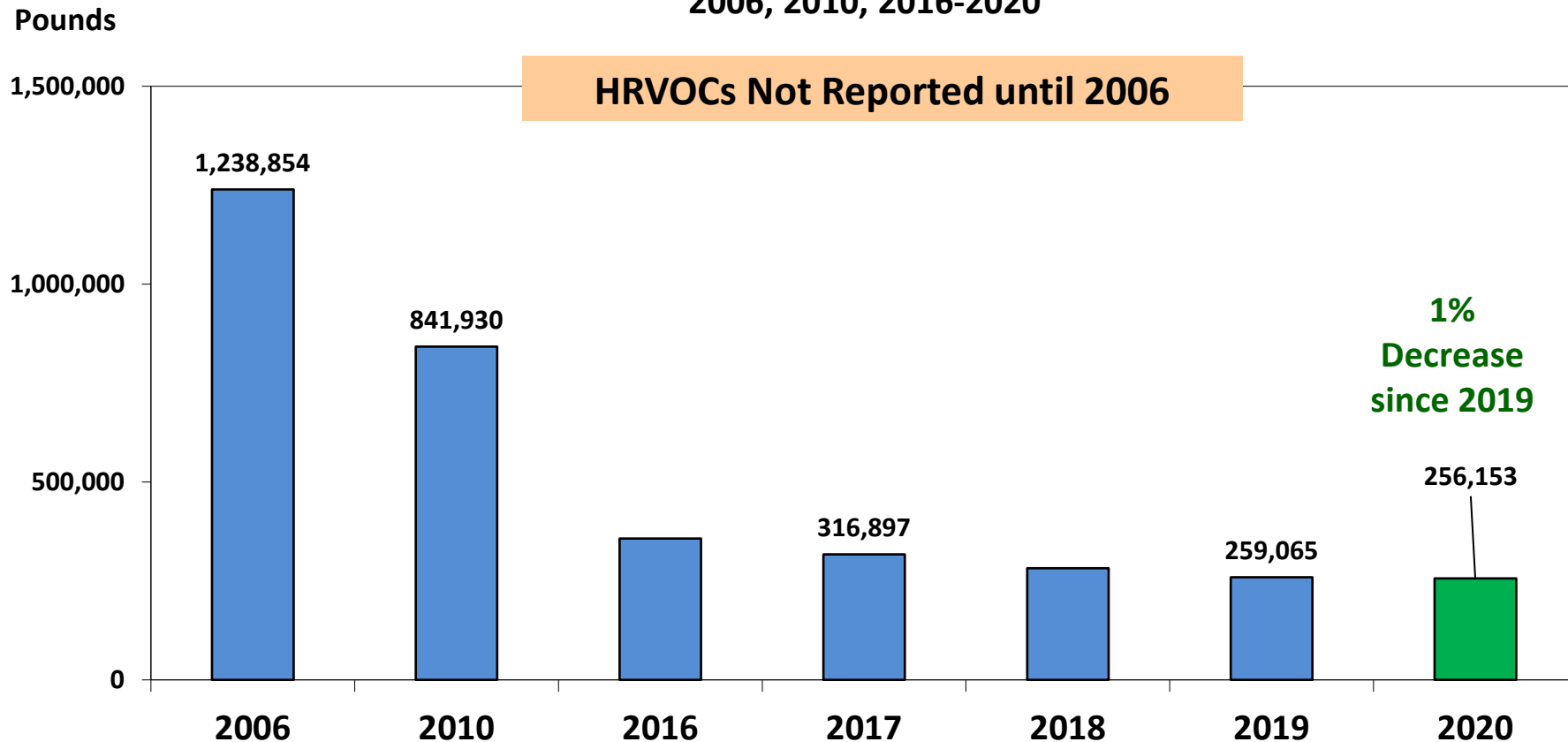
- *Temporary:* Less production (36% Change)

Highly Reactive Volatile Organic Compounds (HRVOCs)

(subset of VOCs)

TCEQ Air Emissions Inventory for PCAC Plants

2006, 2010, 2016-2020



2006 → 2020 : 79% Reduction in HRVOC Emissions

Biggest change from 2019 was increase at Enterprise Products:
Experienced an increase in 2020 due to increased flaring activities

Highly Reactive Volatile Organic Compounds (HRVOCs) (subset of VOCs) 2020 Changes

Increases

Enterprise Products (+7,284 lbs.)

- Experienced an increase in 2020 due to increased flaring activities (38% Change)

Chevron Pasadena Refinery (+2,840 lbs.)

- Increase primarily from estimated emissions of propylene from the flares (7% Change)

Highly Reactive Volatile Organic Compounds (HRVOCs) (subset of VOCs) 2020 Changes

Decreases

Chevron Phillips (-4,867 lbs.)

➤ (5% Change)

BASF (-2,372 lbs.)

➤ *Temporary: less production* (56% Change)

Albemarle (-2,220 lbs.)

