

Its good to be back at NIES...

... if only virtually.

# U.S. Trends and Pathways

Jae Edmonds

2020 Asia Integrated Modeling Keynote Address



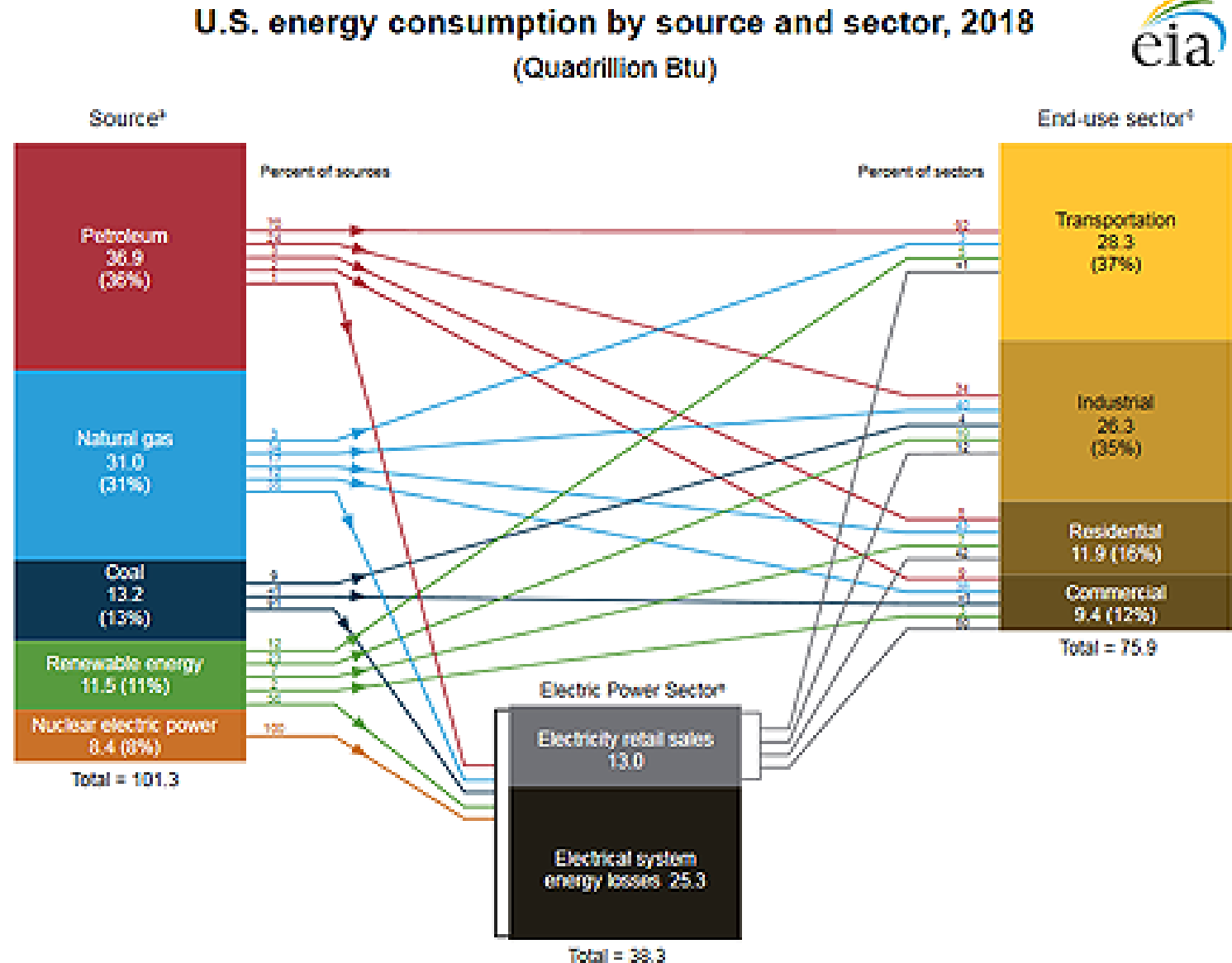
# Major U.S. Trends

---

- U.S. power sector is going through a transition
- U.S. is shifting from a net energy importer to a net energy exporter
- U.S. GHG emissions have trended downward

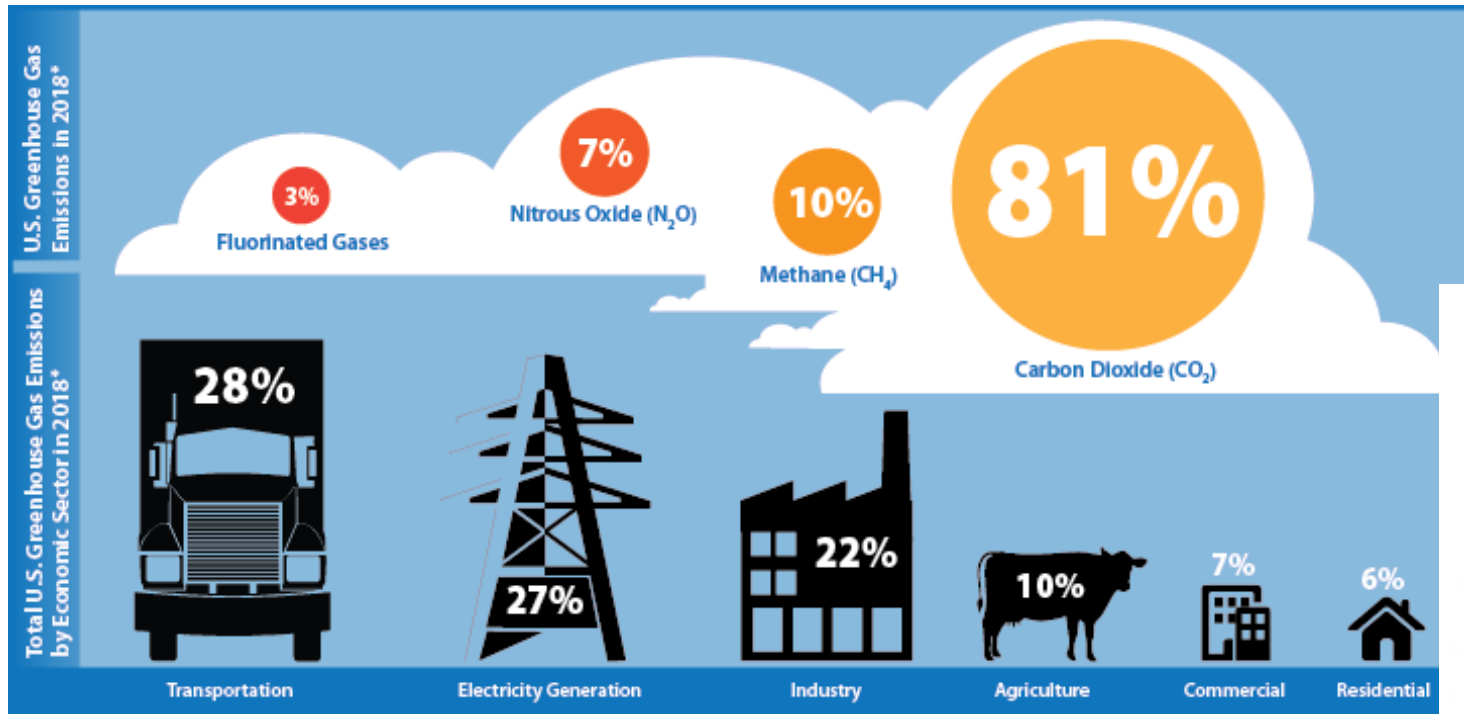
# U.S. Energy Production and Consumption

