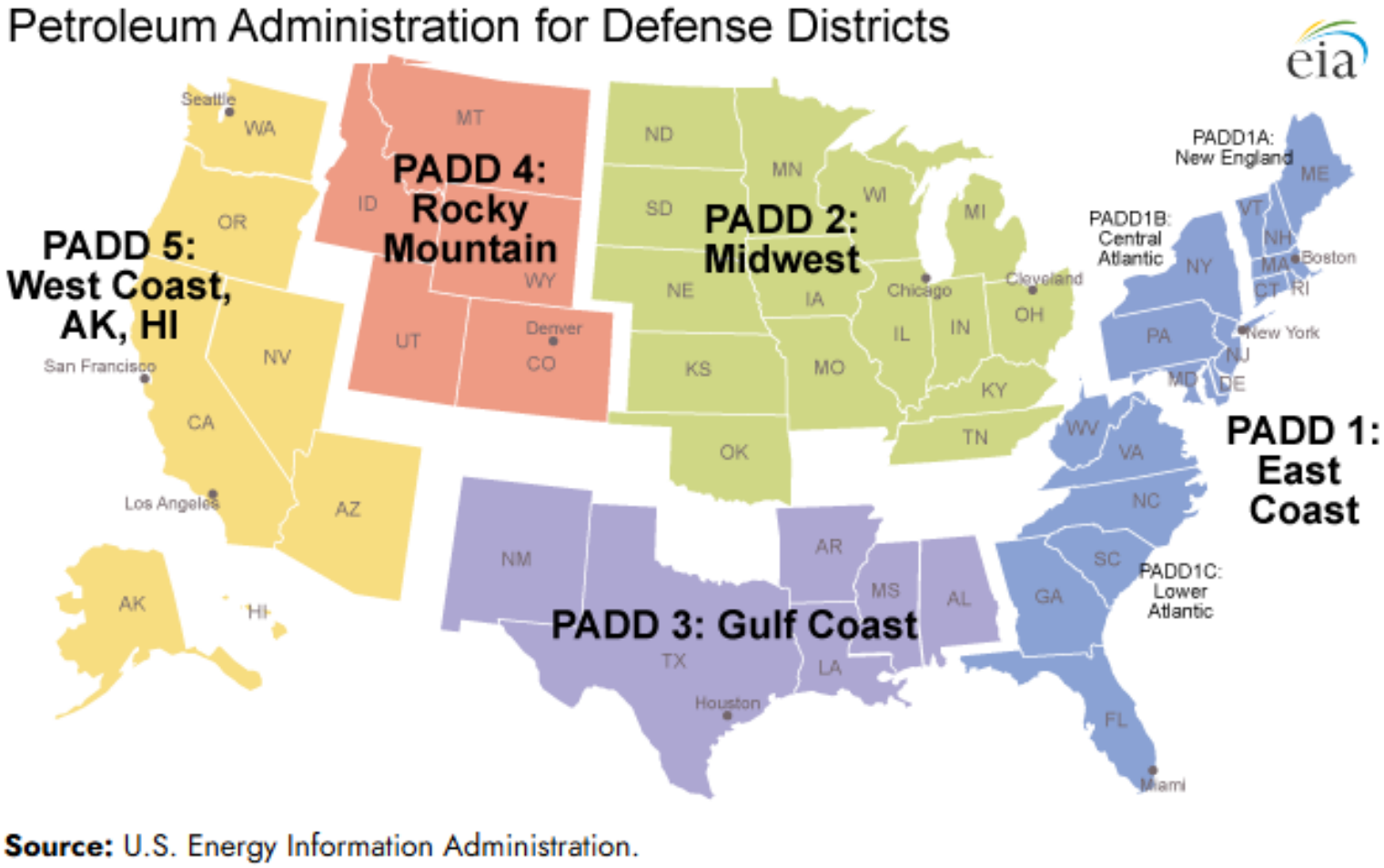
Protecting US Refining: Challenges and Opportunities

Glossary

- PADD: Petroleum Administration for Defense District (5 PADDs make up the US). See map on next slide.
- MMb/d or Mb/d: Million barrels per day
- Kb/d: thousand barrels per day
- CDU: crude distillation unit. Used to express refinery capacity net additions
- API gravity: American Petroleum Institute measure of specific gravity of crude oil or condensate in degrees. An arbitrary scale expressing the gravity or density of liquid petroleum products.
- Sulfur: A yellowish nonmetallic element, sometimes known as "brimstone." It is present at various levels of concentration in many fossil fuels whose combustion releases sulfur compounds that are considered harmful to the environment. Some of the most used fossil fuels are categorized according to their sulfur content, with lower sulfur fuels usually selling at a higher price.
- Crude grade quality definitions:
  - Light Sour: API > 34; Sulfur > 0.6%
  - Light Sweet: API > 34; Sulfur < 0.6%
  - Medium Sour: 25 < API < 34; Sulfur > 0.6%
  - Medium Sweet: 25 < API < 34; Sulfur < 0.6%
  - Heavy Sour: API < 25; Sulfur > 0.6%
  - Heavy Sweet: API < 25; Sulfur < 0.6%

Source: EIA

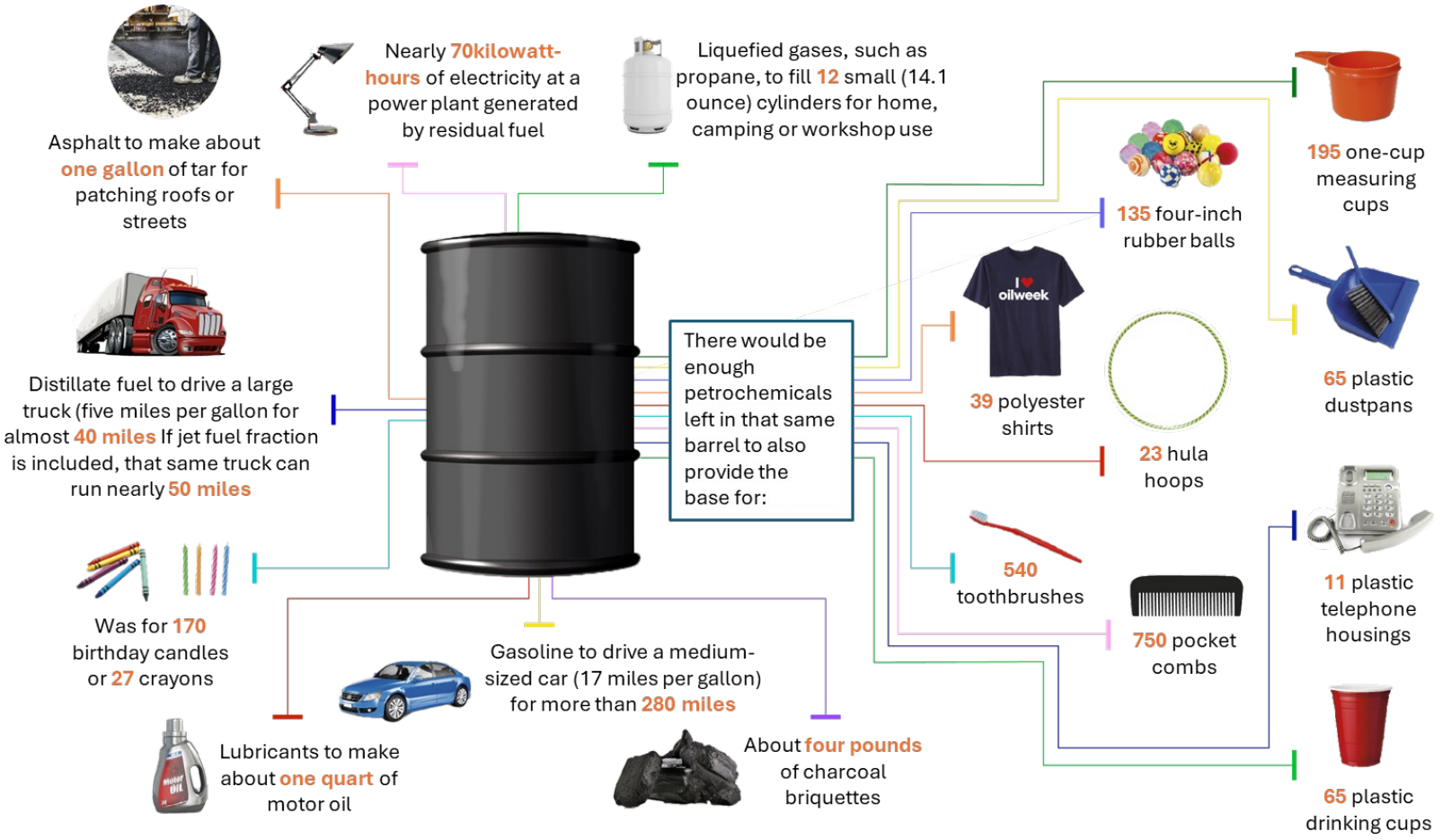
EIA US PADD Map Explained



Source: U.S. Energy Information Administration.

