Global and Domestic Energy Trends

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Baker Institute and Baker Botts Annual Energy Summit
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September 28, 2022

Talk Overview

- Key Trends
  - Natural gas and LNG exports
  - Electric sector transition
  - Inflation Reduction Act
  - Petroleum supply and demand
- My Priorities
- Plans for Annual Energy Outlook 2023

Natural Gas Markets

Concerns Over Natural Gas

- Impacts of Russian invasion, including European heating season
- Tight US market and low elasticity of substitution in the electric sector

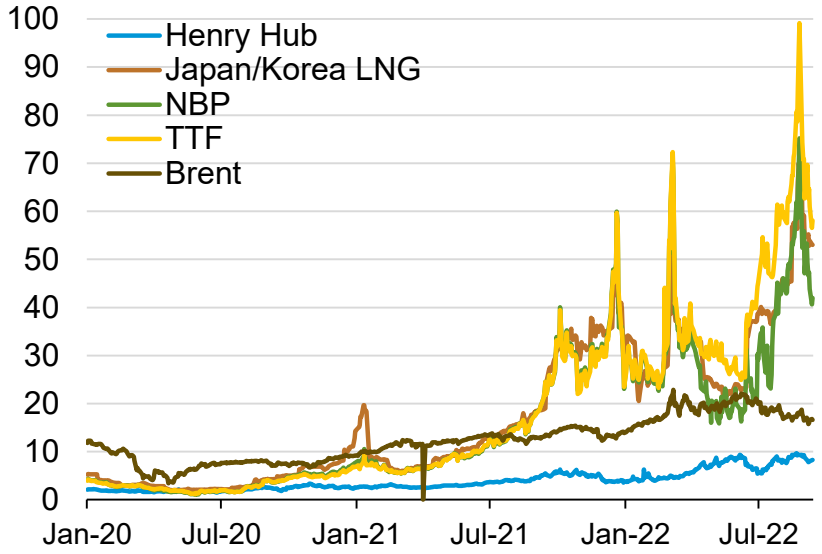
Our planned analysis:

- Regular natural gas updates
- Tabletop exercise – late October
- NEMS Issues in Focus – late next year

Growing LNG exports are connecting the United States to the global market

International natural gas prices and Brent crude oil

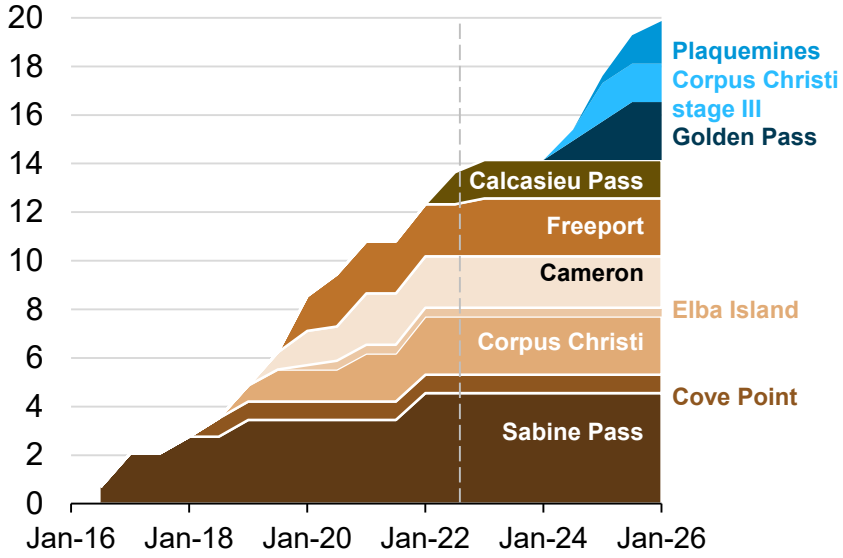
$/MMBtu



Source: U.S. Energy Information Administration, Short-Term Energy Outlook, September 2022 with data from CME Group and Bloomberg L.P.

