

# *Energy Outlook 2015: Focus on the Electricity Supply Mix*



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*for*

*Natural Gas Power Generation US*

*May 18, 2015 | Philadelphia, Pennsylvania*

*by*

*Howard Gruenspecht, Deputy Administrator*

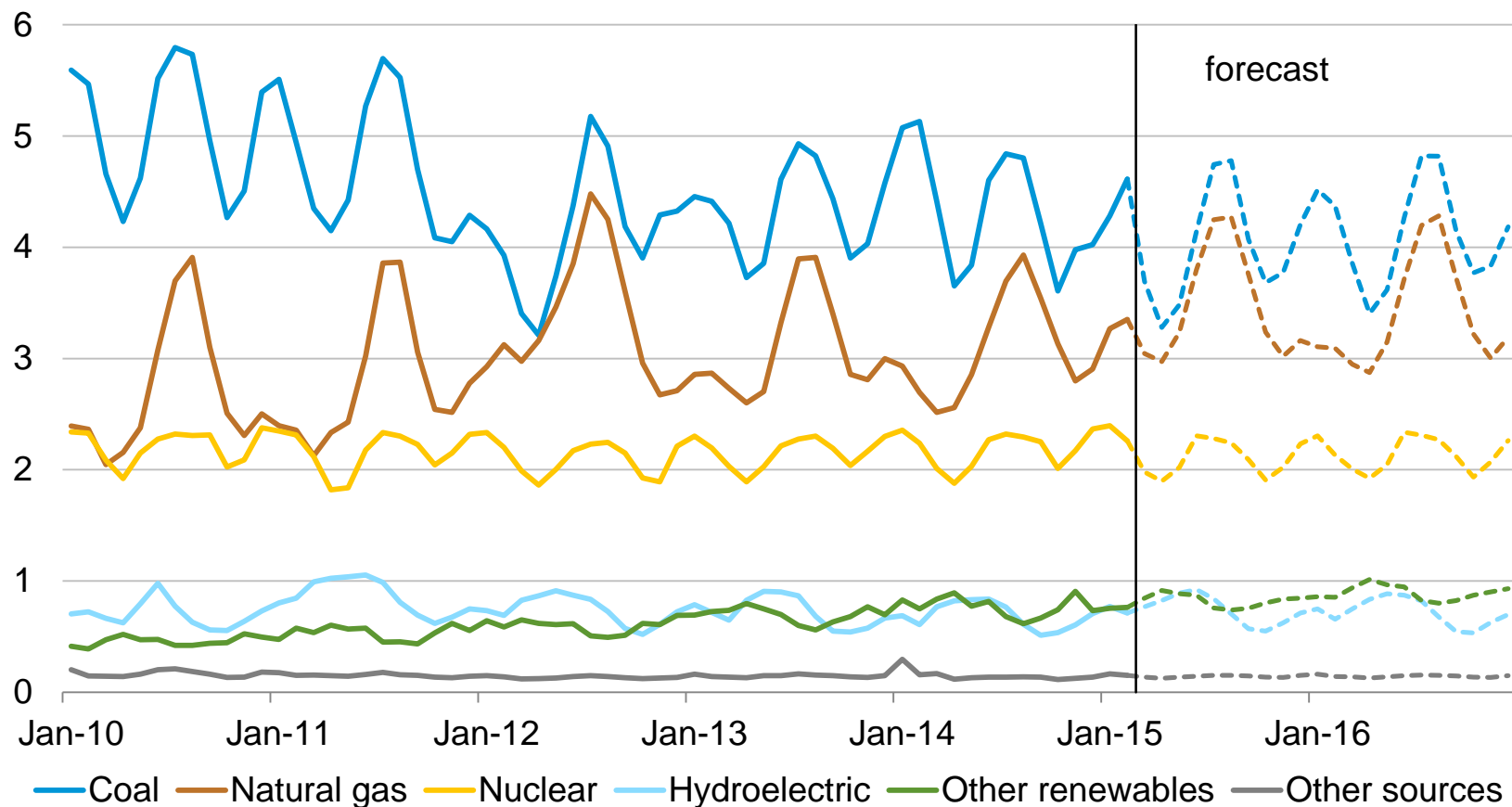
# U.S. Energy Information Administration

- Statistical and analytical agency within the U.S. Department of Energy
- Produces monthly short-term and annual long-term projections
- Produces special analyses of emerging issues and regulatory changes
- EIA's analyses and projections are independent, by law, and should not be seen as representing the views of the Department of Energy, the Administration, or any other organization.

# Short-term

# U.S. Monthly Net Electric Power Generation, 2010 - 2016

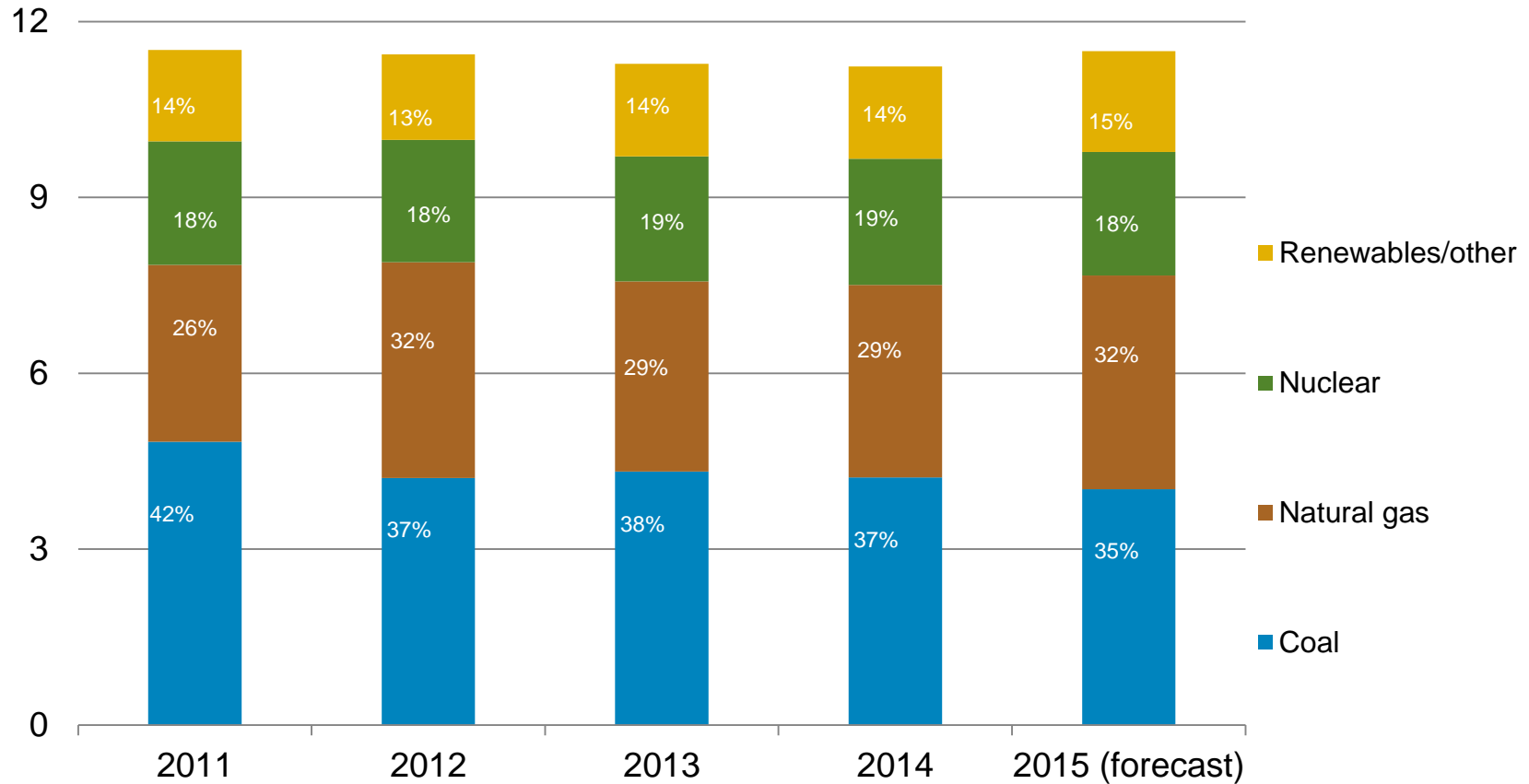
U.S. electricity generation by energy source  
gigawatthours per day



Source: EIA, Short-Term Energy Outlook, April 2015

# In EIA's forecast, coal's share of summer generation falls to historic low while natural gas and renewables match or exceed record highs

average daily power generation, by fuel source, April through October  
billion kilowatt hours per day



