

Energy from Petroleum:

II. Reserves, Production, and Consumption

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For EGY 105 – Energy in Our World
at Wilkes University



Outline for Lecture 14

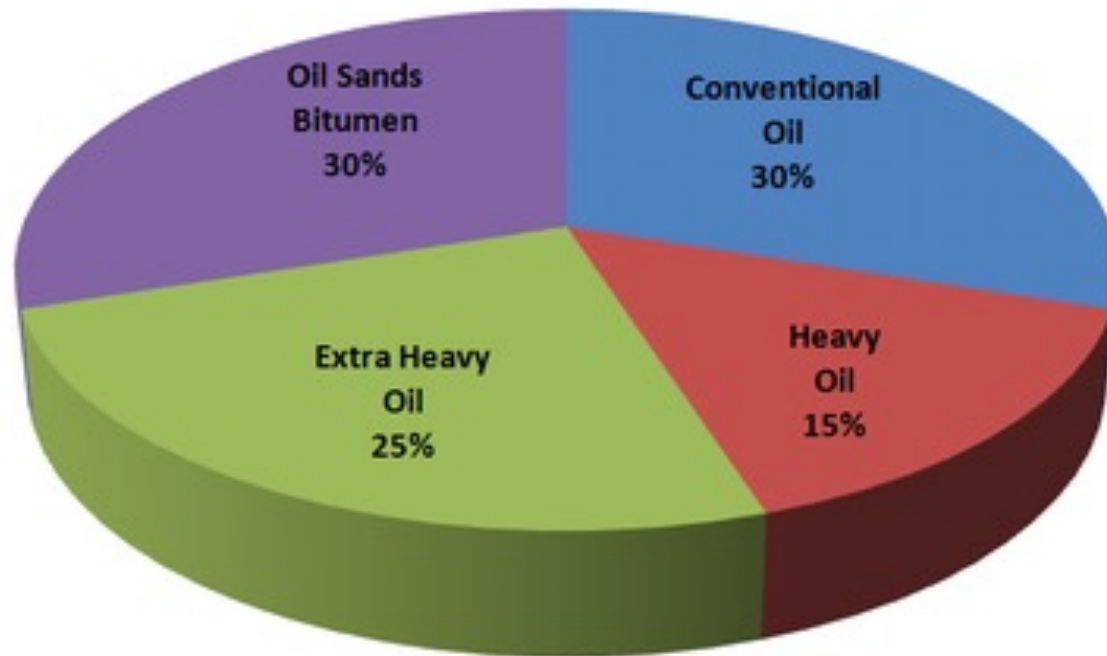
- Data on all of the following with respect to oil:
 - Reserves (availability)
 - Different forms
 - Worldwide (between countries)
 - Within US
 - Production
 - Worldwide
 - Within US
 - Consumption
 - Worldwide
 - Within US
 - U.S. imports and exports
 - Benefits and drawbacks of oil

Let's look first at oil availability

- What forms does oil take in the earth?
- How much oil is present:
 - Worldwide and in different countries?
 - In the U.S. and individual states?

What forms does oil take in the earth?

Total World Oil Reserves

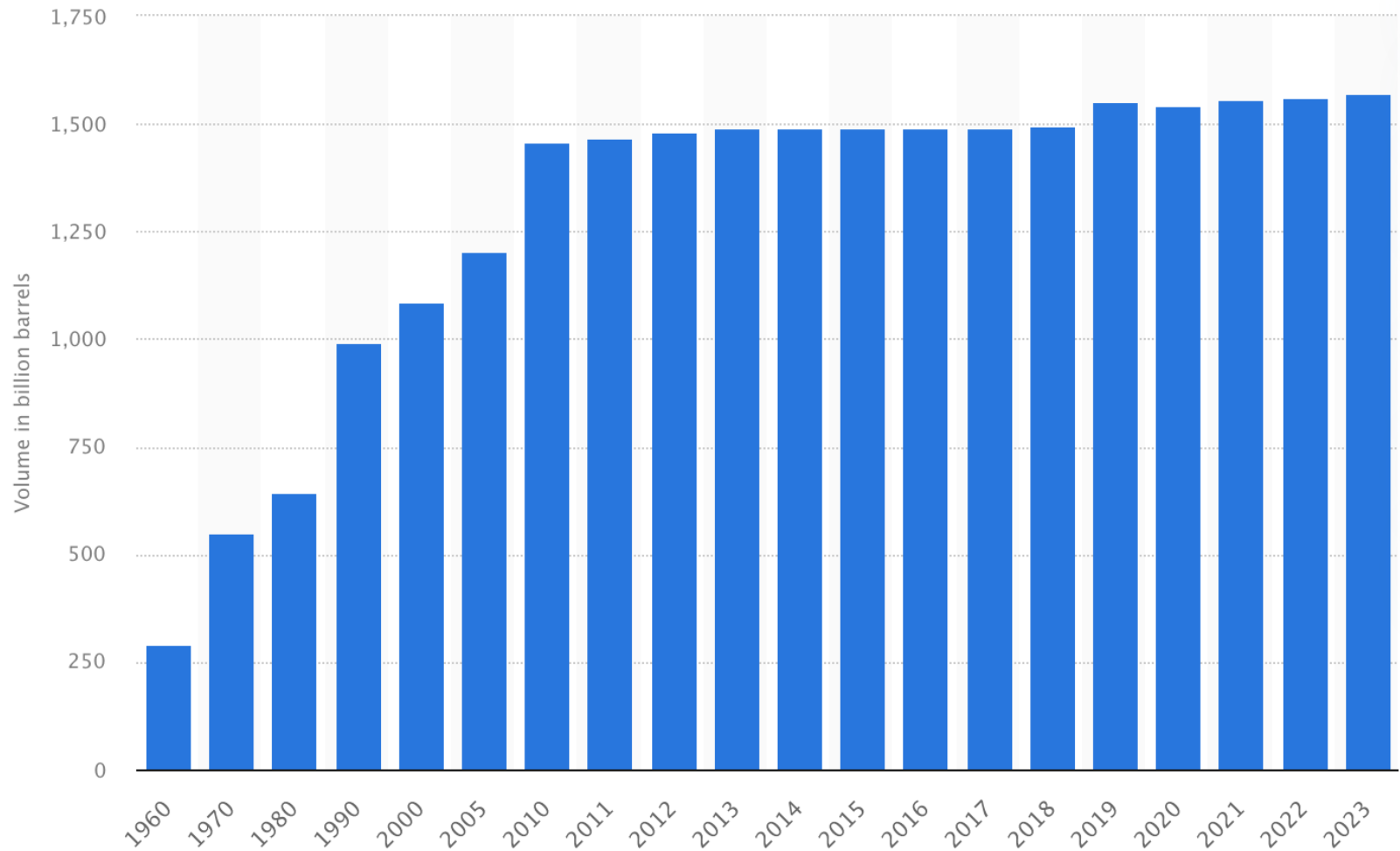


https://www.researchgate.net/publication/284358139_Structural_Study_and_Upgrading_of_Kazakhstan_Oil_Sands/figures?lo=1

How much oil is available?



Worldwide petroleum reserves



<https://www.statista.com/statistics/236657/global-crude-oil-reserves-since-1990/>

Petroleum reserves worldwide

Crude Oil Reserves in Billion Barrels (Gbbl)



Note: For visualization purposes we are showing only countries with 100,000,000 bbl (0.1 Gbbl) of crude oil reserves or more.

How to read this map: Countries appear bigger as their crude oil reserves are bigger. e.g. Venezuela. Conversely, countries that have smaller reserves of crude oil appear smaller. e.g. Côte d'Ivoire

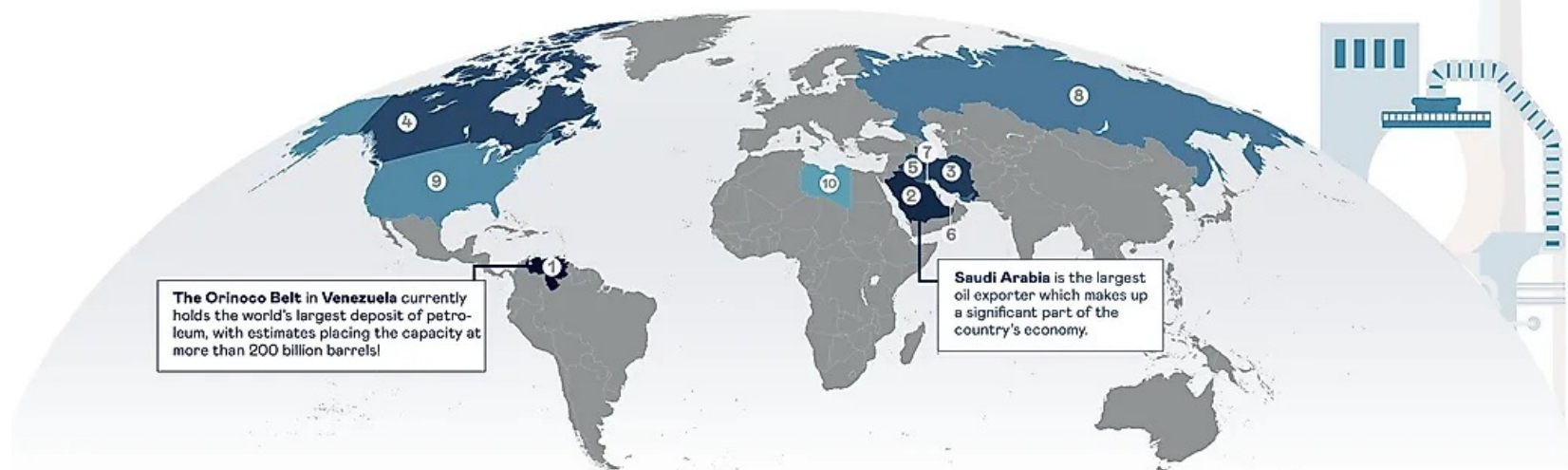
Article & Sources:

Central Intelligence Agency - <https://www.cia.gov/library>

Petroleum reserves (2024 data)



The World's
LARGEST OIL RESERVES by Country



Reserves in billions of barrels (US EIA Estimate)