- Total U.S. energy consumption is 101 Quads (~107 EJ) per year.
- Dominated by oil and gas consumption
- Growing share of renewable energy
- End use energy 76 quads (80 EJ) per year



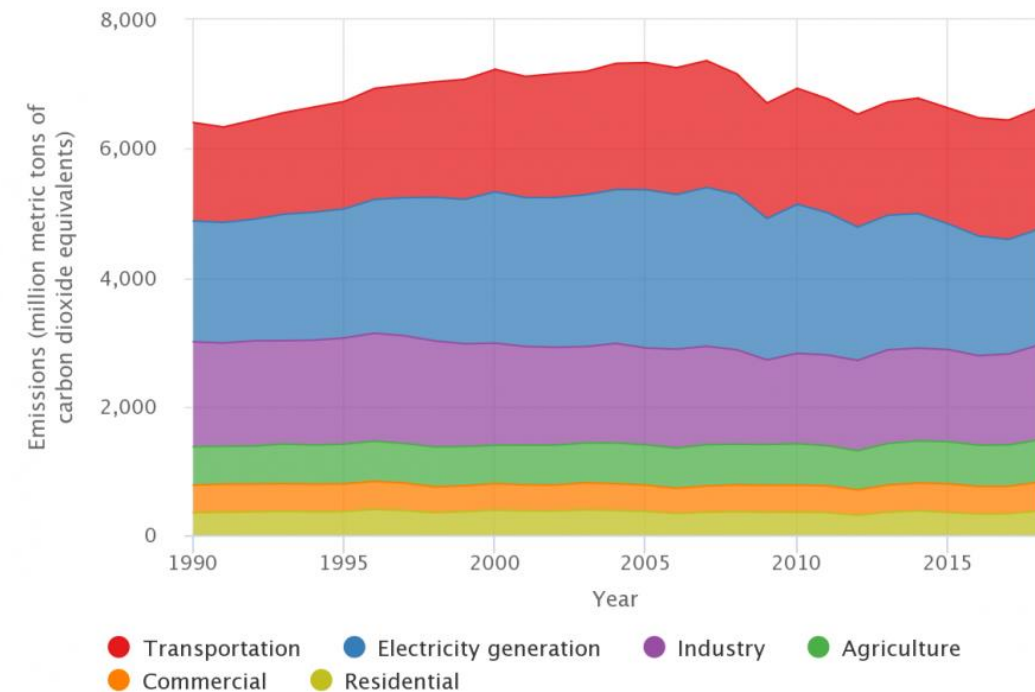
Source: U.S. Energy Information Administration, [Monthly Energy Review](#)

# U.S. Greenhouse Gas Emissions



Source: <https://cfpub.epa.gov/ghgdata/inventoryexplorer/>

U.S. Greenhouse Gas Emissions by Economic Sector, 1990-2018



# U.S. Power Sector

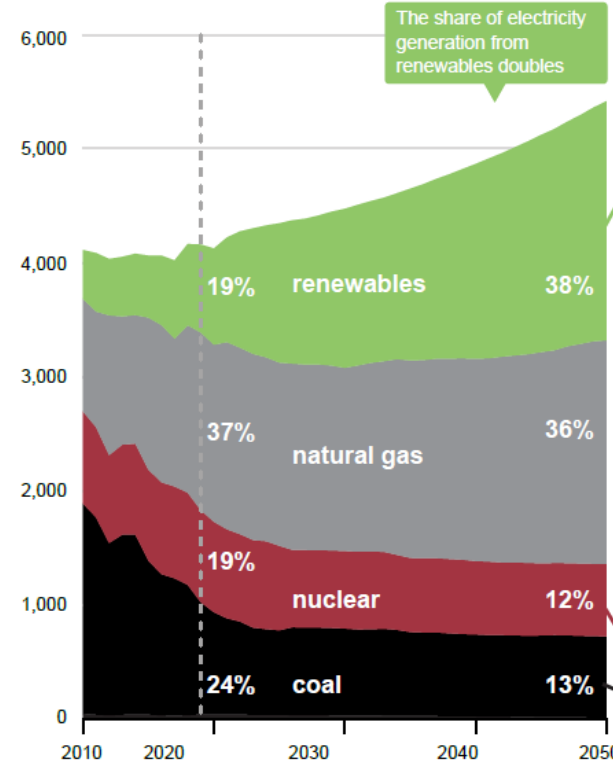
- Going through a transition
- Increasing role
  - Renewables
  - Natural gas
- Retirements of coal



AE02020 Reference case

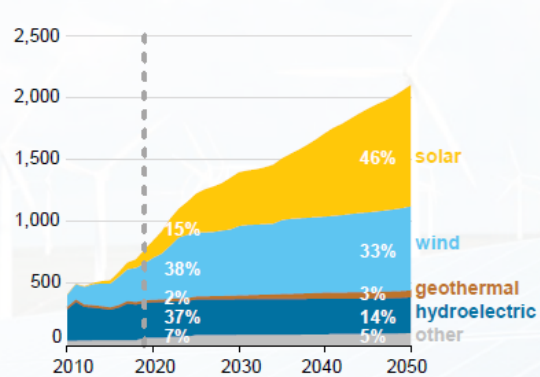
## Electricity generation from selected fuels

billion kilowatthours



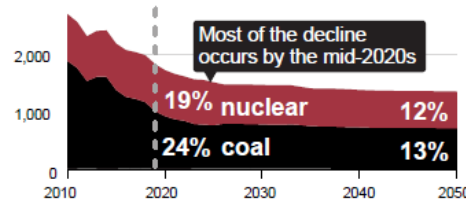
## U.S. renewable electricity generation is the fastest-growing electricity resource throughout the projection period.