➤ (6% Change)

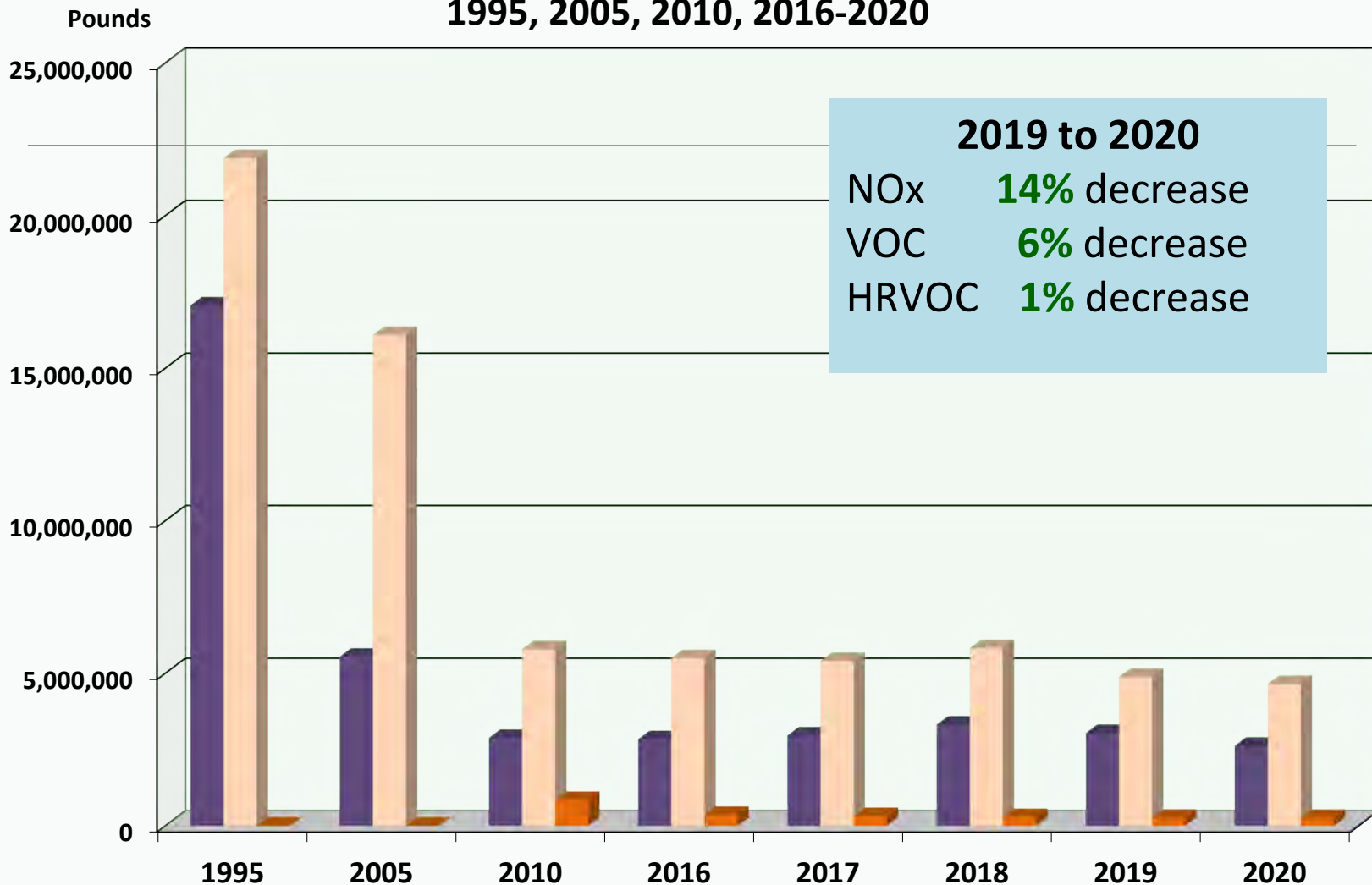
LyondellBasell Refinery (-2,153 lbs.)

➤ (5% Change)

Summary of Contributors to Ozone Formation

NO_x, VOCs (excluding HRVOCs) & HRVOCs

1995, 2005, 2010, 2016-2020



■ NO_x- Nitrogen Oxides

■ VOCs-Volatile Organic Compounds (ex HRVOCs)