U.S. LNG export projects: existing & under construction

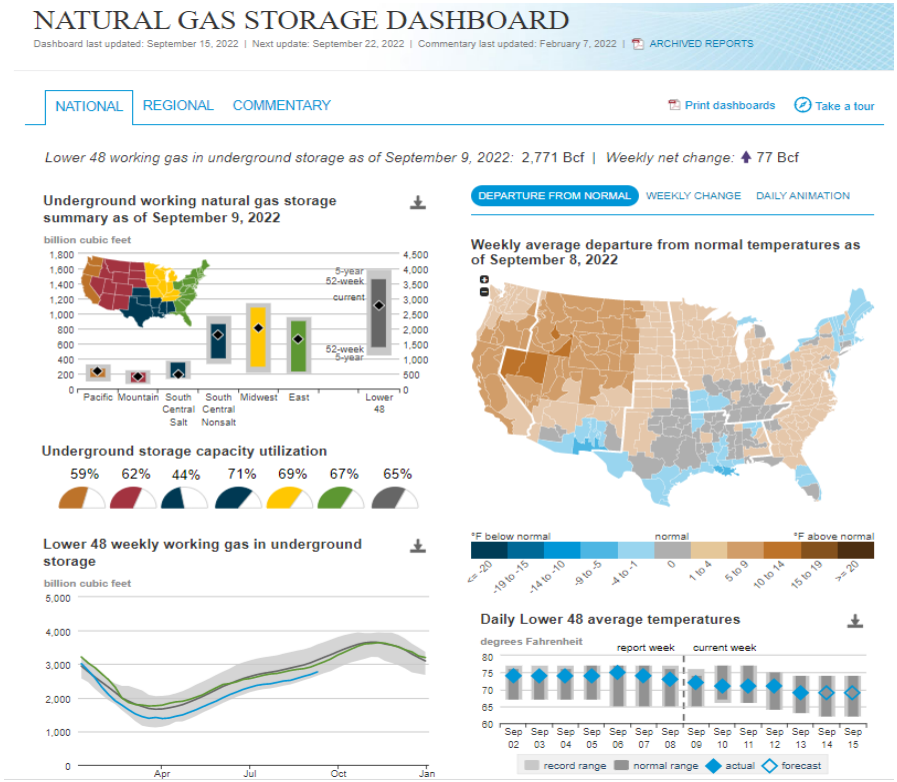
Bcf/d

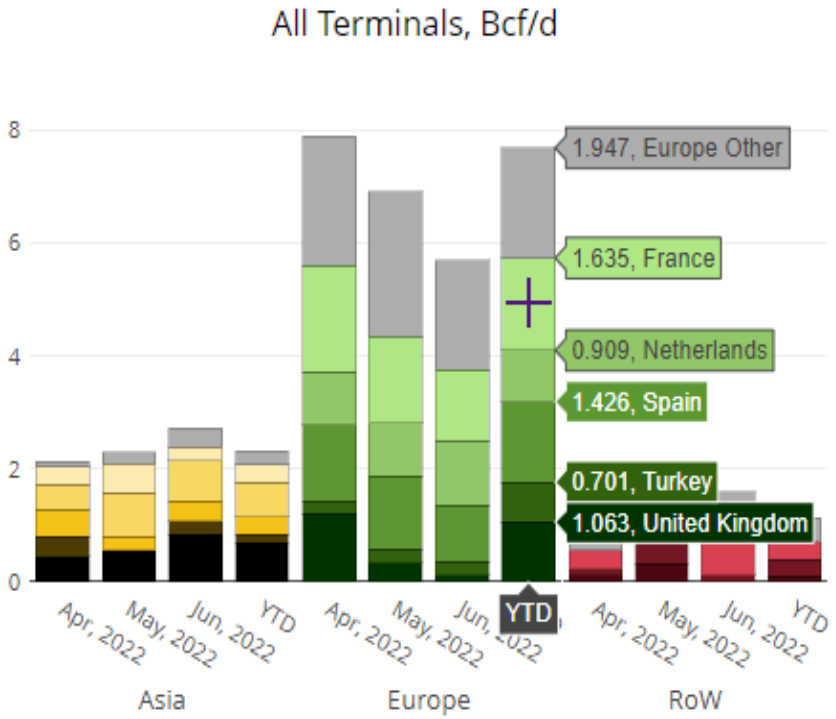


Note: EIA estimates are based on information from Federal Energy Regulatory Commission and U.S. Department of Energy filings, company websites, trade press, and other industry sources