Source: Electric Power Monthly, EIA Short-Term Energy Outlook April 2015

## Coal plant retirements have had minimal impact on gas use for generation to date

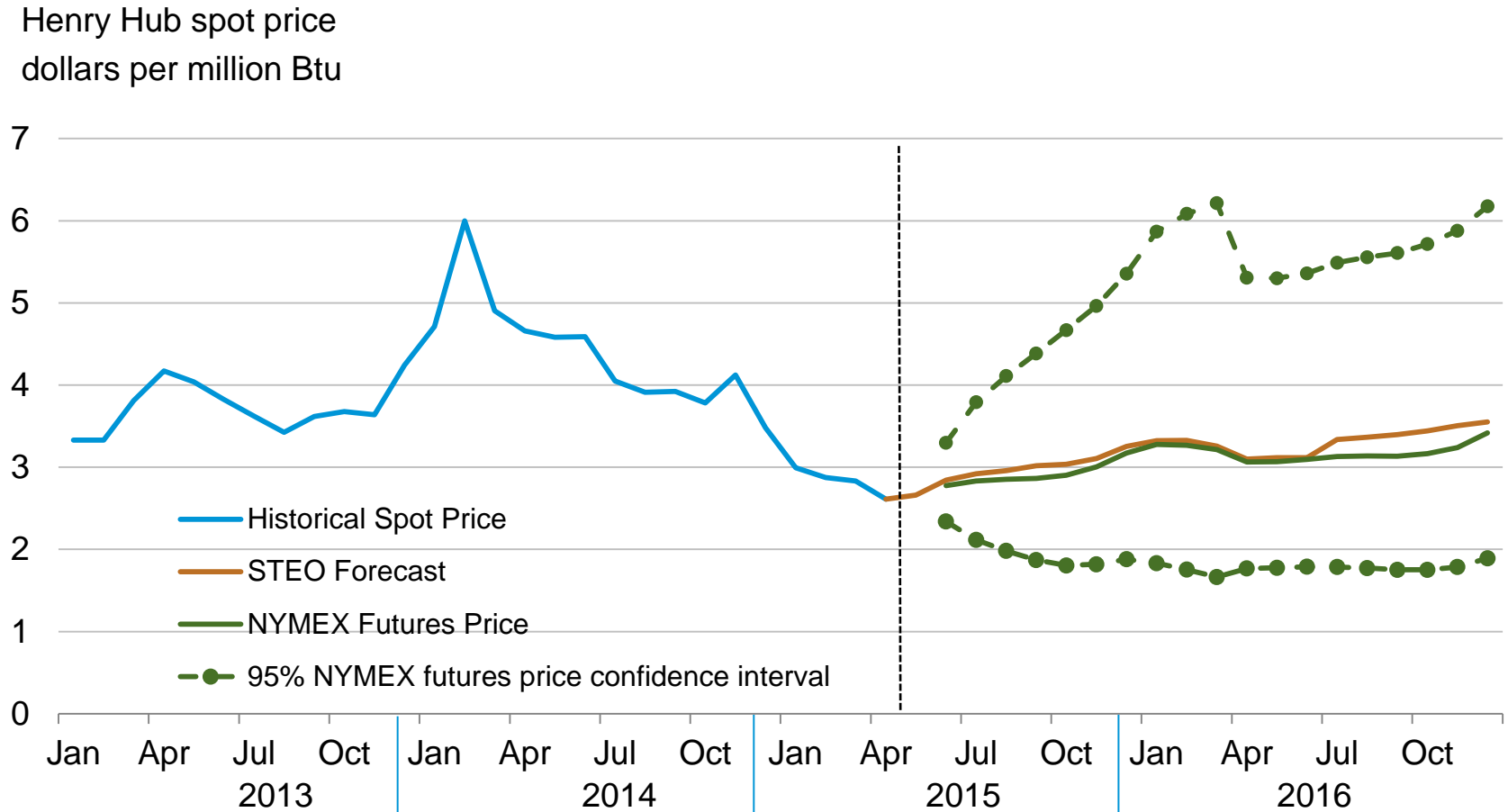
- Recent and near-term coal retirements have operated at below-average capacity factors
- Average capacity factor for coal plants is 58%
- Low natural gas prices have been the main driver of coal displacement

	Coal Retirements by Year, Net Summer Capacity (MW)	Capacity Factor Based on 2013 April – October Generation	2013 April – October Generation (thousand MWh)	Equivalent Natural Gas Consumption (Bcf/d)
<b>2014</b>	2,758	11%	1,615	0.1
<b>2015</b>	13,939	25%	18,086	0.7
<b>2016</b>	4,587	46%	10,724	0.4

*Note: Estimates for 2015 and 2016 subject to change based on EIA-860 survey responses*

*Source: EIA, Annual Energy Outlook 2015; Electric Power Annual 2013*

# EIA forecast for Henry Hub prices is slightly above the Nymex strip through 2016; however, confidence intervals based on options values suggest a wide band of uncertainty in price projections