Refiners Manufacture Crude Into Usable Products

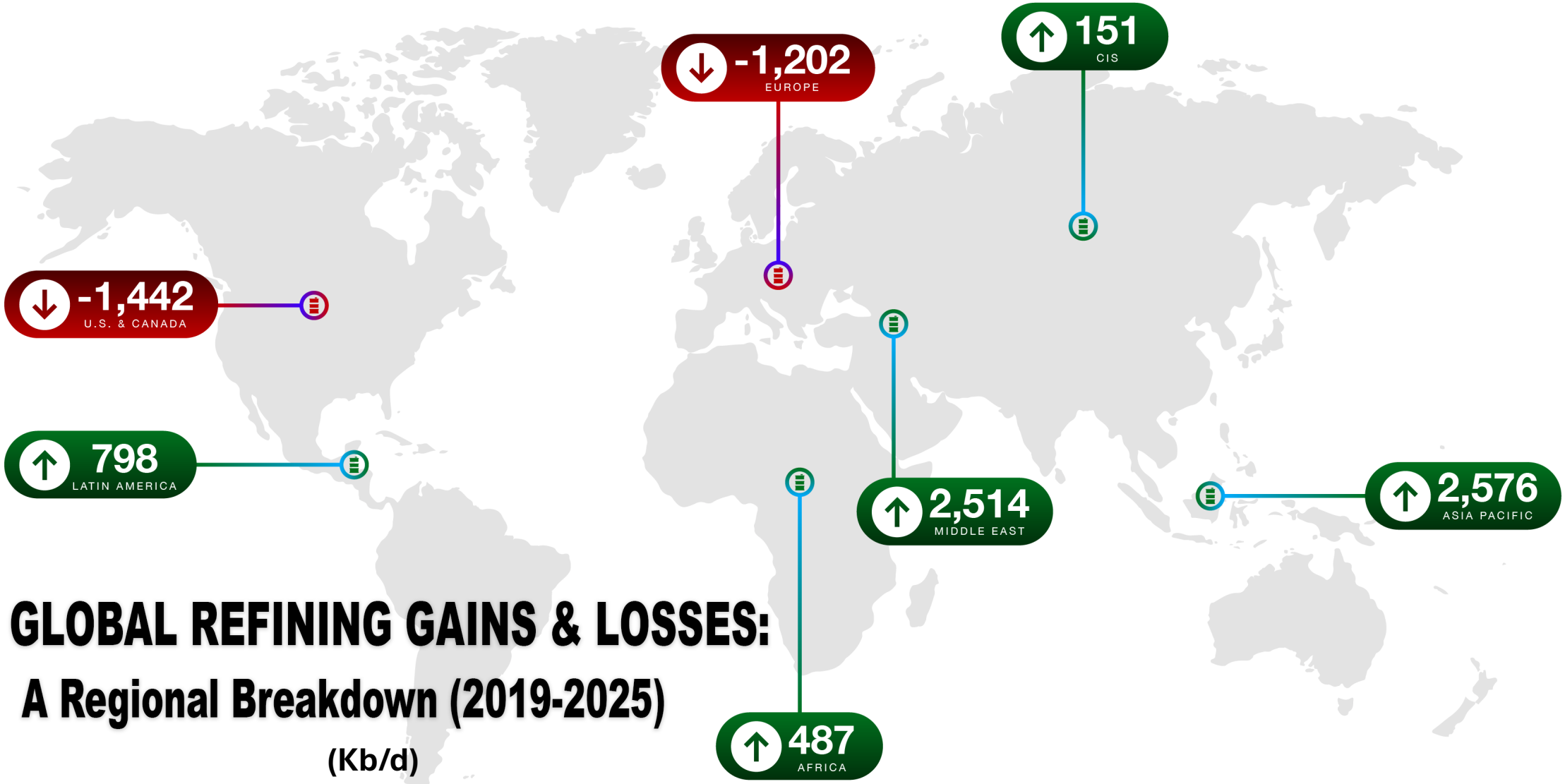
Crude is worthless unless it is manufactured into fuels and chemicals that make everything from tires to cell phones to medicine.



https://www.visualcapitalist.com/can-made-one-barrel-oil/

America's Energy Manufacturers – Refiners – are at Risk

- President Trump's National Energy Emergency Executive Order (EO) accurately states declining domestic & regionally diverse refining capacity is a national security and economic risk.
- While capacity expansions at larger plants in the Gulf somewhat offset historic closures, U.S. refining capacity is still in longer term decline.
- However, refining capacity is expanding abroad.
- The four primary factors behind declining domestic refining:
  - Declining long term demand projections.
  - Lack of economic **crude access** to the **types of oil** domestic capacity was built to process.
  - **Infrastructure** barriers that prevent domestic crudes from being moved to the coasts.
  - **Costly overregulation at the state and federal level.**
- Without addressing these challenges, the U.S. may become energy independent in terms of **crude production,** but **lose its independence** in relation to **fuels and finished petroleum products**.



GLOBAL REFINING GAINS & LOSSES:

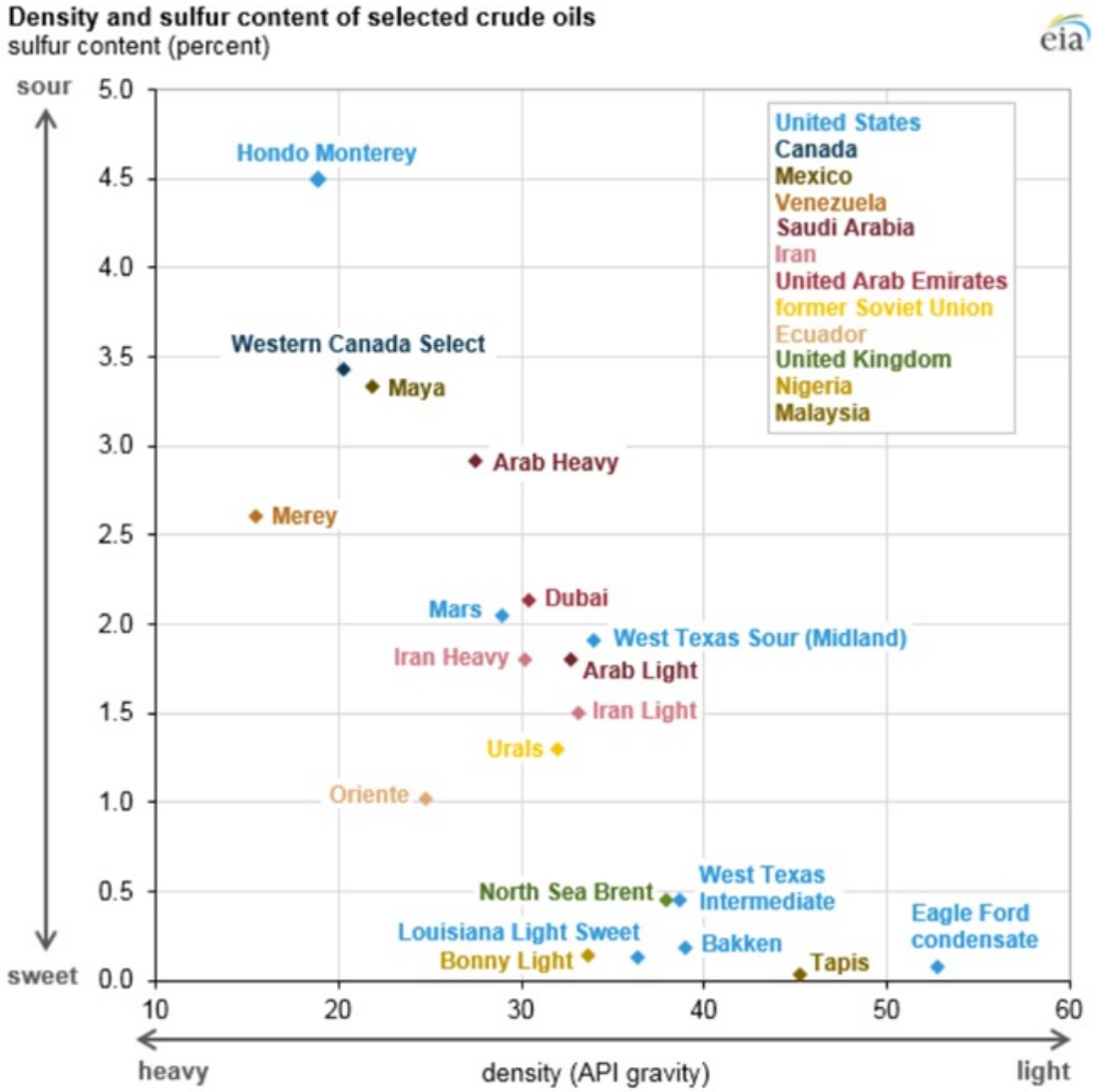
A Regional Breakdown (2019-2025)

(Kb/d)

Crude Access: Not All Crude Is Created Equal

- Different types of crude oil have different consistencies or densities.
  - Generally separated into “light,” “medium” and “heavy” and measured by API gravity.

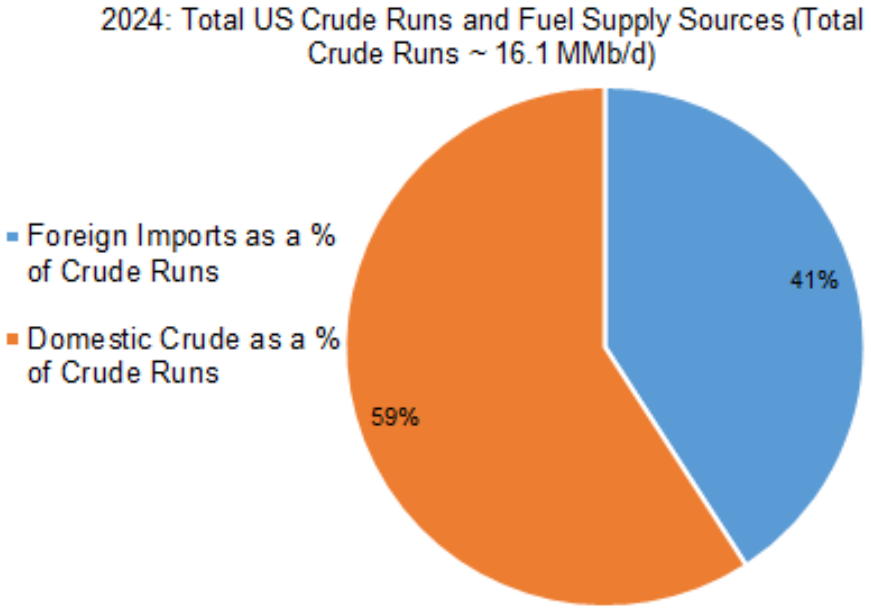
- Refineries are built with a certain type of crude or mix of crudes in mind and run economically when paired with what they were designed to process.