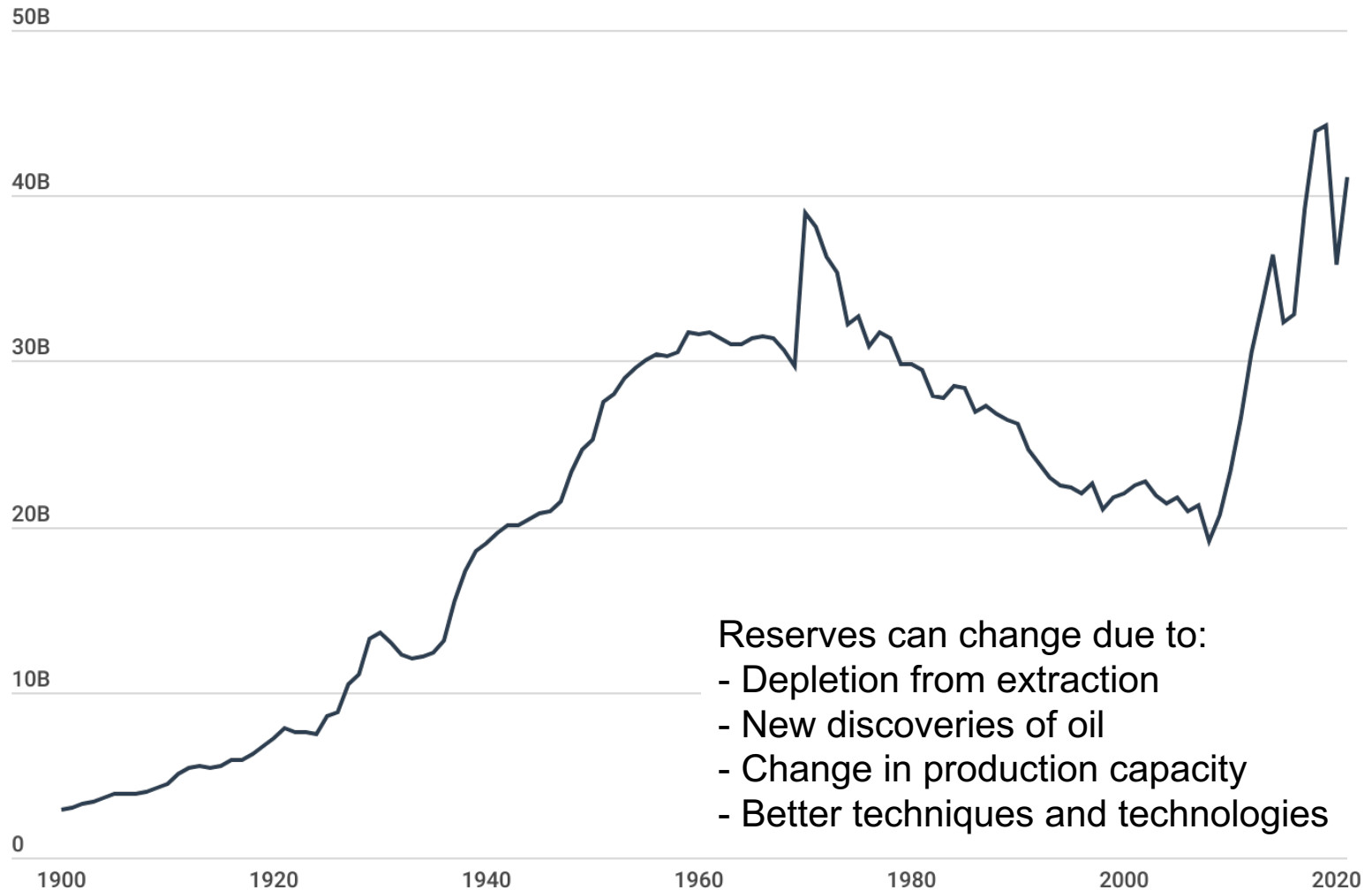


How much oil is found in the U.S.? (and where?)

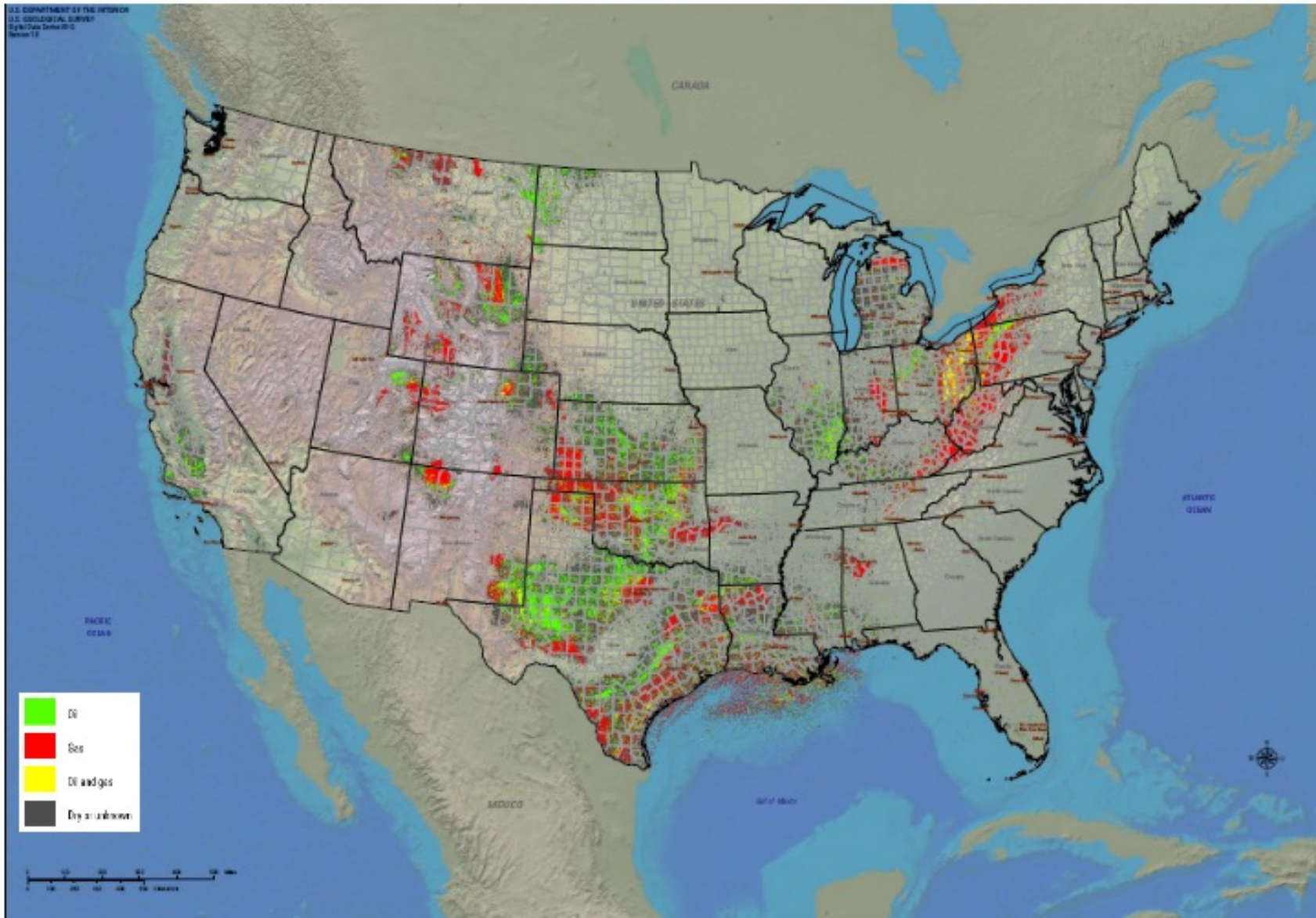


How much oil does the U.S. have?

Proved reserves (barrels)



U.S. Petroleum Reserves



States with the most oil reserves

(as of 29 June 2024)

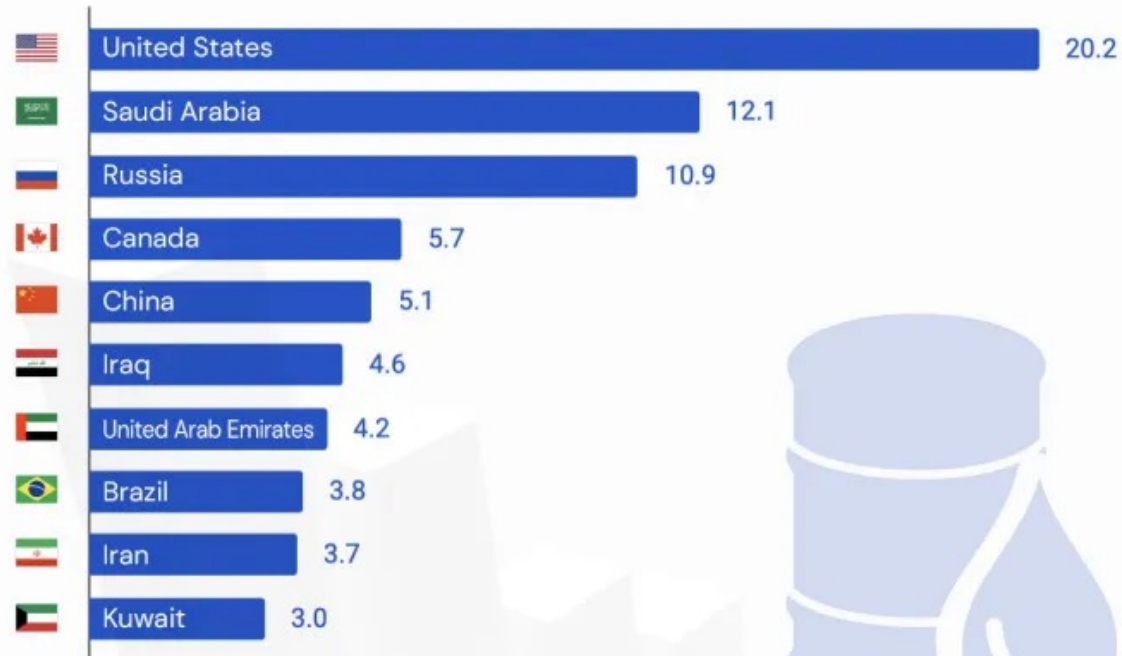
State	Proven reserves (mmbbl)	5-year change in proven reserves (%)
1. Texas	17,031	+32.4
2. New Mexico	4,517	+191.6
3. North Dakota	4,353	-17.2
4. Alaska	3,127	+98.9
5. California	1,716	-11.2
6. Oklahoma	1,474	-12.9
7. Colorado	1,469	+15.9
8. Wyoming	978	+23.6
9. Utah	530	+42.5
10. Louisiana	365	-10.5

Now look at oil production.