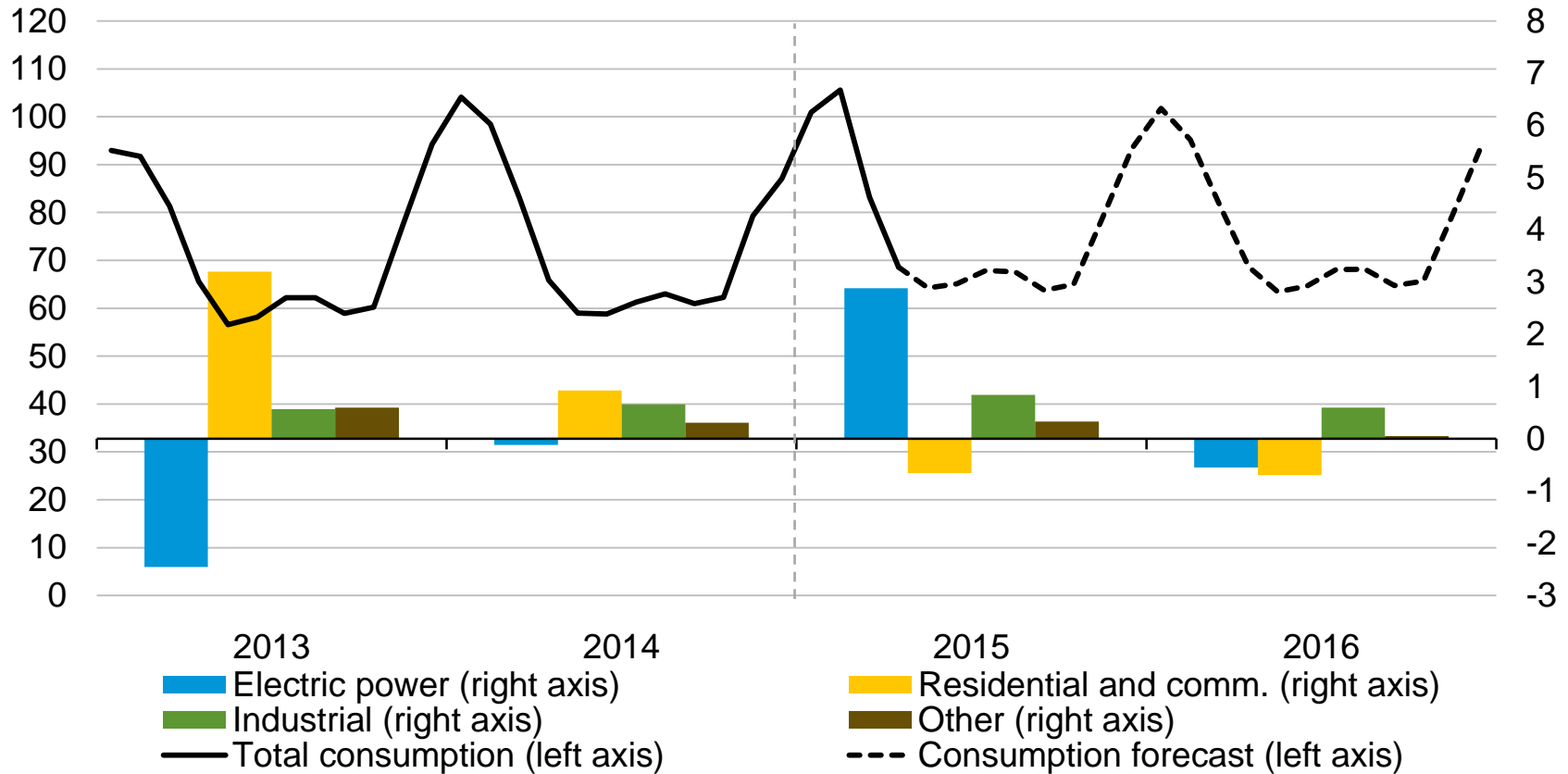


Source: EIA, Short-Term Energy Outlook, May 2015

# Industrial and power sectors drive natural gas consumption growth in the forecast

Natural gas consumption  
billion cubic feet per day

annual change  
billion cubic feet per day



Source: EIA, Short-Term Energy Outlook, May 2015



# Long-term

# AEO2015 underpinnings

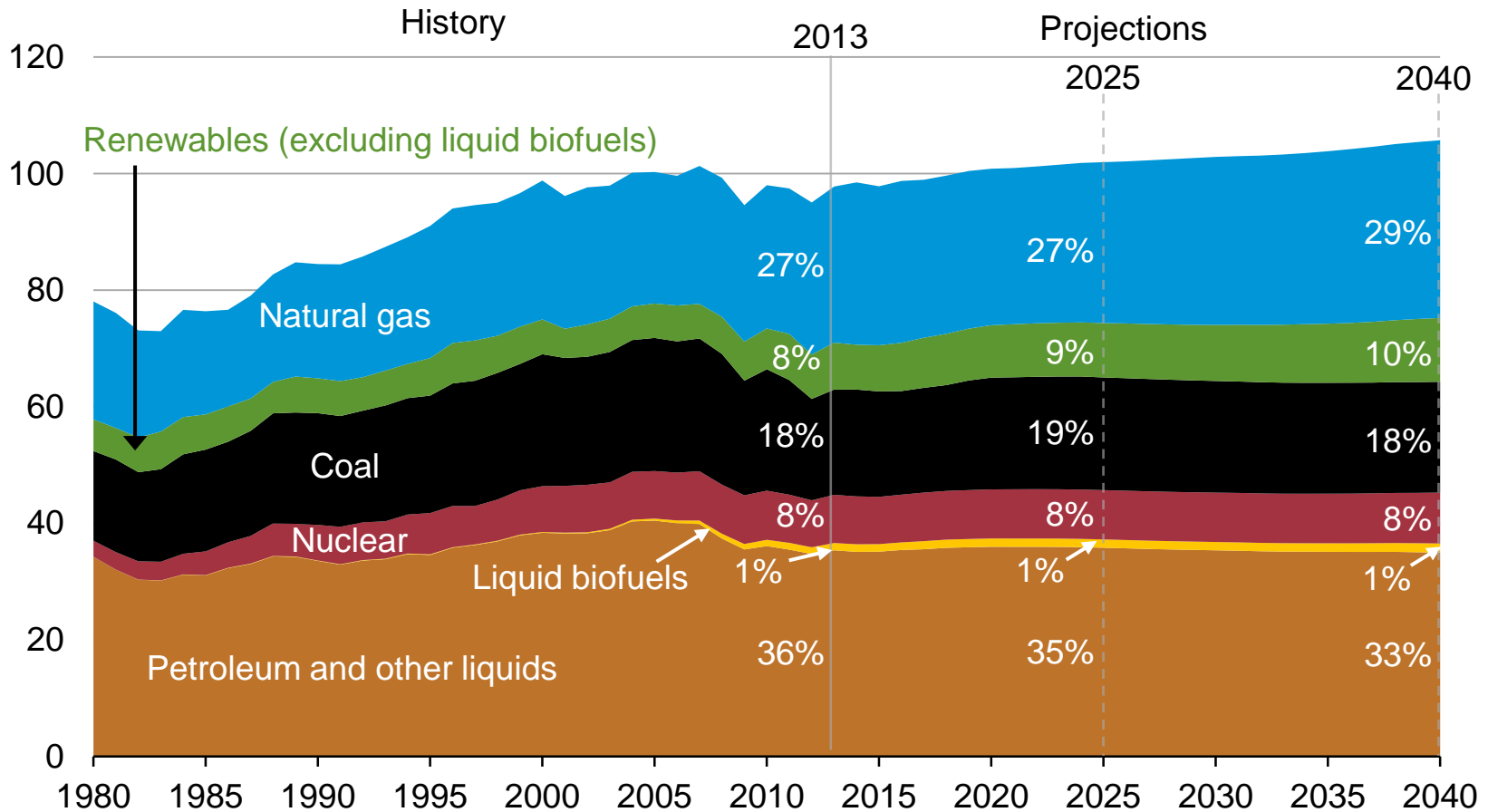
- Reference case: assumes current laws and regulations
  - Reinstatement of the Clean Air Interstate Rule (CAIR) after the court's announcement of intent to vacate the Cross-State Air Pollution Rule (CSAPR)
  - Includes representation of Mercury and Air Toxics Standards (MATS), with effective implementation date assumed to be 2016 rather than 2015
  - Includes state renewable portfolio standards
  - Represents California's cap-and-trade program and the Northeast's RGGI program
  - DOES NOT include EPA's proposed Clean Power

## Key results from *AEO2015*

- In most AEO2015 cases, U.S. net energy imports, including all fuels, decline and ultimately end by 2030 for the first time since the 1950s
- U.S. energy consumption grows at a modest rate over the projection with reductions in energy intensity resulting from improved technologies and trends driven by existing laws and regulations
- Renewables provide an increased share of electricity generation, reflecting rising long-term natural gas prices and the high capital costs of new coal and nuclear generation capacity
- Improved efficiency of energy consumption in end-use sectors and a shift away from more carbon-intensive fuels help to stabilize U.S. energy-related carbon dioxide emissions, which remain below the 2005 level through 2040
- Hydrocarbon production varies significantly across regions and cases; shifts in flows between regions require infrastructure adjustments
- The AEO2015 cases generally reflect current policies, including final regulations and the sunset of tax credits under current law; they do not consider EPA's proposed Clean Power Plan for existing fossil-fired electric generating units or the effects of relaxing current limits on crude oil exports

# Reductions in energy intensity largely offset impact of GDP growth, leading to slow projected growth in energy use

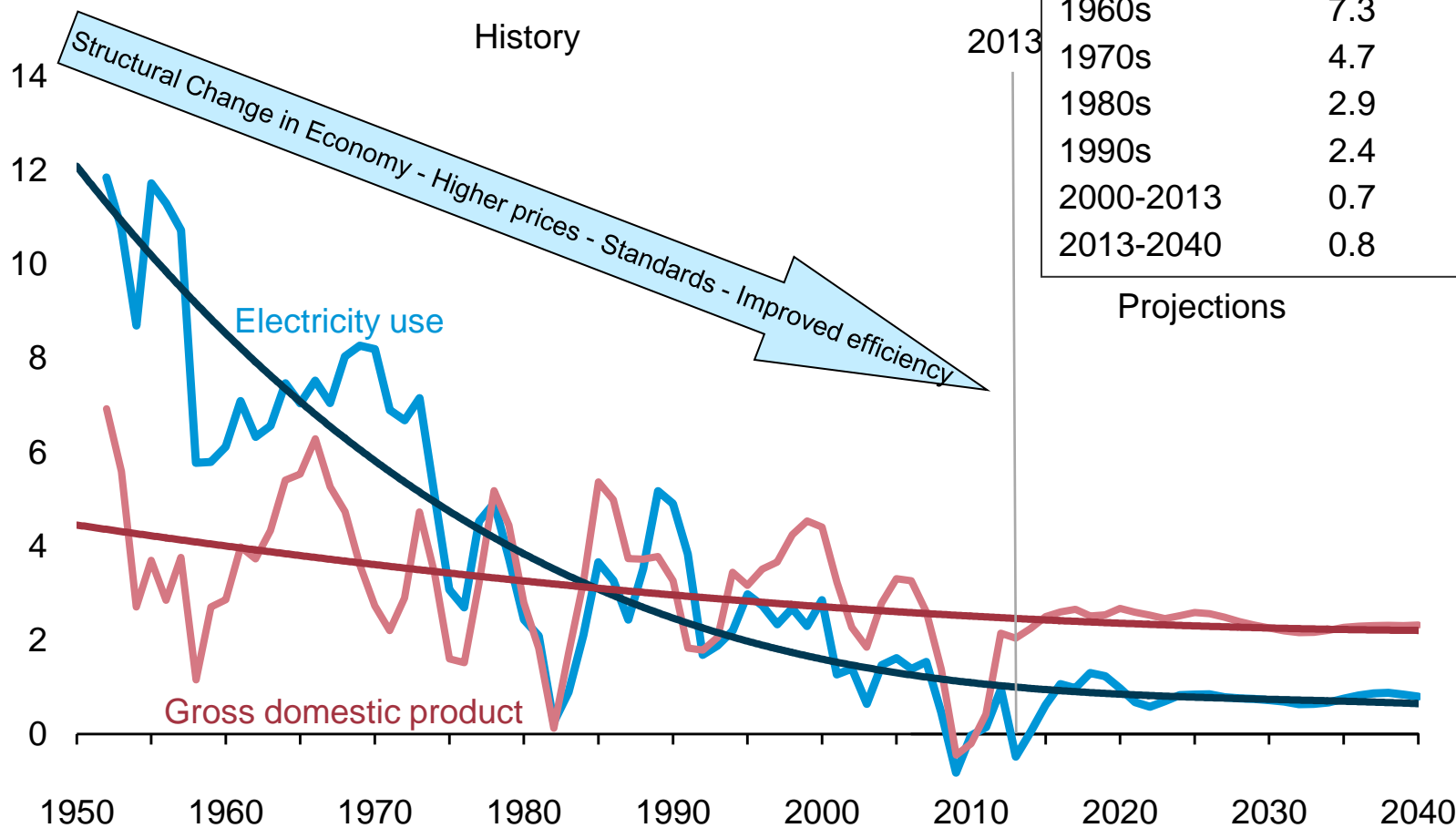
U.S. primary energy consumption  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2015 Reference case