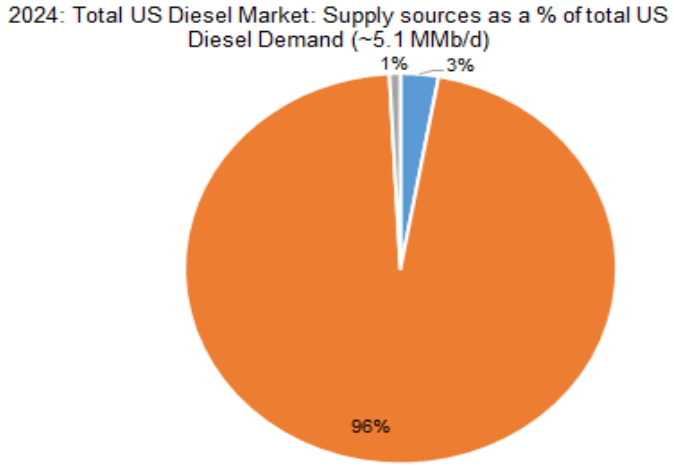
Crude Access: US Refiners Need “Heavy” Crude

- Prior to the shale revolution, refiners retooled their operations to process a certain percentage of “heavy” crude.
- The shale revolution vaulted America to the world’s top crude producer, but shale oil is “light” crude.
- Domestic refiners did increase their use of this “light” crude significantly, but given their configurations, have “maxed out” their ability to process more.
- As a result of refinery configurations, lacking pipeline infrastructure and other regulations, increased domestic crude production is essentially “export” oil.
- **All PADDs other than PADD 3 (Gulf Coast) are reliant on heavy crude imports.**

