

Near-Term Outlook for Domestic Energy Markets



For

39th USAEE/IAEE North American Conference

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By

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@EIA_One

What does EIA do?

The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. Department of Energy.

EIA collects, analyzes, and disseminates **independent and impartial energy information** to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment. EIA is the nation's premier source of energy information and, by law, its **data, analyses, and forecasts are independent** of approval by any other officer or employee of the U.S. government.

Talk Overview

Winter Fuels Outlook

- Propane
- Fuel Oil
- Natural gas
- Electricity

EIA Priorities and Plans

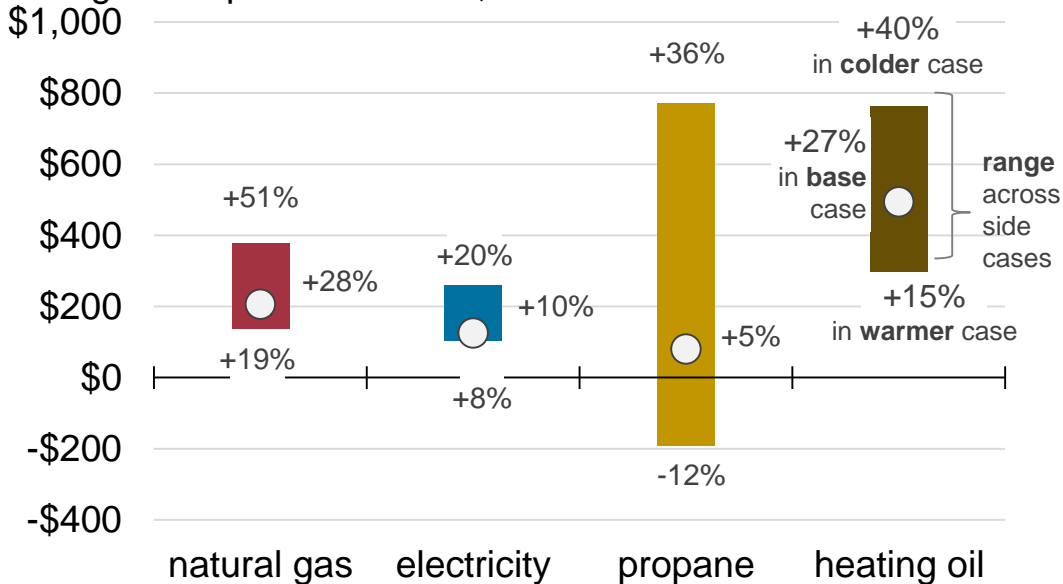
Winter Fuels Outlook

Findings

- Winter energy expenditures for most households are likely to be higher than last winter.
- Expenditures could be much higher if the weather is very cold.
- Inventories are low, which could lead to volatile commodity prices.

Average nominal winter household energy expenditures (winter = Oct–Mar)

change from previous winter, dollars

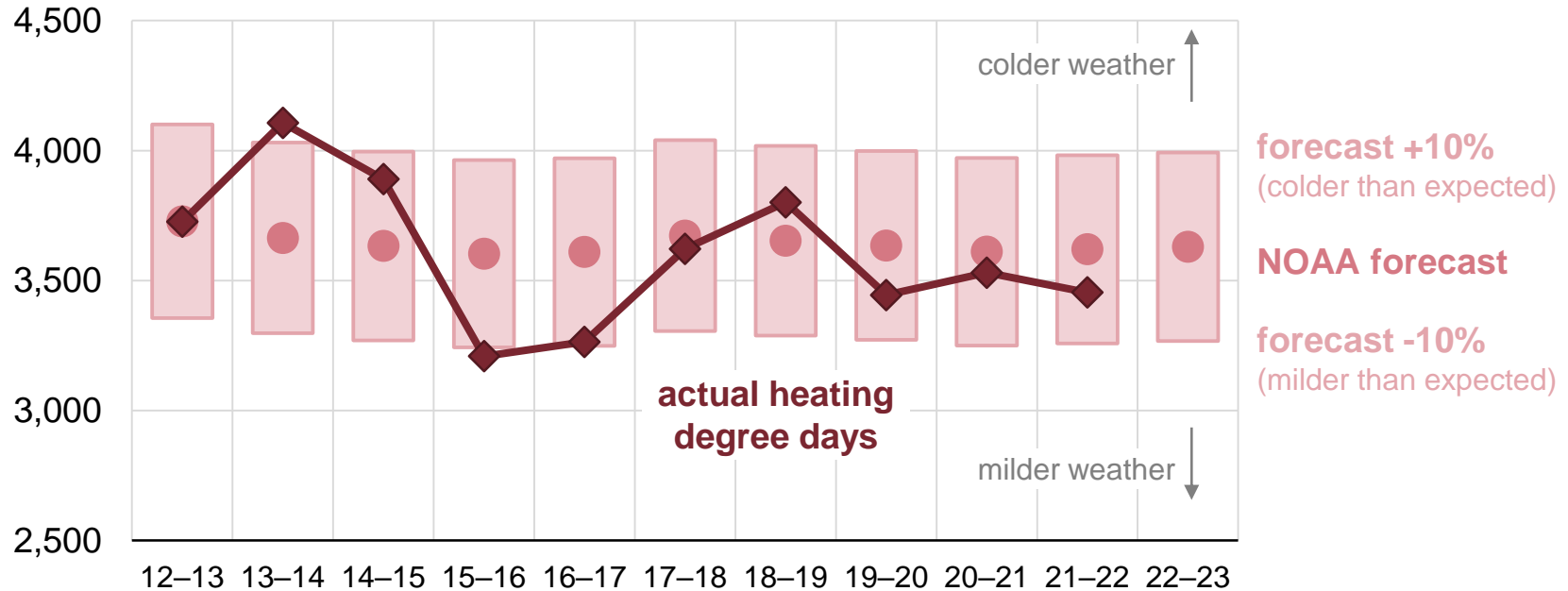


Key notes and definitions

- Winter season: October – March.
- Forecast expenditures for households grouped by their primary space heating fuel.
- The reported expenditures represent the total bill for the primary heating fuel, not just for heating
- We use the [Residential Energy Consumption Survey](#) (RECS) as a baseline for the average amount of energy that homes use for space heating and other appliances.
- Fuel expenditures for individual homes depend on their size, energy efficiency, and heating equipment, along with thermostat settings and local weather conditions.
- Each fuel also has its own market structure, physical infrastructure, regulations, and limitations that can affect the connection between wholesale and retail market events.
- To produce this outlook, we use the [Short-Term Integrated Forecasting System](#), which mostly comprises a system of linear regressions with several exogenous inputs including forecasts for weather and macroeconomic variables.

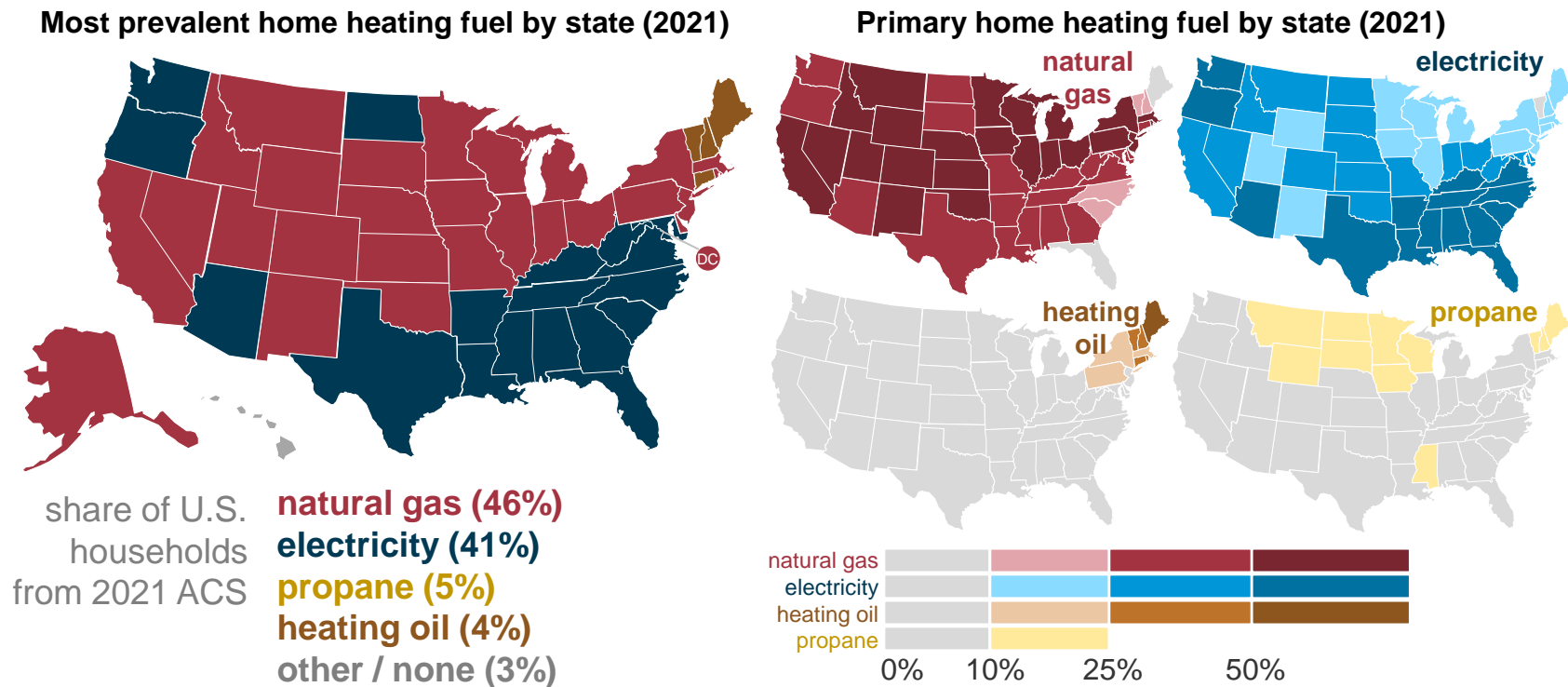
Actual heating degree days tend to be within 10% of the forecast