Source: U.S. Energy Information Administration, Liquefaction Capacity File

Our Natural Gas Dashboard

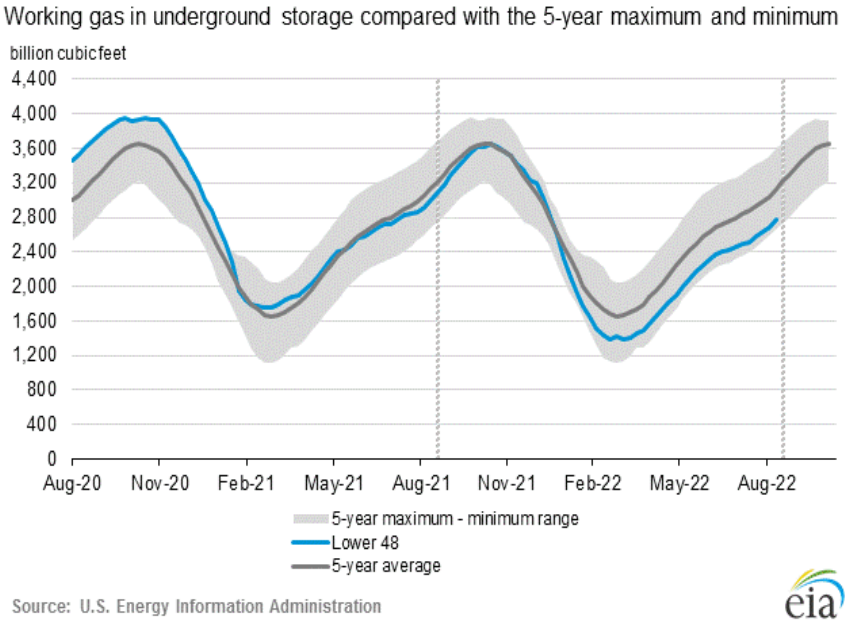


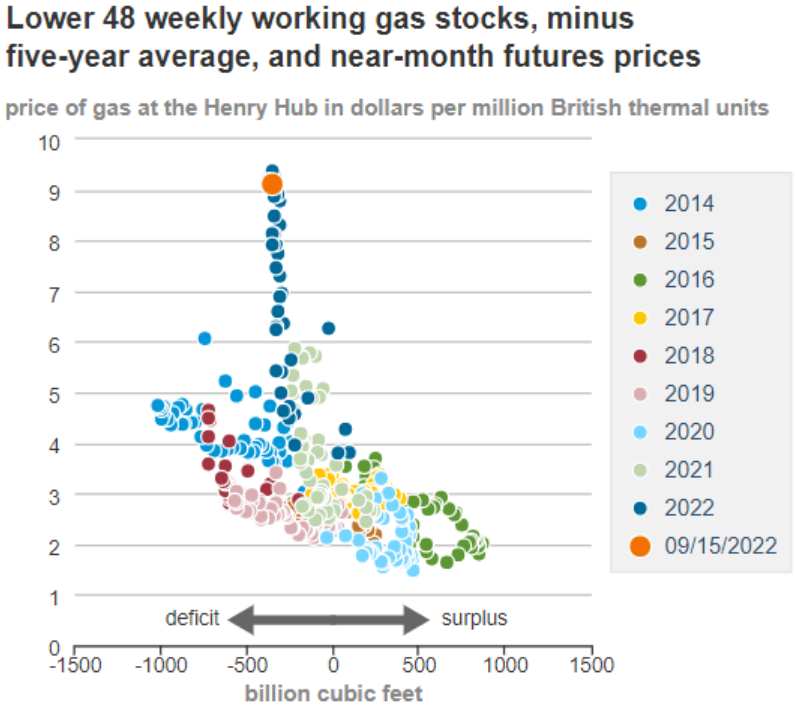


Source: U.S. Energy Information Administration, Natural Gas Storage Dashboard

Domestic Electric Sector Effects

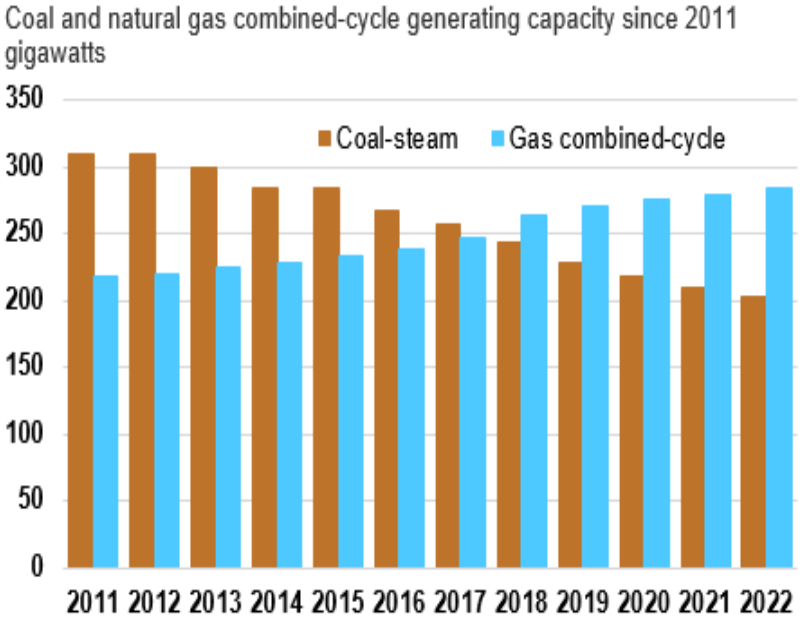
Natural gas inventories lag the five-year average; more inelastic supply/demand means moderate changes in stocks have outsized price effects

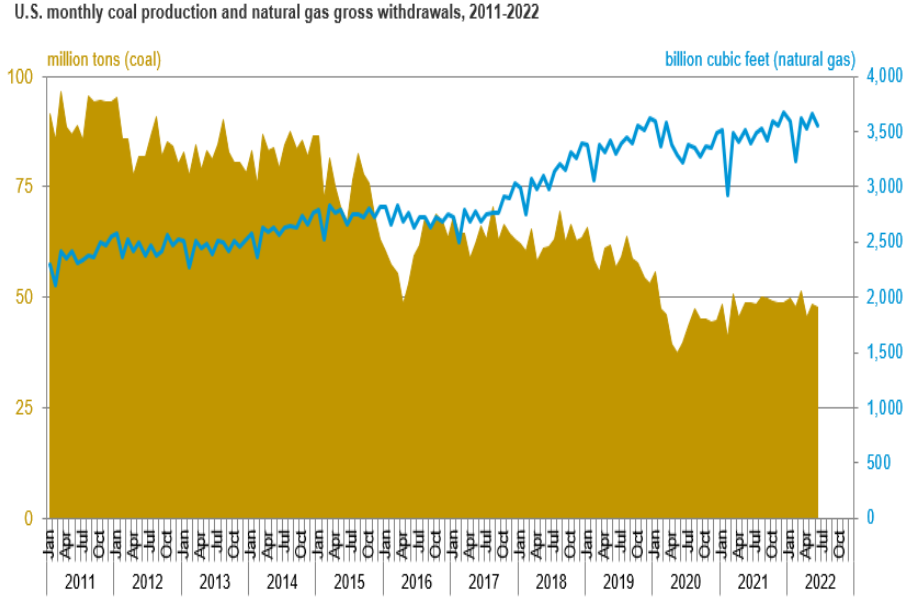




Sources: U.S. Energy Information Administration Weekly Natural Gas Storage Report and Natural Gas Storage Dashboard

With a fall in coal generating capacity, monthly coal production is nearly half 2011-levels

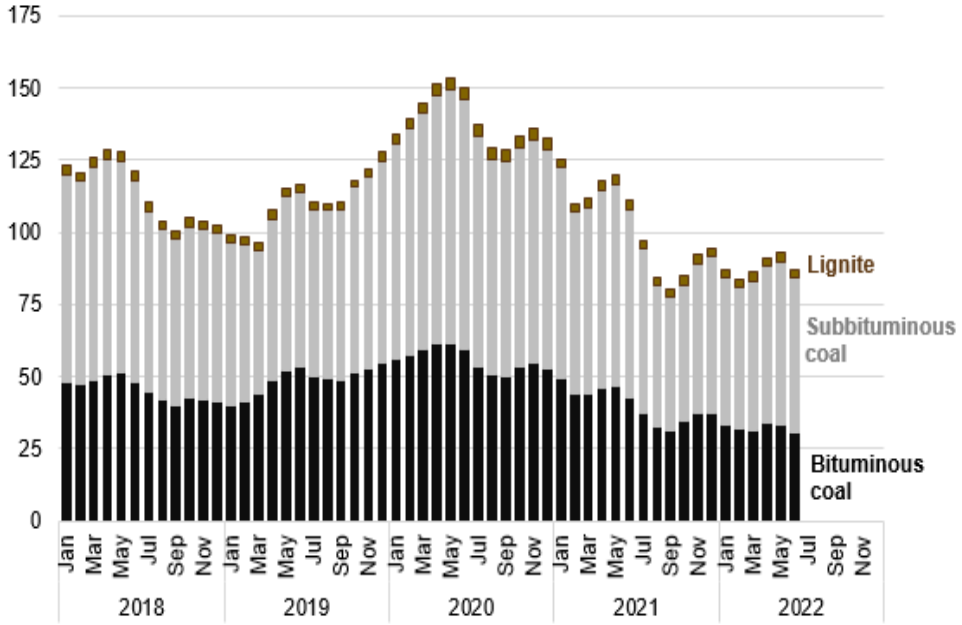




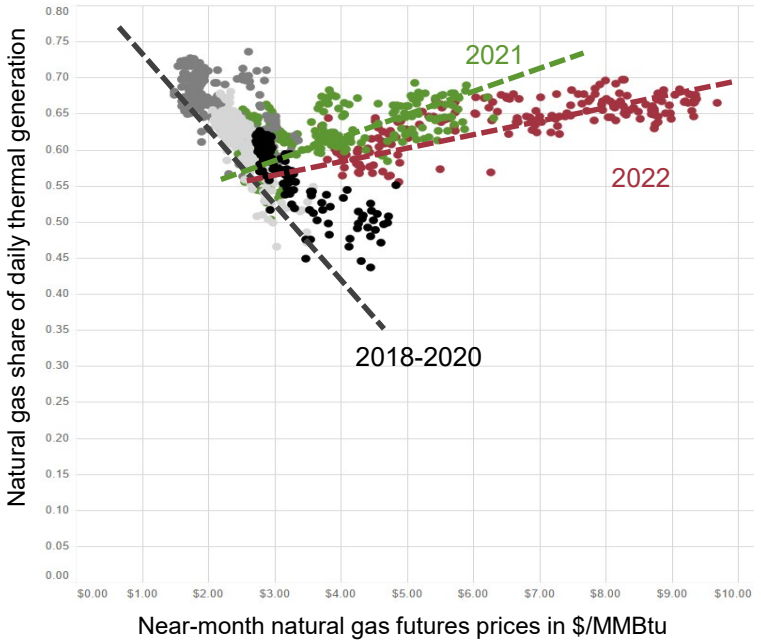
Sources: U.S. Energy Information Administration, Forms 860 and 923, Monthly Energy Review.