# Growth in electricity use slows, but electricity use still increases by 24% from 2013 to 2040

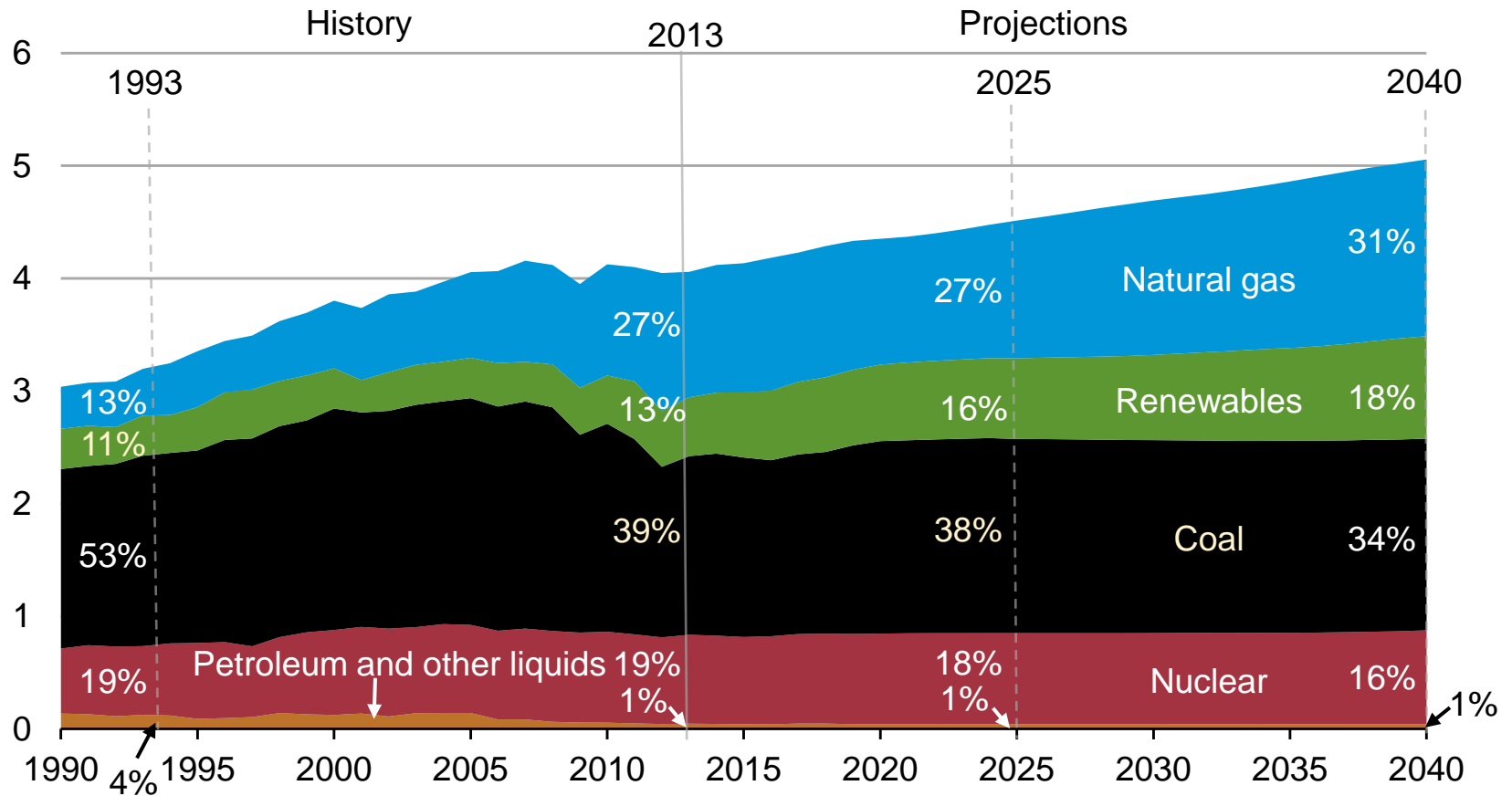
U.S. electricity use and GDP  
percent growth (rolling average of 3-year periods)



Source: EIA, Annual Energy Outlook 2015 Reference case

# Over time the electricity mix gradually shifts to lower-carbon options, led by growth in renewables and gas-fired generation