Renewable electricity generation, including end use  
billion kilowatthours



## U.S. coal-fired and nuclear electricity generation declines

Electricity generation from nuclear and coal  
billion kilowatthours



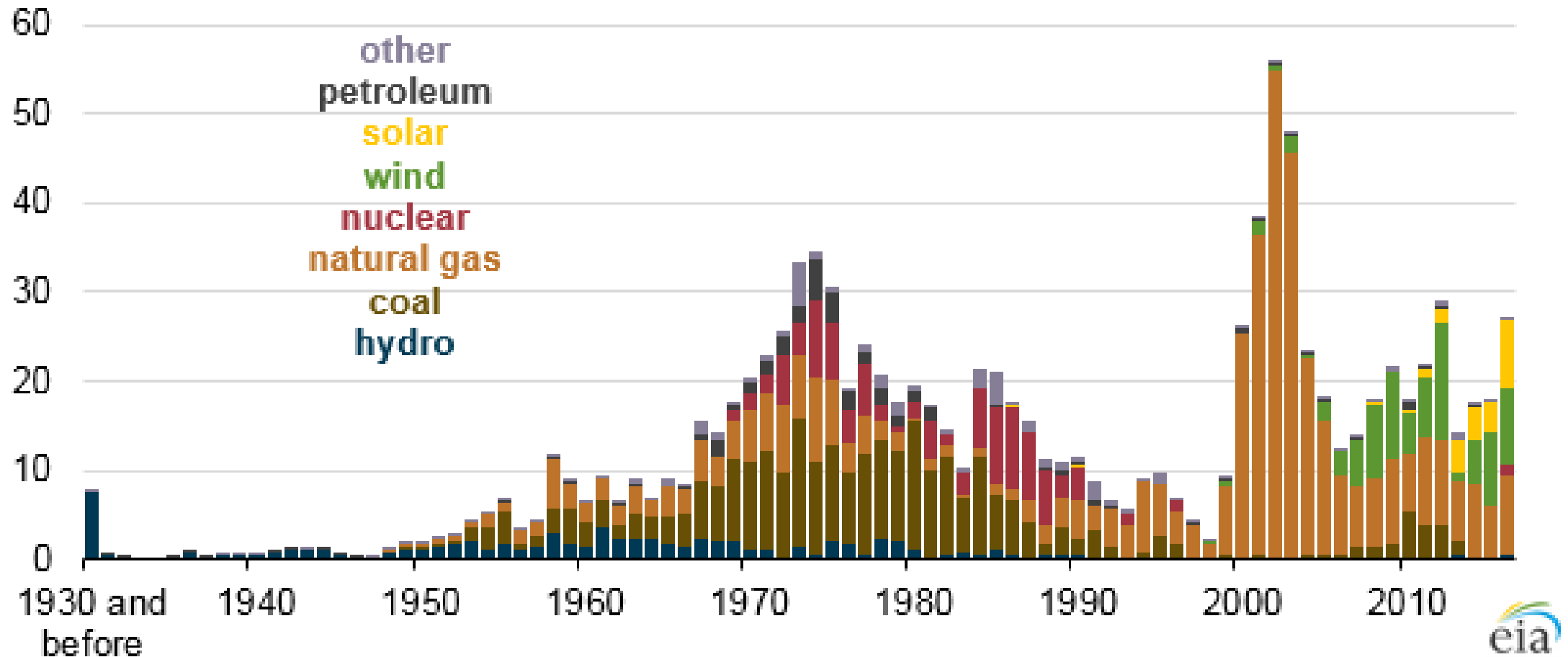
The share of coal-fired electricity generation falls from 24% to 13%.

The share of nuclear generation falls from 19% to 12%.

Source: U.S. Energy Information Administration, Annual Energy Outlook 2020 (AE02020) Reference case

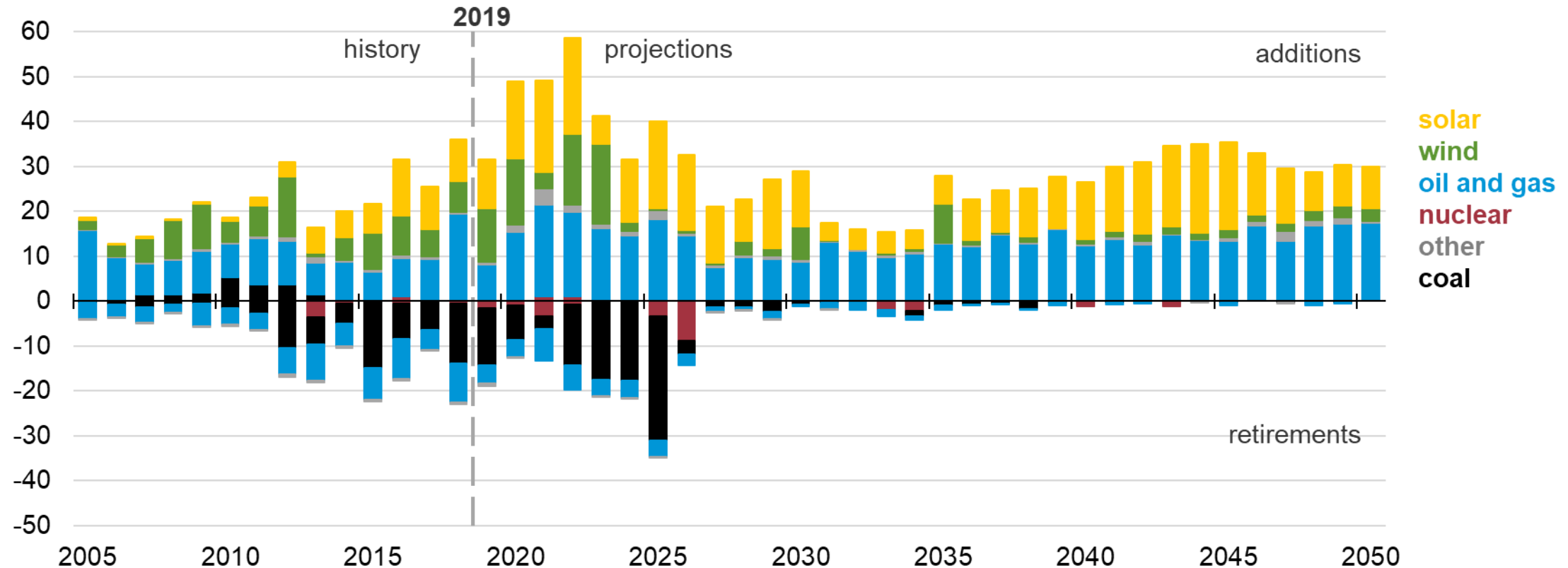
# Age structure of U.S. generating capacity (2016)

U.S. utility-scale electric generating capacity by initial operating year (as of Dec 2016)  
gigawatts



# Changes in power sector capacity: history to 2019 and EIA projection to 2050

Annual electricity generating capacity additions and retirements (Reference case)  
gigawatts