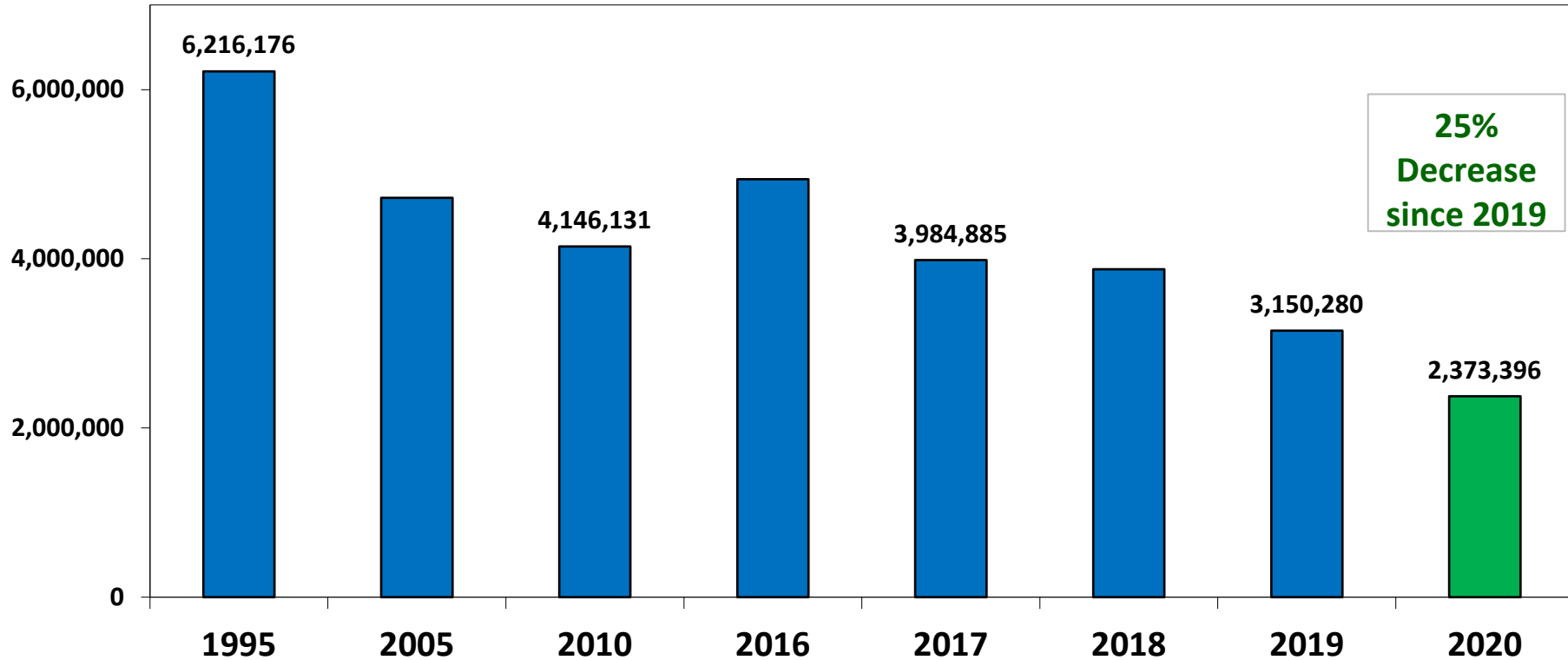
■ Highly Reactive VOCs

Sulfur Oxides (SOx)

TCEQ Air Emissions Inventory for PCAC Plants

1995, 2005, 2010, 2016-2020

Pounds



1995 → 2020: 62% Reduction in SOx Emissions

Biggest change from 2019 was decrease at LyondellBasell Refinery:
Lower refinery rates and fewer emission events in 2020

Sulfur Oxides (SOx)

2020 Changes

Increases

Chevron Pasadena Refinery (+60,812 lbs.)

- *Temporary:* Increase primarily from scheduled maintenance activities (6% Change)

PCI Nitrogen (+14,459 lbs.)

- *Temporary:* Increase in onstream time. (5% Change)