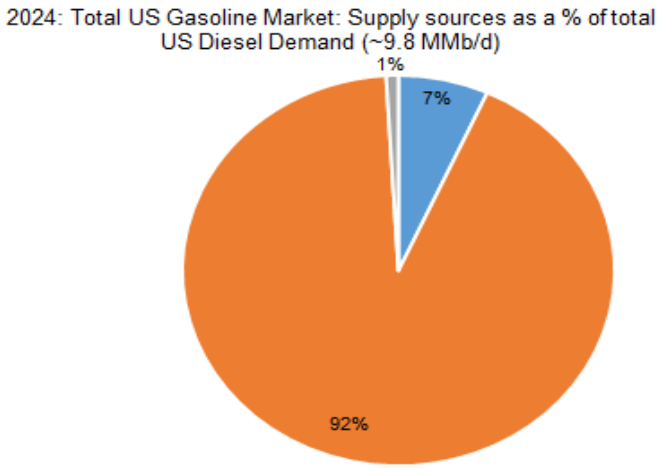
Total US Market Balances: 2024



Crude



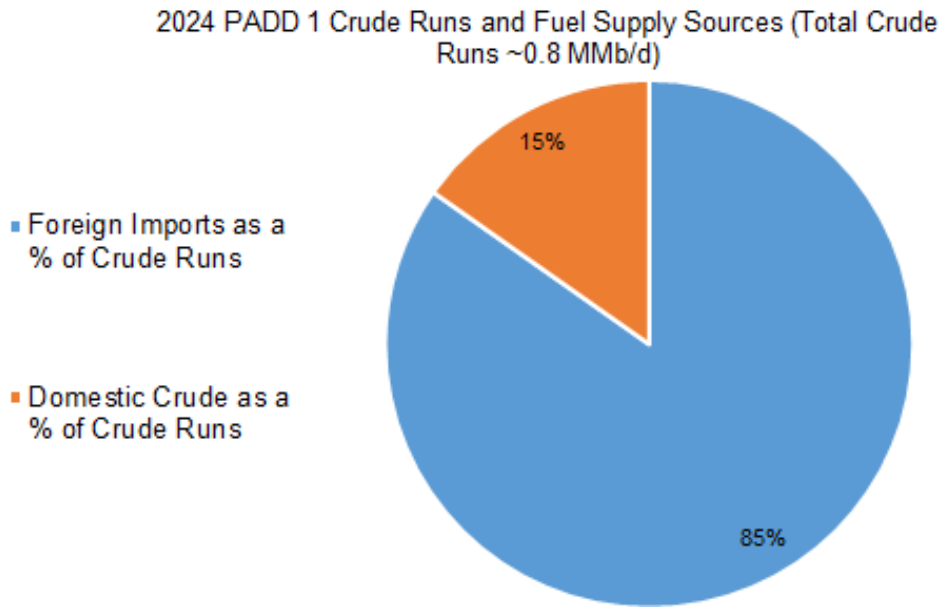
Diesel



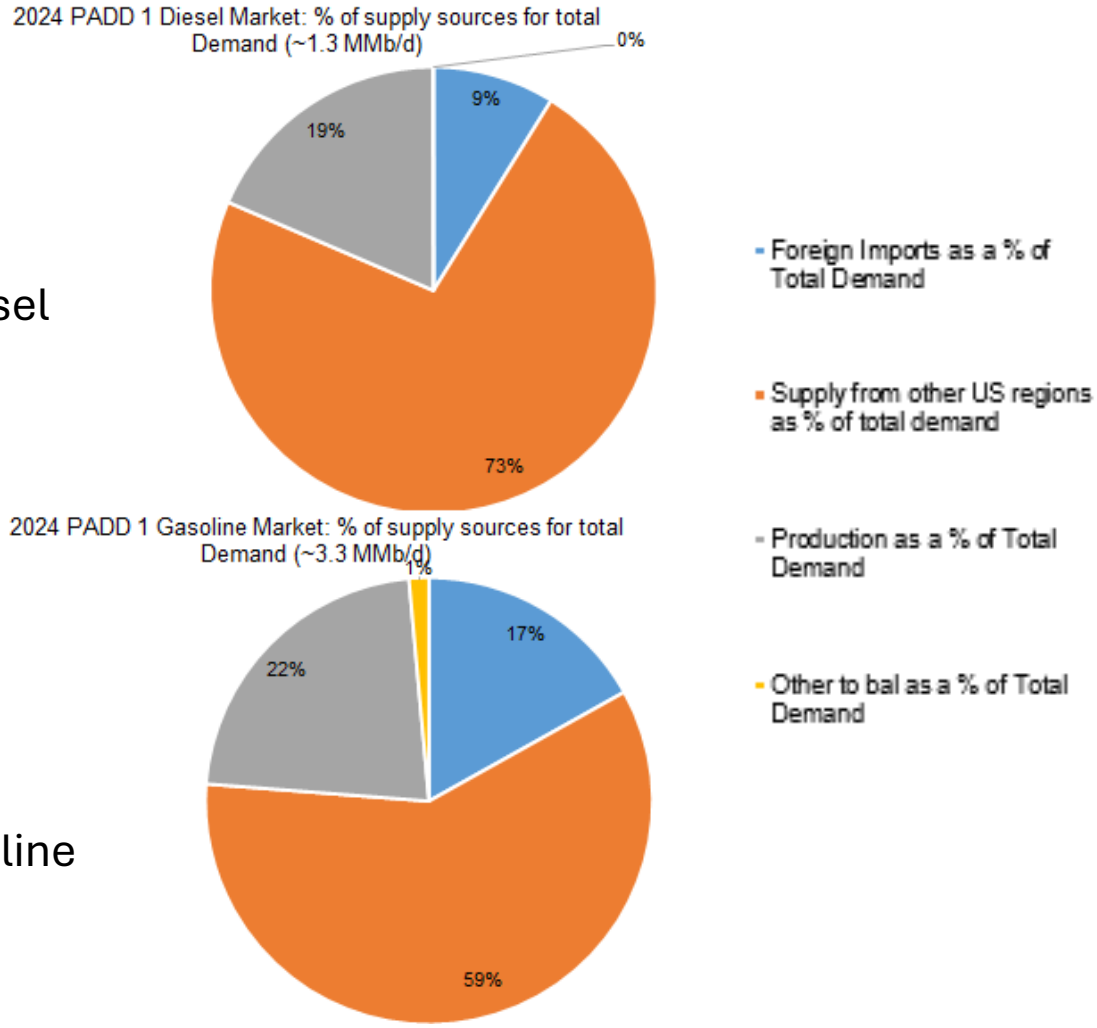
Gasoline

Source: EIA

PADD 1 Market Balances: 2024



Crude



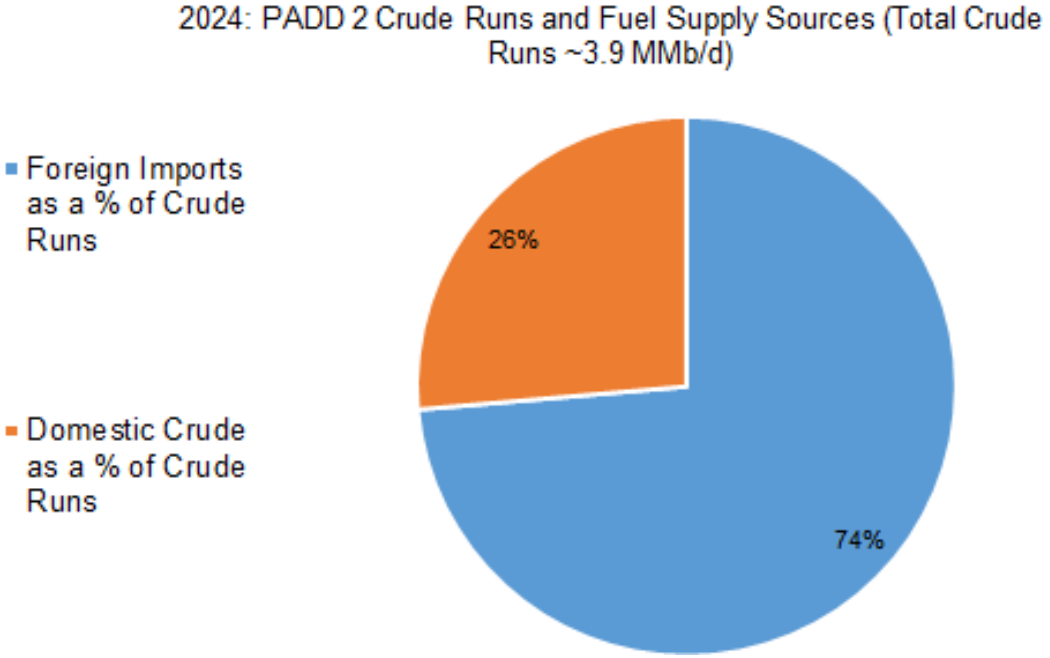
Diesel

Gasoline

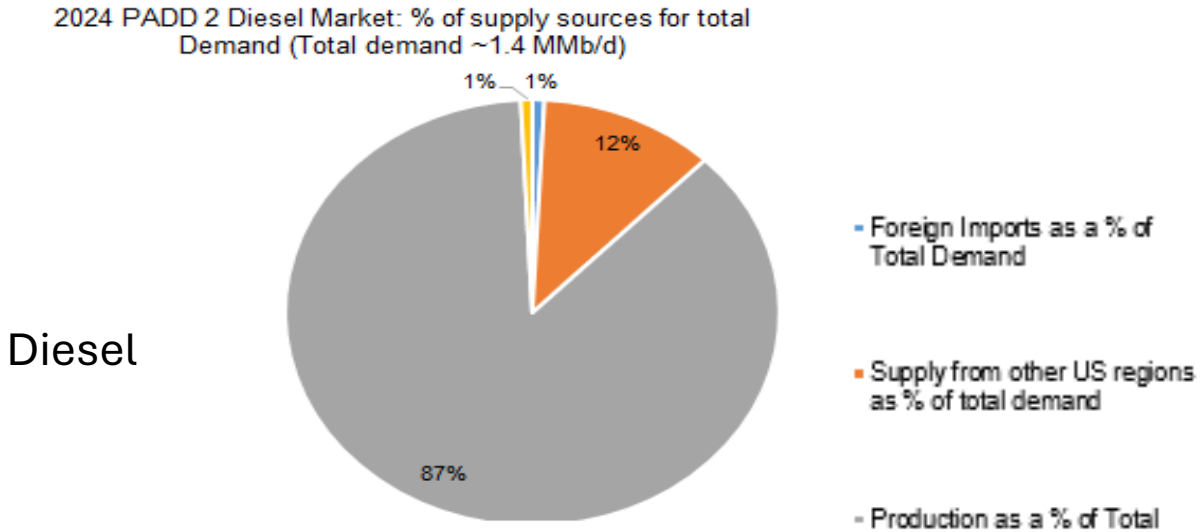
Total diesel, gasoline and crude demand each defined as domestic consumption plus exports