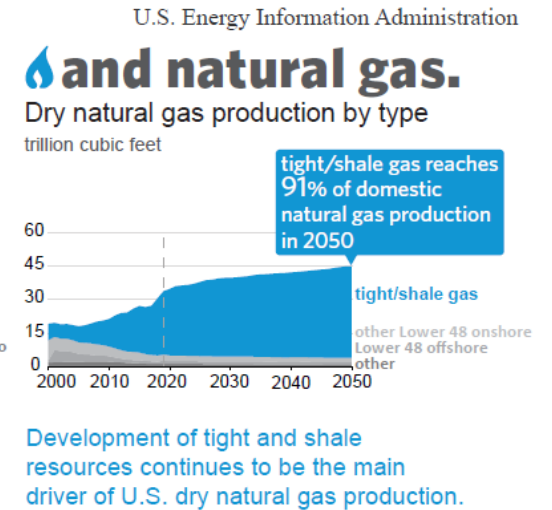
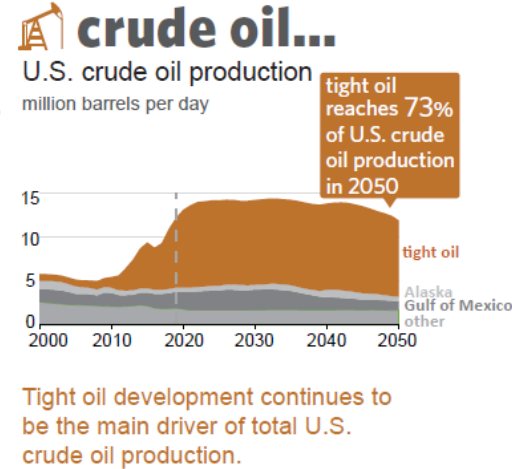


# The U.S. EIA Annual Energy Outlook

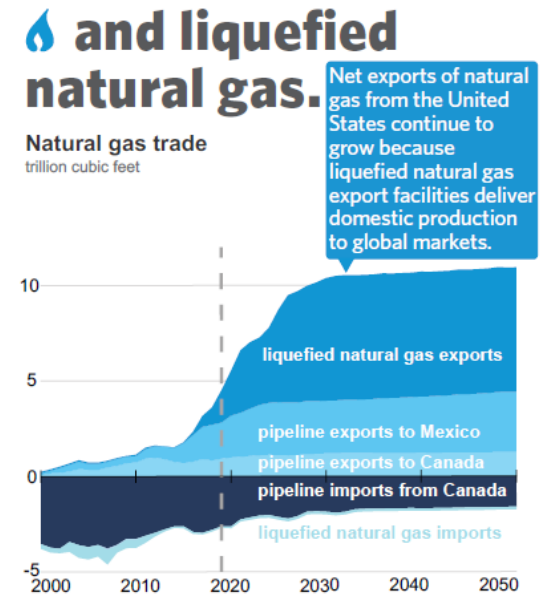
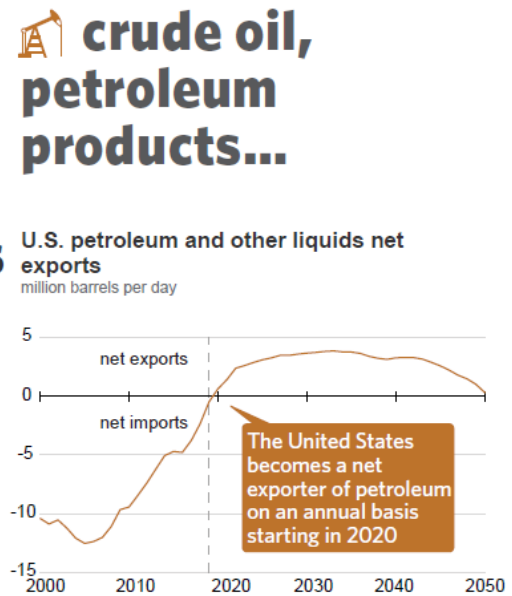
Advances in oil and gas production technology has enabled increased production from shales and other previously inaccessible resources

eia  
AEO2020 Reference case

**The United States continues to produce historically high levels of...**

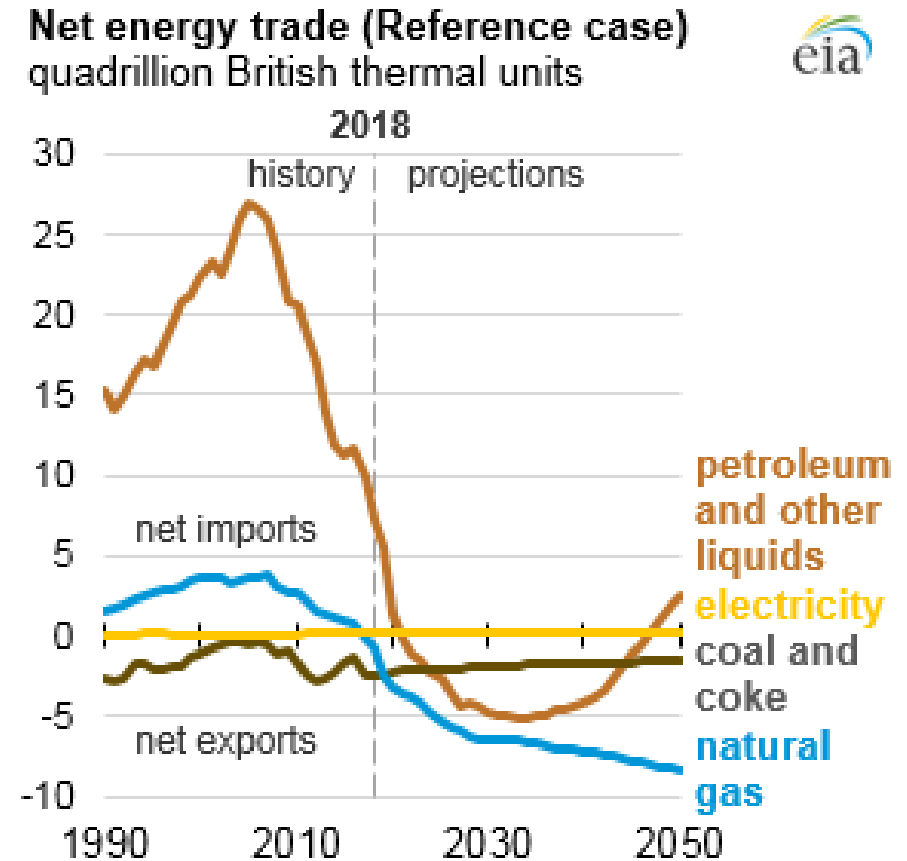
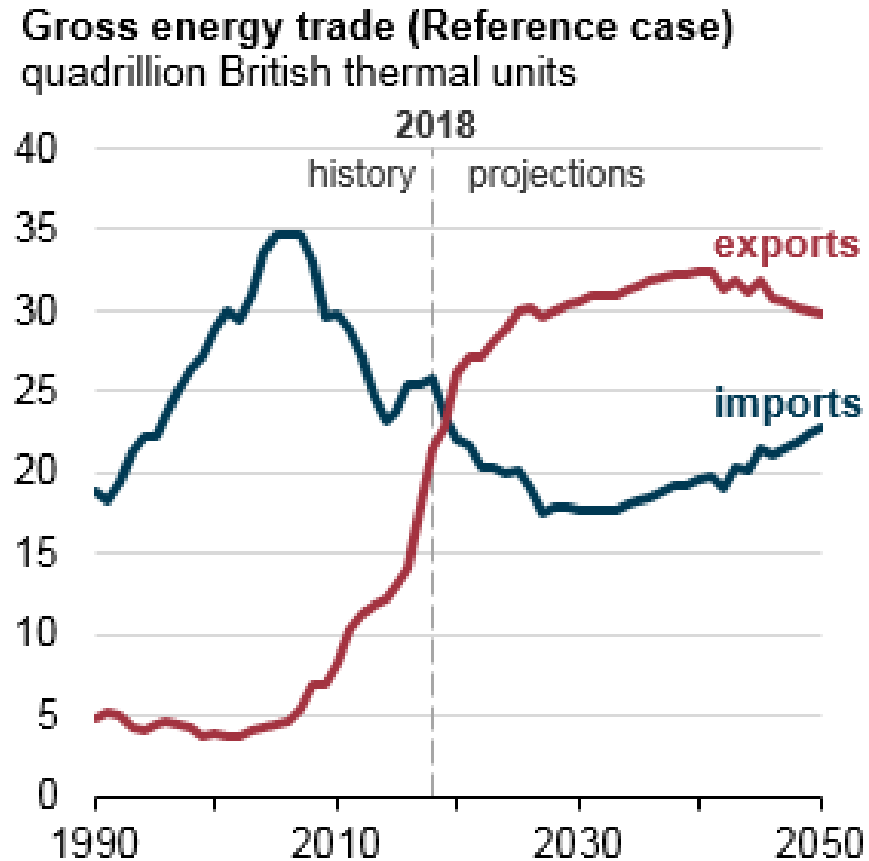