World production by country

World's Biggest Oil Producers



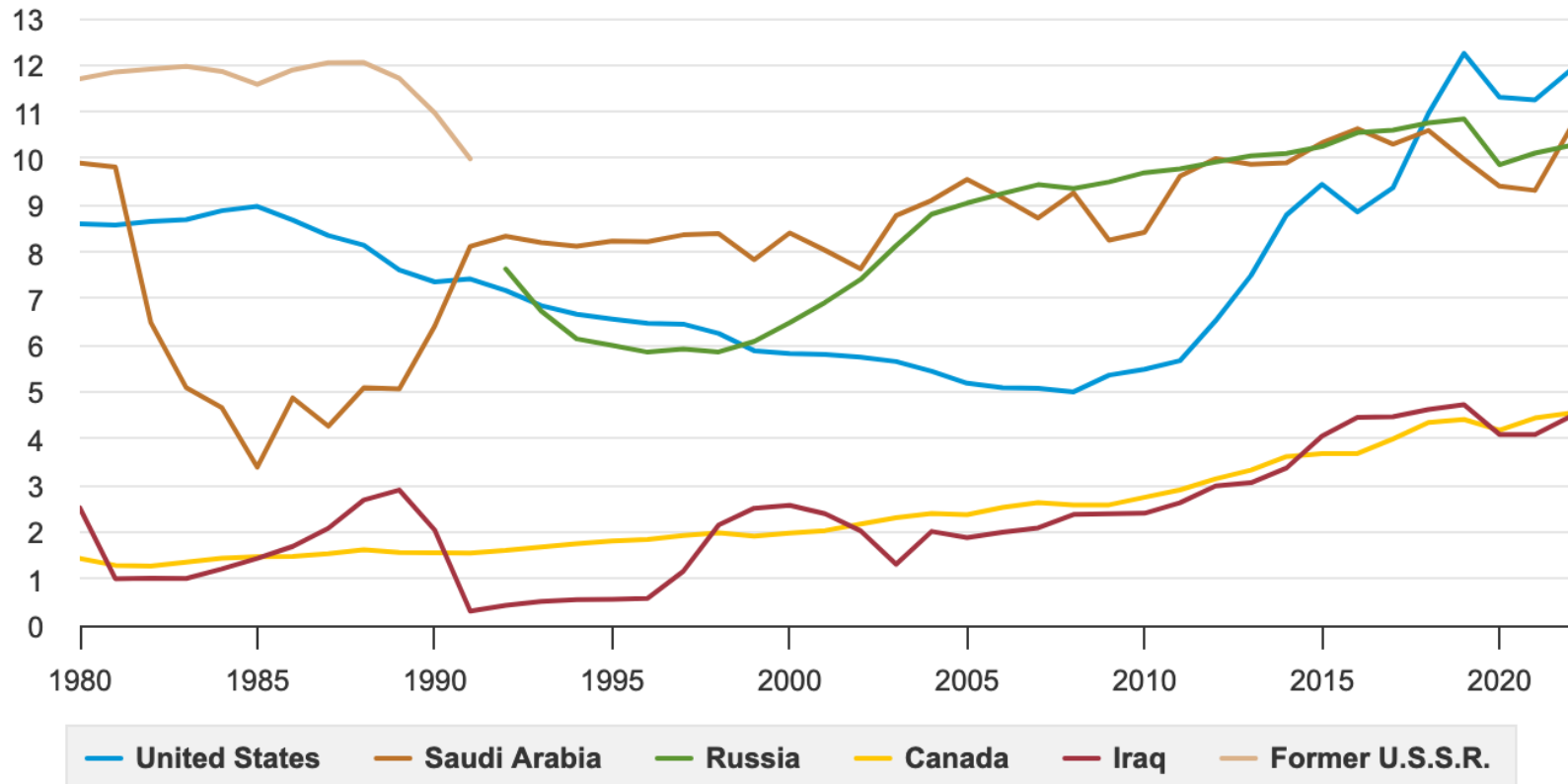
Source: U.S. Energy Information Administration, International Energy Statistics

Note: Oil production by country (in million barrels per day) as of May 1, 2023

Global oil production by country 1980-2022

Top five crude oil producing countries, 1980-2022

million barrels per day



Data source: U.S. Energy Information Administration, International Energy Statistics, as of September 6, 2023



Note: Includes crude oil and lease condensate. Ranking based on production in 2022. USSR is Union of Soviet Socialist Republics.

World oil production leaders over time, 2013-2023

United States Produces More Crude Oil than Any Country, Ever

U.S. Energy Information Administration, March 13, 2024

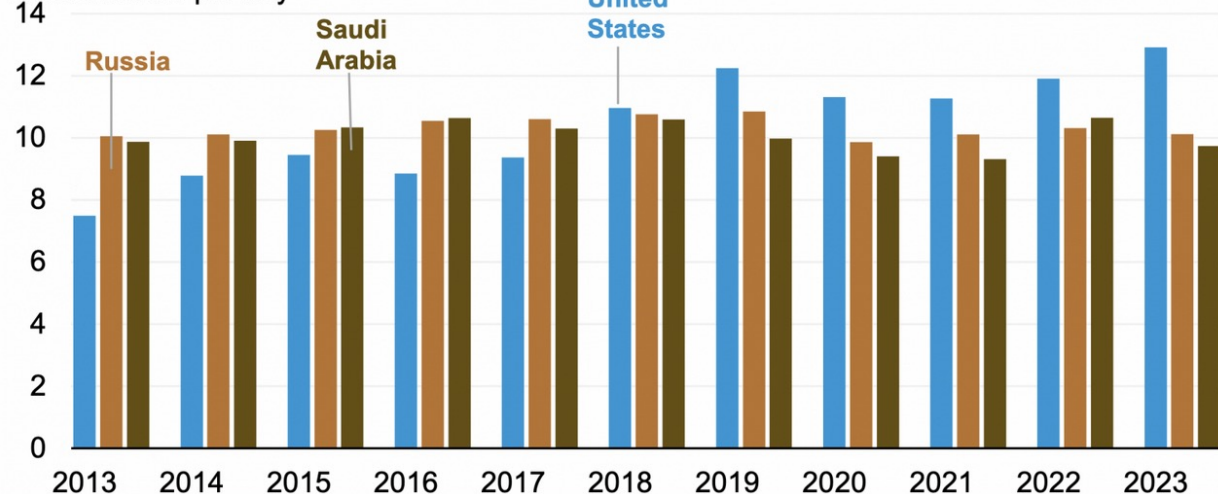
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Average annual crude oil and condensate production from top three global producers (2013–2023)

million barrels per day



Oil production in the U.S.

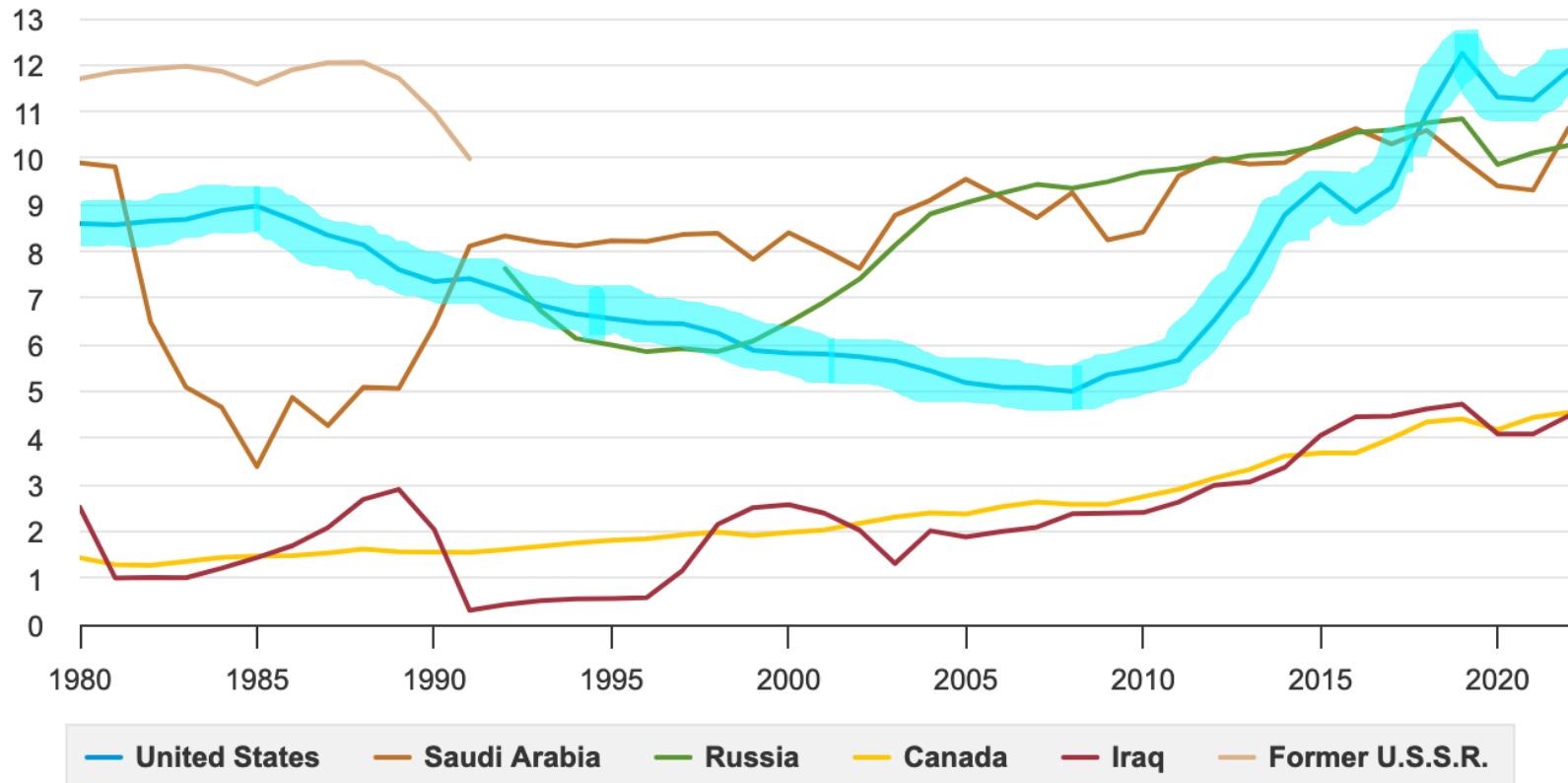


<https://energy-oil-gas.com/news/whats-driving-the-surge-in-us-crude-oil-production/>

Global oil production by country 1980-2022

Top five crude oil producing countries, 1980-2022

million barrels per day



Data source: U.S. Energy Information Administration, International Energy Statistics, as of September 6, 2023