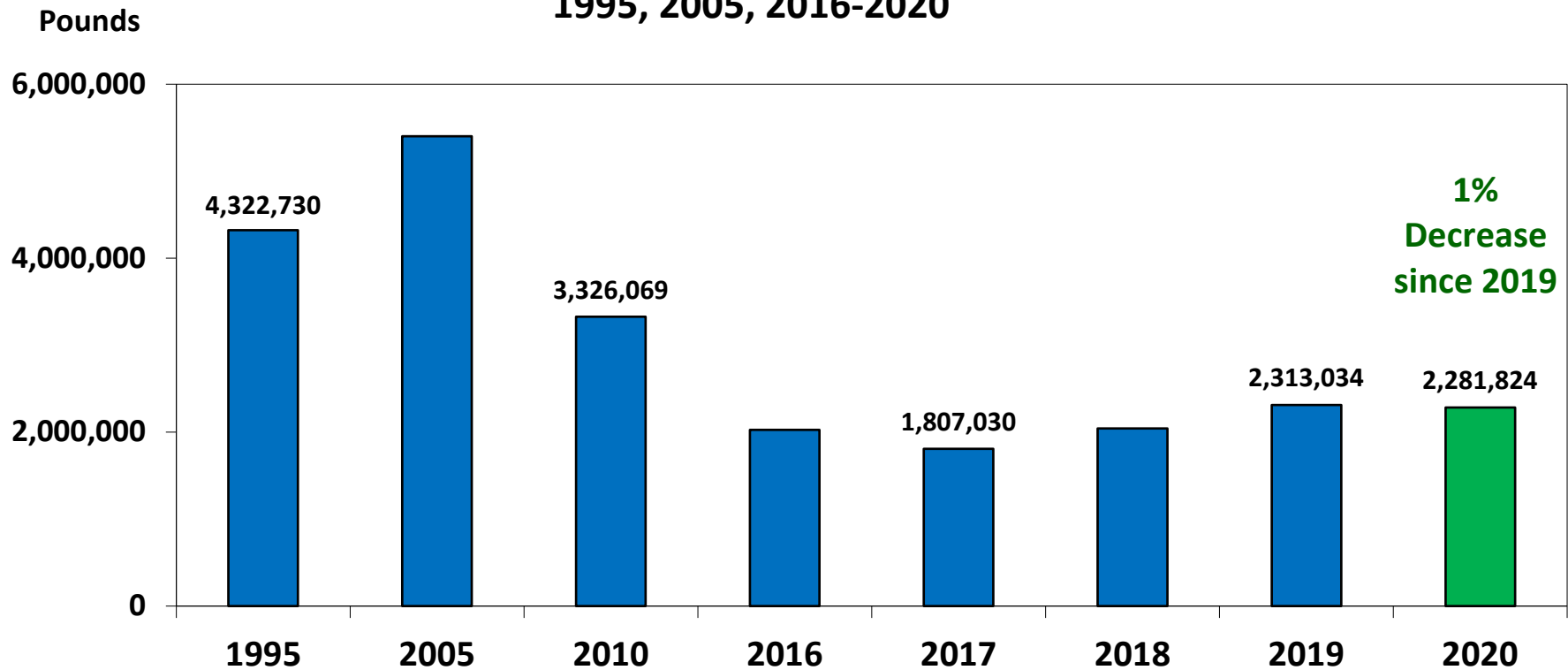
Decreases

LyondellBasell Refinery (-854,001 lbs.)

- Lower refinery rates and fewer emission events in 2020 (44% Change)

Carbon Monoxide (CO) TCEQ Air Emissions Inventory for PCAC Plants

1995, 2005, 2016-2020



1995→2020: 47% Reduction in CO Emissions

Biggest change from 2019 was increase at Chevron Pasadena Refinery:

Temporary: Increased use of natural gas in the flares to comply with refinery standard regulations as well as increased number of startups / shutdowns

Carbon Monoxide (CO) 2020 Changes

Increases

Chevron Pasadena Refinery (+37,773 lbs.)

- *Temporary:* Increased use of natural gas in the flares to comply with refinery standard regulations as well as increased number of startups/shutdowns (9% Change)

Albemarle (+5,800 lbs.)

- *Temporary:* Has variability from year to year (7% Change)

Carbon Monoxide (CO) 2020 Changes

Decreases

LyondellBasell Refinery (-33,981 lbs.)

- Lower refinery rates (5% Change)

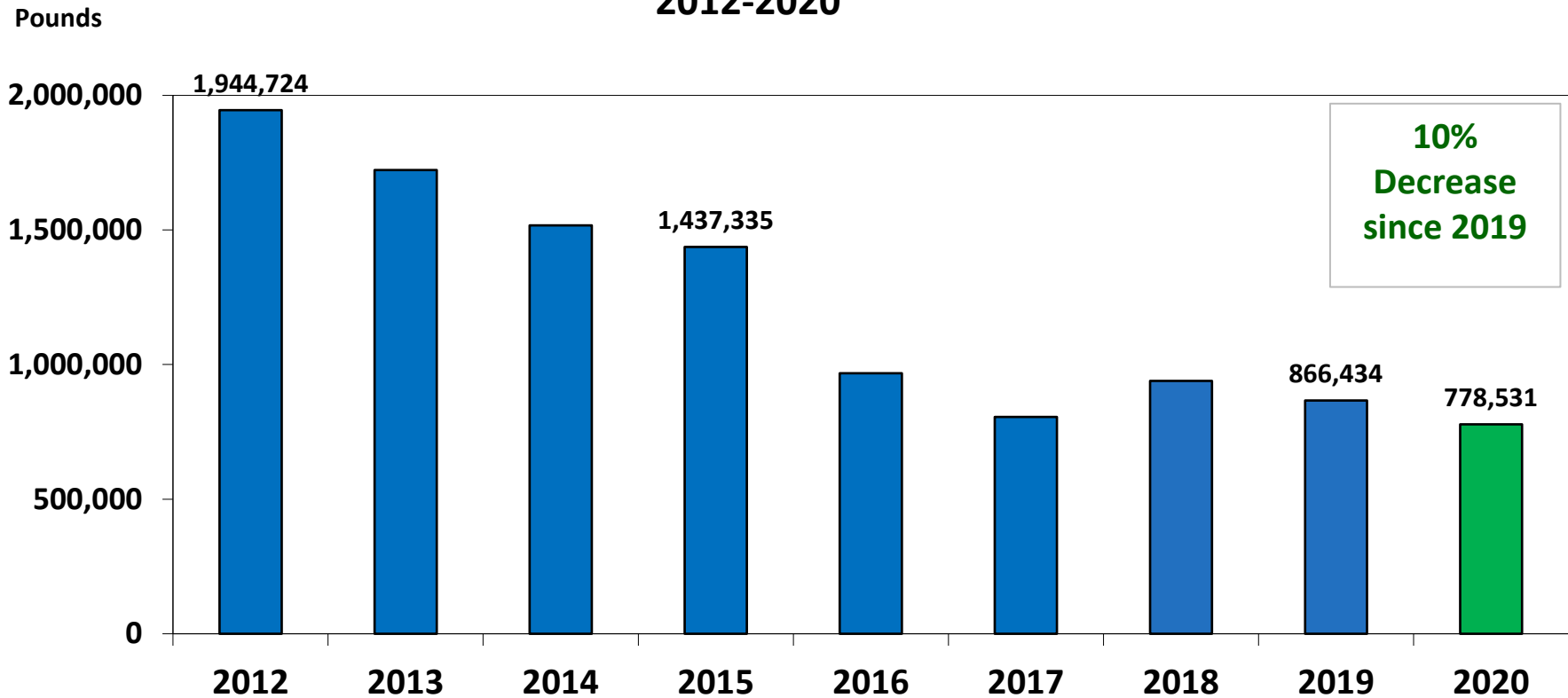
BASF (-18,802 lbs.)