electricity net generation  
trillion kilowatthours

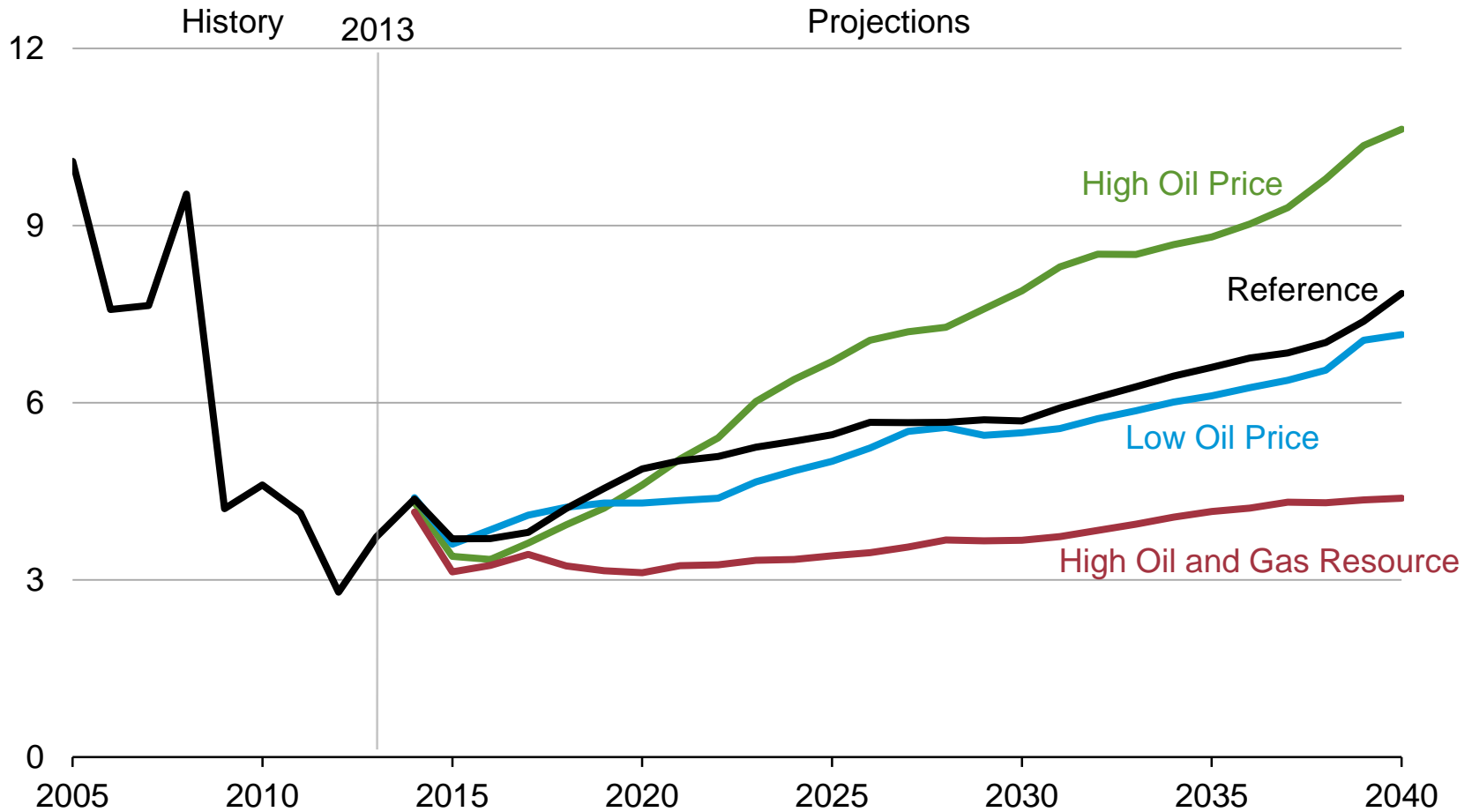


Source: EIA, Annual Energy Outlook 2015 Reference case

# Future domestic natural gas prices depend on both domestic resource availability & technology and world energy prices

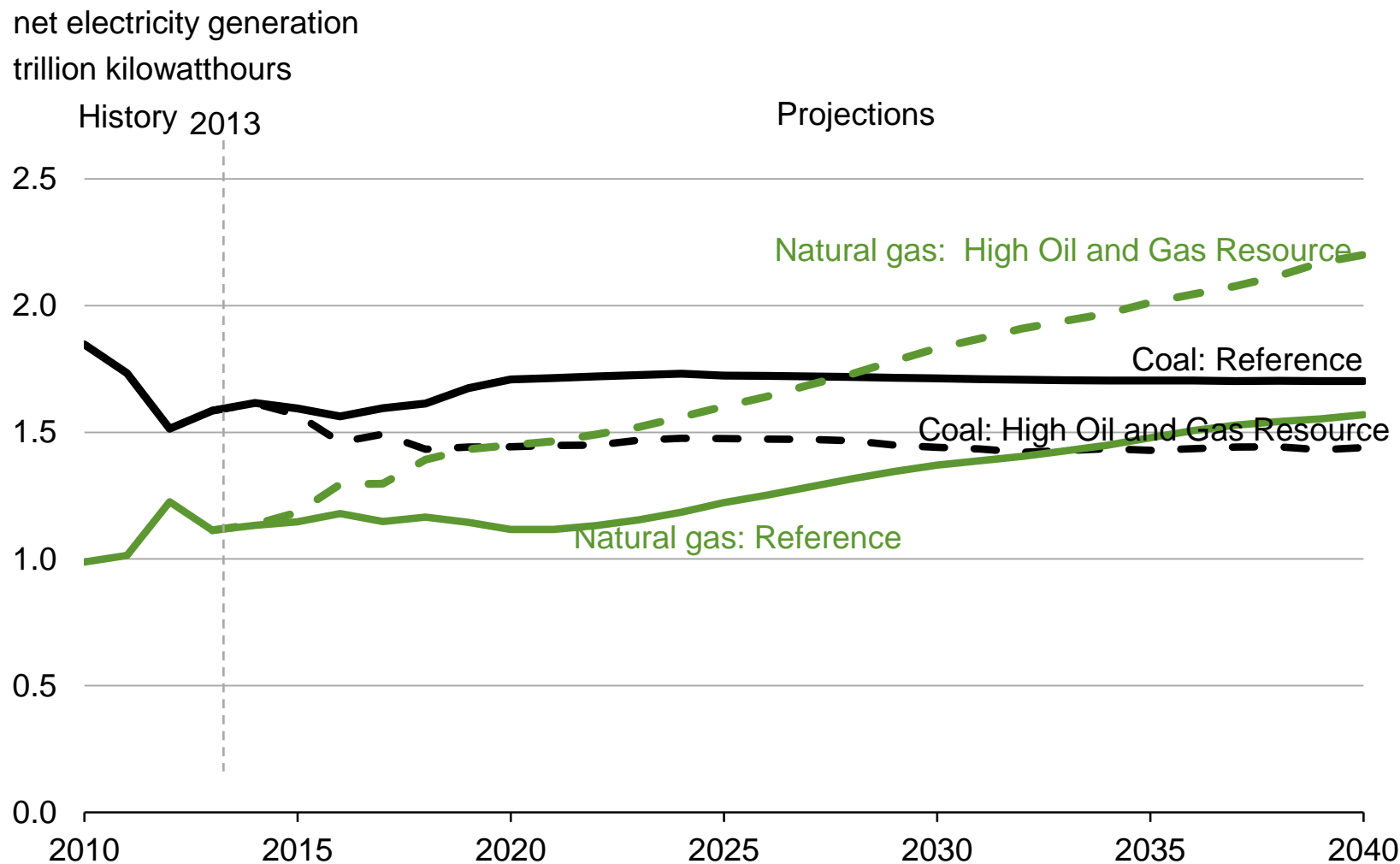
average Henry Hub spot prices for natural gas

2013 dollars per million Btu



Source: EIA, Annual Energy Outlook 2015

# With lower natural gas prices in the High Oil and Gas Resource case, coal is displaced as the leading generation source before 2020

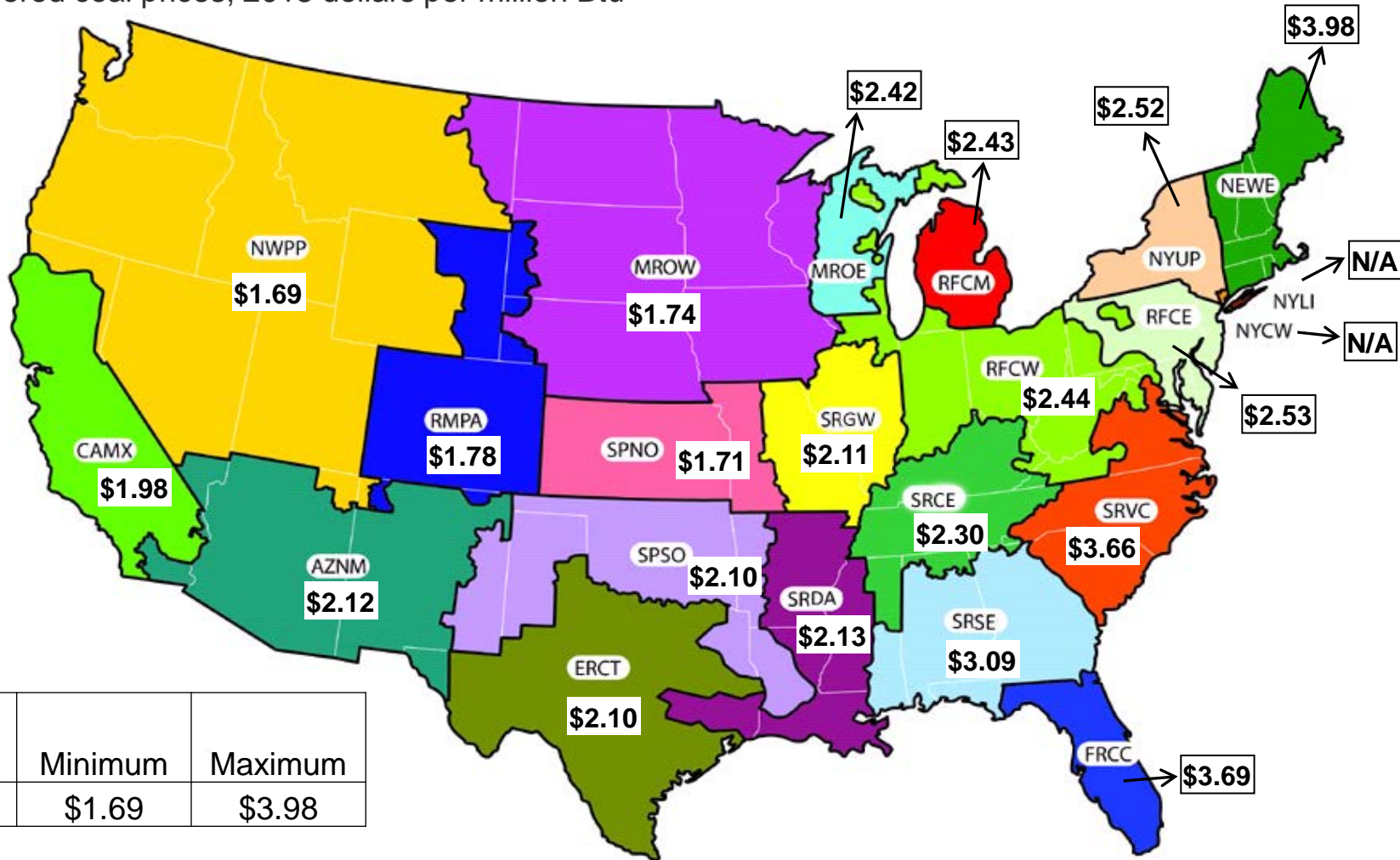


Source: EIA, Annual Energy Outlook 2015



# In 2013, the average delivered price of coal to electricity generators varied widely across U.S. regions – transport costs are a key reason