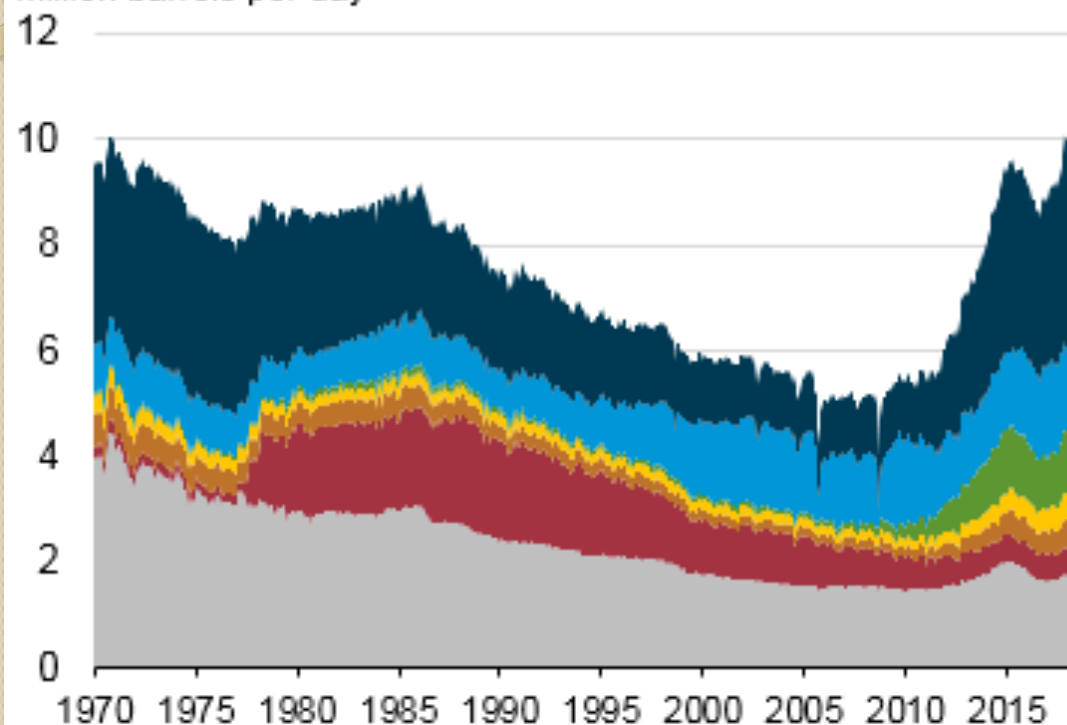


Note: Includes crude oil and lease condensate. Ranking based on production in 2022. USSR is Union of Soviet Socialist Republics.

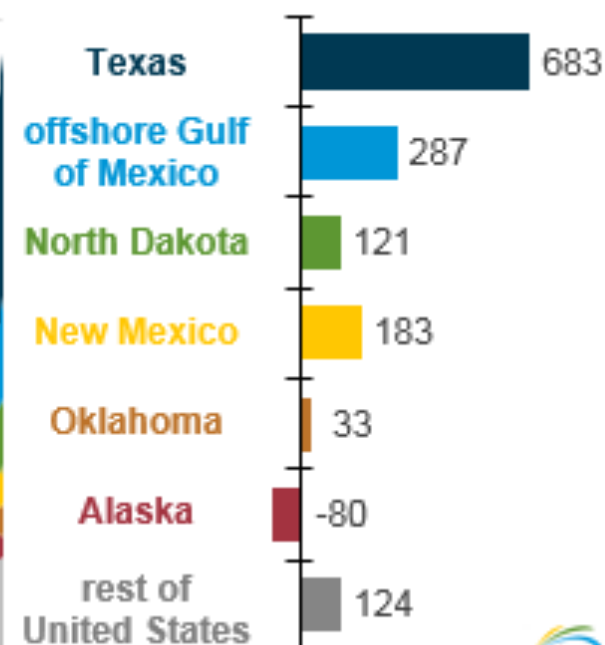
Production by state

Crude oil production in selected states and areas (Jan 1970-Aug 2018)

monthly crude oil production
million barrels per day



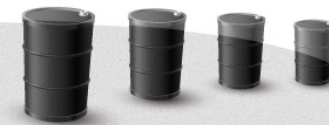
change (Jan-Aug 2018)
thousand barrels per day



United States ★★★★★

Oil Production

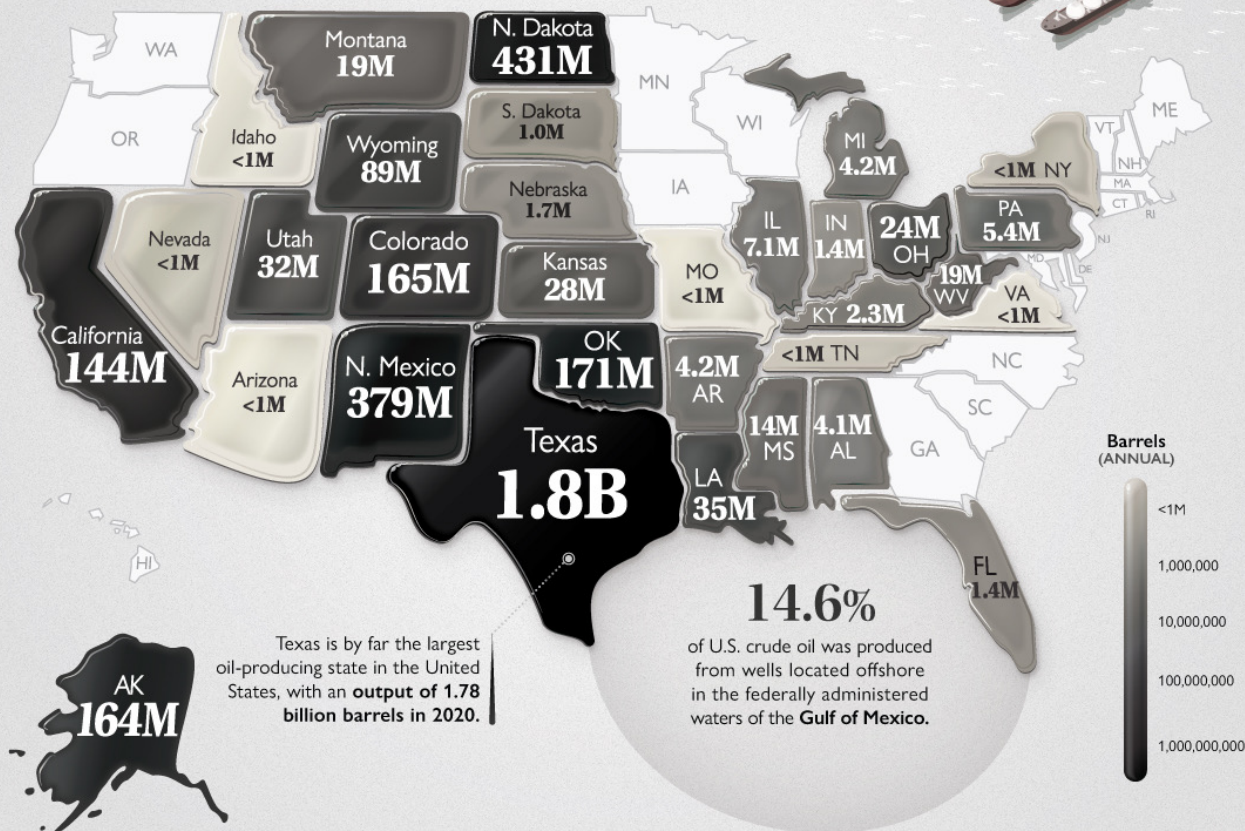
★★★★★ By State



+62%

more crude will be imported by 2022 compared to 2020 due to domestic production declines in the U.S.

The U.S. accounts for 15% of the world's total oil production, making it one of the top oil-producing countries. Of the 50 U.S. states, 32 produce oil, totaling nearly 4.1B barrels of oil in 2020. **Who are these oil-producing states, and how much did they contribute to the nation's annual production in 2020?**



Source: U.S. Energy Information Administration (2021)

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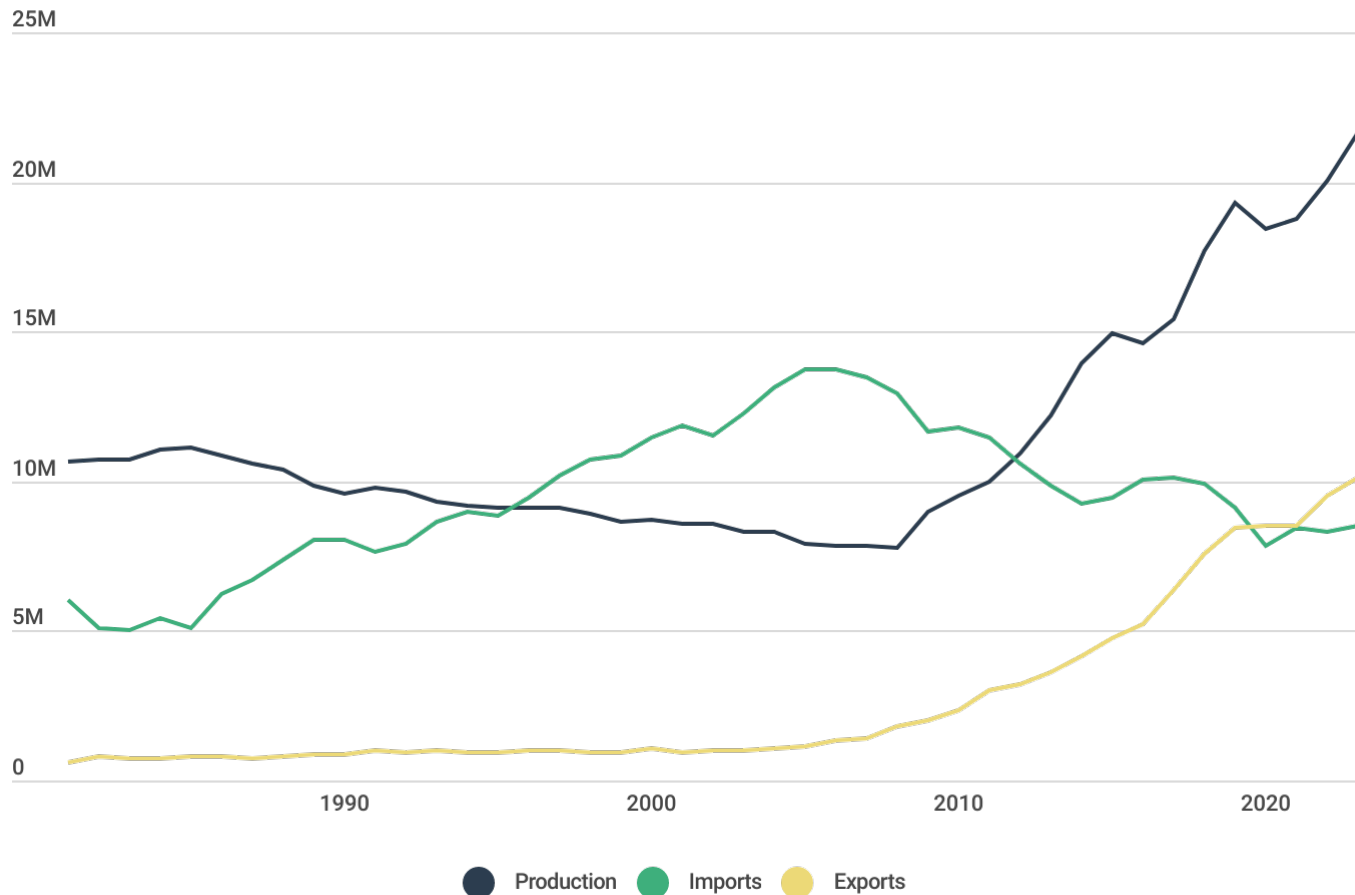
What about U.S. imports and exports?