- *Temporary:* Less production (18% Change)

Chevron Phillips (-17,103 lbs.)

- *Calculation Method Change:* Decrease in CO from five Catalyst Activators due to new emission factors from regulatory required tune-ups to the burners. (2% Change)

Total Suspended Particulates (TSP) TCEQ Air Emissions Inventory for PCAC Plants 2012-2020



2012 → 2020 : 60% Reduction in TSP Emissions

Biggest change from 2019 was decrease at LyondellBasell Refinery:
Lower refinery rates and utilization of Fluid Catalytic Cracking Unit (FCCU)

Total Suspended Particulates (TSP) 2020 Changes

Increases

Kinder Morgan Liquids Terminal (+4,947 lbs.)

- *Temporary:* Coating and blasting activities increased in RY2020. (260% Change)

Decreases

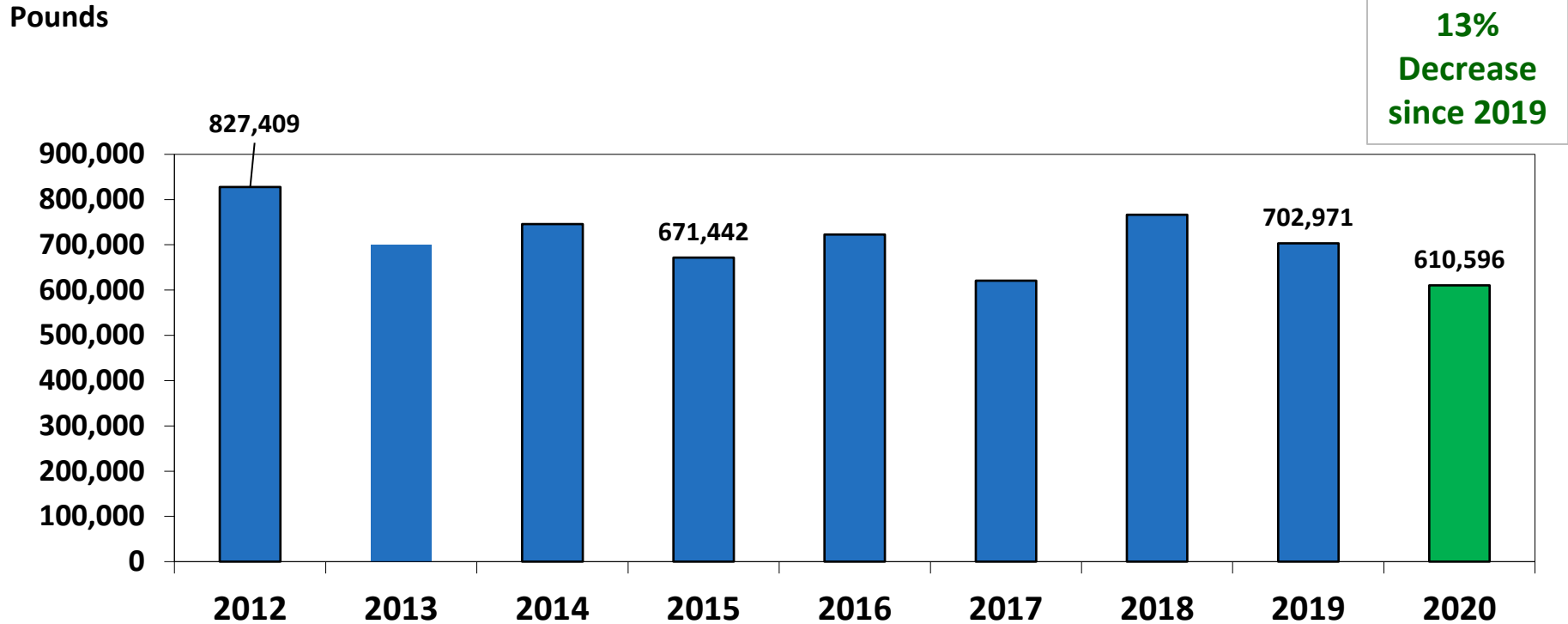
LyondellBasell Refinery (-78,909 lbs.)