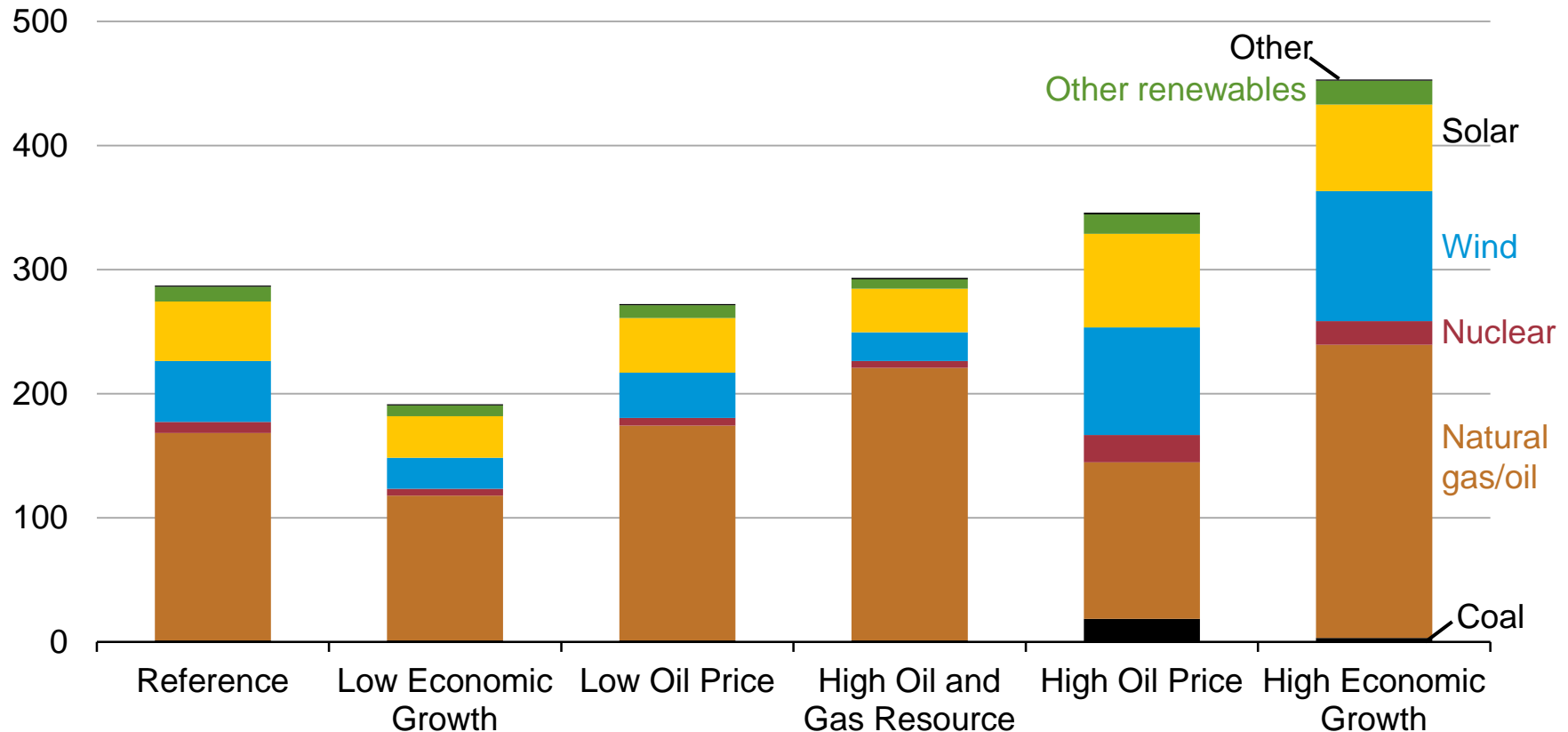
Delivered coal prices, 2013 dollars per million Btu