U.S. population-weighted winter heating degree days (winter = Oct–Mar, 2011–2022)
heating degree days



Data source: National Oceanic and Atmospheric Administration (NOAA)

Almost 90% of U.S. homes are primarily heated by natural gas or electricity; heating oil and propane are regionally concentrated

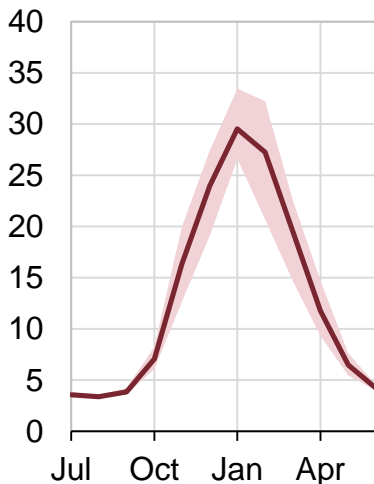


Data source: U.S. Census Bureau, American Community Survey (ACS) 2021

For most fuels, residential consumption is concentrated in winter

Natural gas

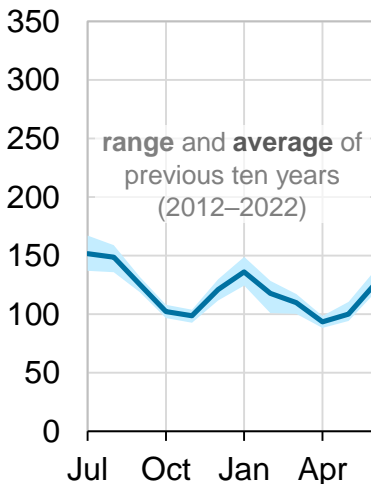
billion cubic feet per day



The winter months of October through March account for **79%** of annual residential **natural gas** consumption...

Electricity

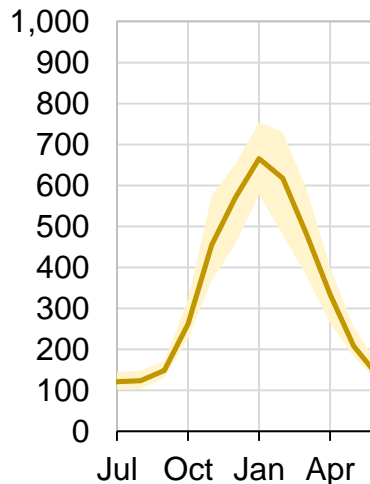
billion kilowatthours



...**48%** of annual residential **electricity** consumption...

Propane

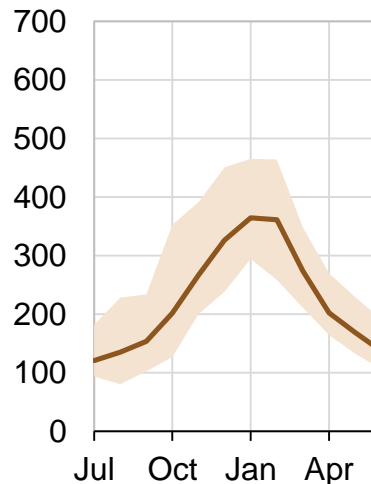
thousand barrels per day



...**74%** of annual residential **propane** consumption...

Distillate fuel oil

thousand barrels per day



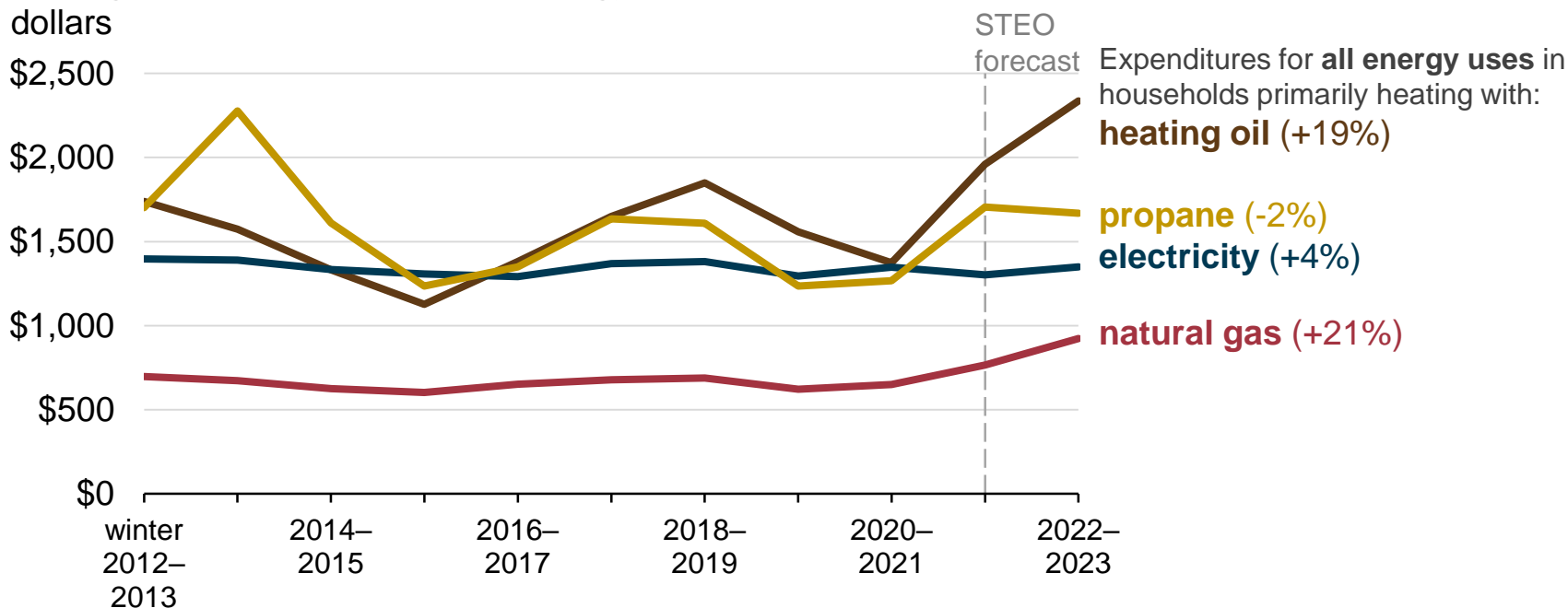
...and **66%** of annual residential **distillate fuel oil** consumption.

Note: Reflects consumption in all households for all uses, not just those using the fuel for primary space heating.

Data source: U.S. Energy Information Administration, Monthly Energy Review

We expect real energy expenditures to increase for heating fuels, excluding propane, primarily driven by higher prices

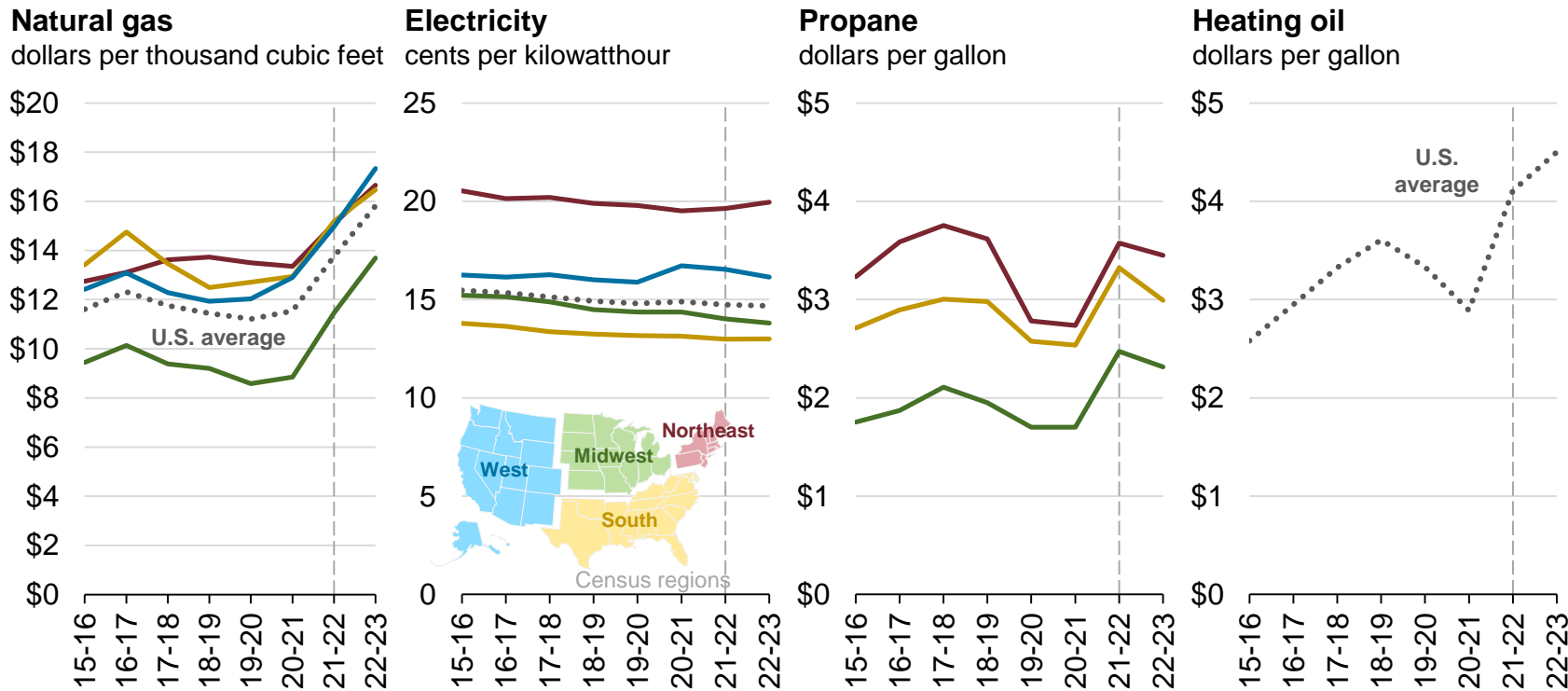
Average real winter household energy expenditures (winter = Oct–Mar, 2012–2023)



Note: Propane price reflects the average of Northeast and Midwest regions through winter 2013–14 and average of Northeast, Midwest, and South regions after winter 2013–14. Expenditures are adjusted for inflation based on the Consumer Price Index history and forecasts from the S&P Global macroeconomic model.

Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022 and S&P Global

Real prices for natural gas are up the most compared with last winter; we expect propane prices will be lower than last year

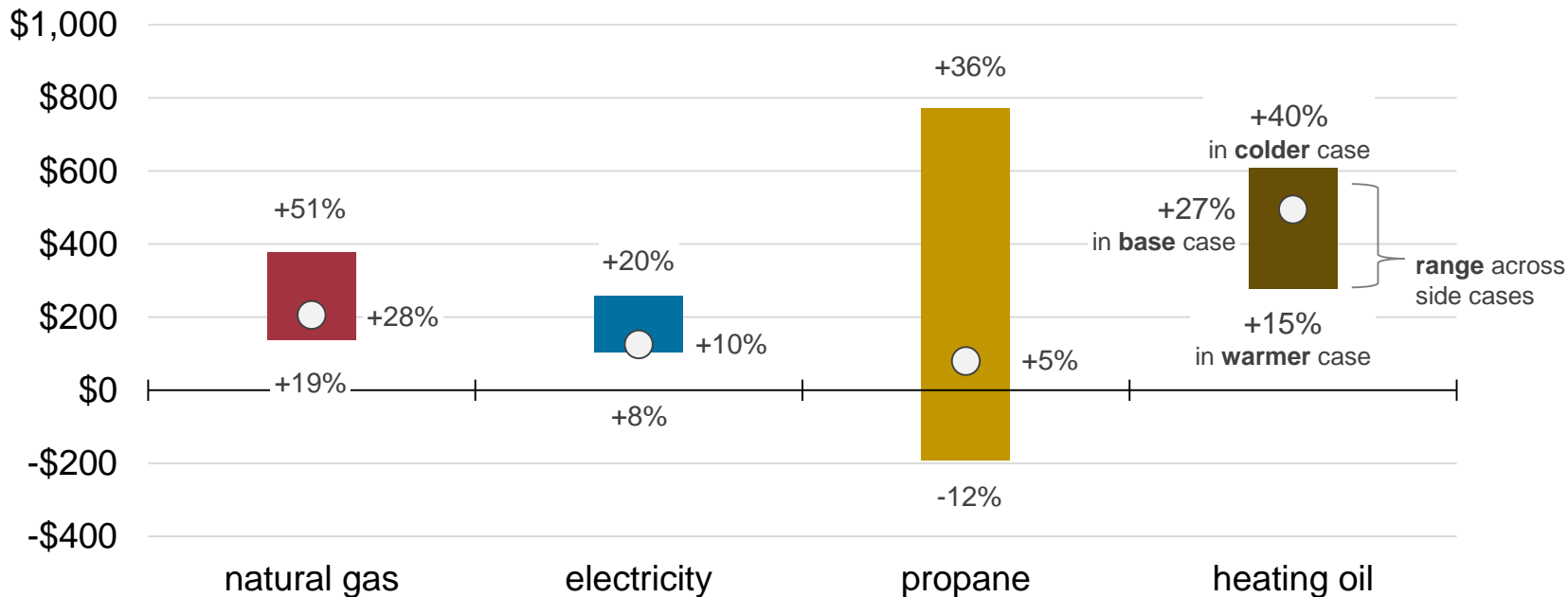


Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022 and S&P Global

Propane and heating oil expenditures have the widest range of expenditures across weather cases

Average nominal winter household energy expenditures (winter = Oct–Mar)

change from previous winter, dollars



Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

Natural Gas

Nominal natural gas prices and expenditures are higher than last winter

U.S. average

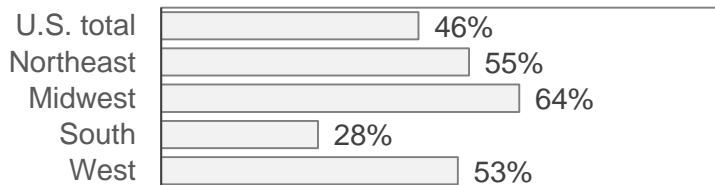
change from previous winter

nominal retail price **+22%**

consumption **+5%**

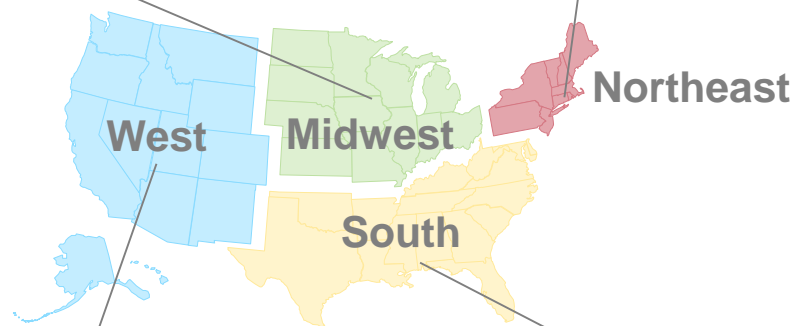
expenditures **+28%**

heating fuel share within region



retail price	+27%
consumption	+5%
expenditures	+33%

retail price	+17%
consumption	+4%
expenditures	+23%



retail price	+23%
consumption	+5%
expenditures	+29%

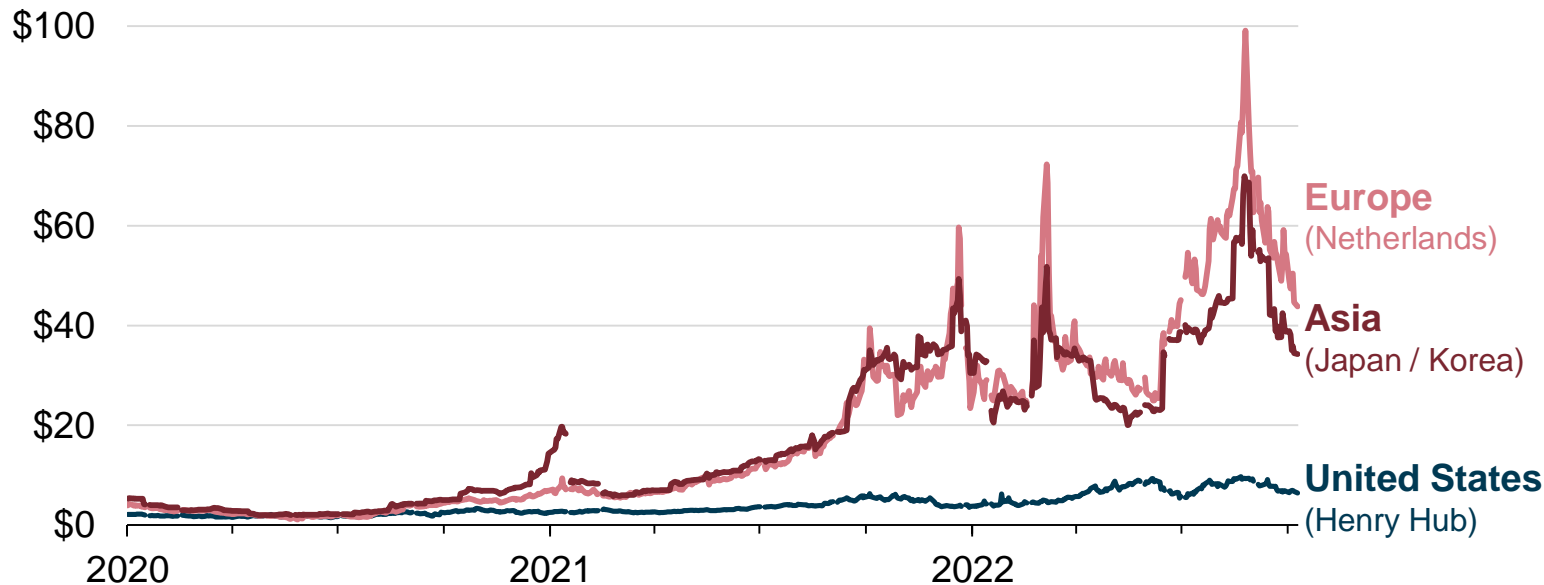
retail price	+15%
consumption	+7%
expenditures	+24%

Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

High natural gas prices in Europe and Asia continue to support U.S. liquefied natural gas exports