Coal stockthermal s held by utilities have been declining; natural gas' share of daily generation is high despite higher natural gas prices

Electricity utility coal stocks by rank and month since 2018
million tons



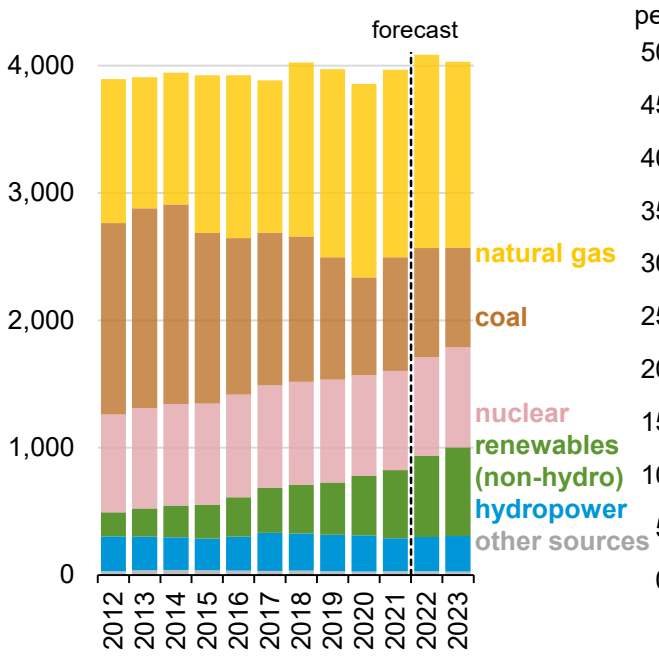
Natural gas' share of daily thermal generation relative to near-month natural gas futures prices

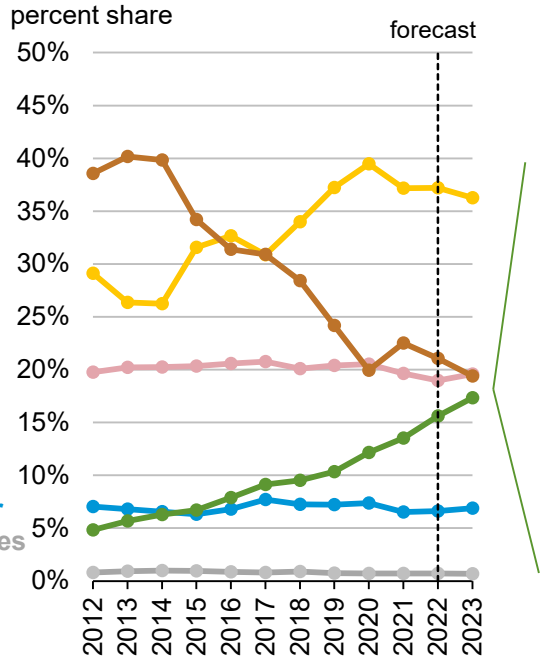


Sources: U.S. Energy Information Administration, Forms 923 and 930, Bloomberg, L.P.

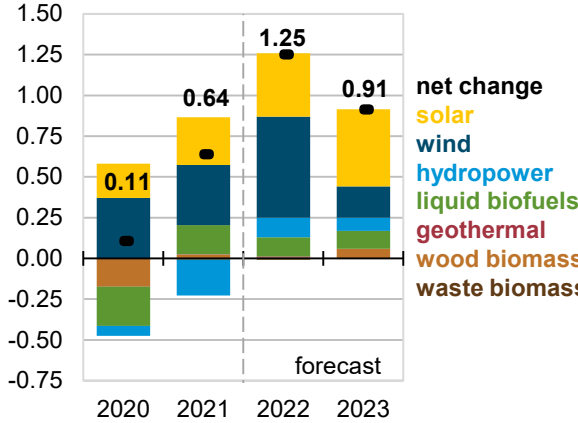
Increased renewables deployment in the short-term