Source: EIA

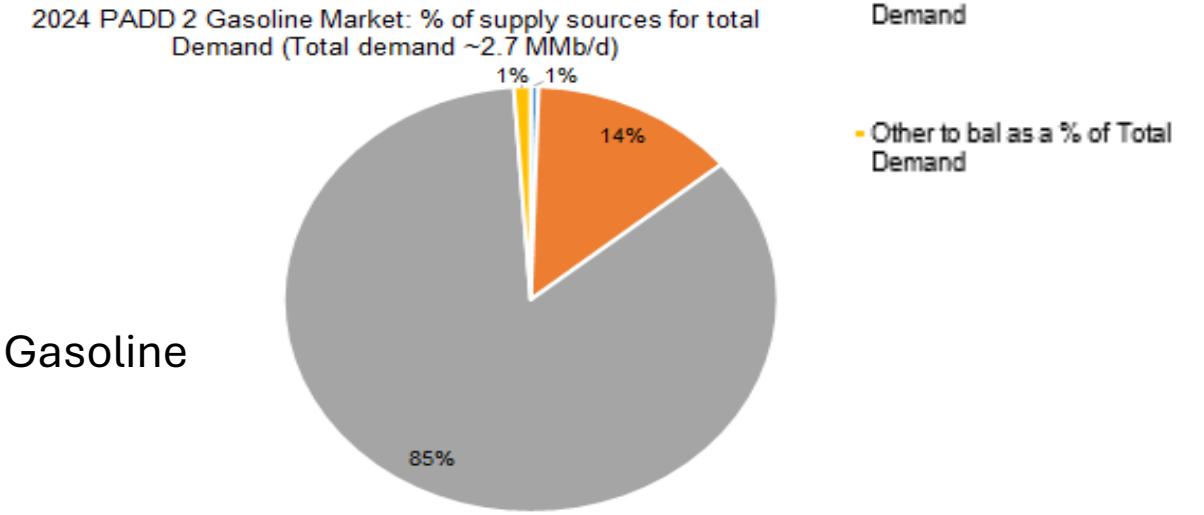
PADD 2 Market Balances: 2024



Crude



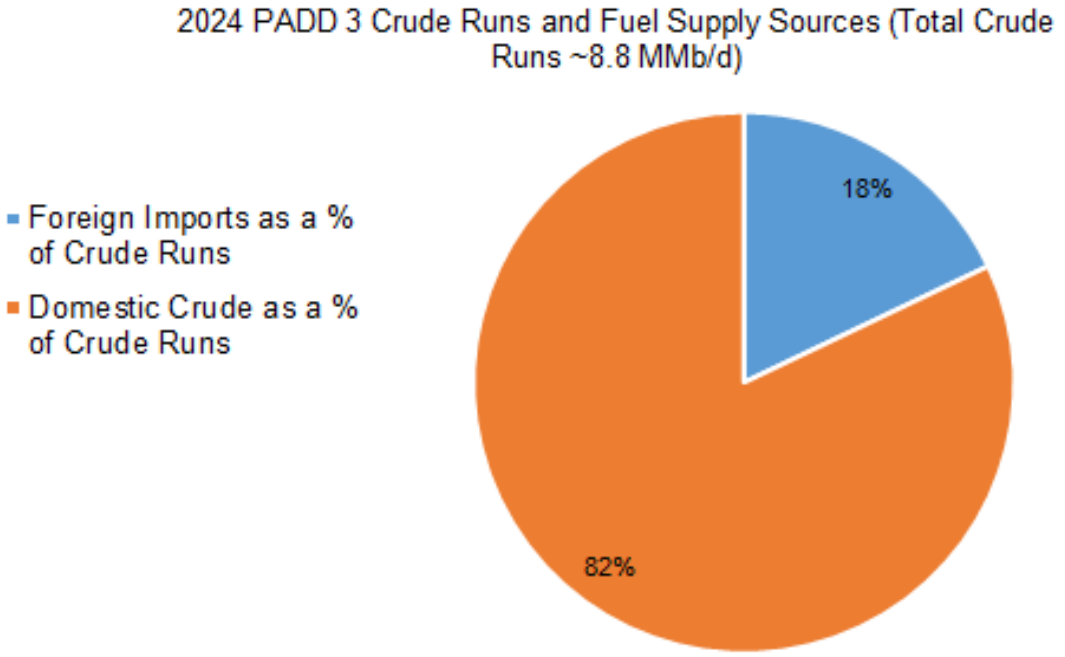
Diesel



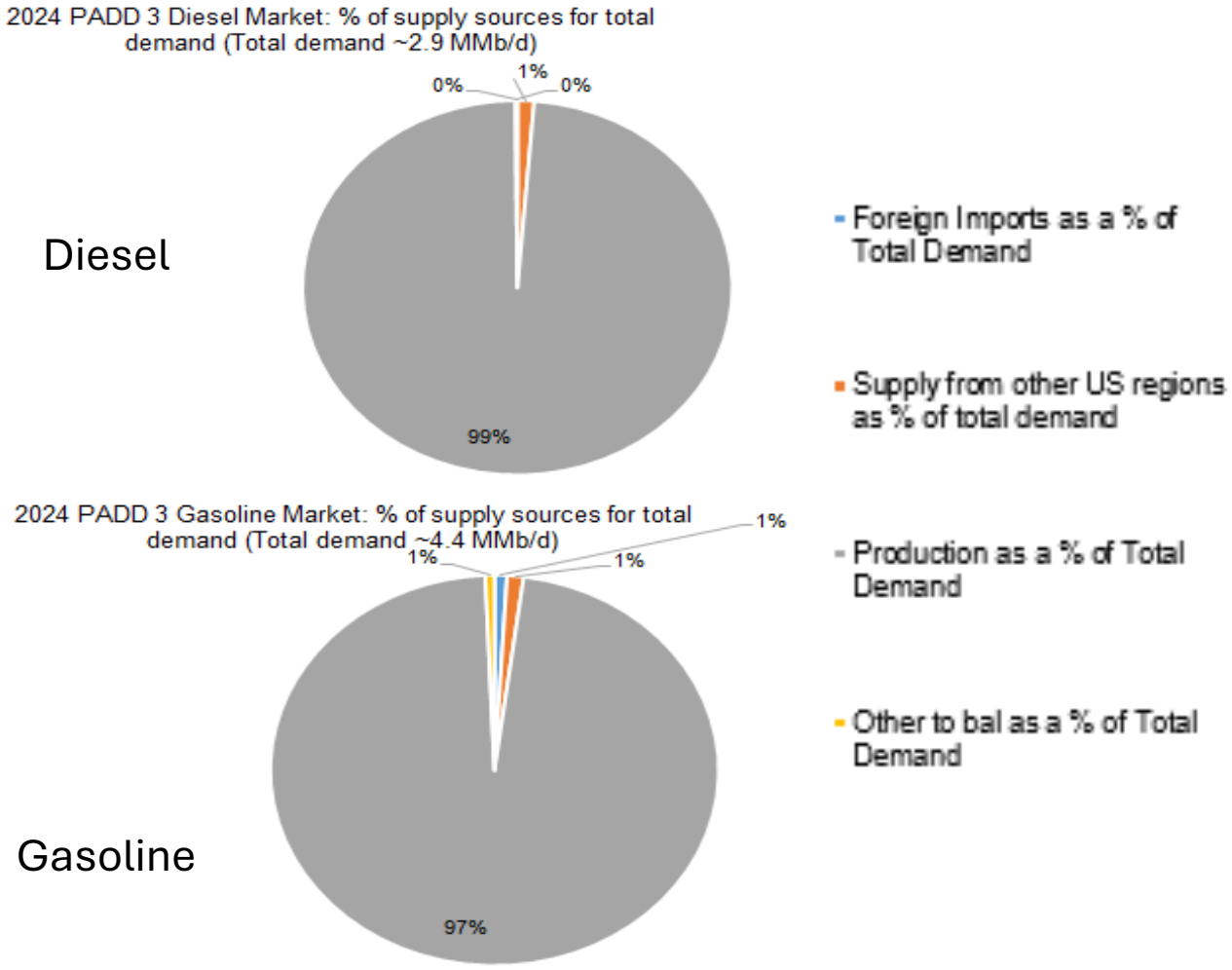
Gasoline

Source: EIA

PADD 3 Market Balances: 2024



Crude

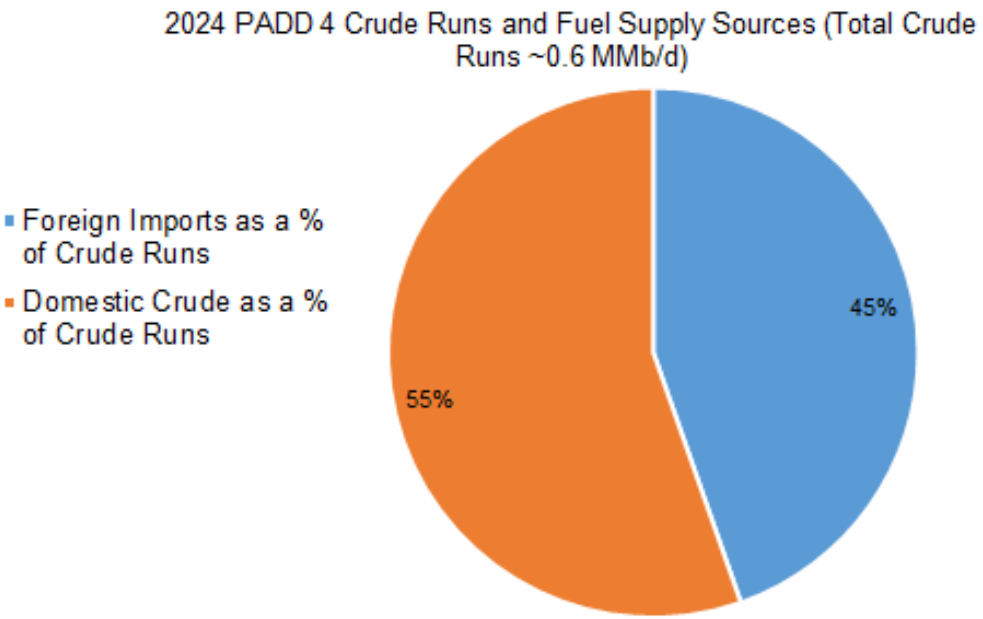


Diesel

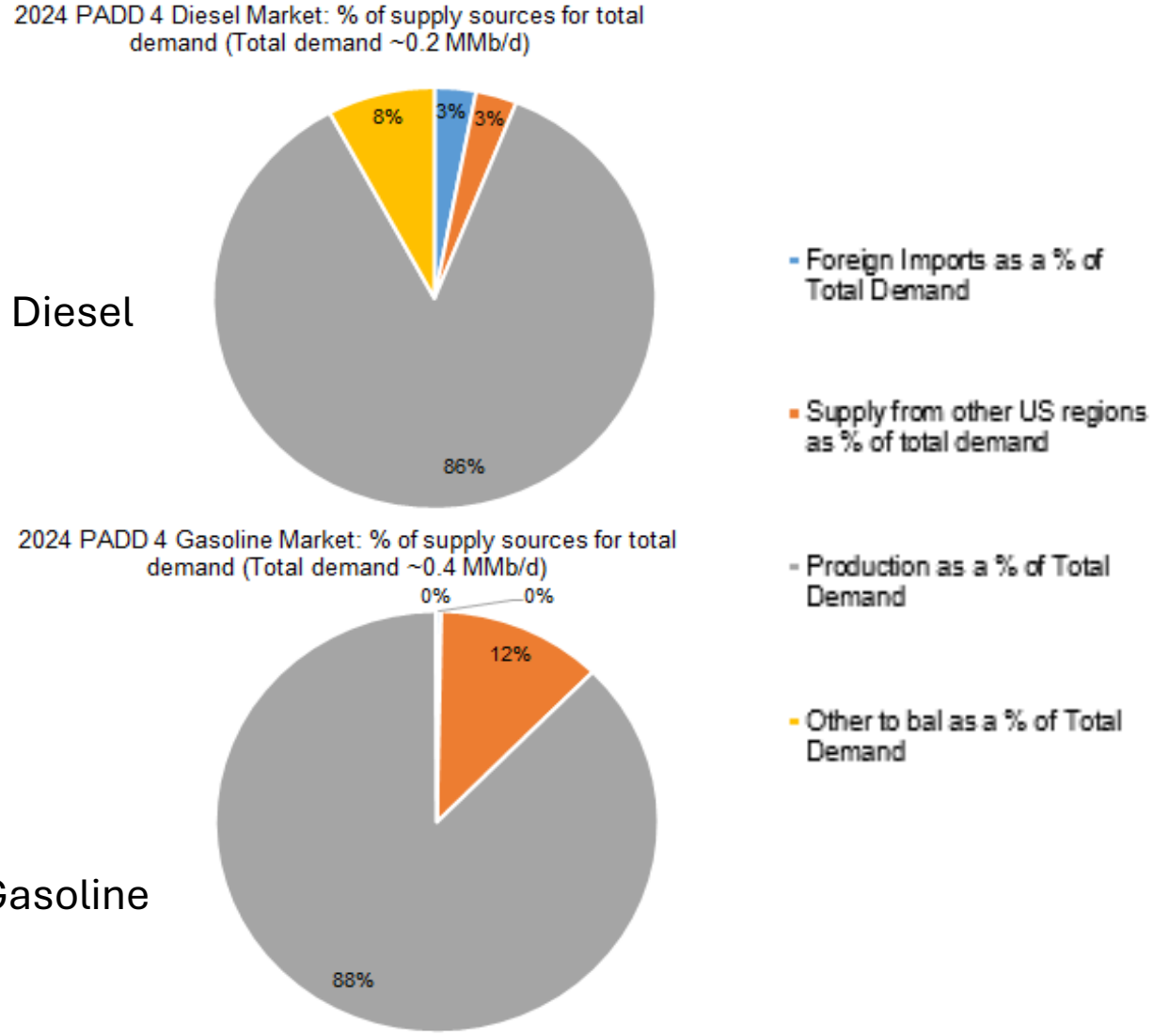
Gasoline

Source: EIA

PADD 4 Market Balances: 2024