Source: EIA, Annual Energy Outlook 2015

# Cumulative additions to electricity generation capacity by fuel in six cases, 2013-2040

capacity additions  
gigawatts



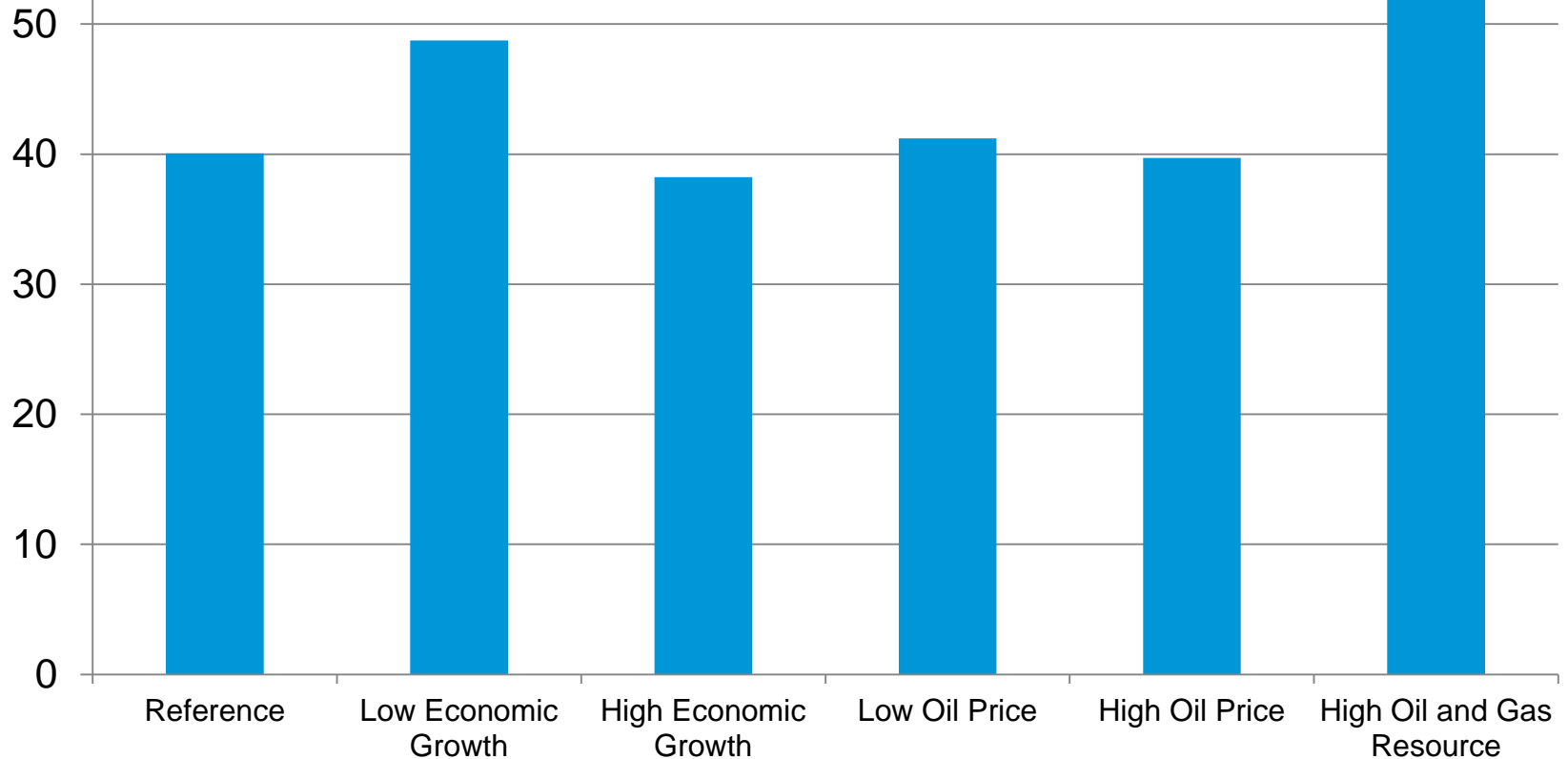
Source: EIA, Annual Energy Outlook 2015

# Cumulative coal-fired capacity retirements, 2014-40

gigawatts

Class of '85 Briefing

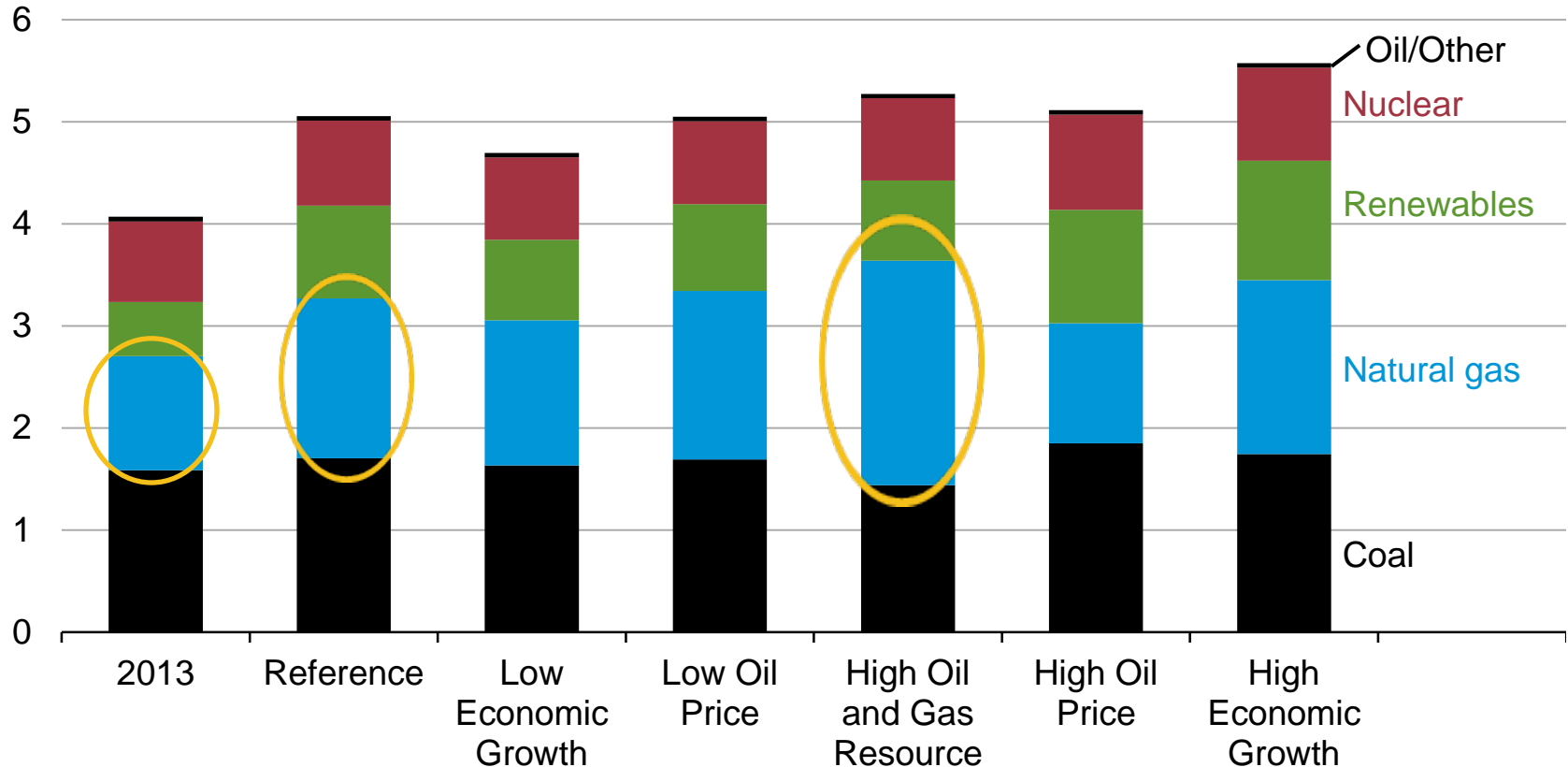
Washington, DC, April 22, 2013



Source: Annual Energy Outlook 2015

# Electricity generation by fuel in six cases, 2013 and 2040

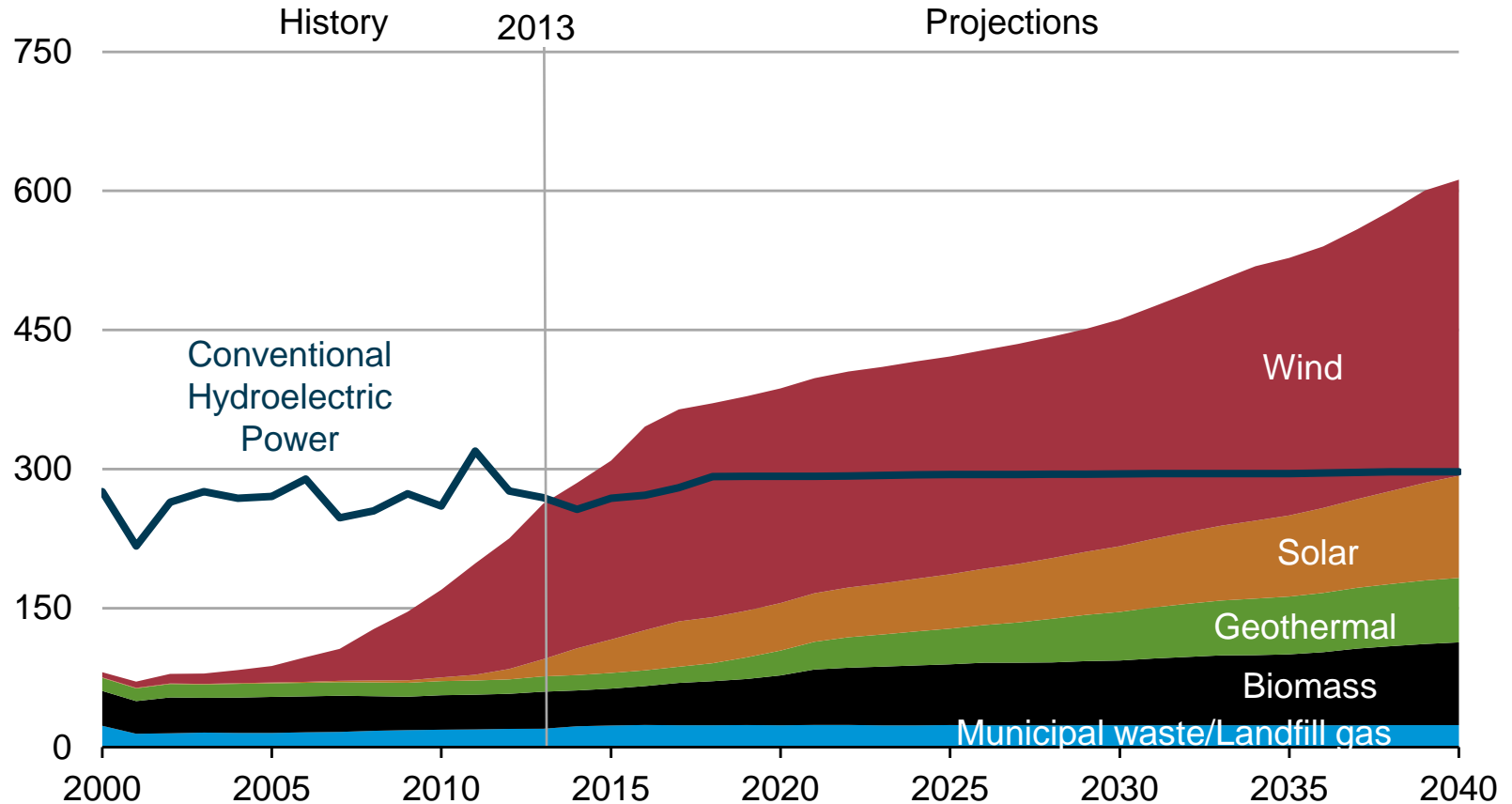
electricity net generation  
trillion kilowatthours



Source: EIA, Annual Energy Outlook 2015

# Non-hydro renewable generation grows to double hydropower generation by 2040

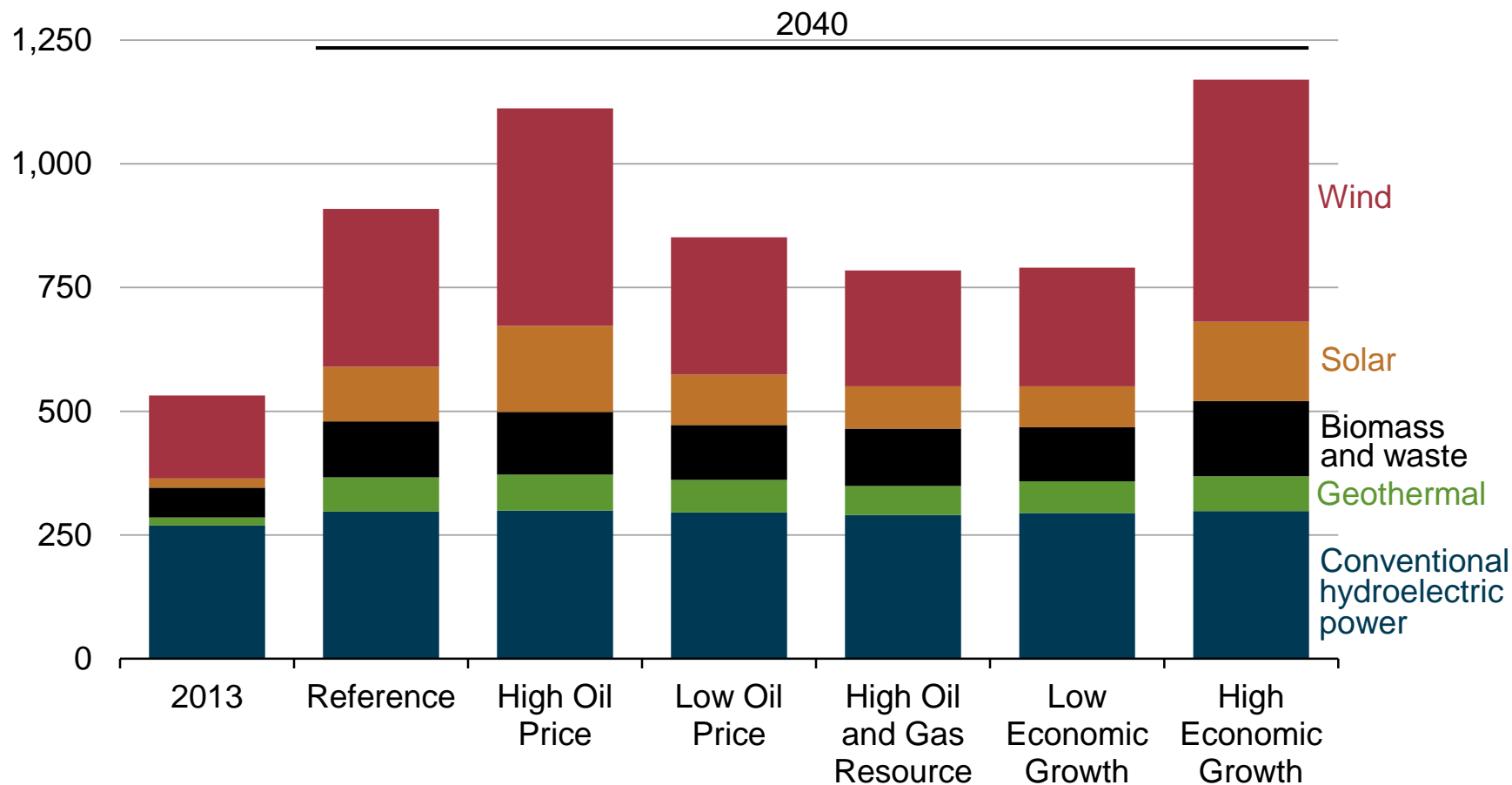
renewable electricity generation by fuel type  
billion kilowatthours