U.S. electricity generation by source, all sectors
billion kilowatthours





Components of annual change
quadrillion British thermal units



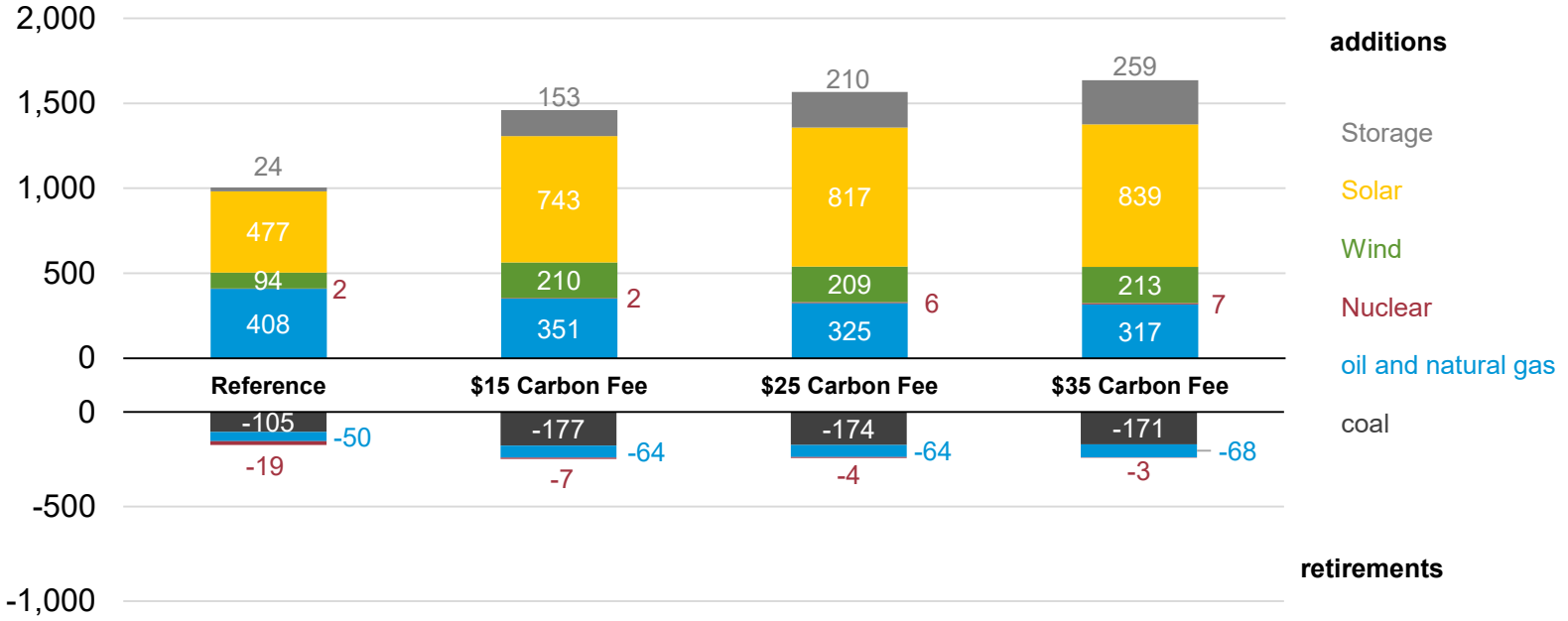
Source: U.S. Energy Information Administration, Short-Term Energy Outlook, September 2022

Inflation Reduction Act: Potential High/ Medium Impacts

Section of Legislation	Description
PTC/ITC Tax Credit Extension - Zero Emitting Source (Section 45 PTC, Section 48 ITC) (Section 13102)	The federal renewable electricity production tax credit (PTC) is an inflation-adjusted per-kilowatt-hour (kWh) tax credit for electricity generated by qualified energy resources. The duration of the credit is 10 years after the date the facility is placed in service. The ITC allows taxpayers to receive a percentage of the cost of installing a qualified energy system as a credit toward their federal taxes.
Prevailing wage "bonus credit" for PTC/ITC (Section 13102)	Starting in 2023 zero emission projects that take the PTC/ITC can gain an additional credit 5 times the size of the base credit for meeting requirements for prevailing wages and apprenticeships during the project construction and subsequent maintenance
Storage ITC (Section 13102)	30% ITC included for standalone storage

Renewables and Storage Deployment Are Significant Through 2050

Total all-sector cumulative capacity additions and retirements, Reference case and carbon fee cases (2021 to 2050)
gigawatts