- Lower refinery rates and utilization of Fluid Catalytic Cracking Unit (FCCU) (21% Change)

PCI Nitrogen (-8,169 lbs.)

- *Temporary:* Reduction due to increase in efficiency of baghouse and overall production. (7% Change)

Total Suspended Particulates Reported as PM 2.5 TCEQ Air Emissions Inventory for PCAC Plants 2012-2020



2012→2020: 13% Reduction in PM 2.5 Emissions

Biggest change from 2019 was decrease at LyondellBasell Refinery:
Lower refinery rates and utilization of Fluid Catalytic Cracking Unit (FCCU)

PM 2.5 Portion of TSP

2020 Changes

Increase

Enterprise Products (+1,992 lbs.)

- In 2019 the PM2.5 were not separated out from the PM Total

Decreases

LyondellBasell Refinery (-78,527 lbs.)

- Lower refinery rates and utilization of Fluid Catalytic Cracking Unit (FCCU) (22% Change)

Albemarle (-5,500 lbs.)

- Variability on the load on the boilers and other equipment (25% Change)

PCI Nitrogen (-5,090 lbs.)

- Reduction due to increase in efficiency of baghouse and overall production. (12% Change)

Questions?

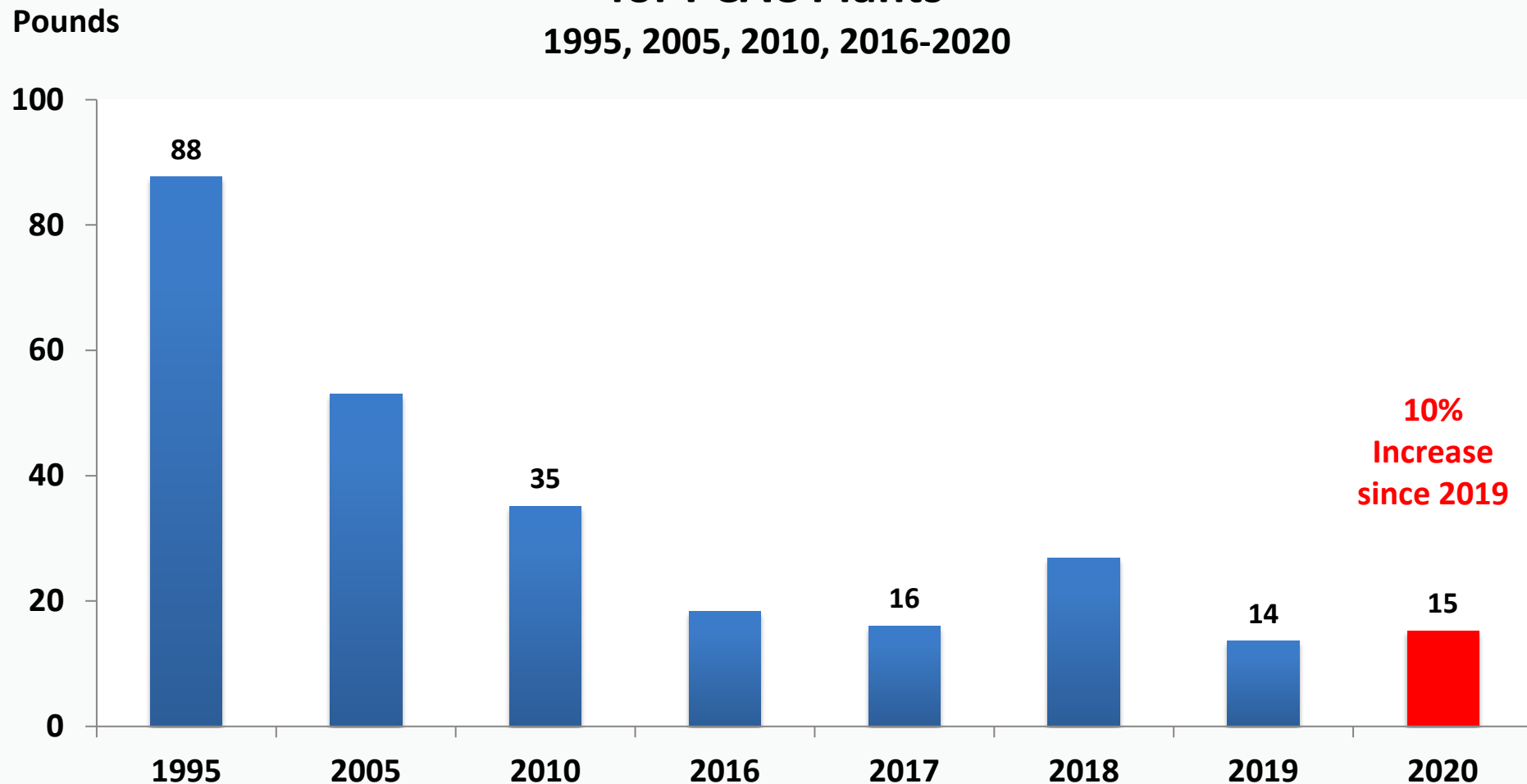
EPA Toxics Release Inventory (TRI) Trends for PCAC Plants