Crude

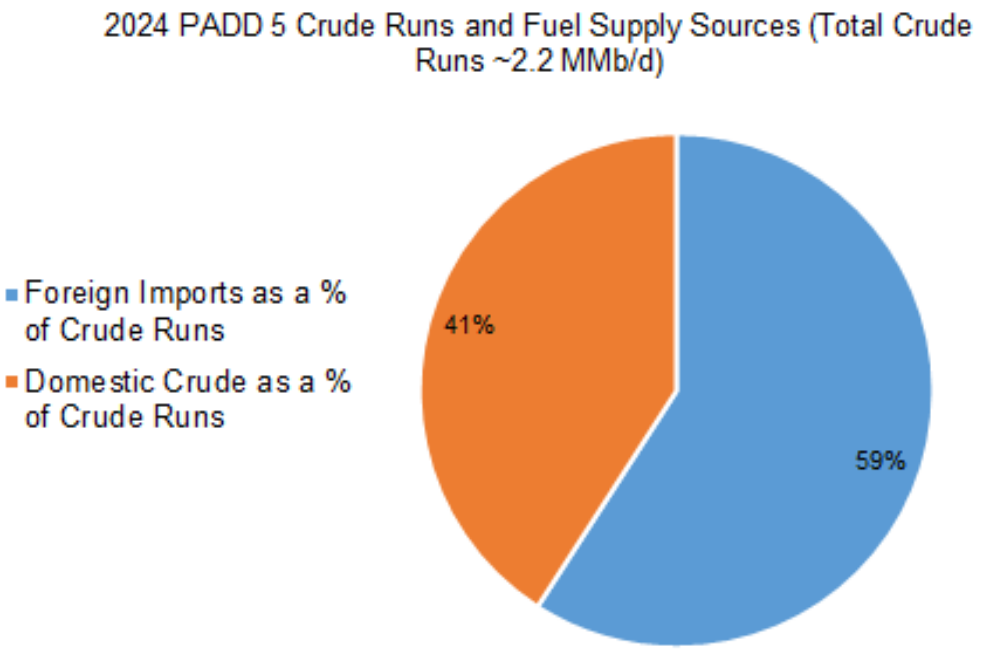


Diesel

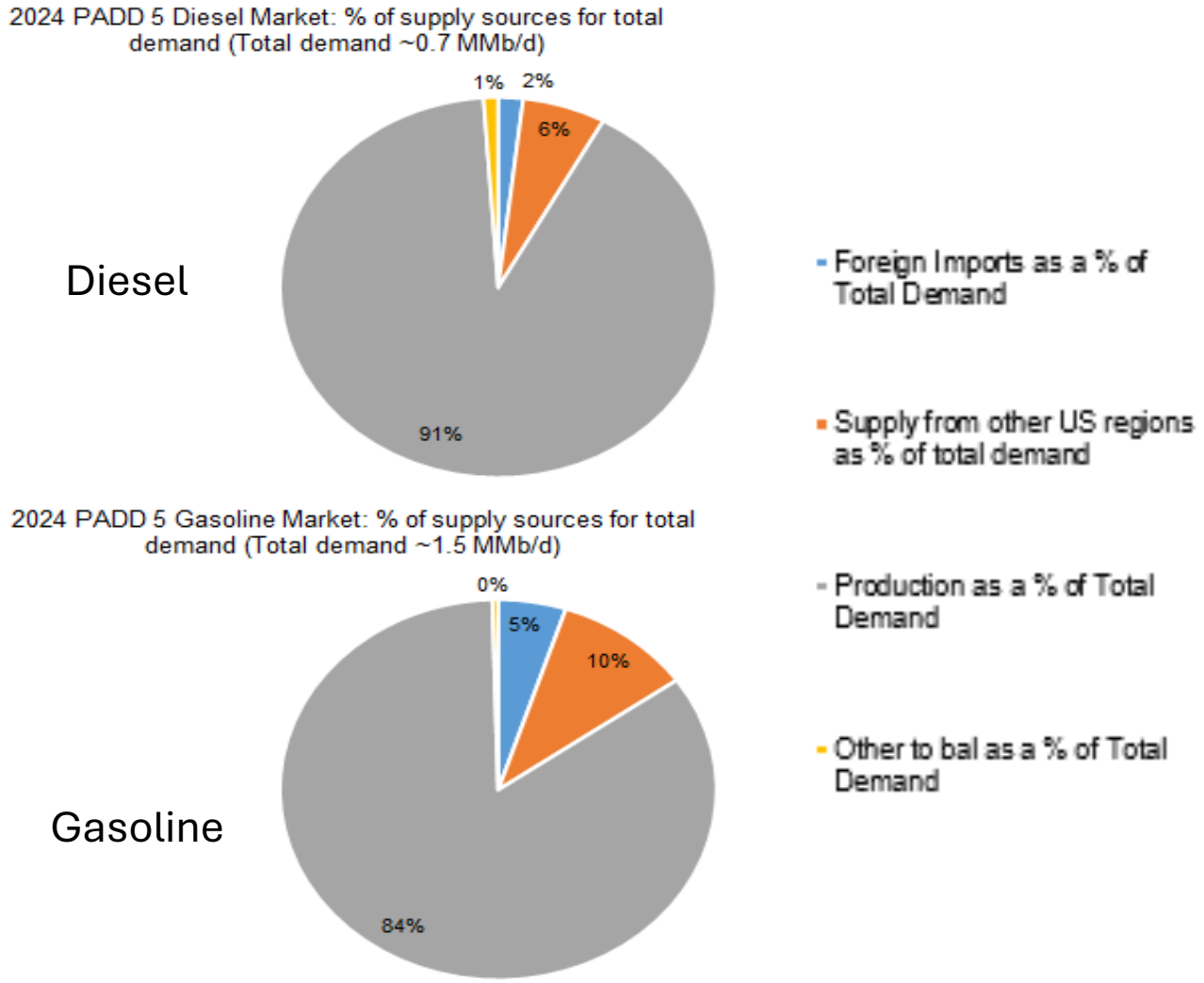
Gasoline

Source: EIA

PADD 5 Market Balances: 2024



Crude

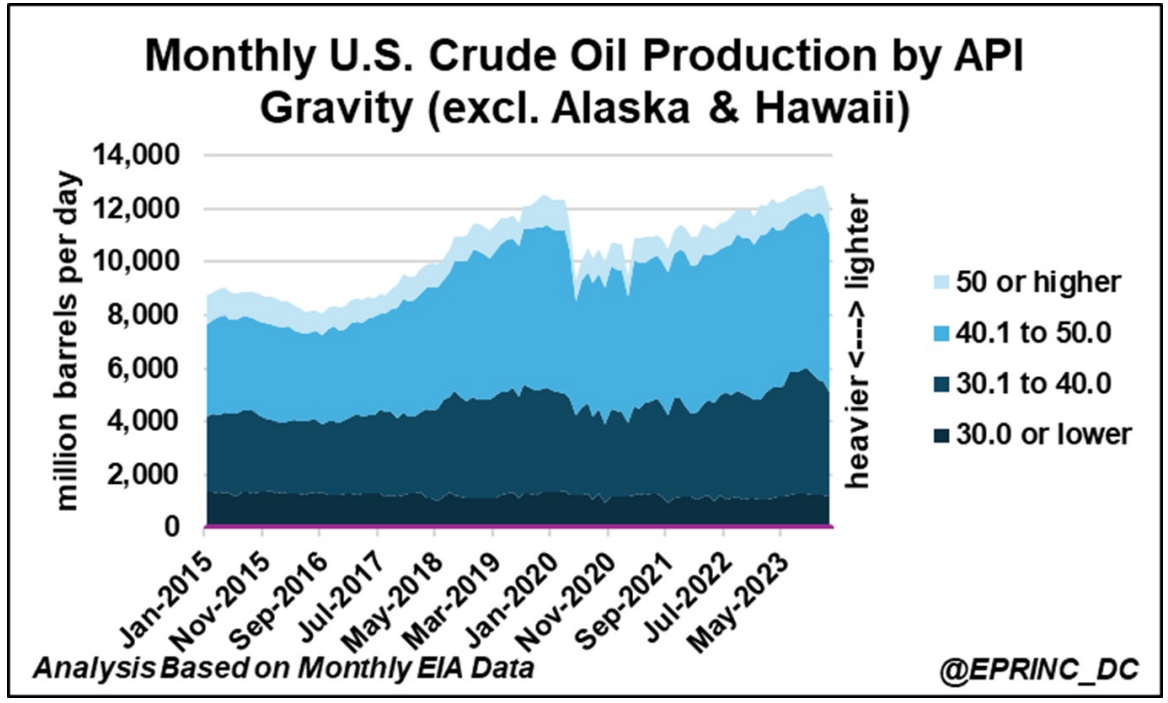


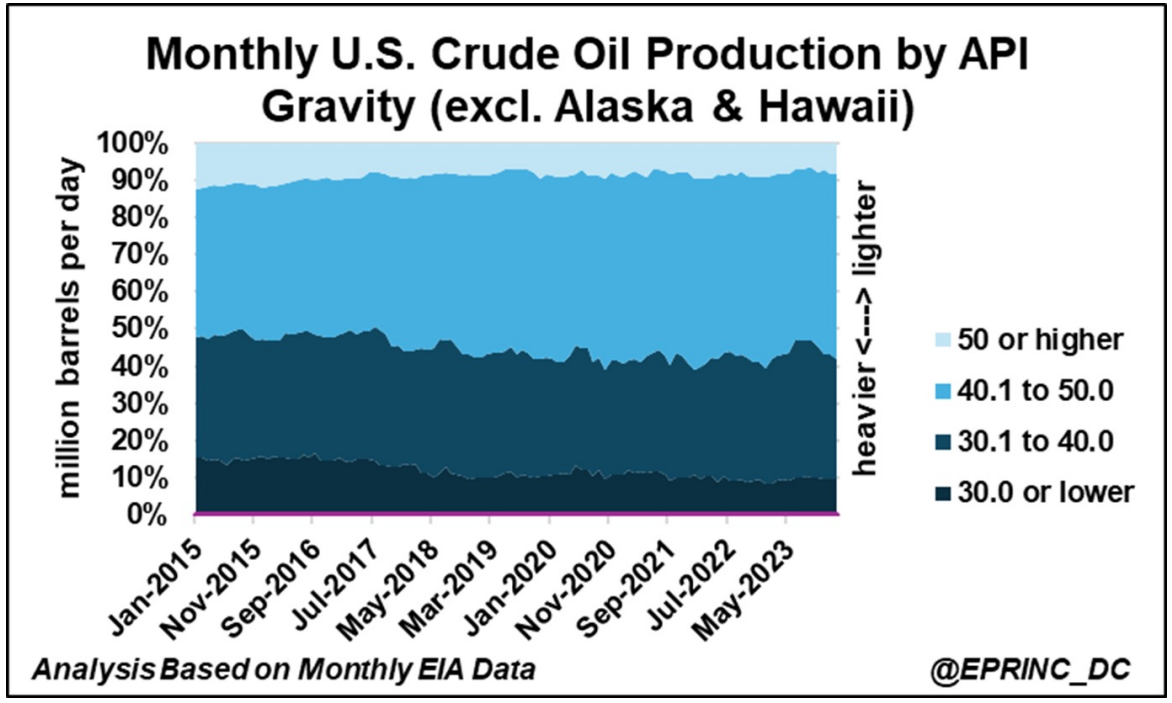
Diesel

Gasoline

Source: EIA

Total US Crude Production by Grade



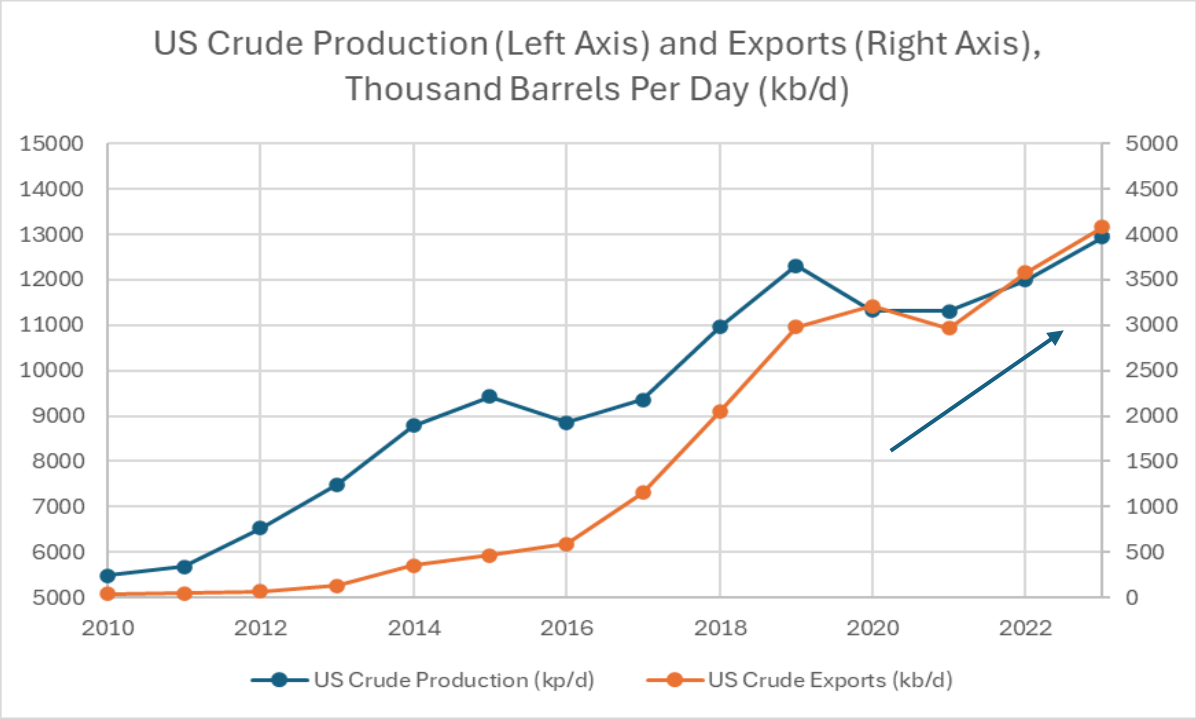