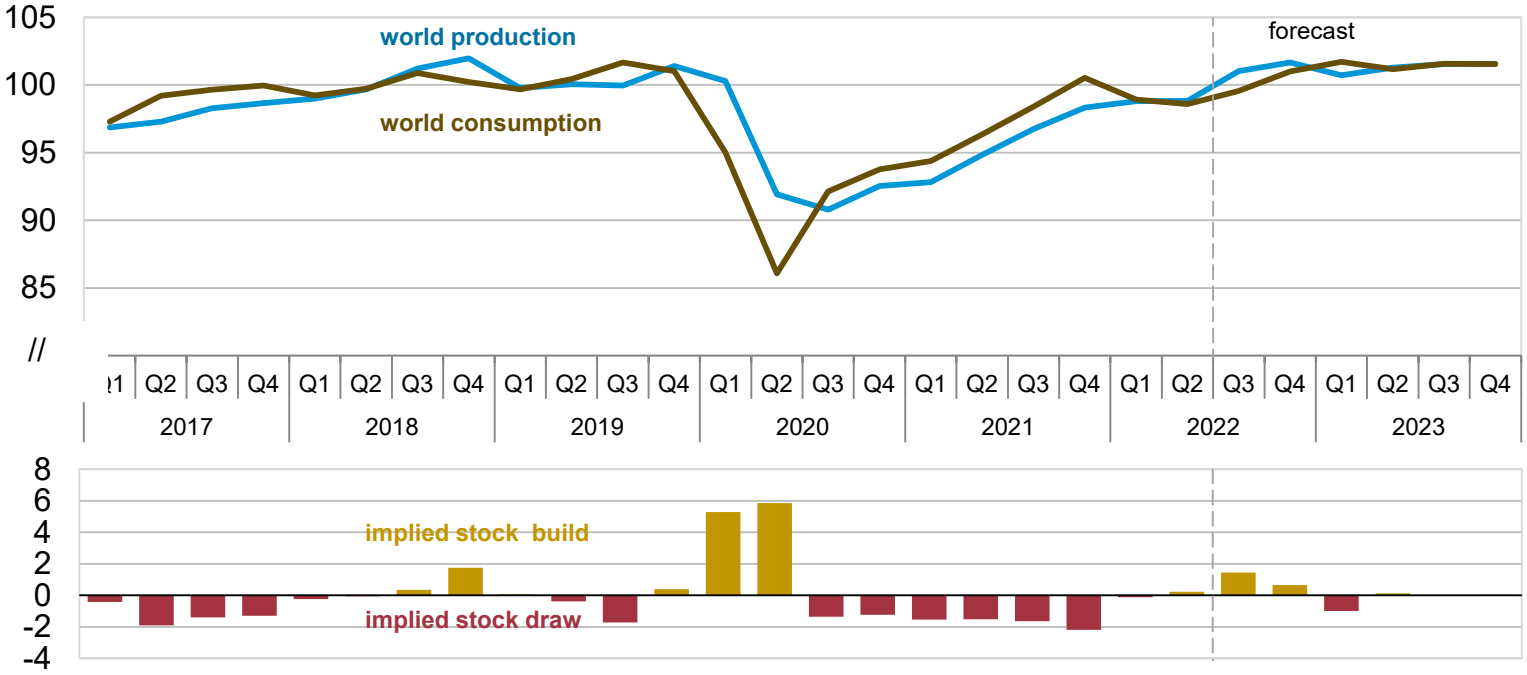


Source: U.S. Energy Information Administration, Annual Energy Outlook 2022

Petroleum and Refined Products

World liquid fuels production and consumption balance

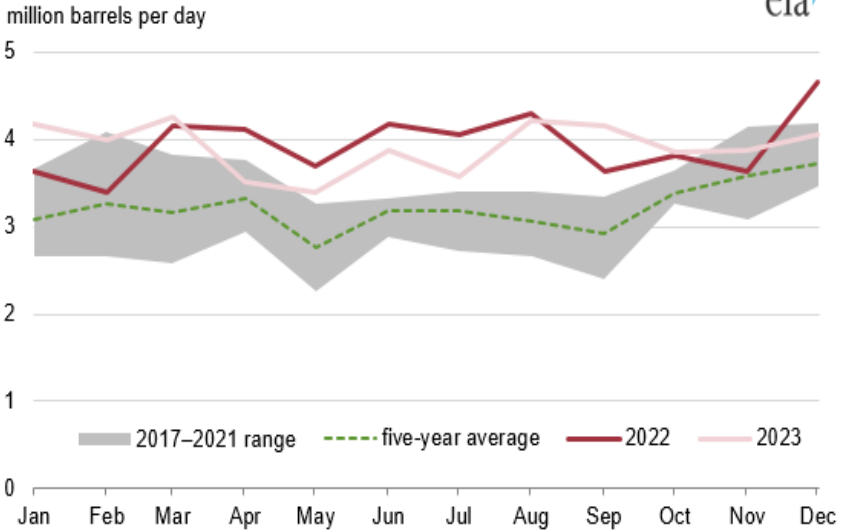
World liquid fuels production and consumption balance
million barrels per day



Source: U.S. Energy Information Administration, Short-Term Energy Outlook, September 2022

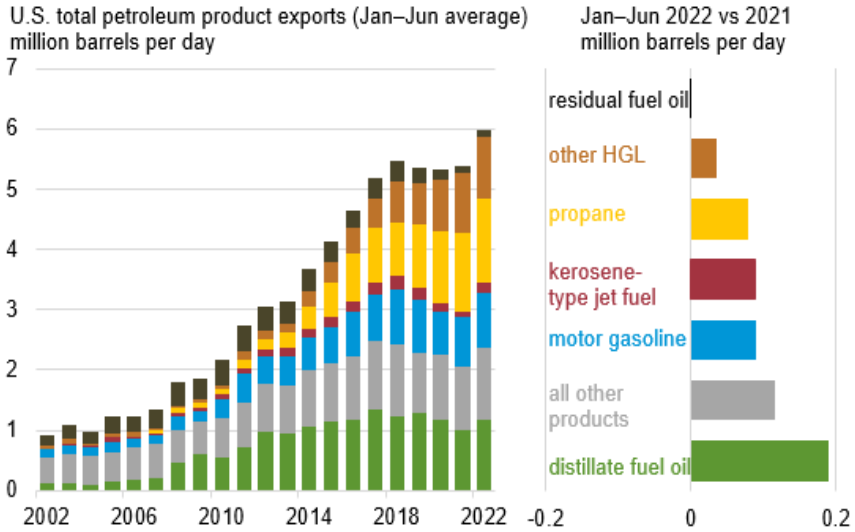
U.S. exports of petroleum products reached their highest average in first-half 2022 as Russia's invasion of Ukraine shifts trading patterns

Figure 4. Net exports of petroleum products from the United States



Data source: U.S. Energy Information Administration, *Petroleum Supply Monthly* and *Short-Term Energy Outlook*, September 2022

Figure 1. Exports of petroleum products from the United States during the first half of the year



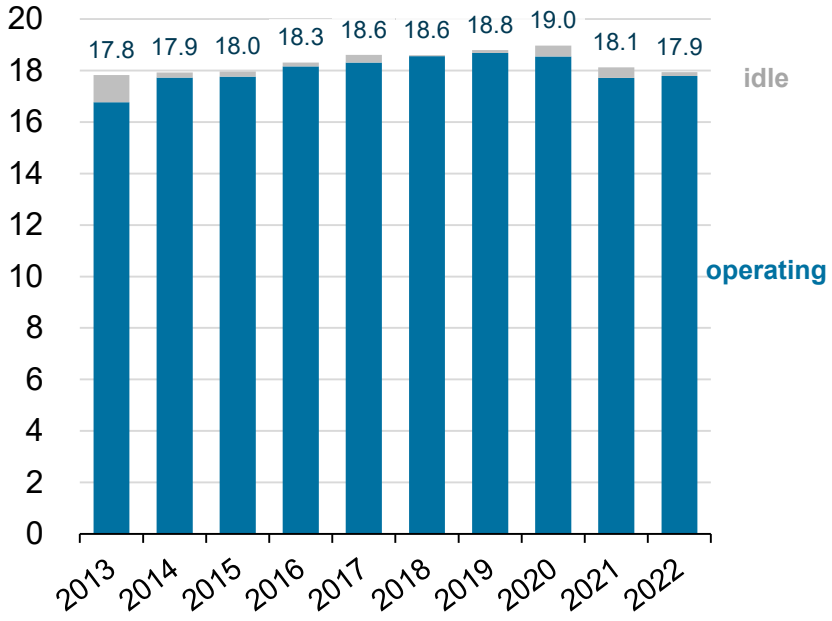
Data source: U.S. Energy Information Administration, *Petroleum Supply Monthly*
Note: Other HGL=hydrocarbon gas liquids, excluding propane

Source: https://www.eia.gov/petroleum/weekly/archive/2022/220914/includes/analysis_print.php

U.S. refining capacity has fallen over the past two years, contributing to lower than normal inventories in some regions