<https://www.cnbc.com/2015/09/21/the-booming-business-of-oil-tankers.html>

Annual oil production, imports and exports

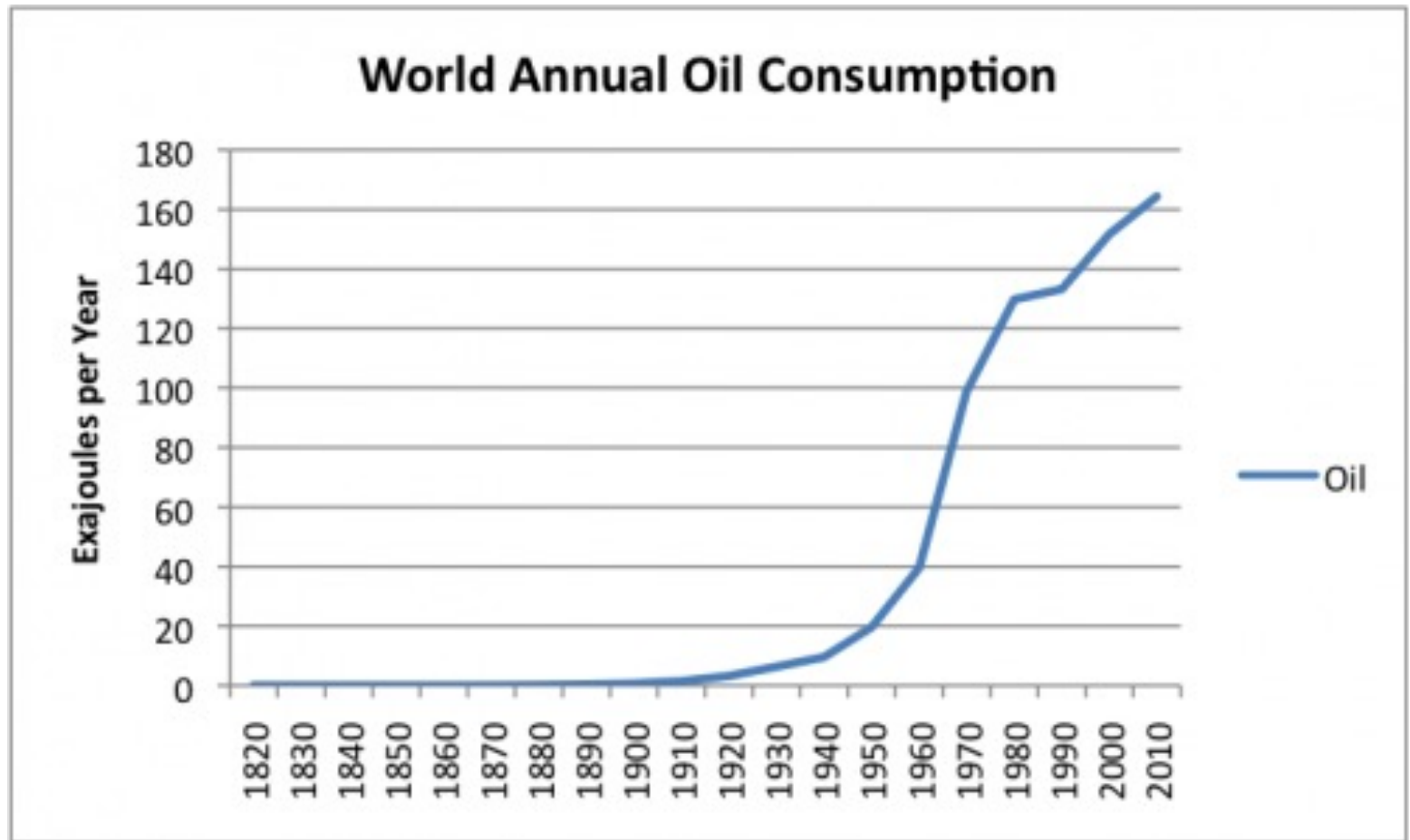
Annual average oil production (barrels per day)



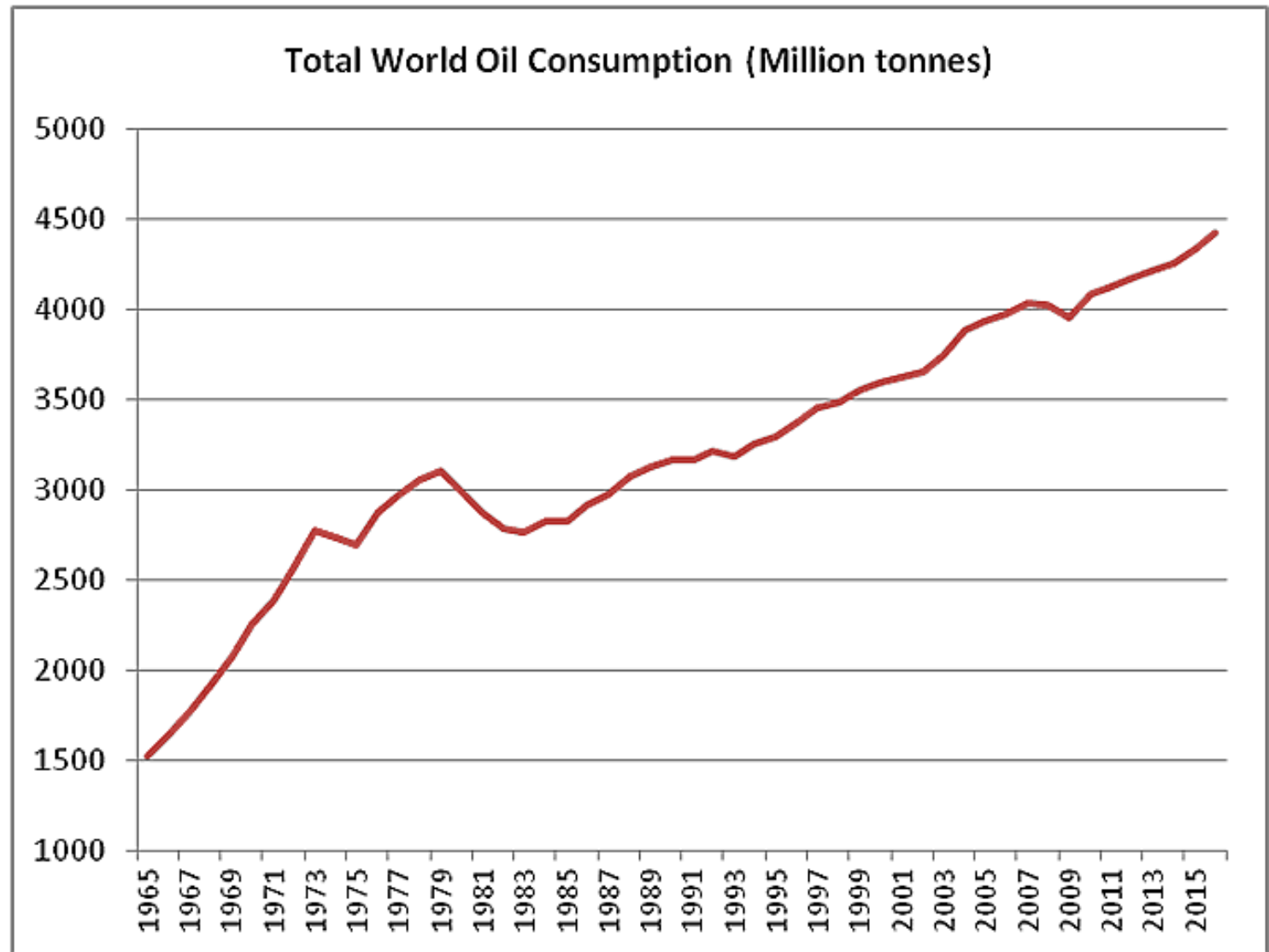
<https://constructioncoverage.com/research/states-with-the-most-oil-reserves>

Why does the U.S. export oil if we need it at home?