**Slower growth in domestic consumption of these fuels leads to increasing exports of...**



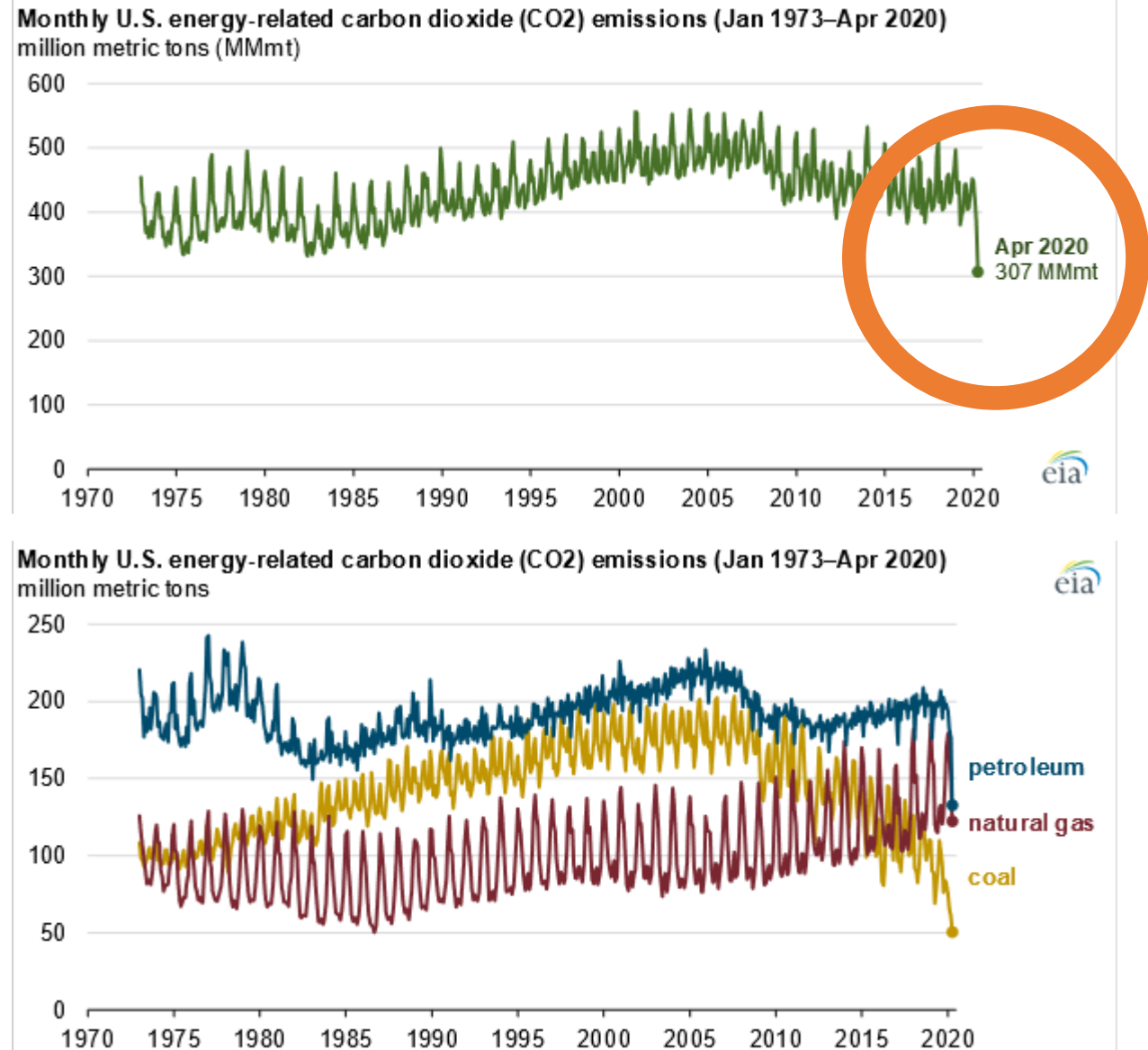
# U.S. moving from net importer to net exporter

Advances in oil and gas production technology has enabled increased production from shales and other previously inaccessible resources