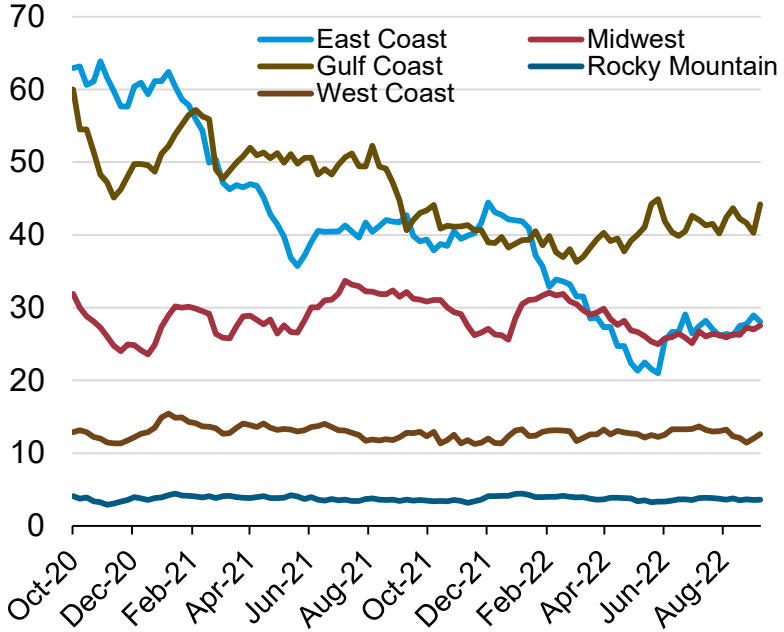
U.S. atmospheric crude oil distillation capacity

million barrels per calendar day as of January 1



Regional distillate stocks

million barrels

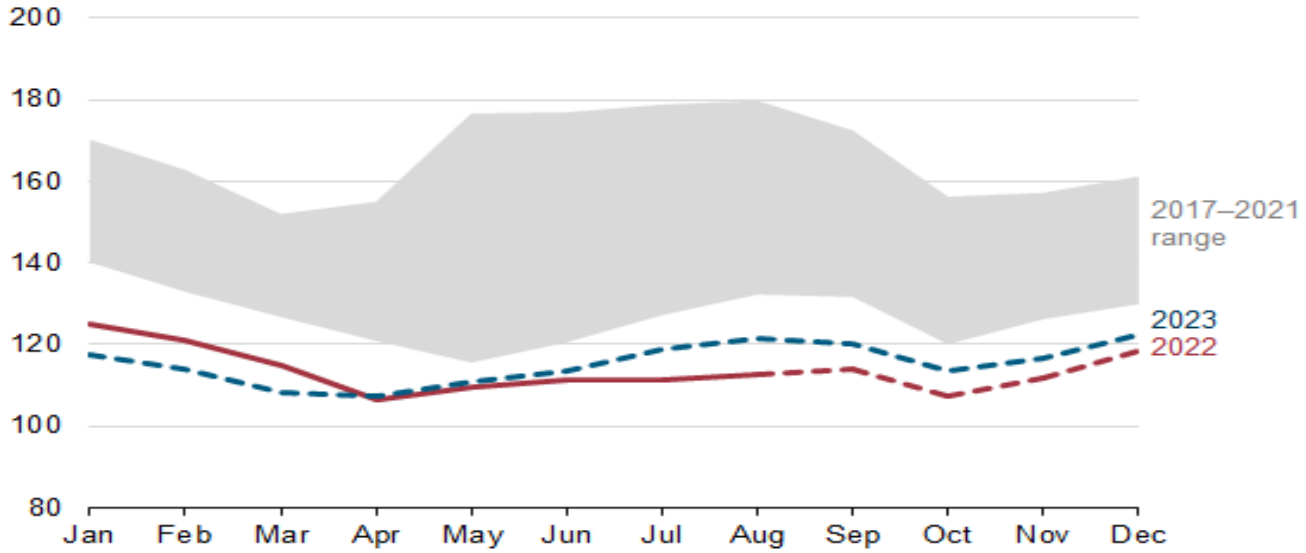


Source: U.S. Energy Information Administration, Refinery Capacity Report

Total U.S. distillate inventory is projected to be below the 5-year range

U.S. distillate inventory forecast

million barrels



https://www.eia.gov/petroleum/weekly/archive/2022/220908/includes/analysis_print.php

Source: U.S. Energy Information Administration, Short-Term Energy Outlook, September 2022

My Priorities and Plans for the Annual Energy Outlook

My priorities

- Strive to make EIA's information more transparent and accessible
- Expand energy modeling capabilities to examine a wider range of future scenarios
- Provide new insight into energy trends and their community-level impacts
- Modernize EIA's IT enterprise
- Ensure our hybrid workplace promotes a diverse, equitable, and inclusive culture

Importance of the Annual Energy Outlook

- The Annual Energy Outlook has been published since 1979.
- Widely cited; Reference case assumptions and results also used as a benchmark for other modeling efforts.
- Currently consists of a Reference case and the following core side cases:
  - Low Oil Price case
  - High Oil Price case
  - High Oil and Gas Supply case
  - Low Oil and Gas Supply case
  - High Economic Growth case
  - Low Economic Growth case
  - High Renewables Cost case
  - Low Renewables Cost case

Characterization of the Reference Case

The Reference Case is characterized as a “baseline for comparison” but it is also presented as a best guess:

- Terminology for our cases: “Reference” versus “Side” cases
- 70% of AEO Narrative figures focus exclusively on the Reference Case
- AEO Retrospective focuses exclusively on the Reference Case

From the AEO 2022:

“Projections in the Reference case of our Annual Energy Outlook 2022 (AEO2022) are not predictions of what will happen, but rather, they are modeled projections of what may happen given certain assumptions and methodologies. **The Reference case serves as a baseline for comparison between side cases that explain alternative trends**. By varying Reference case assumptions and methodologies in side cases, AEO2022 can illustrate important factors in future energy production and use in the United States.”

Even if the Reference Case is our best guess, the probability of any single scenario matching reality across output metrics of interest **is zero**.

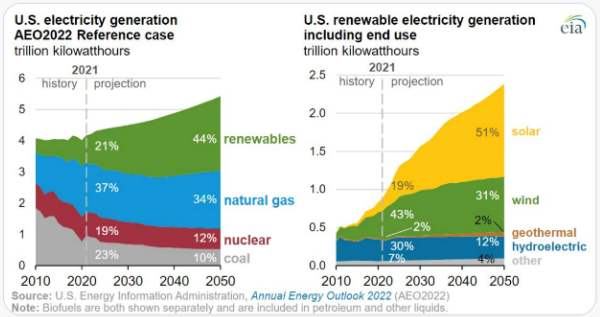
Communication around the Reference Case

Today in Energy: https://www.eia.gov/todayinenergy/detail.php?id=51698

EIA received a reply

EIA @EIAgov · Mar 18

#TodayInEnergy - EIA projects that #renewable generation will supply 44% of U.S. #electricity by 2050 #AEO2022 go.usa.gov/xzmma



18 52 69

Ric O'Connell @RicOConnell8 · 21h

Hi @eiagov! Please stop using the word projects. AEO is not a forecast. AEO is a set of scenarios.