Change in PCAC Plants EPA Toxic Release Inventory

	2019-2020	2016-2020
Total PCAC TRI Releases to air	- 5%	- 21%
From fugitive sources	+ 1%	- 34%
From point sources	- 8%	- 10%

Pounds EPA TRI per Million Pounds of Product for PCAC Plants

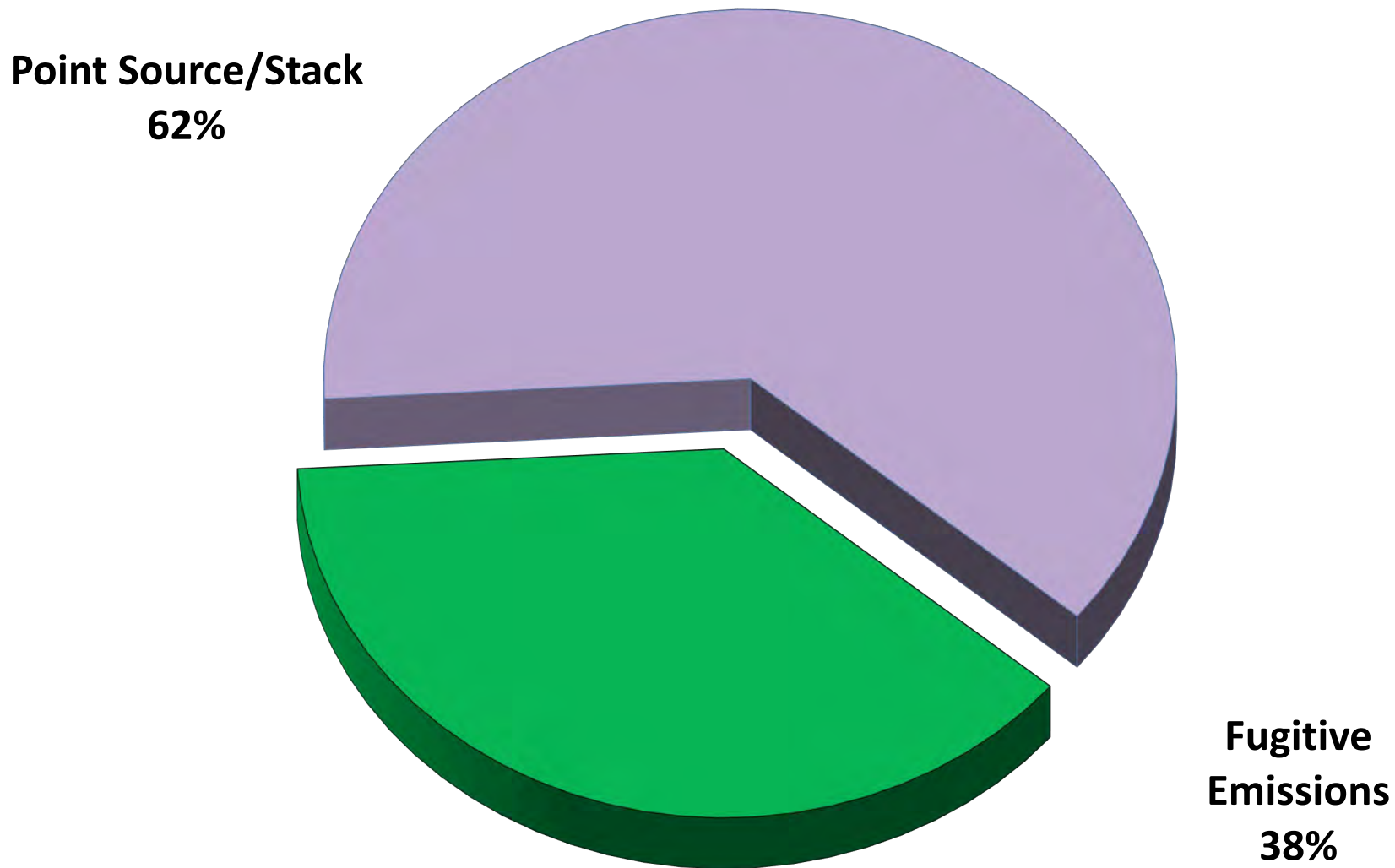
1995, 2005, 2010, 2016-2020



1995→2020: 83% Reduction in Pounds of TRI Releases per Million Pounds of Product

Since 1995, PCAC plants have produced 47-57 billion pounds of product each year.