International natural gas futures prices

dollars per million British thermal units

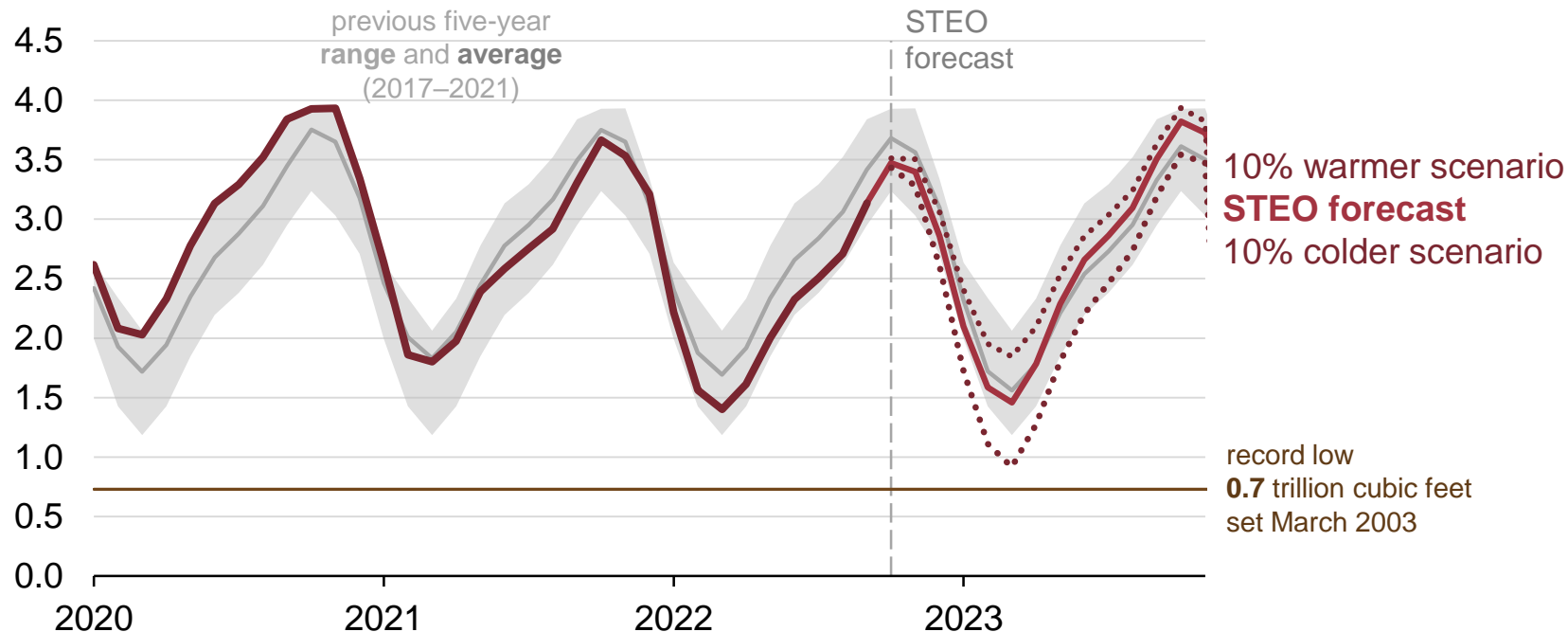


Data source: CME Group and Bloomberg L.P.

Natural gas inventories are likely to be lower than the five-year average in the base case and cold scenarios

End-of-month U.S. working natural gas in storage (2020–2023)

trillion cubic feet

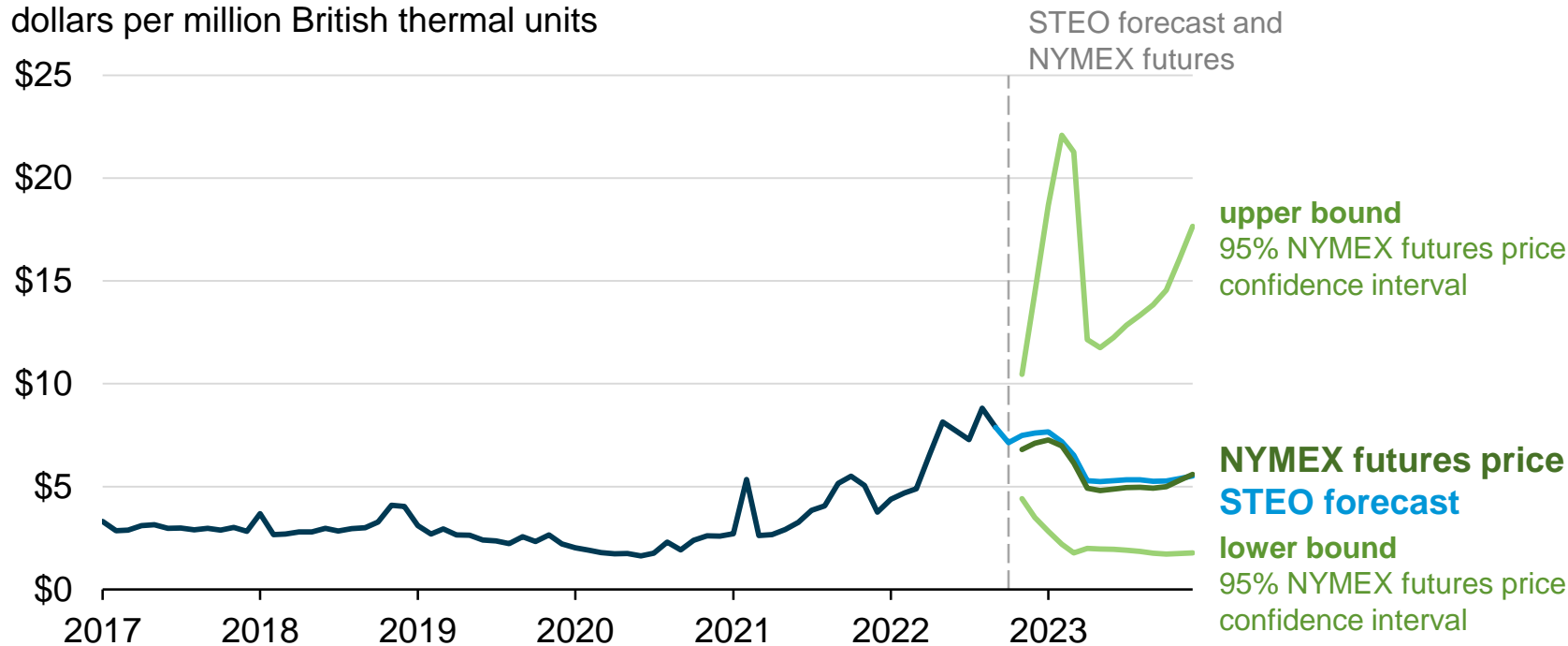


Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

Futures and options markets data implies the 95% confidence interval for Henry Hub prices in early 2023 ranges from \$2 to \$22

Henry Hub natural gas price and NYMEX confidence intervals

dollars per million British thermal units



Data sources: CME Group and Refinitiv, an LSEG Business

Electricity

With relatively flat retail electricity prices, expenditures rise with consumption

U.S. average

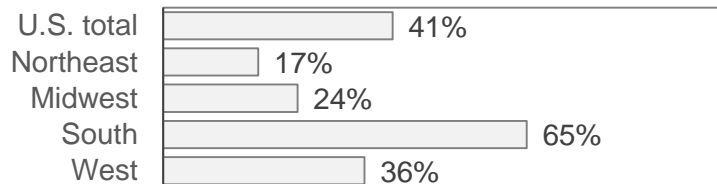
change from previous winter

nominal retail price **+6%**

consumption **+4%**

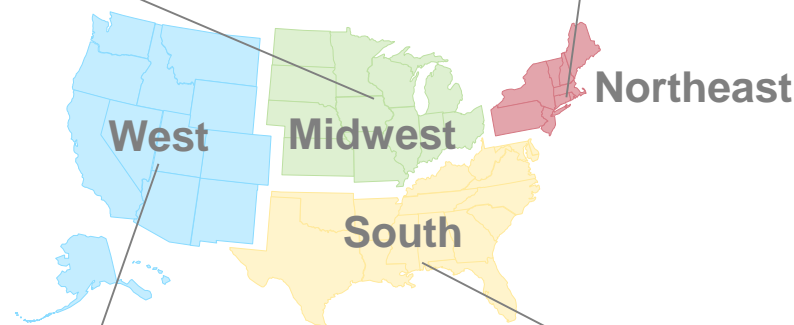
expenditures **+10%**

heating fuel share within region



retail price	+3%
consumption	+3%
expenditures	+8%

retail price	+8%
consumption	+3%
expenditures	+11%



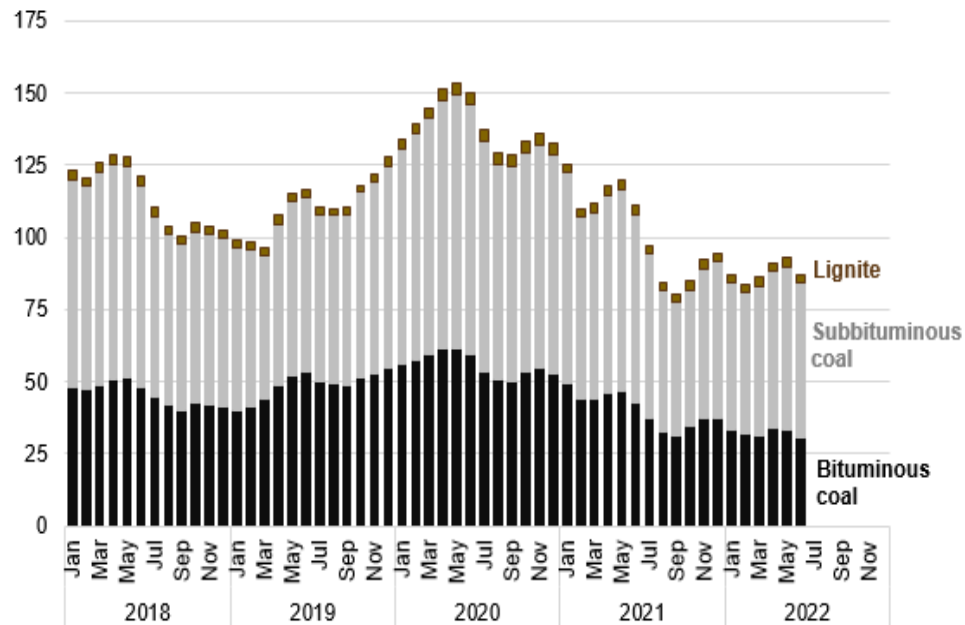
retail price	+4%
consumption	+4%
expenditures	+8%

retail price	+6%
consumption	+5%
expenditures	+12%

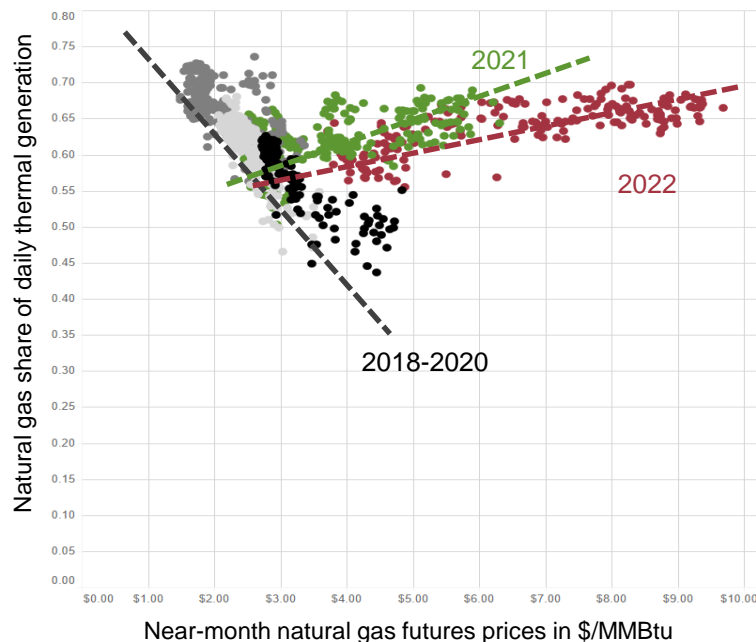
Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