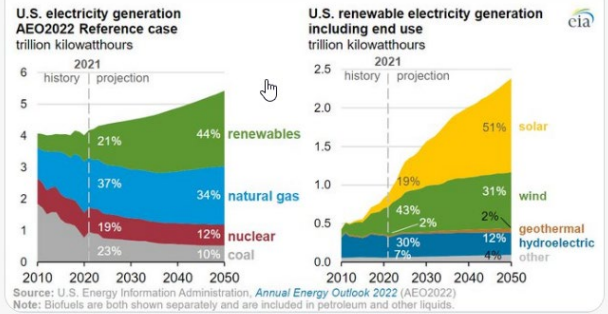
1 2 17

JesseJenkins @JesseJenkins · Mar 18

But IT WASN'T A PROJECTION ITS A SCENARIO! A no new policy scenario is not particularly plausible, let alone the most probable outcome, to base a projection on over a three decade time period. But @EIAgov knows that. They should be clearer in their comms.

EIA @EIAgov · Mar 18

#TodayInEnergy - EIA projects that #renewable generation will supply 44% of U.S. #electricity by 2050 #AEO2022 go.usa.gov/xzmma



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This goes deeper than just terminology, e.g., “prediction” vs “projection” vs “scenario”

Our communication in the narrative, chart library, and in TIEs effectively treats the Reference case like a forecast.

Priorities for AEO 2023

Increase the range of results to better capture real world possibilities

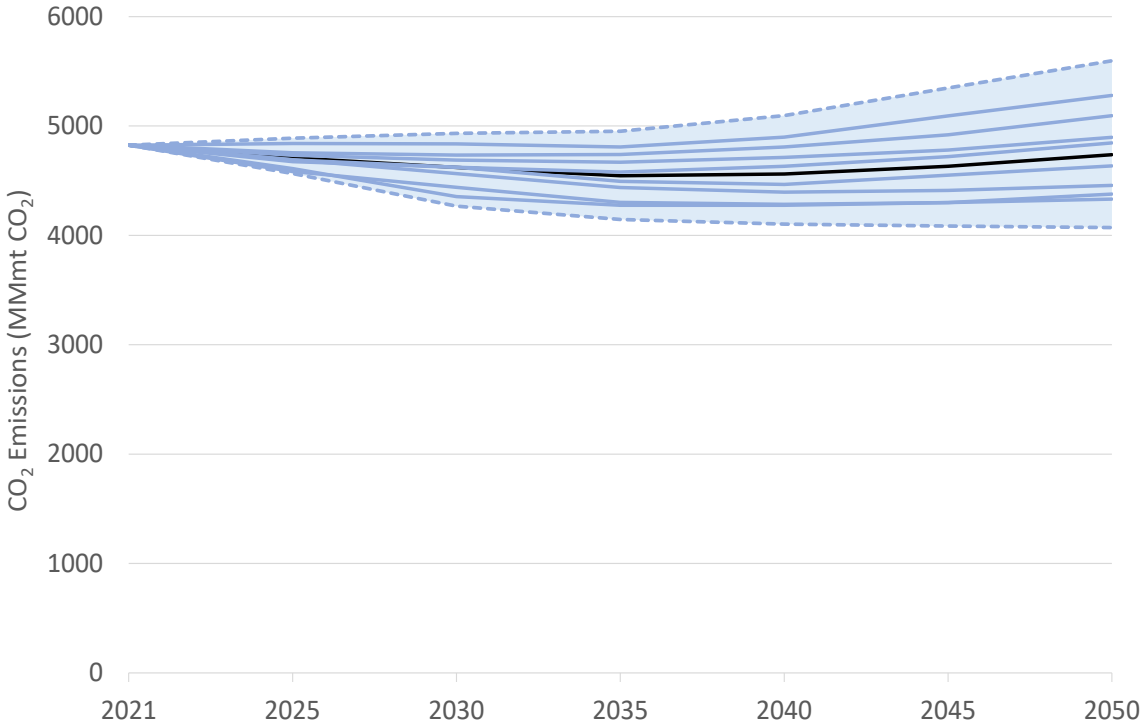
- For the core cases, update input assumptions extensively while remaining plausible
- Rather than considering one-at-a-time perturbations to the Reference case, consider additional cases that combine scenario assumptions.

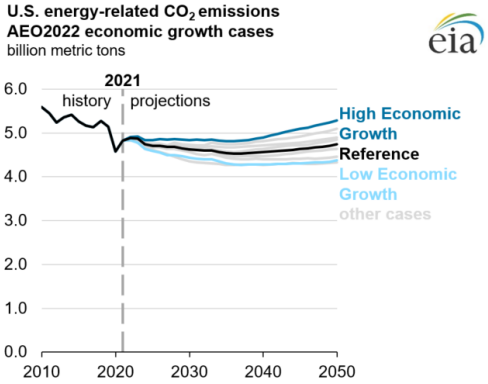
Focus on the range of results to communicate uncertainty

- Communicate the importance of the Reference case, but emphasize the range of results drawn from the side cases
- Consistently present results from across all cases

Focus on the narrative, which allows us to contextualize the results

Visualizing uncertainty





- Reference Case in black
- Blue lines indicate side cases
- Dotted blue lines represent the most extreme cases
- Range in light blue indicates a continuous solution space rather than a set of discrete outcomes
- No line labels emphasize uncertainty range than rather case specifics

Source: U.S. Energy Information Administration, Annual Energy Outlook 2022

Modeling next steps

Short-Term

- Plan to release main components of NEMS via GitHub under a well-established open source license
- Governance plan to process public feedback in a consistent way
- A small step towards greater transparency

Long-Term

- We are at a critical juncture for re-imagining the future of our modeling program.
- Initiated a “blue sky” process to fundamentally re-examine our modeling objectives and think creatively about next generation modeling capabilities without concern for budget and logistics

Key Takeaways

- Regional natural gas markets are becoming more interconnected
- Domestic and international markets are evolving rapidly in response to geopolitics, policy, and technology innovation
- EIA is committed to providing unbiased data and analysis on the full range of energy challenges that confront us
- We are retooling our modeling work to:
  - Better capture the evolving nature of the energy system
  - Better reflect future uncertainty
  - Be more transparent