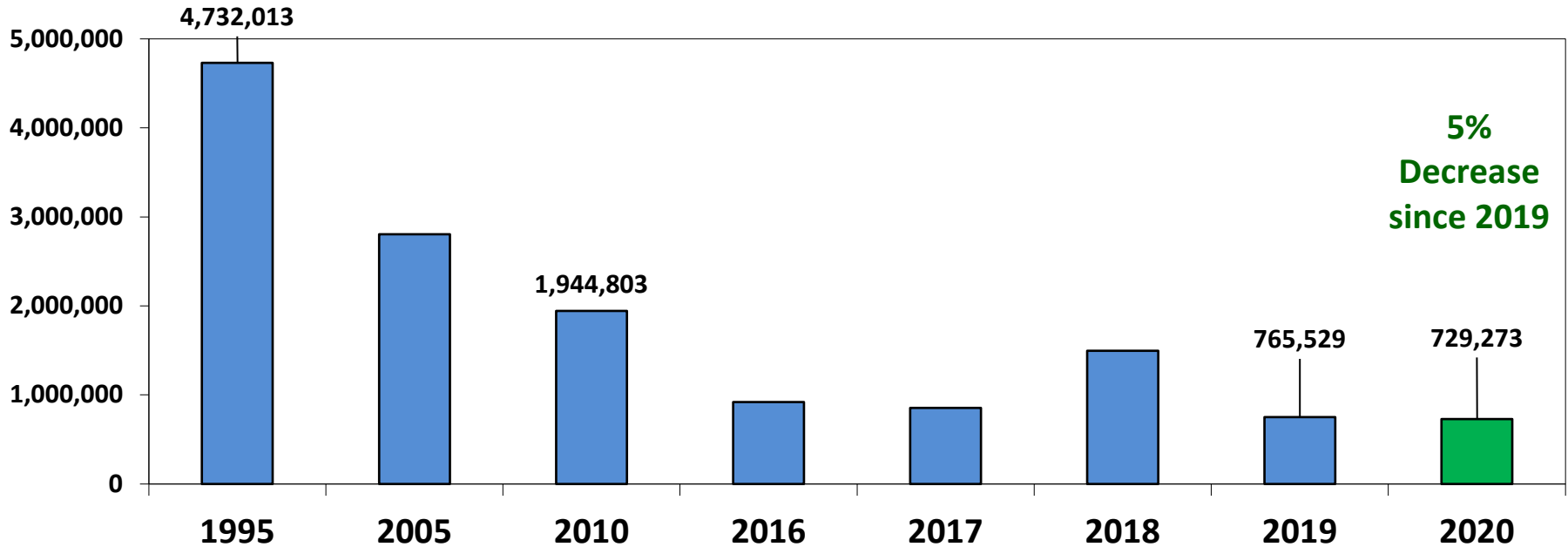
2020 EPA TRI Releases by Source for PCAC Plants



EPA TRI Total Air Releases for PCAC Plants

1995, 2005, 2010, 2016-2020

Pounds



1995 → 2020 : 85% Reduction in TRI Total Air Releases

Biggest change from 2019 was decrease at LyondellBasell Refinery:
Lower utilization of Fluid Catalytic Cracking Unit (FCCU) and fewer emission events in 2020

Total TRI Air Releases

2020 Changes

Increase

Chevron Pasadena Refinery (+17,114 lbs.)

- **Fugitive emissions:** *Temporary:* Increased based on LDAR measurements
- **Point Source:** Increase due to estimated emissions of propylene from the flares
(40% Change)

Albemarle (+6,000 lbs.)

- **Point Source:** *Temporary* - Variability due to customer demand.
(9% Change)

Total TRI Air Releases

2020 Changes

Decreases

LyondellBasell Refinery (-45,553 lbs.)

- **Fugitive:** Lower utilization of Fluid Catalytic Cracking Unit (FCCU) and fewer emission events in 2020. (19% Change)

Air Products (-5,613 lbs.)

- **Point Source:** 2019 included emissions from Jan-Sept from a boiler which was sold in Oct 2019. (53% Change)

Comparison With Other CACs 2010 – 2019

	BAYCAP (26 plants)	Deer Park CAC (14 plants)	La Porte CAC (47 Reports)	Pasadena CAC (18 plants)
TRI Air	- 25%	- 32%	- 24%	- 63%
NOx	- 4%	- 14%	- 4%	+ 5%
VOCs	- 21%	- 28%	0%	- 24%

2019 Texas and Harris County Comparisons

	Number of Facilities reporting EI in 2019	VOCs	NOx
Texas	2024	178,000,000 lbs.	480,000,000 lbs.
Harris County	246	32,000,000 lbs.	31,000,000 lbs.
PCAC	17	5,100,000 lbs.	3,000,000 lbs.

PCAC portion of Emissions Inventory

	VOCs	NOx
Texas	3%	0.6%
Harris County	16%	10%

In Summary 2020

All pollutants down 2019-2020

All pollutants down 2016-2020

Main change this past year was less production, operating hours/rates, customer demand.

Questions?