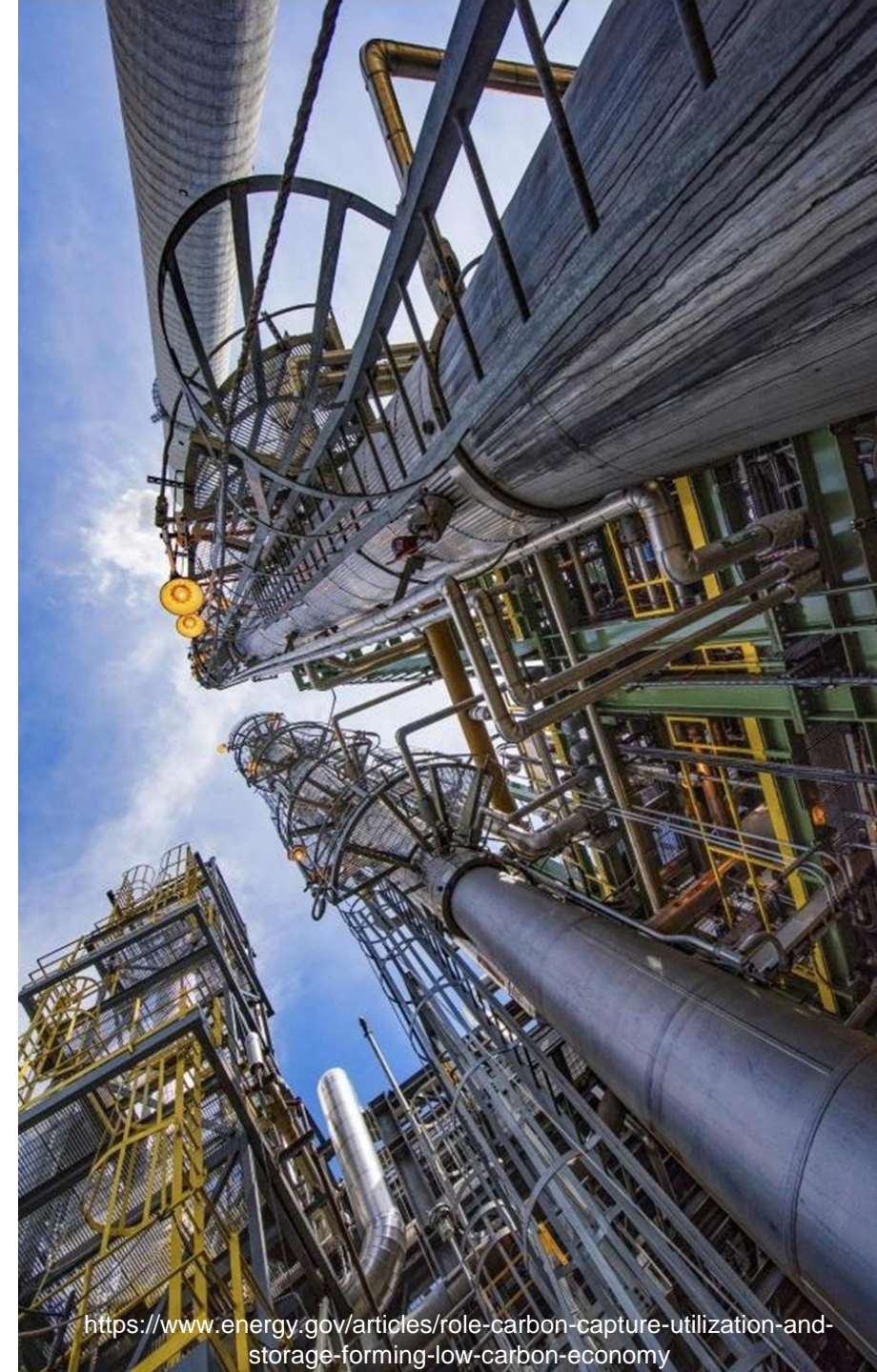
# A note on COVID-19

- The short-term impact of COVID-19 is showing up in the data
- The longer-term impact of COVID-19 is uncertain.
- If COVID-19 creates a global recession, the impact could extend beyond the time when the disease is controlled.