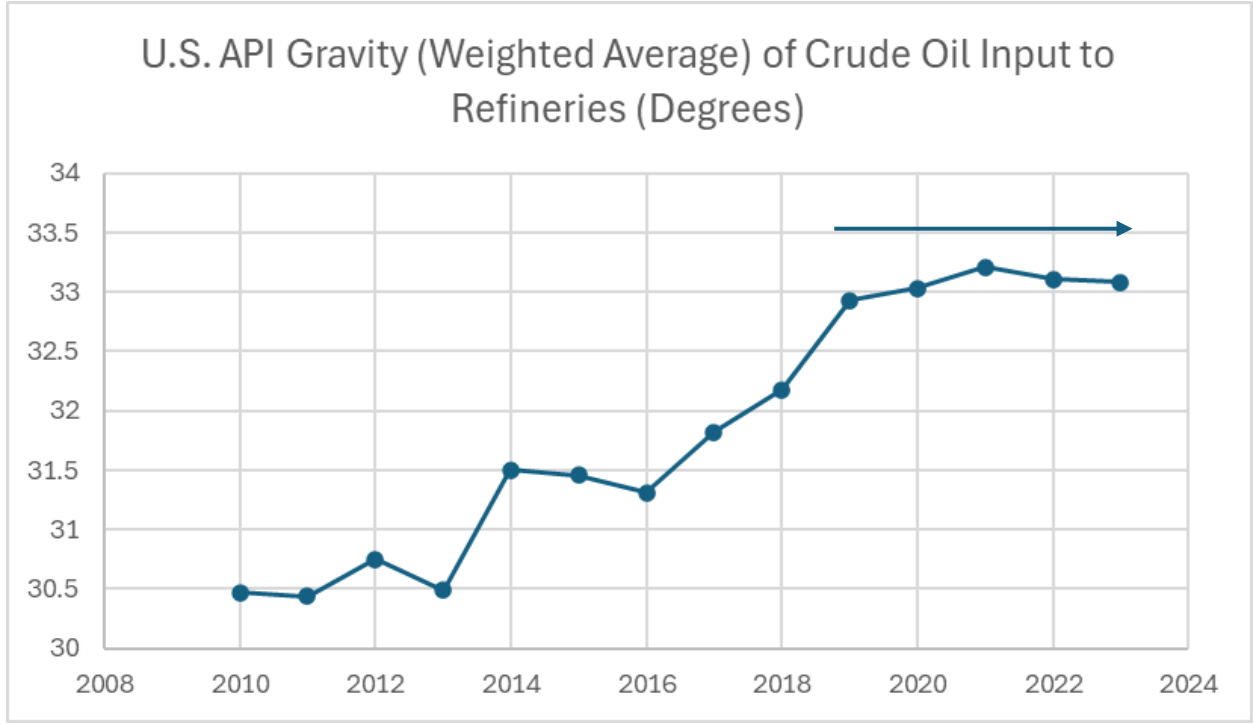
Source: Energy Policy Research Foundation

US Refining System has a limit for domestic “light” crude production

Crude exports have increased proportionally with increased domestic production, because…

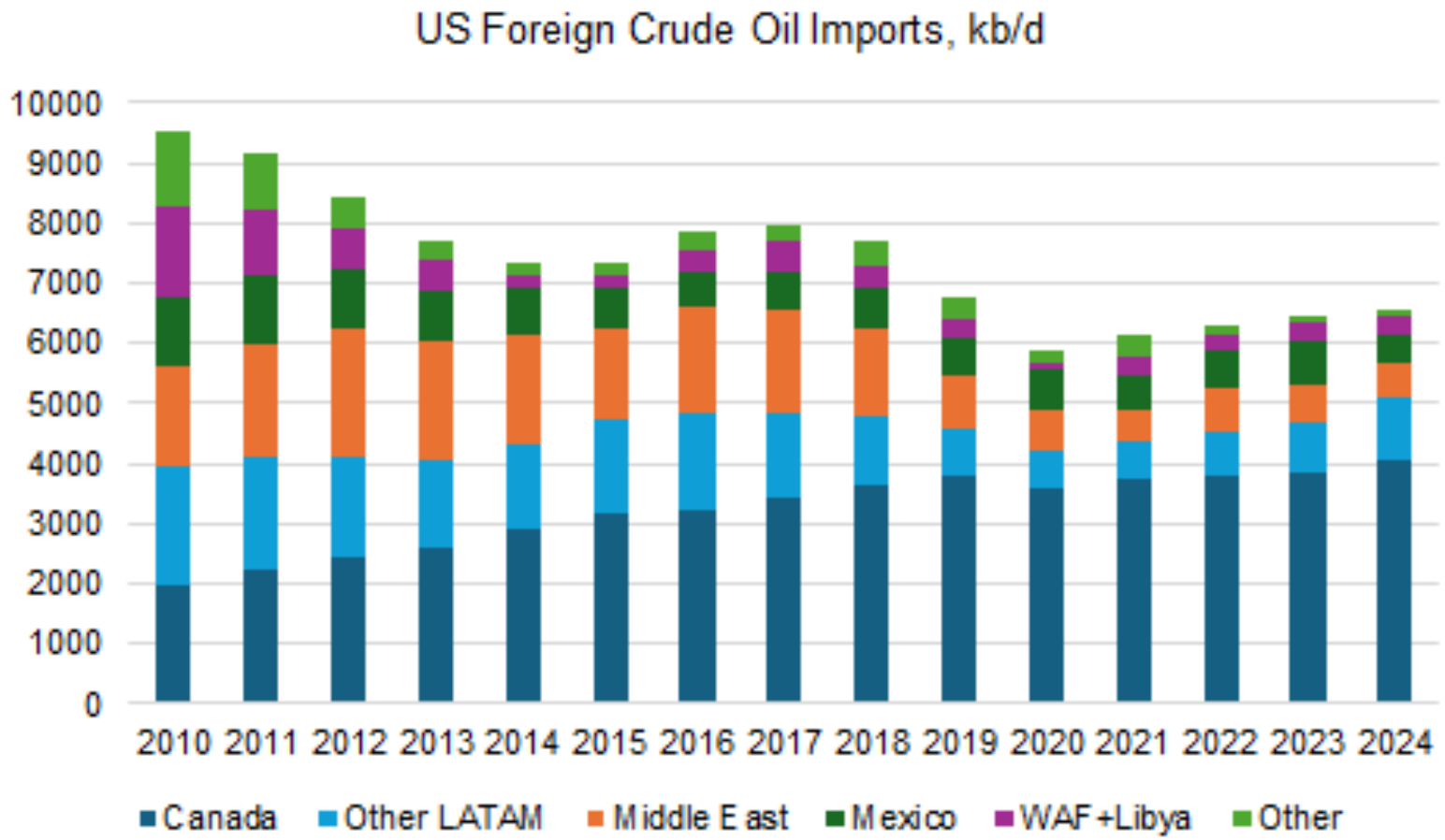
U.S. refiners have maxed out their ability to run the “light” crude coming from shale production.