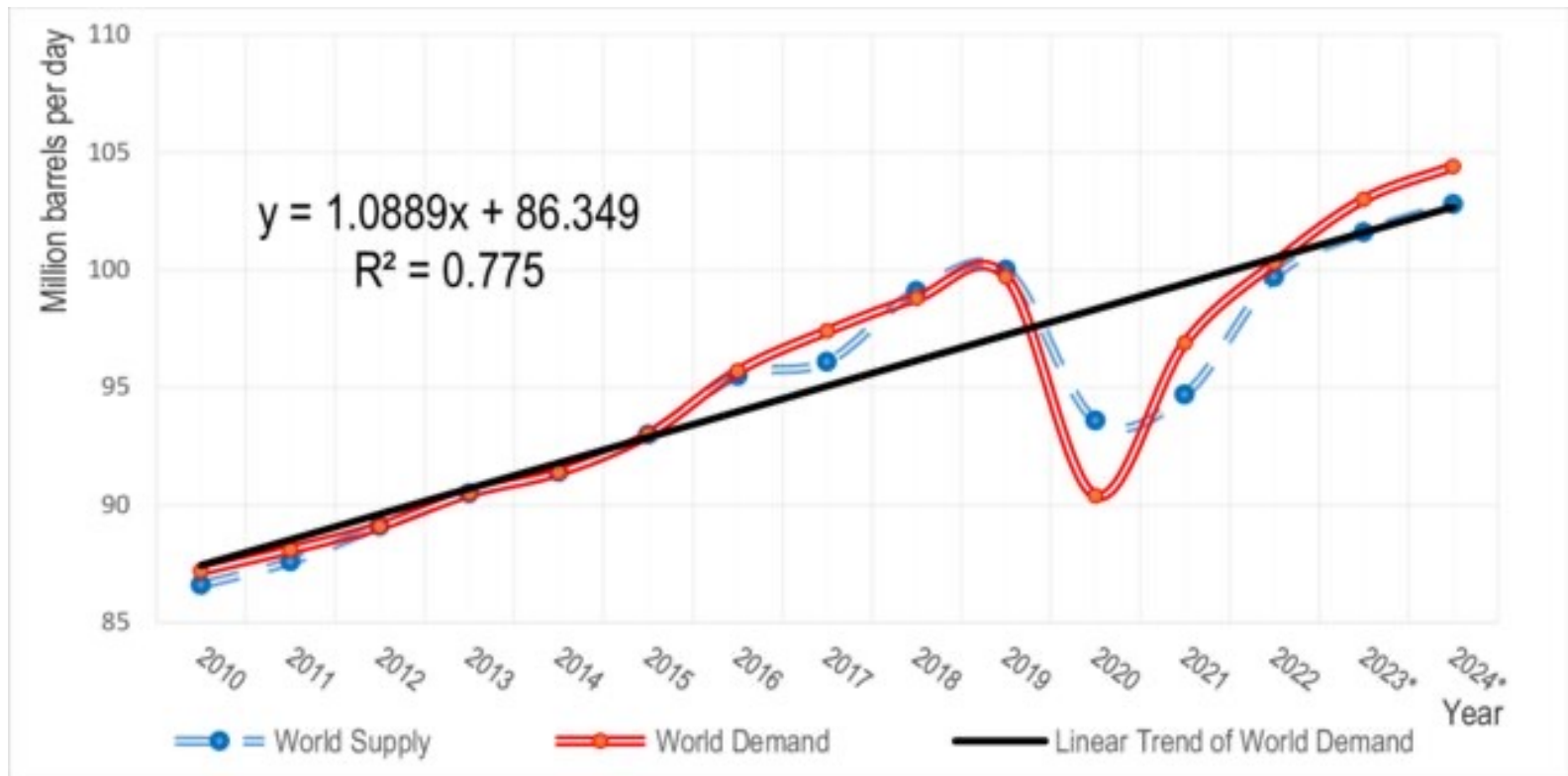
Now look at oil consumption



More recent data

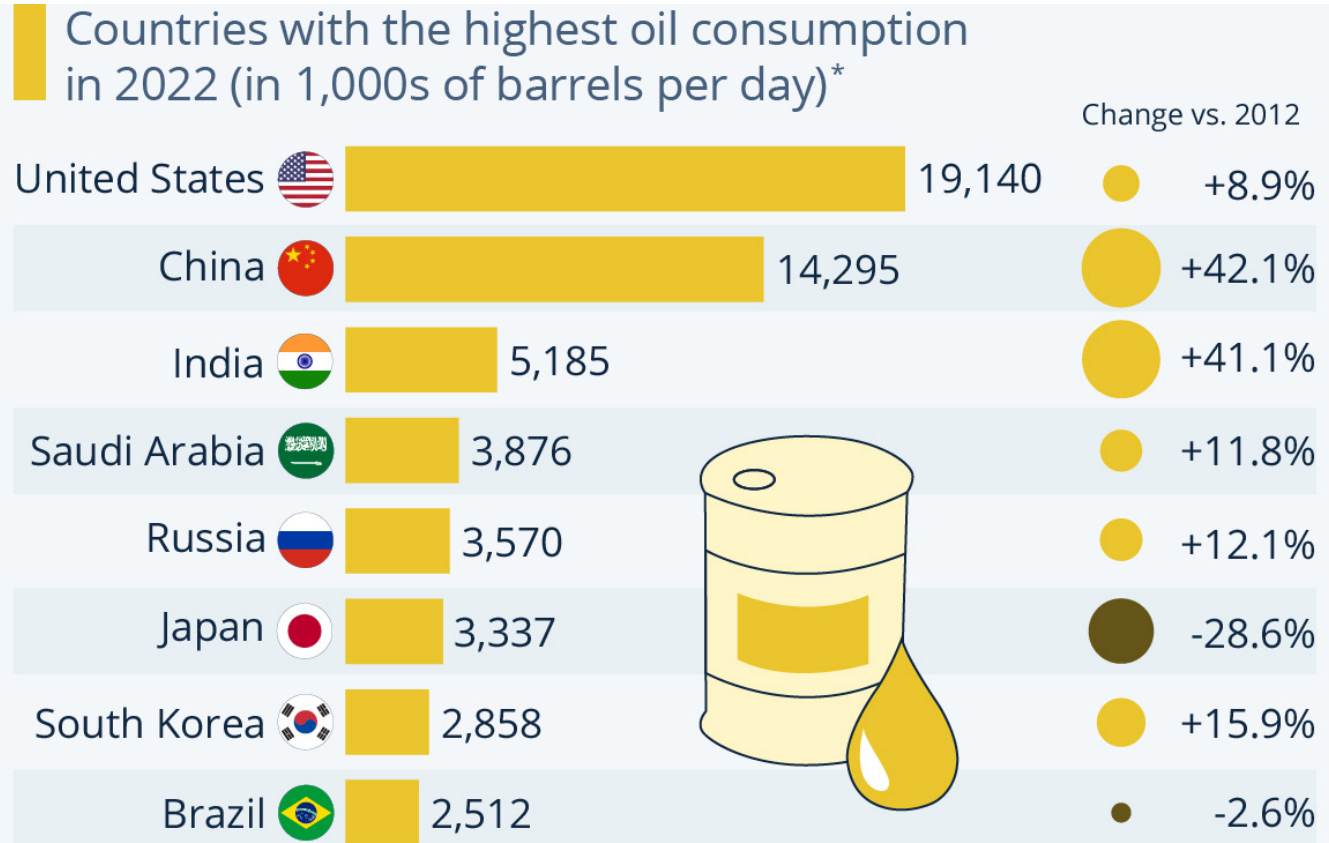


Worldwide oil supply and demand 2010-2024



https://www.researchgate.net/publication/374005179_ANALYSIS_OF_THE_DEMAND_SUPPLY_AND_PRICES_OF_CRUDE_OIL_FOR_THE_PERIOD_2010_2022/figures?lo=1