Coal stocks 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

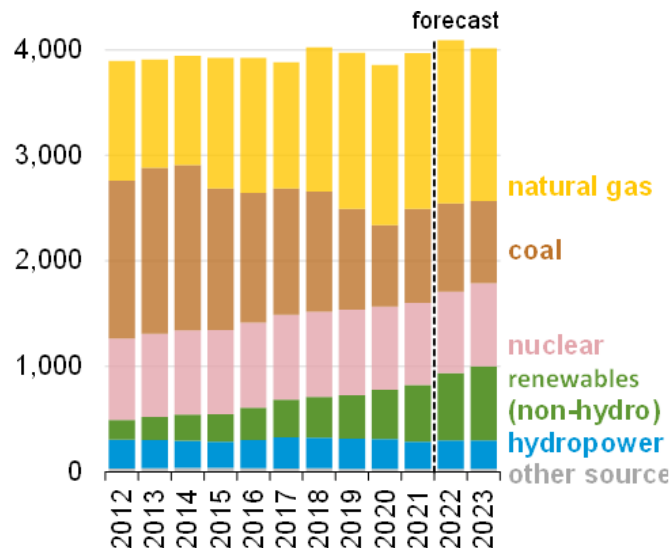


Sources: U.S. Energy Information Administration, Forms 923 and 930, Bloomberg, L.P.

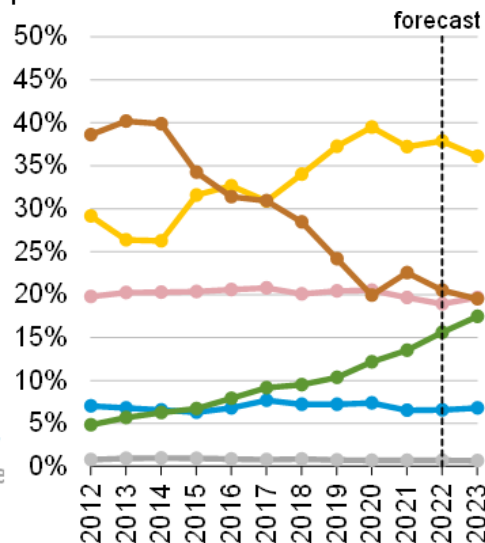
Forecasted decline in natural gas and coal; increased renewables deployment in the short-term

U.S. electricity generation by source, all sectors

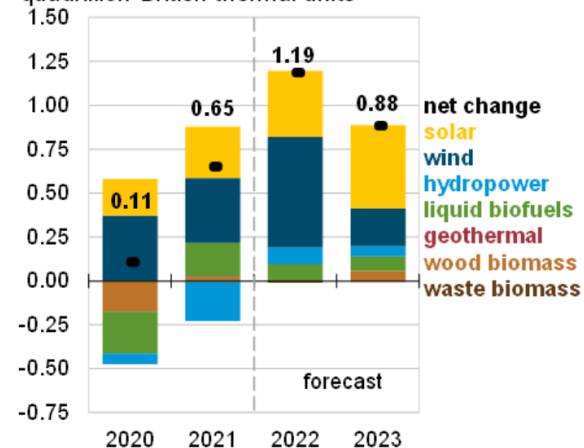
billion kilowatthours



percent share



Components of annual change



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

Propane

Propane retail prices are similar to last winter in our forecast

U.S. average

change from previous winter

Nominal retail price 0%

consumption +5%

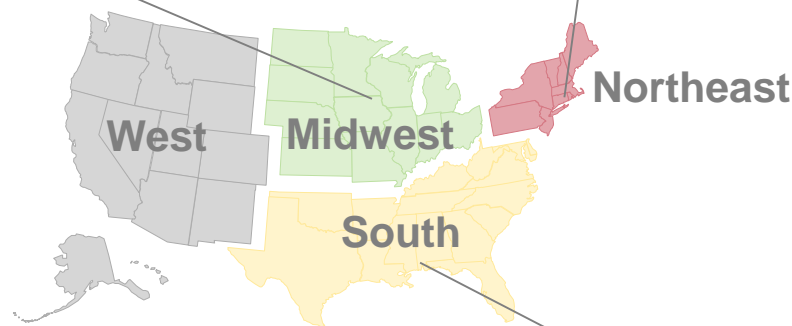
expenditures +5%

heating fuel share within region

U.S. total	5%
Northeast	5%
Midwest	8%
South	4%
West	4%

retail price	0%
consumption	+4%
expenditures	+5%

retail price	+4%
consumption	+4%
expenditures	+8%



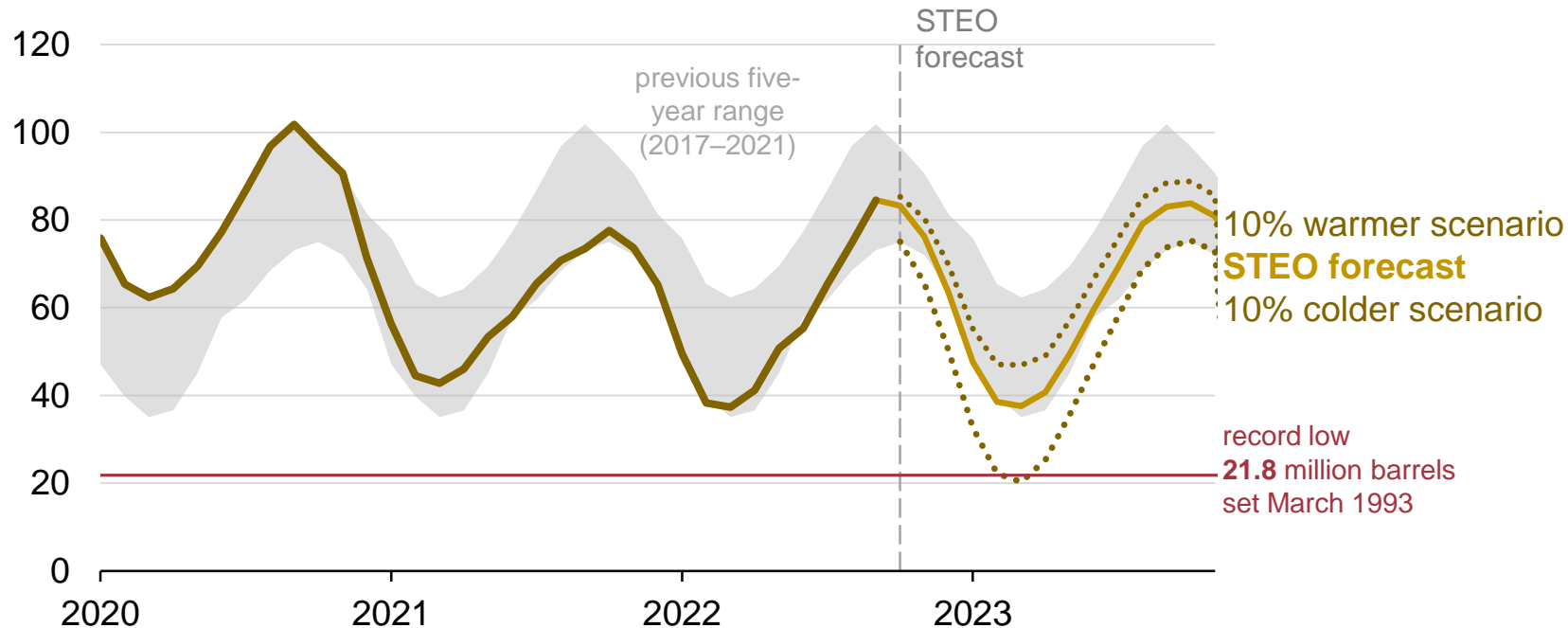
retail price	-3%
consumption	+7%
expenditures	+4%

Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

Propane inventories, already low, could fall to record lows if weather is colder-than-forecast

End-of-month U.S. propane and propylene inventories (2020–2023)

million barrels

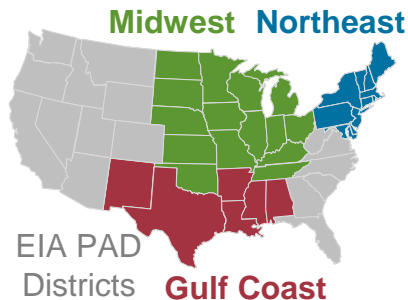
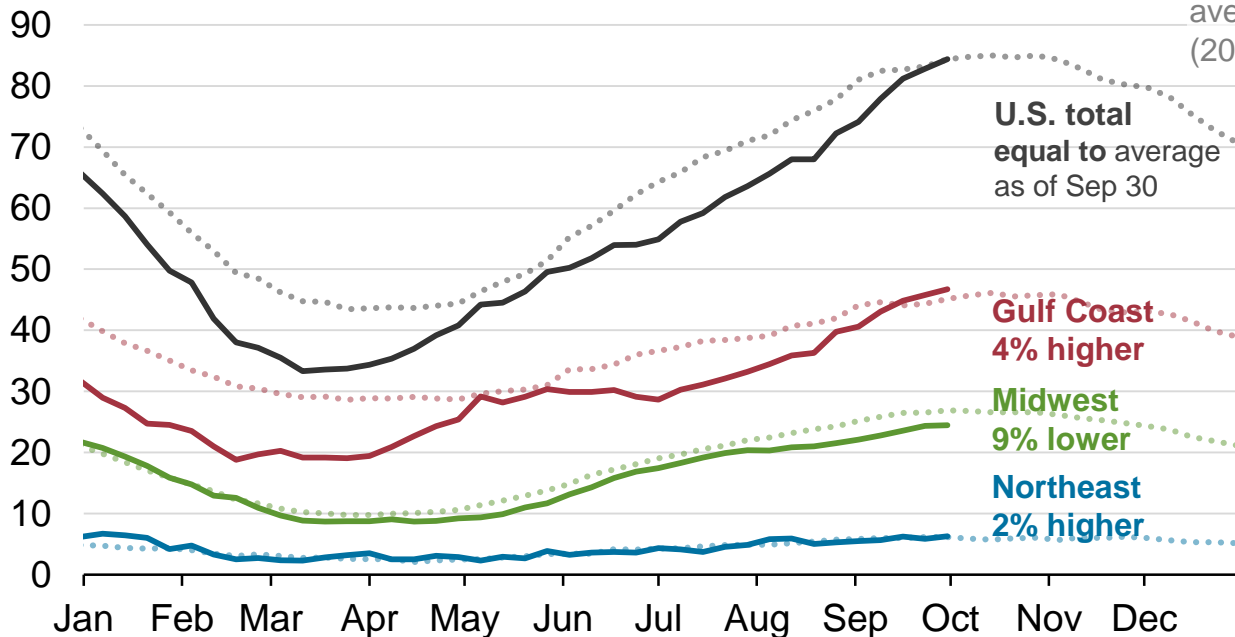


Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

Propane inventories are particularly low in the Midwest, but average at the U.S. level

Weekly propane inventories by region (through Sep 30, 2022)

million barrels



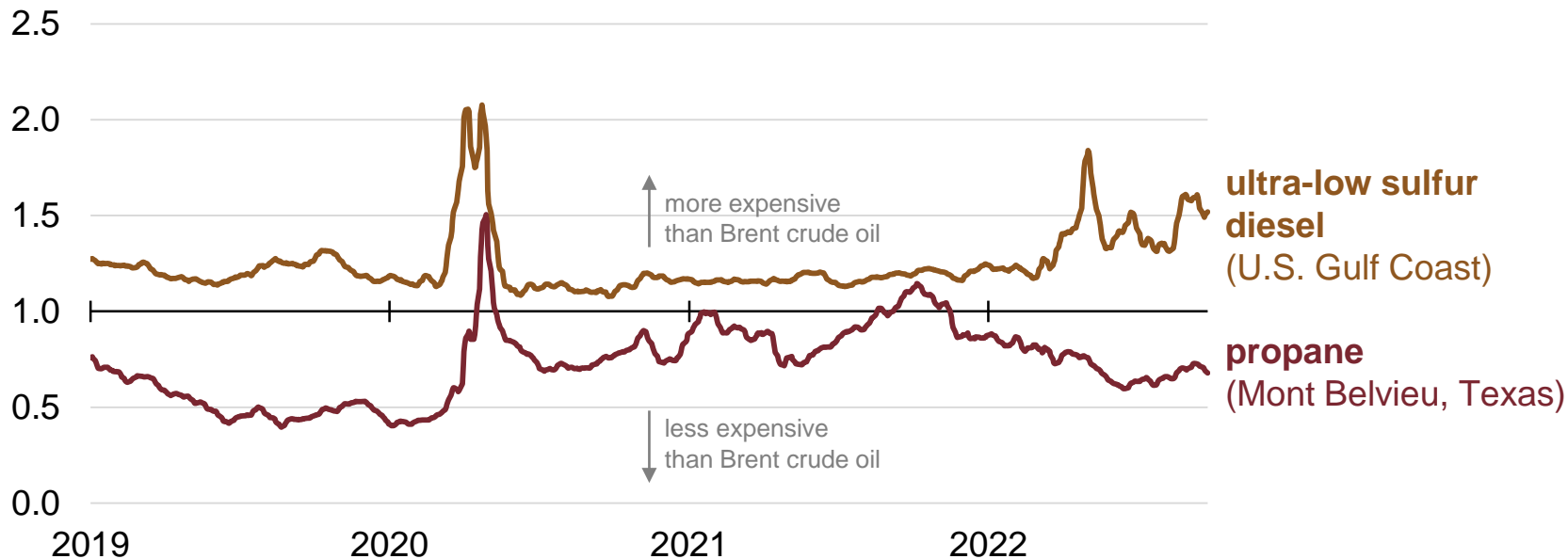
Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

Propane spot prices have fallen relative to Brent crude oil but distillate spot prices have increased relative to Brent

Spot prices of selected petroleum fuels (Jan 2019–Sep 2022)

price ratio to Brent crude oil, adjusted for relative energy content

seven-day moving average



Data source: Refinitiv, an LSEG business

Heating Oil

Heating oil prices are up this winter as a result of tight distillate fuel market conditions globally

U.S. average

change from previous winter

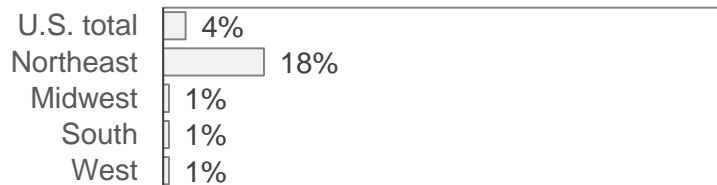
nominal retail price **+16%**

consumption **+9%**

expenditures **+27%**



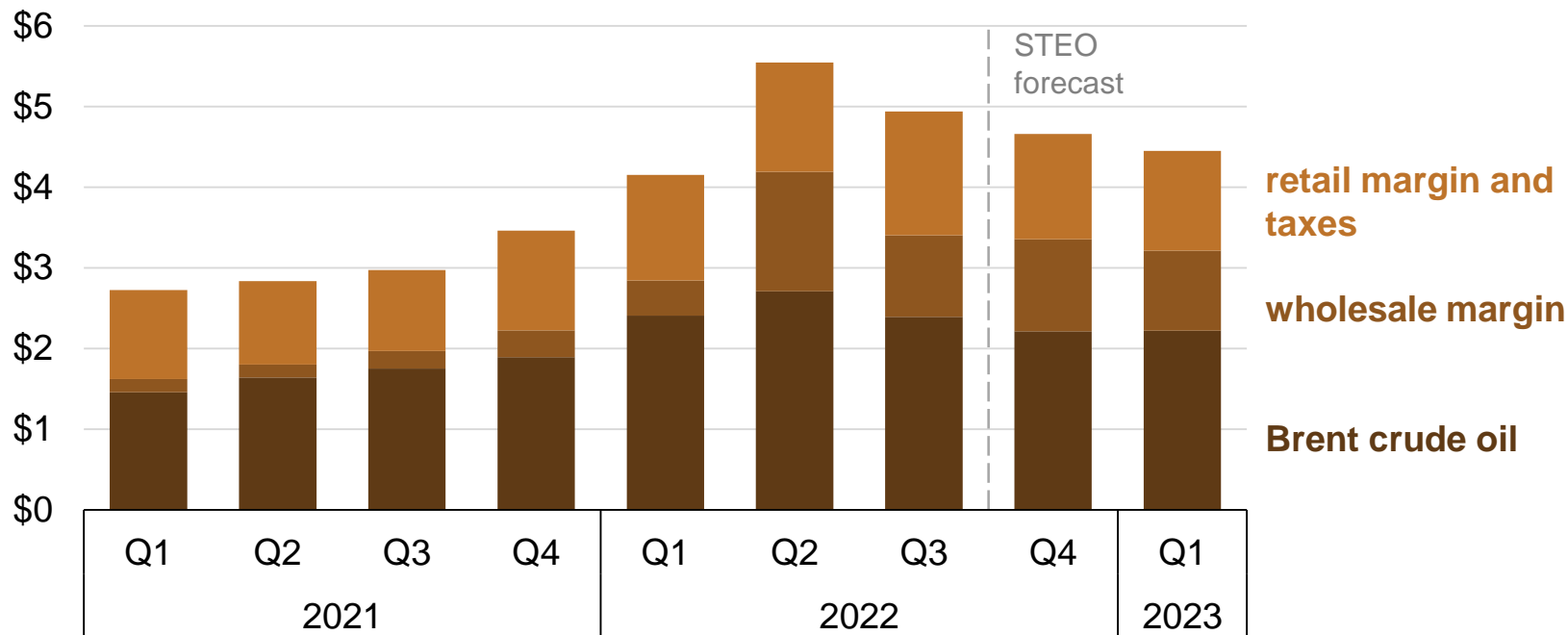
heating fuel share within region



Forecast nominal heating oil prices are higher than last winter because of higher wholesale margins

Estimated components of U.S. heating oil retail price (1Q21–1Q23)

dollars per gallon (nominal)