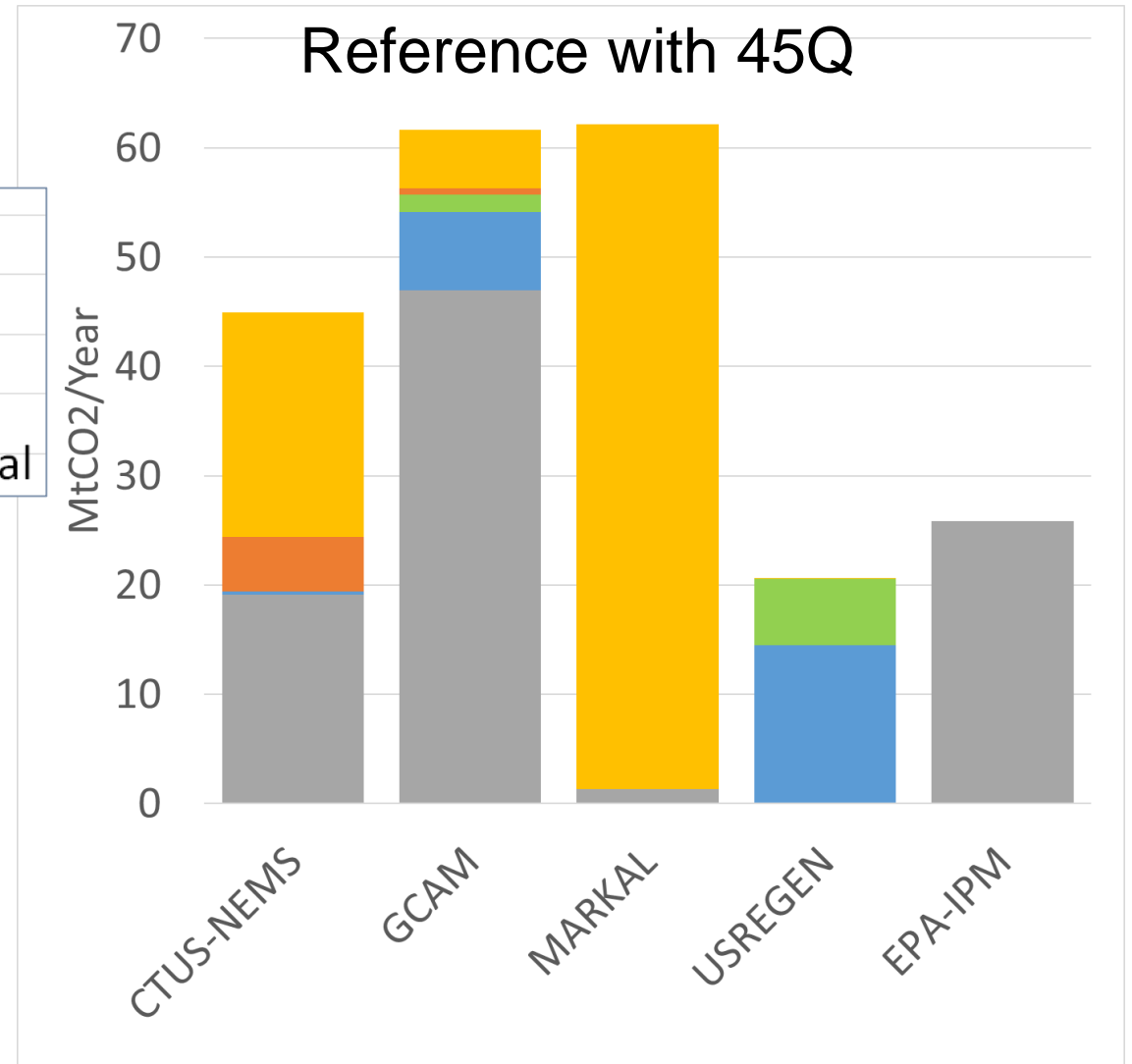
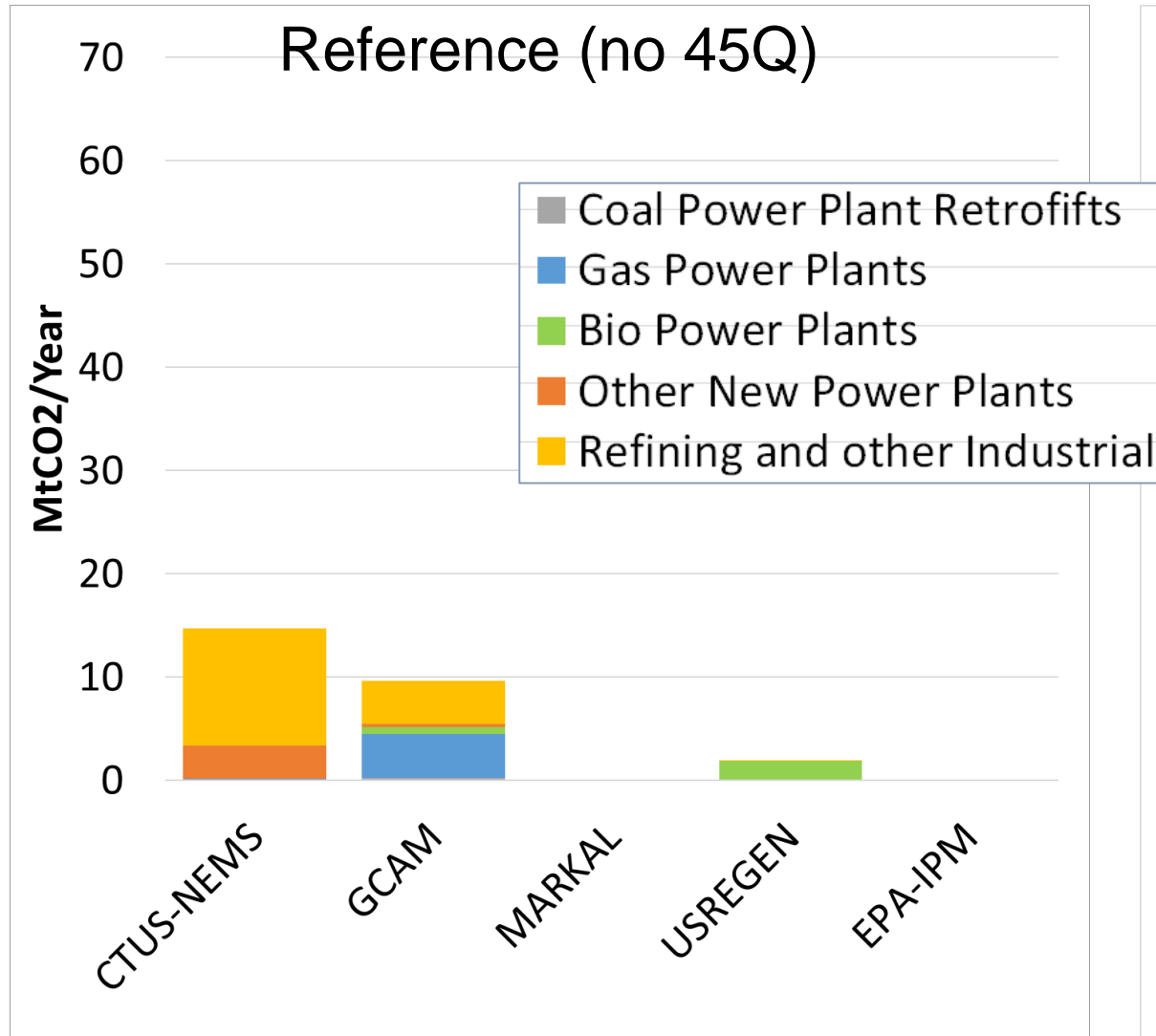


# 45Q

- ▶ The Bipartisan Budget Act of 2018 amends section 45Q of the tax code.
- ▶ The new 45Q provisions increase the value of the credit to \$35/ton for CCUS (EOR) and \$50/ton for saline storage.
  - Linear ramp up from \$12.83/ton (utilization); \$22.66/ton (storage) in 2017.
  - Start construction by 1 Jan 2024
  - Available for 12 years of capture
- ▶ Study group goal: **Assess the effect on CO<sub>2</sub> capture utilization and storage (CCUS) of 45Q and similar measures.**