Worldwide patterns of petroleum use – by country

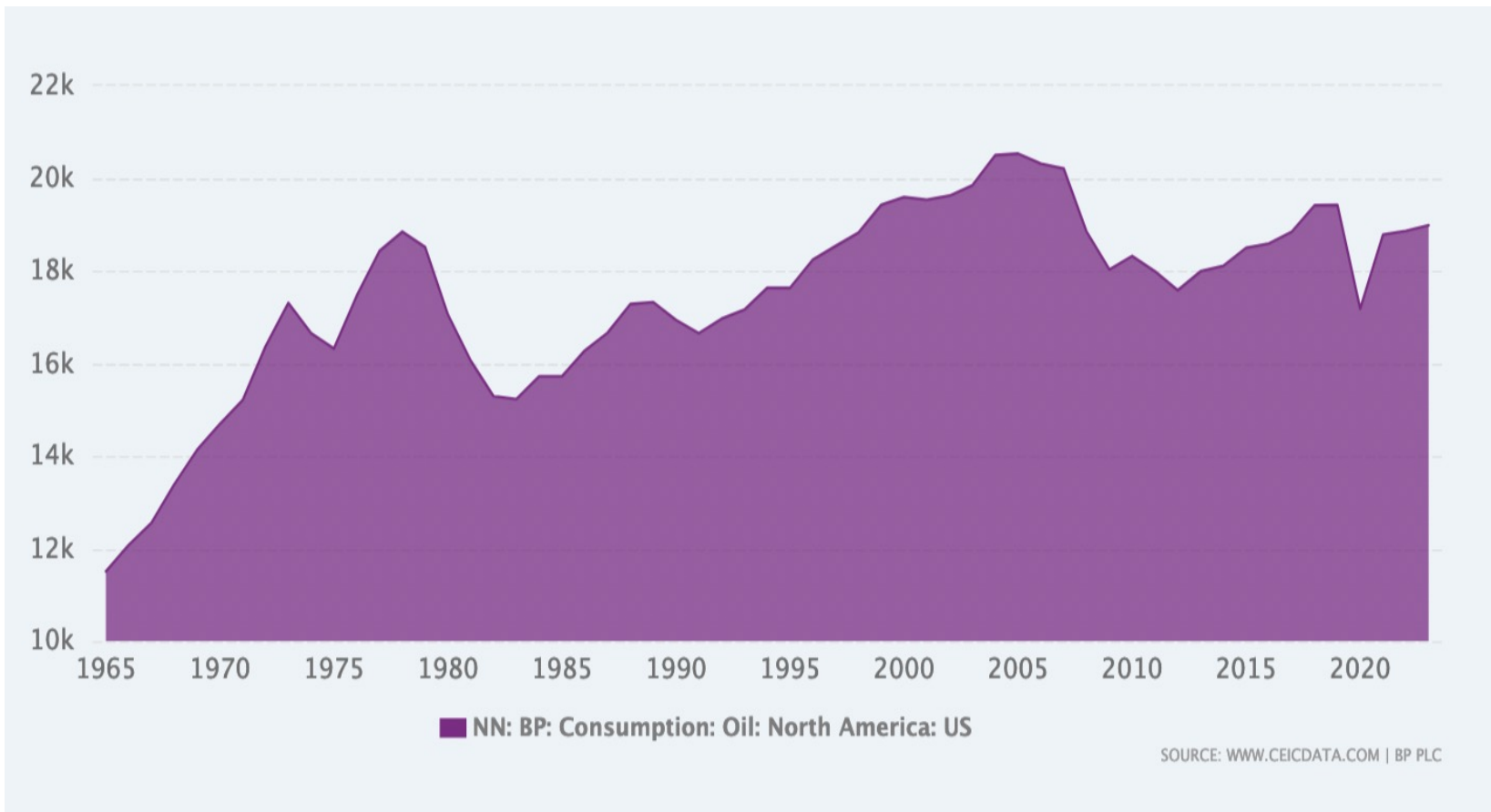


* Incl. derivatives of coal and natural gas, excl. biogasoline and biodiesel

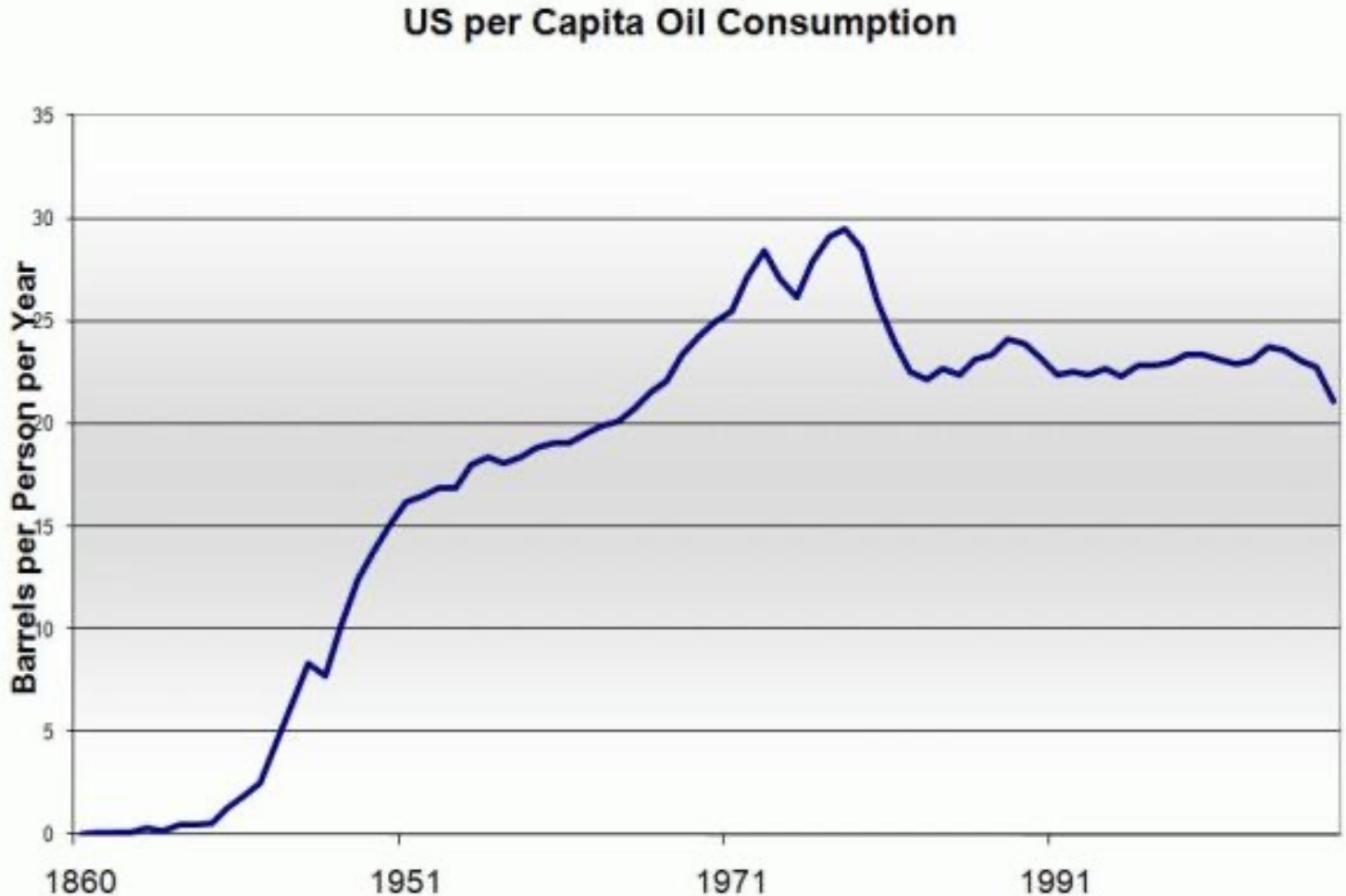
Source: Energy Institute Statistical Review of World Energy 2023



US Oil Consumption 1965-2023



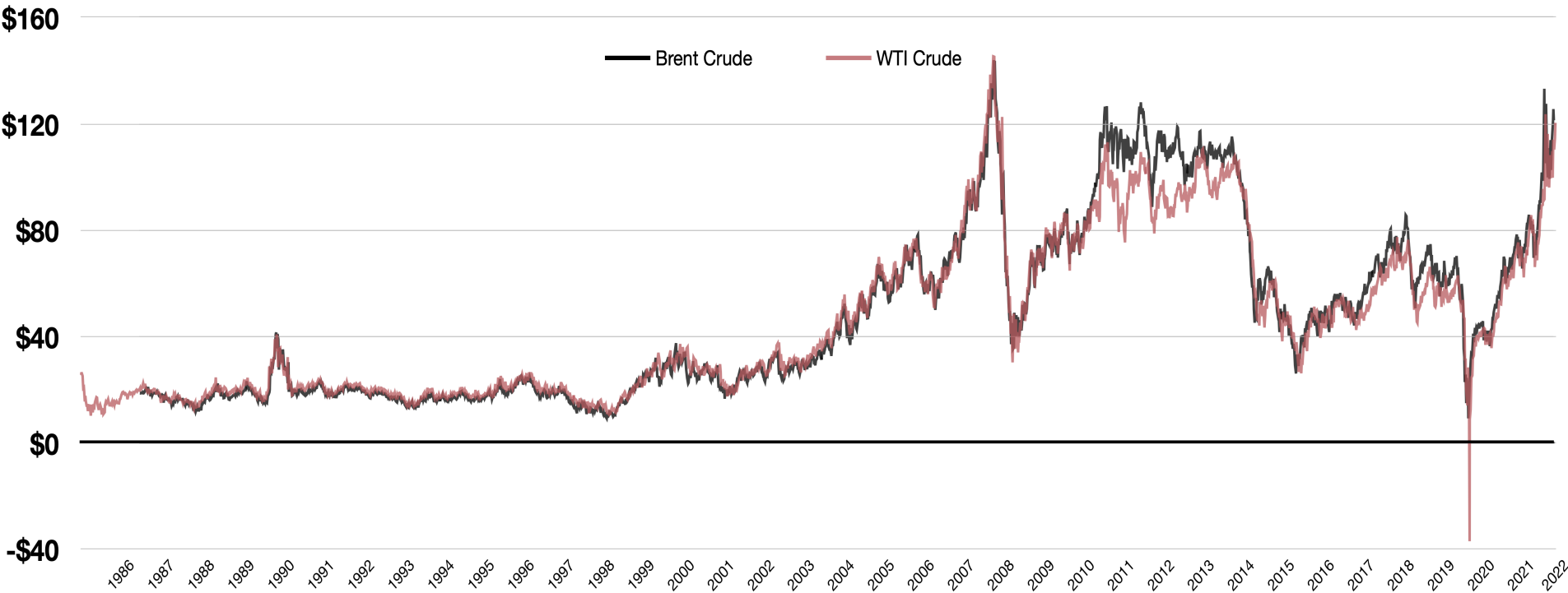
Petroleum use per capita



Pricing petroleum

- Benchmark prices for crude
 - West Texas Intermediate (WTI)
 - Light, sweet oil, used mainly in the U.S.
 - Brent
 - Heavier, more sour than WTI. Used mainly in Europe
 - Also have:
 - Urals - Russia
 - Dubai – Middle East
 - OPEC Basket – Weighted average of several indices for OPEC member nations.