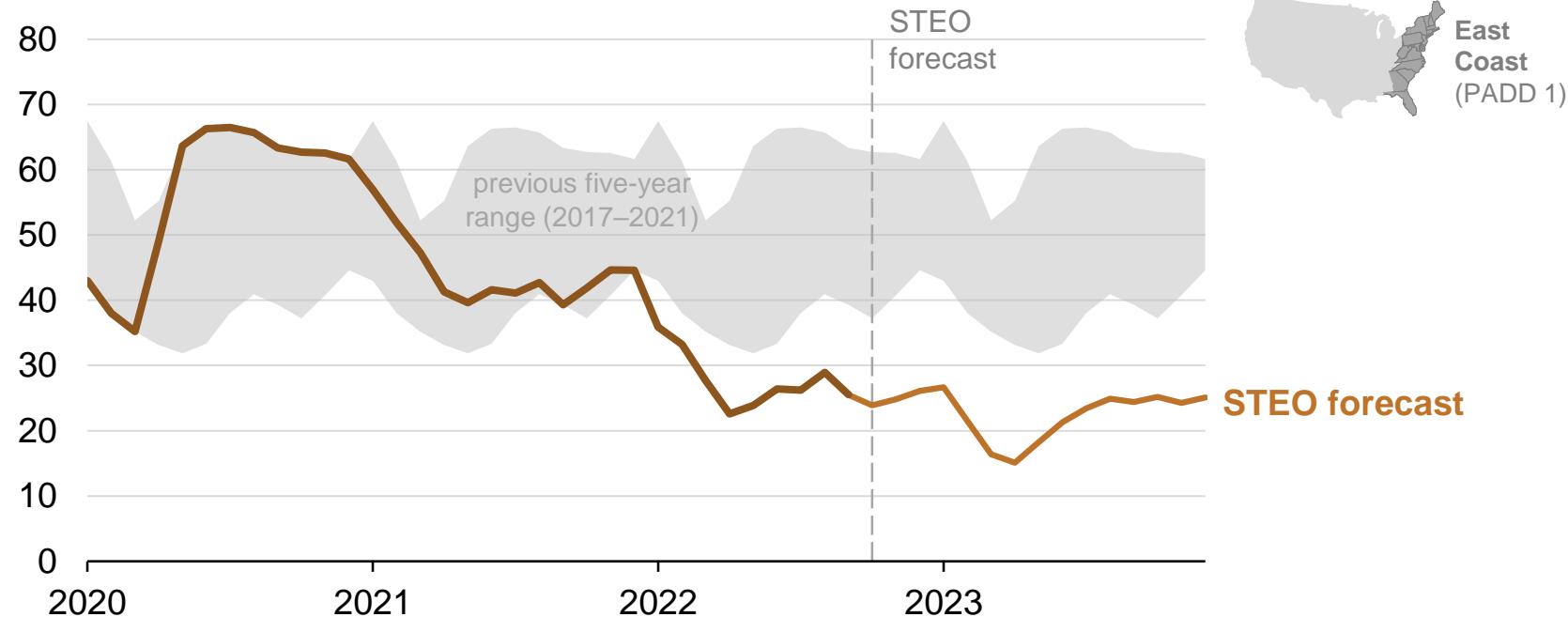


Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022 and Refinitiv, an LSEG Business

Distillate inventories in the East Coast region are relatively low because of recent geopolitical events and reductions in refining capacity

End-of-month East Coast distillate fuel inventories (2020–2023)

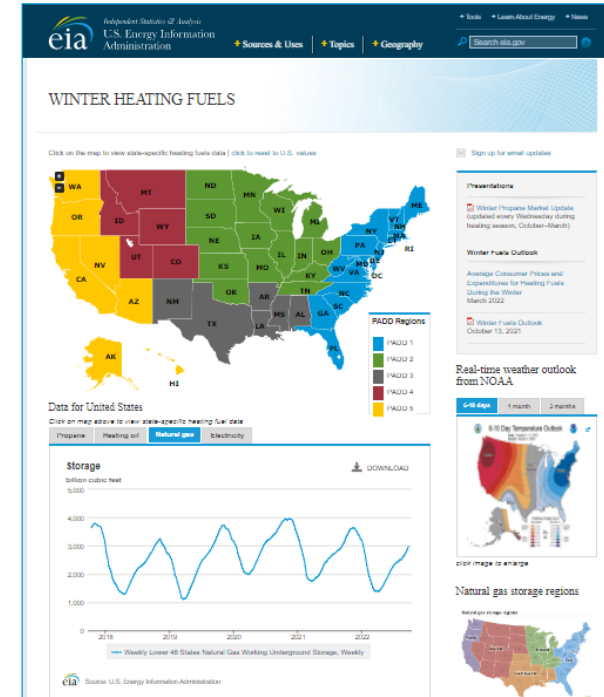
million barrels



Data source: U.S. Energy Information Administration, Short-Term Energy Outlook, October 2022

Other winter heating fuels resources at EIA

- Availability and pricing for the [four principal heating fuels](#)
 - Propane
 - Heating oil
 - Natural gas
 - Electricity
- Data for each state are available on the clickable map
- Links to resources for each state
- Current week and three-month weather forecasts from the National Oceanic and Atmospheric Administration (NOAA)
- Downloadable graphs as an image or as a spreadsheet
- [New England Dashboard](#)
- [Natural Gas Storage Dashboard](#)



Natural Gas Storage Dashboard

NATURAL GAS STORAGE DASHBOARD

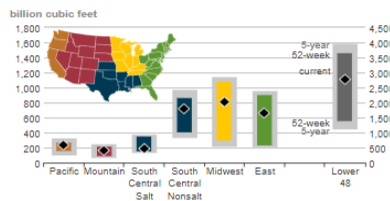
Dashboard last updated: September 16, 2022 | Next update: September 22, 2022 | Commentary last updated: February 7, 2022 | [ARCHIVED REPORTS](#)

[NATIONAL](#) [REGIONAL](#) [COMMENTARY](#)

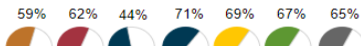
[Print dashboards](#) [Take a tour](#)

Lower 48 working gas in underground storage as of September 9, 2022: 2,771 Bcf | Weekly net change: ▲ 77 Bcf

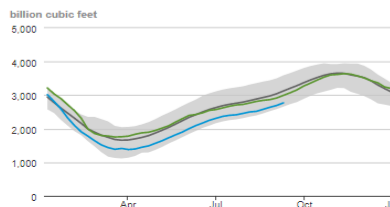
Underground working natural gas storage summary as of September 9, 2022



Underground storage capacity utilization

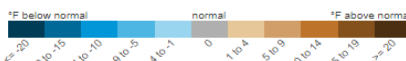
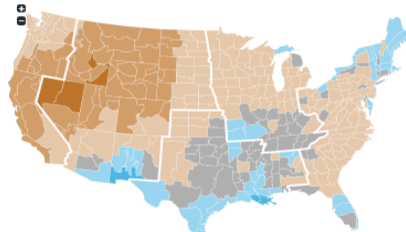


Lower 48 weekly working gas in underground storage

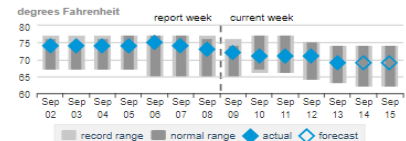


DEPARTURE FROM NORMAL WEEKLY CHANGE DAILY ANIMATION

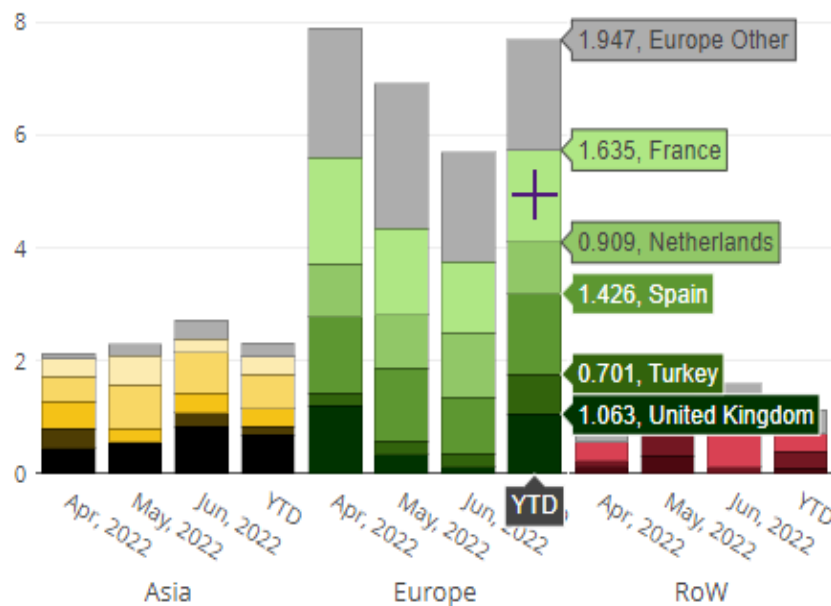
Weekly average departure from normal temperatures as of September 8, 2022



Daily Lower 48 average temperatures



All Terminals, Bcf/d



Source: U.S. Energy Information Administration, [Natural Gas Storage Dashboard](#)

New England Dashboard

OVERVIEW

ELECTRICITY

NATURAL GAS

PETROLEUM

COMMENTARY

Print dashboards

Take a Tour



Normal

Current grid status
as of 10/22/22, 8:07 a.m.



13,620 MW

Today's forecasted peak
demand
10/21/22, hour ending 7:00 p.m.



17,039 MW

Available capacity
10/21/22



43.86 \$/MWh

Day-ahead price
10/22/22, 7:00 a.m.-11:00
p.m.

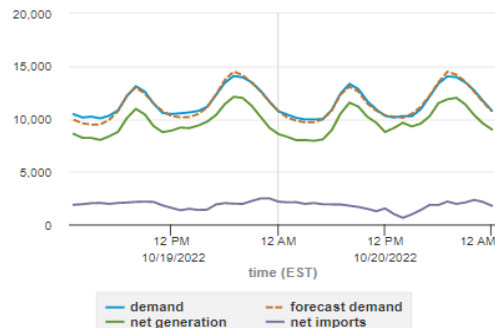
2 DAYS 2 WEEKS 1 YEAR

2 Days



Hourly electricity demand, net generation, and
net imports for New England

megawatthours (MWh)

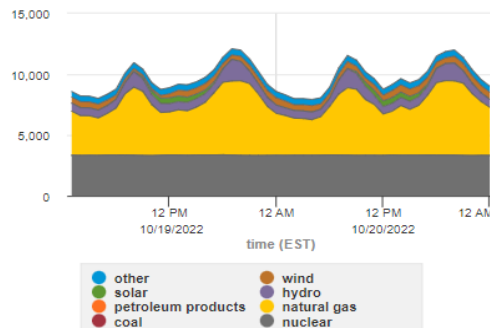


2 Days



Hourly net generation by energy source in New
England

megawatthours (MWh)



Source: U.S. Energy Information Administration, [New England Dashboard](#)

EIA Priorities and Plans

EIA priorities

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

AEO 2023: Expand and explain the range of results

The Annual Energy Outlook is one of our highest visibility and most scrutinized products.

1. 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.