Source: EIA

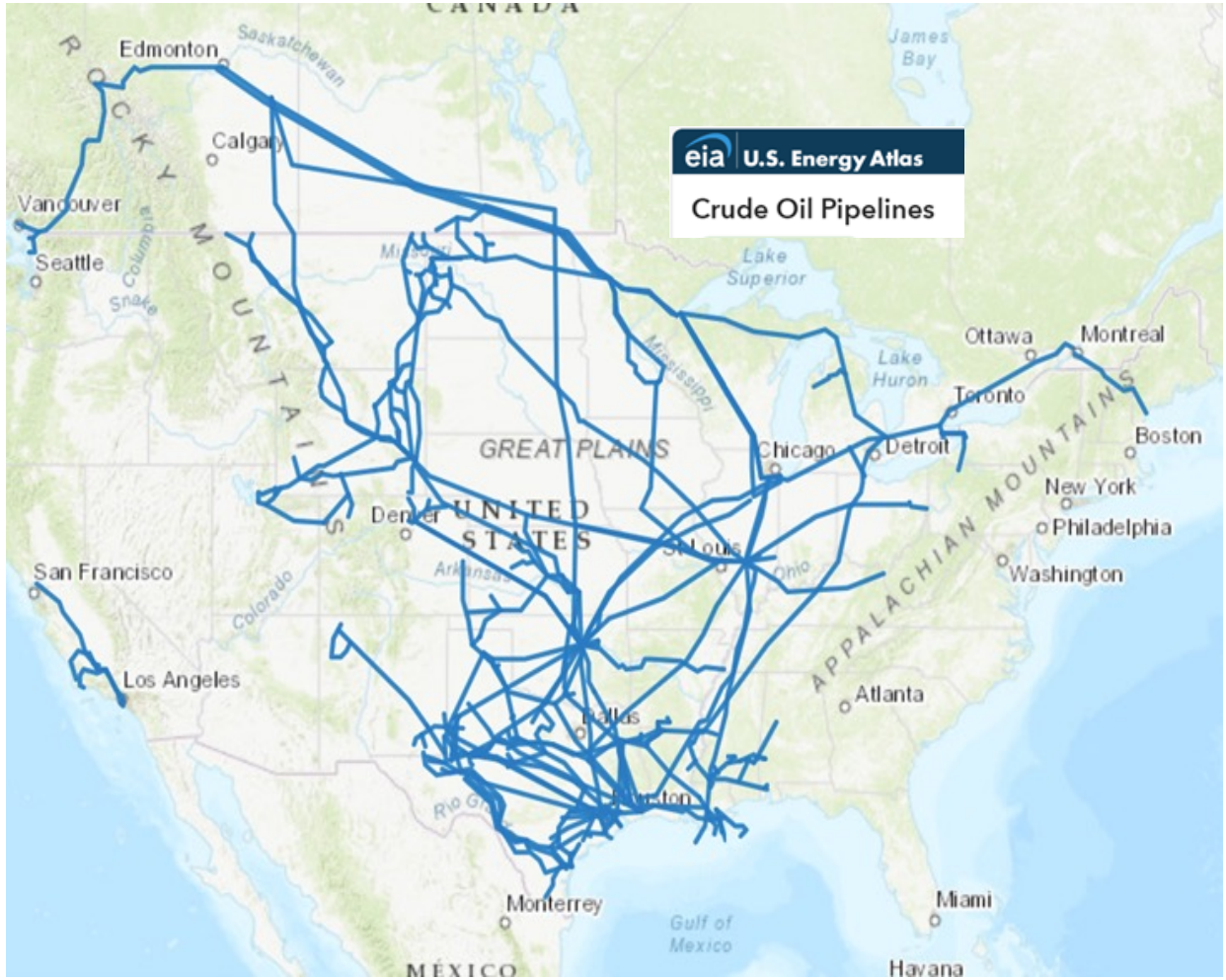
US Crude Oil Imports



Source: EIA

Infrastructure Constraints: Crude Transportation Limitations

- Crude pipelines primarily move north-south, NOT east-west.
- There is no crude pipeline within 200 miles of an East Coast Refiner; further in relation to West Coast.
  - Crude-By-Rail costs 10x pipeline movements.
- This constraint, coupled with U.S. refiner configuration, incentives shale crudes to be refined in the Gulf or exported.



Source: EIA

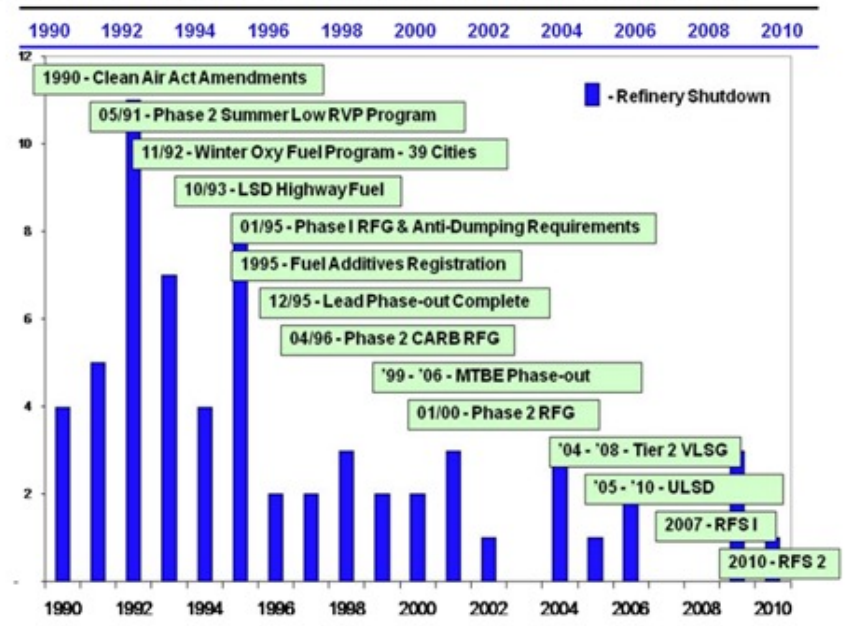
Infrastructure Constraints: Crude Transportation Limitations

- Insufficient Jones Act vessels limit the ability to move domestic crudes on a ship from the Gulf Coast to East & West Coasts.
  - Jones Act requires ships moving from one U.S. port to the other to be U.S. built, flagged and crewed.
- Jones Act shipments cost 2x foreign flagged shipments.
- Pipeline and Jones Act limitations essentially make the East Coast ***reliant*** on foreign crude.
- West Coast faces the same challenge, compounded by various state regulations that raise refining costs exponentially, while shutting in California crude production.

Regulations Contribute to Refining Challenges

- **DOE 2011 Report:** "In addition, compliance with environmental regulations has increased the fixed and variable costs of refinery operations. The cost of compliance contributed to economic stresses that resulted in the shutdown of 66 refineries from 1990 through 2010."

Figure 9. U.S. Refined Product Environmental Regulations 1990-2010



Source: SAIC, 2010, EIA Table 15 - Refineries Permanently Shut Down, 2010.

Source: U.S. Department of Energy (DOE) Small Refinery Exemption Study, March 2011

PADD 1 & 5 Refinery Closure Table

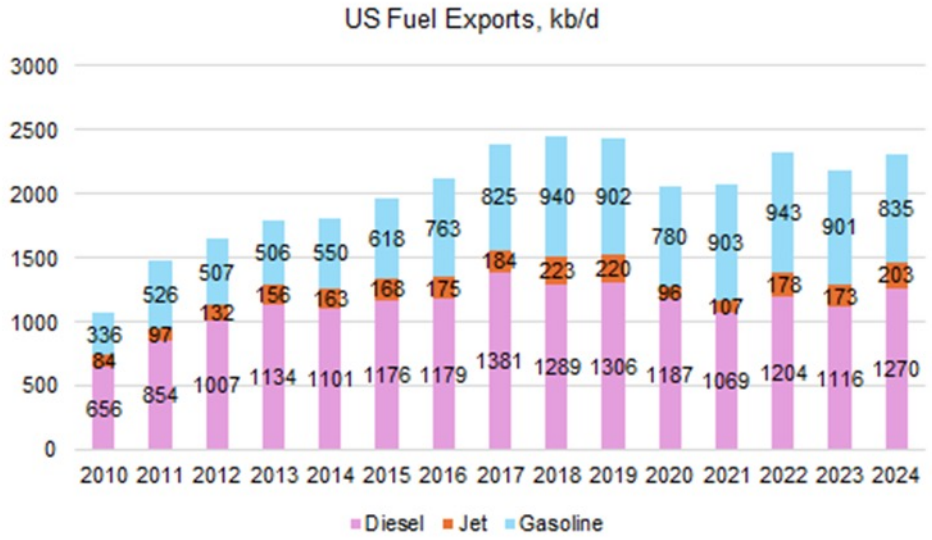
- Cost of crude, infrastructure barriers and state/regulatory factors have been most acute on the East and West Coasts.
- As a result, they have borne the brunt of domestic refining closures, totaling over 1.4 MMb/d after taking into account renewable fuel conversions since 2010.

Company	Closed Refinery Location	PADD	Year	Lost Petroleum Refining Barrels Per Day (BPD)	New Alternative Fuel BPD
Sunoco	Eagle Point/Westville, NJ	1	2010	145,000	0
Sunoco	Marcus Hook, PA	1	2011	178,000	0
Alon	Los Angeles, CA	5	2012	90,000	25,000
Western Refining	Yorktown, VA	1	2012	66,300	0
Flint Hills Resources	North Pole, AK	5	2014	85,000	0
PES	Philadelphia, PA	1	2019	335,000	0
Marathon	Martinez, CA	5	2020	161,000	48,000
North Atlantic Refining	Come by Chance, NEW, Ca	1	2021	130,000	14,000
Phillips 66	Santa Maria, CA	5	2023	44,500	0
Phillips 66	Rodeo, CA	5	2024	140,000	44,357
Phillips 66	Los Angeles, CA	5	2025	165,000	0
	TOTALS			1,539,800	131,357
	NET LOST FUEL SUPPLY			1,408,443	

Source: Press reports & company websites

U.S. Still Serves As the World's Refiner, but Status is at Risk

- Despite the decline in refining, the U.S. can currently still act as the world's refiner, primarily in relation to diesel fuel.
- Gulf Coast refiners produce enough fuel to meet their regional demand, serve other U.S. regions to the extent infrastructure allows AND export substantial amounts of diesel (and, to a lesser extent, gasoline).
- However, increased foreign competition puts Gulf refiners' exporter status at risk.



Source: EIA

How to Protect American Refining

- Ensure cost effective access to heavy crude.
  - Tariffs on heavy crude from allies, without replacements, could put refining capacity at risk; particularly in the Midwest.
  - Actions to bid up the price of heavy crude could have similar impact (e.g. filling SPR too quickly).
  - Consistent with ESA provisions in the EO, encourage domestic heavy production/stop regulation adversely impacting heavy oil.

- Identify policies to address infrastructure constraints; prevent new limitations.
  - Frivolous lawsuits aimed at existing pipelines threaten refining crude supply.
  - Permitting hold ups also threaten pipeline replacements.
  - Explore pipeline access to “islandized” refineries.

- Manage regulations to lower costs on domestic refiners.
  - RFS adds $4 to $10 PER BARREL to refiners’ costs historically and could be managed in a better way that lowers costs.
  - End EV mandates that disincentivize refining investment.

- Focus trade deliberations on foreign manufactured petroleum products, rather than crude supply.