# Modeling Results: CO<sub>2</sub> Capture in 2030



## GCAM was used to explore 3 alternative pathways to deep decarbonization in 2050

### ● A Competitive Climate



### ● Climate Federalism



### ● Low-Carbon Lifestyles

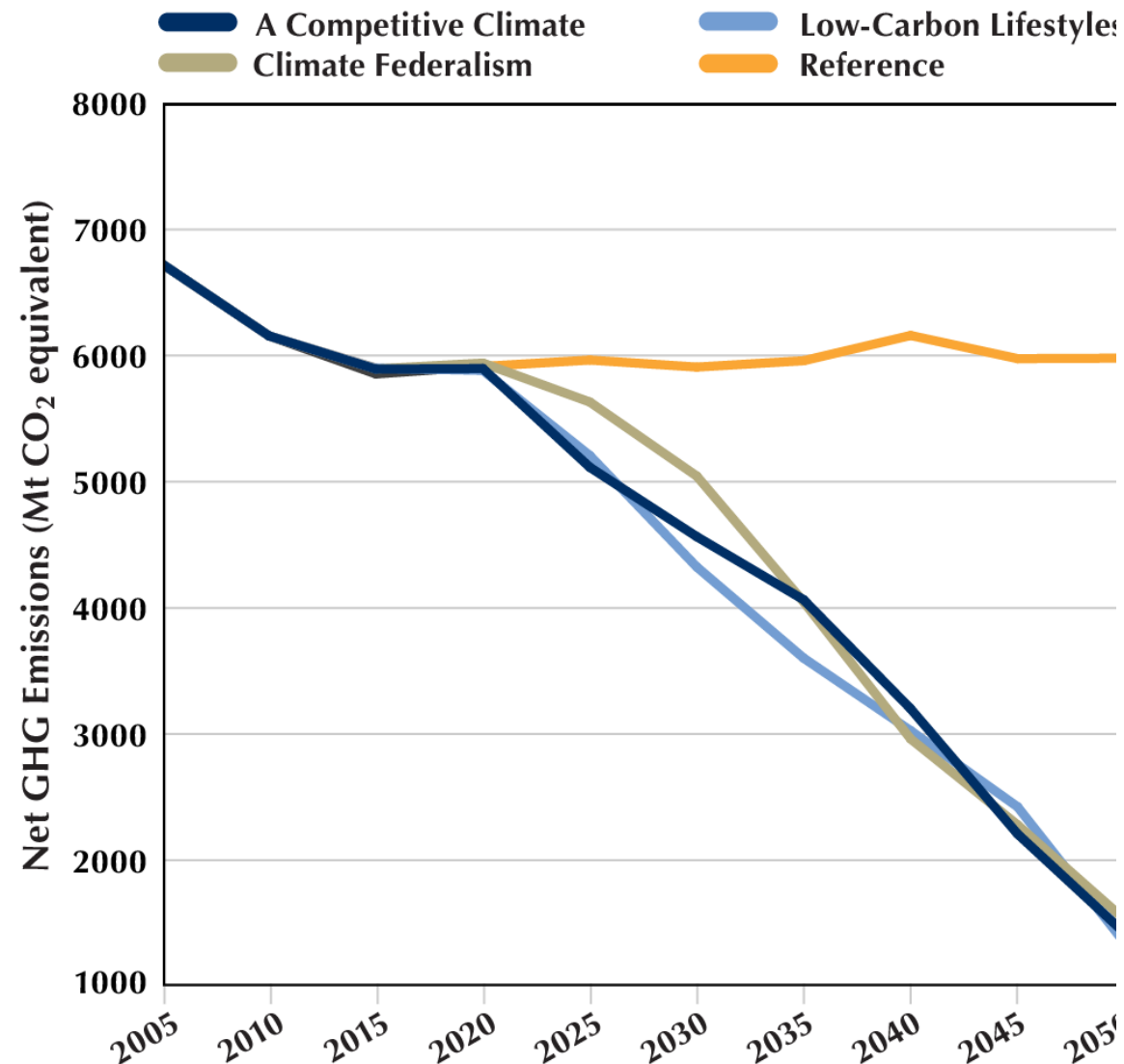


- Each scenario has a unique mix of political drivers, policy (federal, state and local), business action, technology innovation, consumer preferences

# Key Takeaways

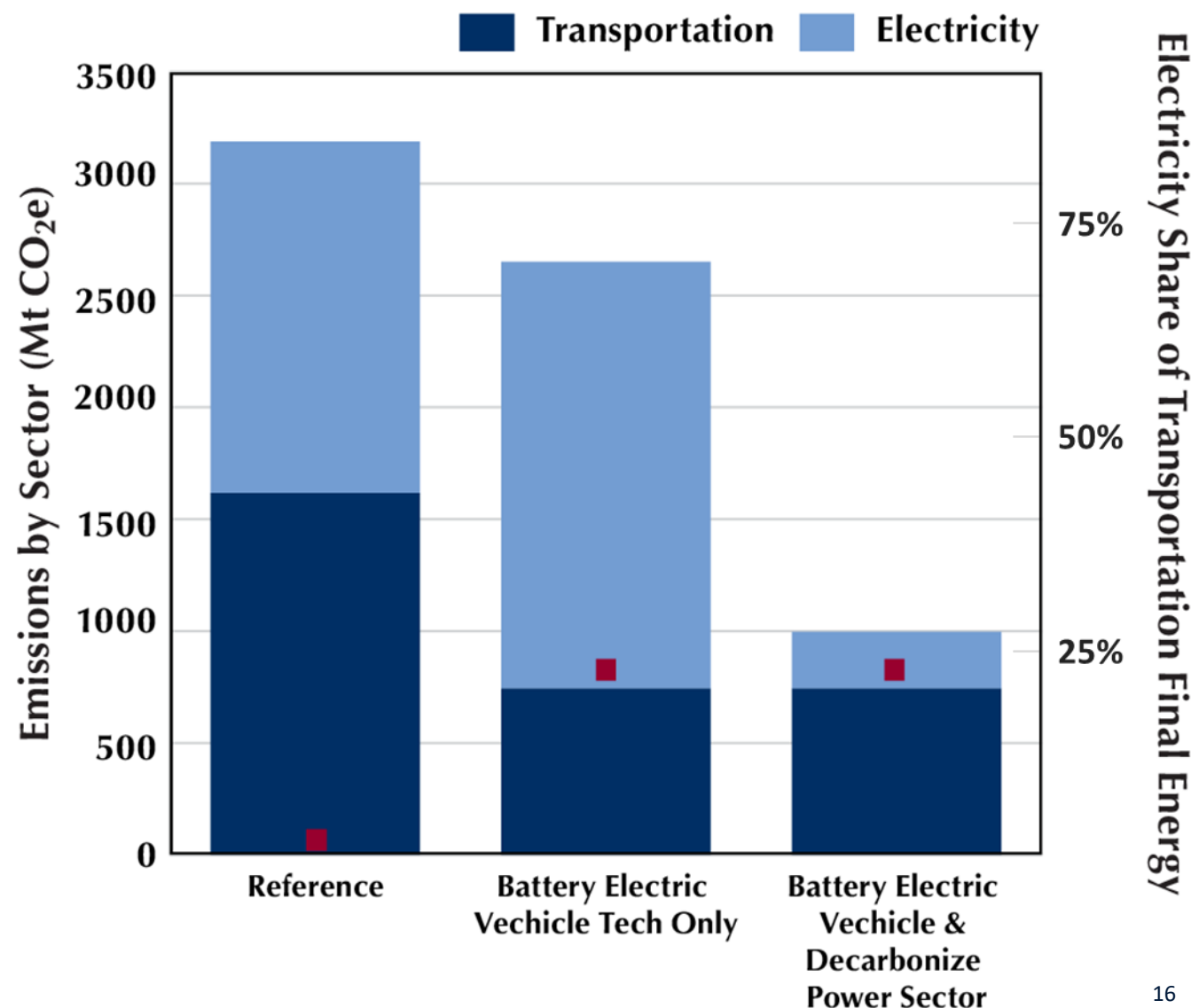
**Decarbonizing the U.S. economy requires certain fundamental shifts in the ways we generate energy, produce goods, deliver services, and manage lands.**

- These fundamental shifts can be achieved through a host of alternative pathways reflecting different drivers, contingencies, and societal choices.
- Every pathway requires that action begins soon and that everyone pitches in—policymakers at all levels, investors, entrepreneurs, consumers, voters, and companies across key sectors of the economy.
- Any successful pathway hinges on high levels of public support, expressed through stronger demand for effective policies and/or low-carbon goods and services.
- Decarbonization also requires a broad suite of policies that drive investment and action by setting goals, targeting resources, providing incentives, and ensuring a level playing field.



# Key Takeaways

- Technological innovation can greatly facilitate decarbonization but is not, on its own, sufficient to achieve it.
- **The private sector is an essential partner in any decarbonization pathway, and timely business leadership can help ensure choices that are beneficial for both companies and society as a whole.**
- Sectoral responses are highly interdependent—the pathway chosen by one sector may enhance or constrain the decarbonization options of others.





Next Year Together Again