2. 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

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

Expanding the range of modeled scenarios in AEO 2023

- The 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

- Exploring **new combination cases**:

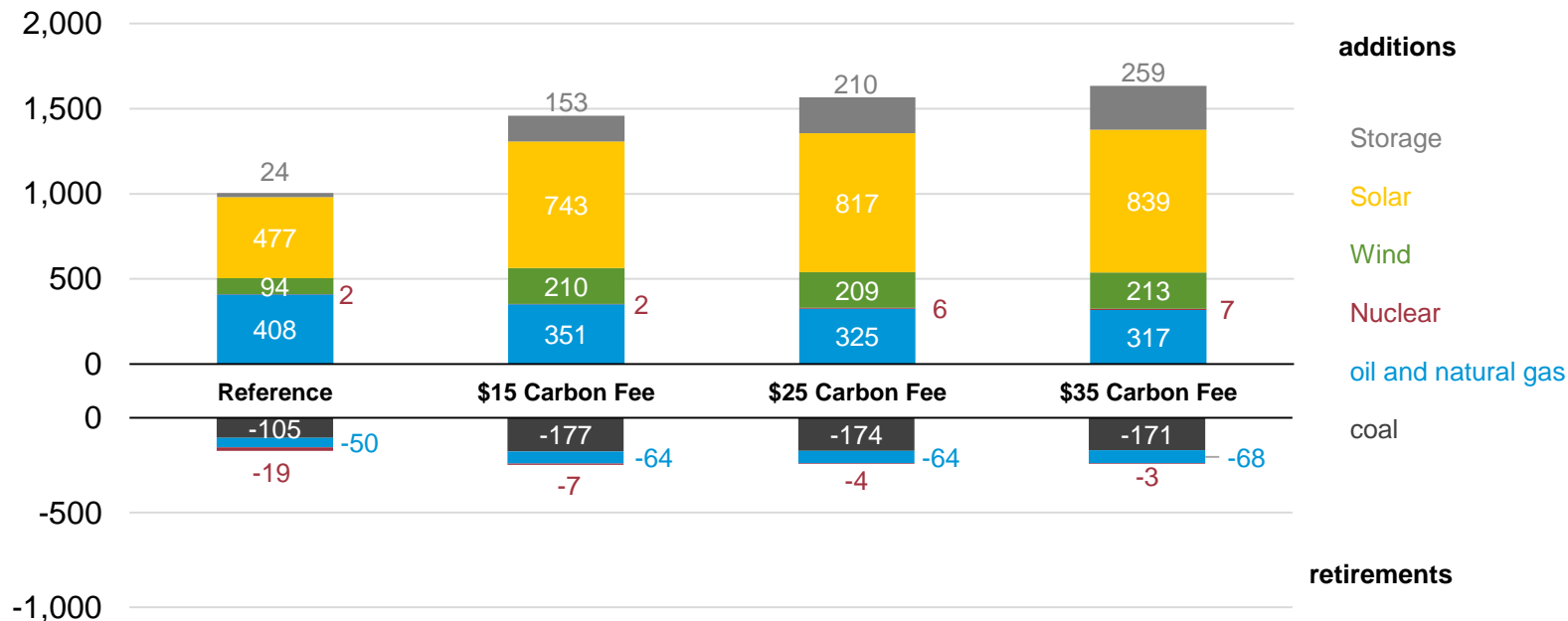
- High Economic Growth case + High Renewables Cost
- Low Economic Growth case + High Renewables Cost
- High Economic Growth case + Low Renewables Cost
- Low Economic Growth case + Low Renewables Cost

The 2023 Reference case includes the Inflation Reduction Act

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

Under Carbon Fees, 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

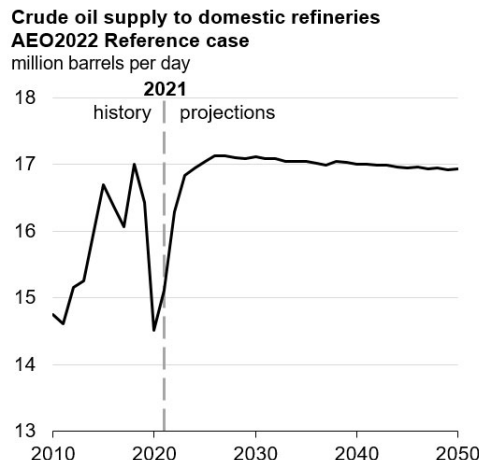


Source: U.S. Energy Information Administration, Annual Energy Outlook 2022

Clarifying the meaning 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:

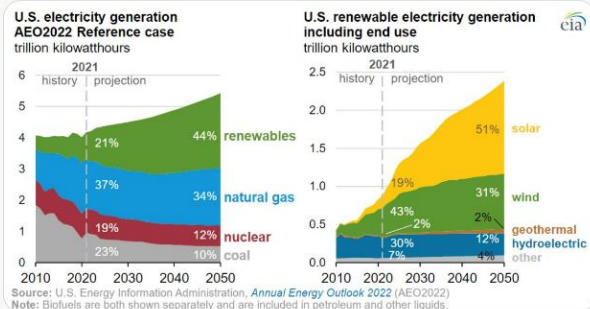
“Projections in the Reference case of our Annual Energy Outlook 2022 (AEO2022) are not predictions of what will happen, but rather, they are modeled projections of what may happen given certain assumptions and methodologies. **The Reference case serves as a baseline for comparison between side cases 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 realizing a single point drawn from the distribution of a continuous variable **is zero**.

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

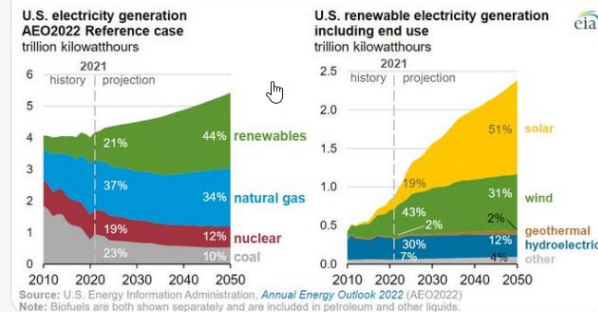
1 2 17



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

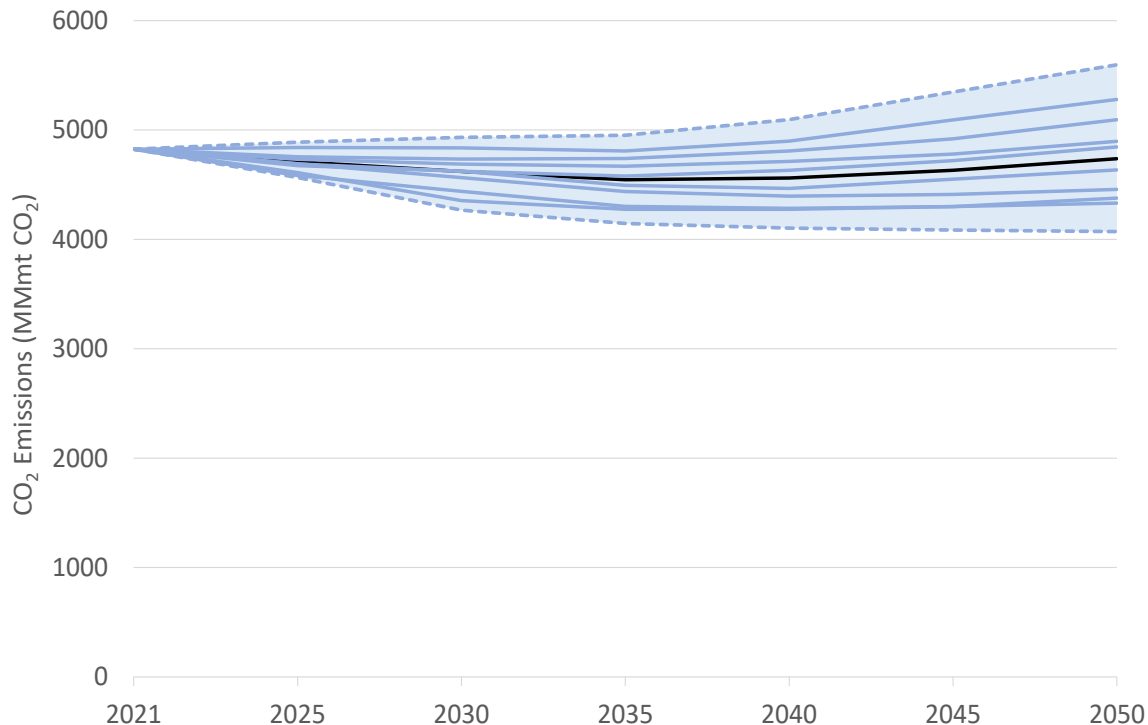


2 8 93

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

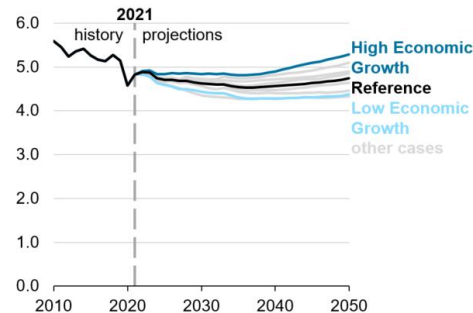
Our communication in the narrative, chart library, and in TIEs effectively treats the Reference case like a forecast.

Exploring new ways to visualize uncertainty



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

U.S. energy-related CO₂ emissions
AEO2022 economic growth cases
billion metric tons



- 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 rather than case specifics

Planned modeling advancements

(14) striving to migrate toward a single, consistent, and open-source modeling platform, and increasing open access to model systems, data, and outcomes, for—

Short-Term: Open source model code

- 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: Reimagine our long-term modeling capabilities

- 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

EIA products

EIA is committed to providing unbiased data and analysis on the full range of energy challenges that confront us.

U.S. Energy Information Administration home page | www.eia.gov

Today in Energy | www.eia.gov/todayinenergy

Consumption and Efficiency Data | www.eia.gov/consumption

Monthly Energy Review | www.eia.gov/totalenergy/data/monthly

State Energy Portal | www.eia.gov/state

Short-Term Energy Outlook | www.eia.gov/forecasts/steo

Annual Energy Outlook | www.eia.gov/forecasts/aeo

EIA jobs

Current open positions at EIA can be found here:

<https://www.eia.gov/about/careers/>

EIA is looking for people to work on model integration, macroeconomics, emissions analysis, regional energy market analysis, and fuel data analysis.

We also have open positions that are specifically targeted towards advancing the next generation of energy models.

Please consider applying!