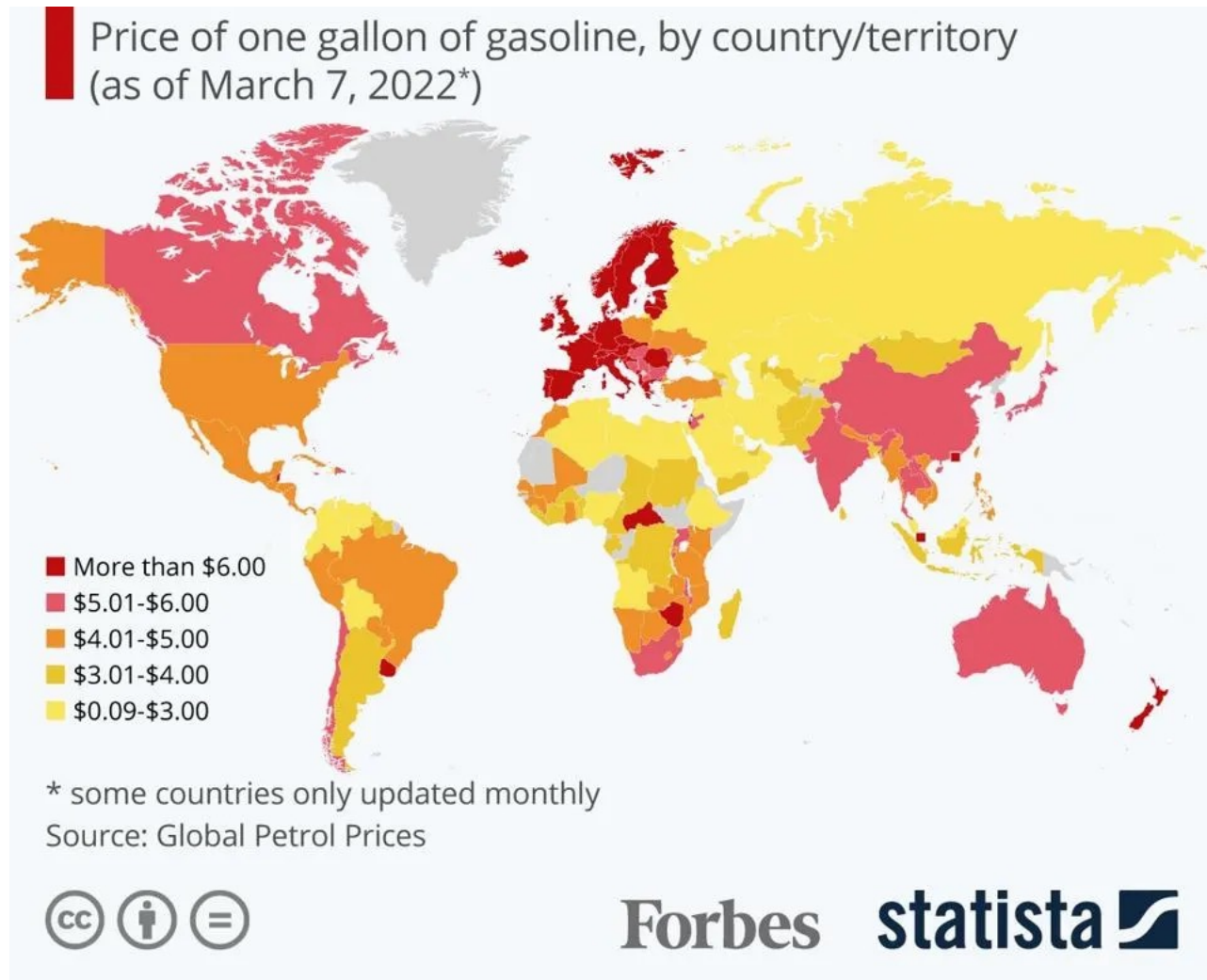
Brent vs WTI Crude Oil Price



Low prices → Drillers stop drilling → Supply decreases → Price increases

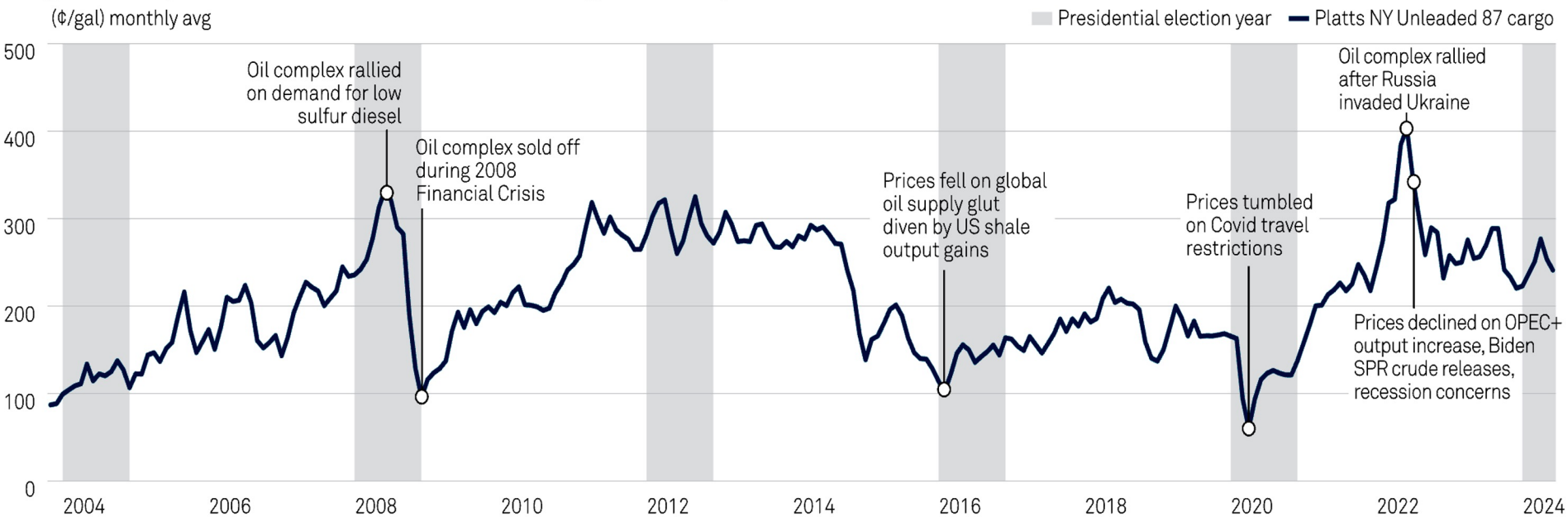
Prices decrease ← Supply increases ← Drillers start drilling ← High prices

Gasoline prices around the world



U.S. Gasoline prices (2002-2024)

US gasoline prices sometimes volatile during election years

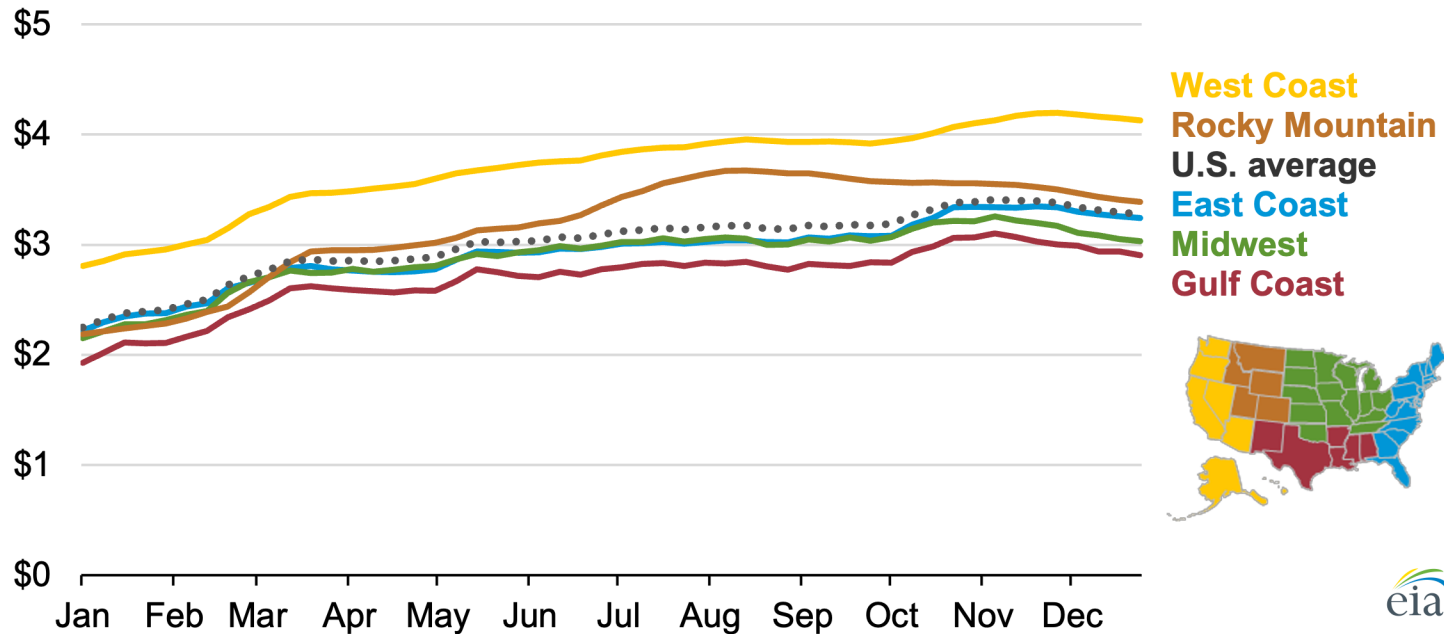


Source: S&P Global Commodity Insights

US Gasoline Prices by Region

Weekly U.S. average retail prices for regular grade gasoline (2021)

dollars per gallon



What is the U.S. Strategic Petroleum Reserve?



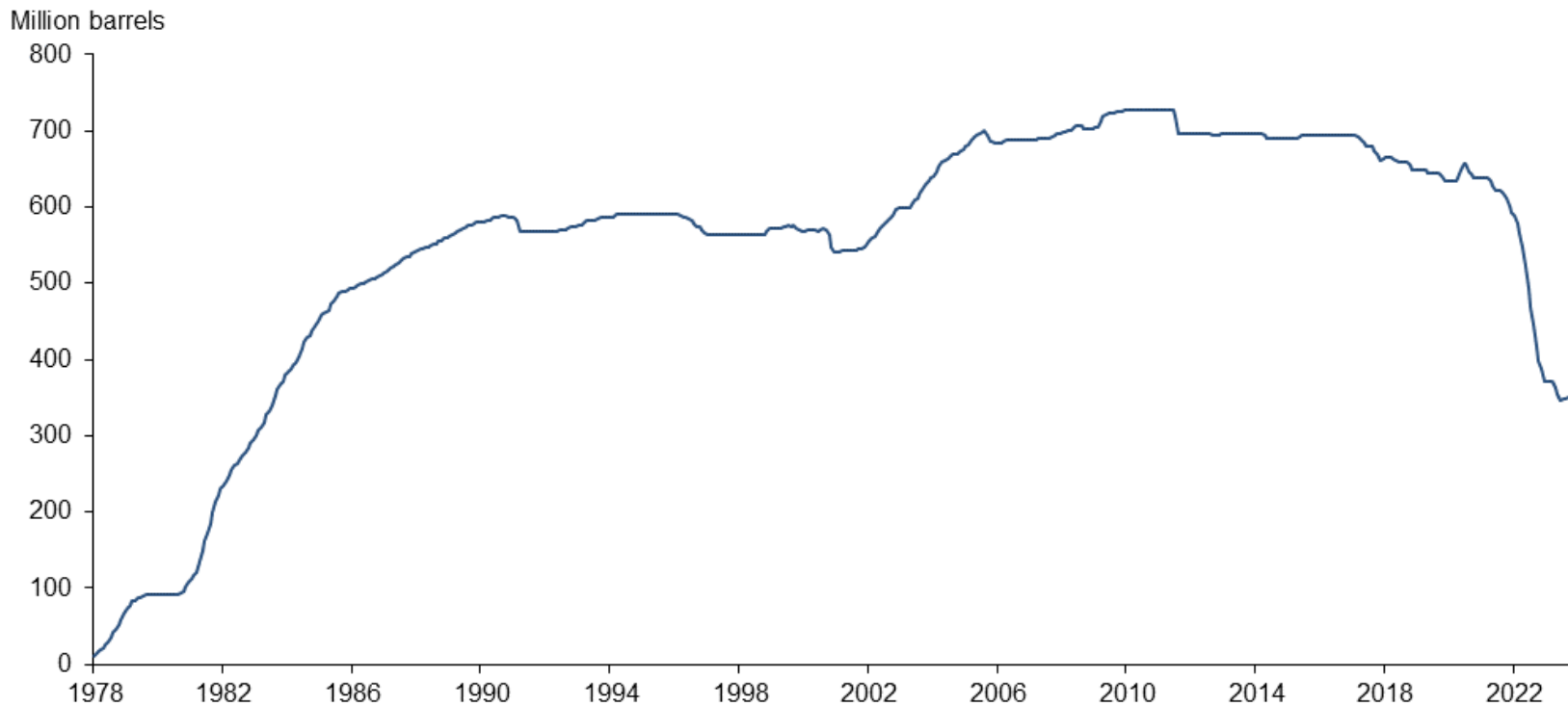
Strategic petroleum reserves

- Operated by the US Department of Energy, the U.S. Strategic Petroleum Reserve is the U.S. government's stash of crude oil
- Created after the 1973/74 oil embargo
- Purpose: To reduce market shock in case of disruptions to U.S. oil supply.
- Crude oil is stored in four salt caverns along the Texas and Louisiana Gulf Coasts.
- Capacity is about 714 million barrels
 - At 20 million barrels per day, can supply 36 days of oil.
- The capacity of the SPR makes it a deterrent to oil import cutoffs and a key tool in foreign policy.

US Strategic Petroleum Reserve

Chart 1

U.S. Strategic Petroleum Reserve inventories decline to 1983 levels



NOTE: Final monthly data are through July 2023. August through September 2023 are calculated with preliminary weekly data.

SOURCE: Energy Information Administration.

Federal Reserve Bank of Dallas

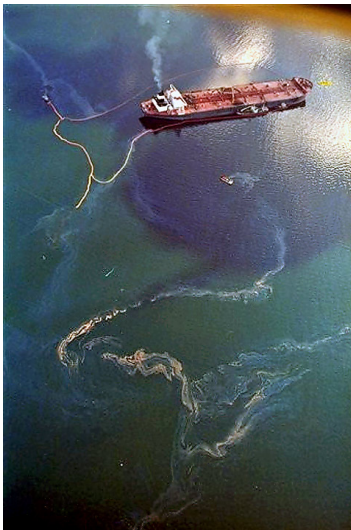


Benefits of petroleum as an energy source

- High energy density
- Convenient to transport
- Burns relatively cleanly
- Produces many forms of energy
- Byproducts common in our modern lives

Drawbacks of petroleum as an energy source

- Often unreliable, especially if imported
- Drilling causes habitat impacts
- Spills can be devastating, ecologically
- Greenhouse gas emissions



<http://seawayblog.blogspot.com>



<http://en.wikipedia.org/wiki/>



<http://www.treehugger.com/>



<http://www.bbc.co.uk/news/world-us-canada-11648354>