Source: EIA, Annual Energy Outlook 2015 Reference case

# Growth in wind and solar generation meets a significant portion of projected total electric load growth in all AEO2015 cases

U.S. renewable generation in all sectors by fuel  
billion kilowatthours



Source: EIA, Annual Energy Outlook 2015

The proposed Clean Power Plan for existing units under 111(d) is not a simple emission rate standard for existing units; provisions affecting the denominator in compliance calculations play a key role

Affected Generators	Additional elements included in compliance denominator
Existing coal (steam and IGCC)	6% of existing nuclear
Existing oil/gas steam	Under construction nuclear
Existing gas combined cycle	Existing non-hydro renewable
	New renewables (including hydro)
	Energy Efficiency savings

$$\text{Compliance CO}_2 \text{ intensity rate} = \frac{\text{emissions from affected generators}}{\text{affected generation base}} =$$

(coal emissions) + (oil/gas emissions)

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(coal gen) + (oil/gas gen) + (eligible nuclear gen) + (eligible renew gen) + EE

# For more information

U.S. Energy Information Administration home page | [www.eia.gov](http://www.eia.gov)

Annual Energy Outlook | [www.eia.gov/forecasts/aeo](http://www.eia.gov/forecasts/aeo)

Short-Term Energy Outlook | [www.eia.gov/forecasts/steo](http://www.eia.gov/forecasts/steo)

International Energy Outlook | [www.eia.gov/forecasts/ieo](http://www.eia.gov/forecasts/ieo)

Today In Energy | [www.eia.gov/todayinenergy](http://www.eia.gov/todayinenergy)

Monthly Energy Review | [www.eia.gov/totalenergy/data/monthly](http://www.eia.gov/totalenergy/data/monthly)

State Energy Portal | [www.eia.gov/state](http://www.eia.gov/state)

Drilling Productivity Report | [www.eia.gov/petroleum/drilling](http://www.eia.gov/petroleum/drilling)

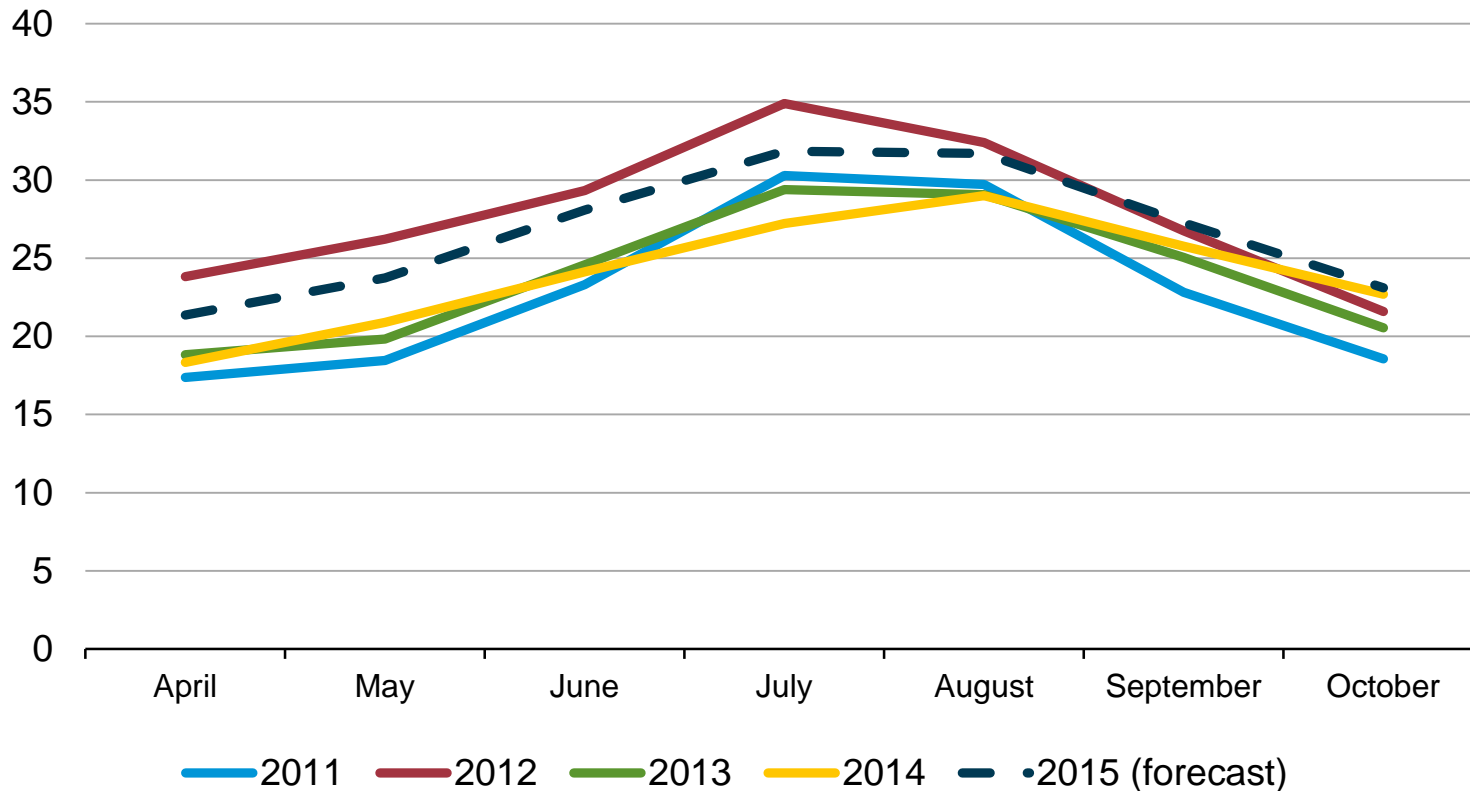


## Key takeaways regarding the outlook for natural gas storage levels

- **Natural gas storage is substantially higher than at this time last year:** End-of-March 2015 inventories total an estimated 1,471 Billion cubic feet (Bcf), compared to 857 Bcf in 2014 following large withdrawals due to the exceptionally cold winter of 2013-2014
- **Strong production:** EIA forecasts average production over the upcoming injection season to be 3.5 Bcf/d greater than production the same time last year
- **Near-record natural gas consumption for electric generation expected due to relatively low natural gas prices and warmer summer weather:** EIA forecasts that the average Henry Hub price over the injection season is \$3.06/MMBtu, much lower than the average of \$4.21/MMBtu last year. NOAA's forecast of cooling degree days for the April – October 2015 injection season is 6.9% above the comparable 2014 period, implying more air conditioning demand
- **Relatively strong injections in the coming months:** EIA expects an overall injection of 2,310 Bcf between April and October, with stocks at the end of October forecast to reach 3,781 Bcf, 194 Bcf higher than 2014

# Forecast for natural gas consumed in the electric power sector is about 11% greater than last summer's levels, but 4% below 2012's record high levels

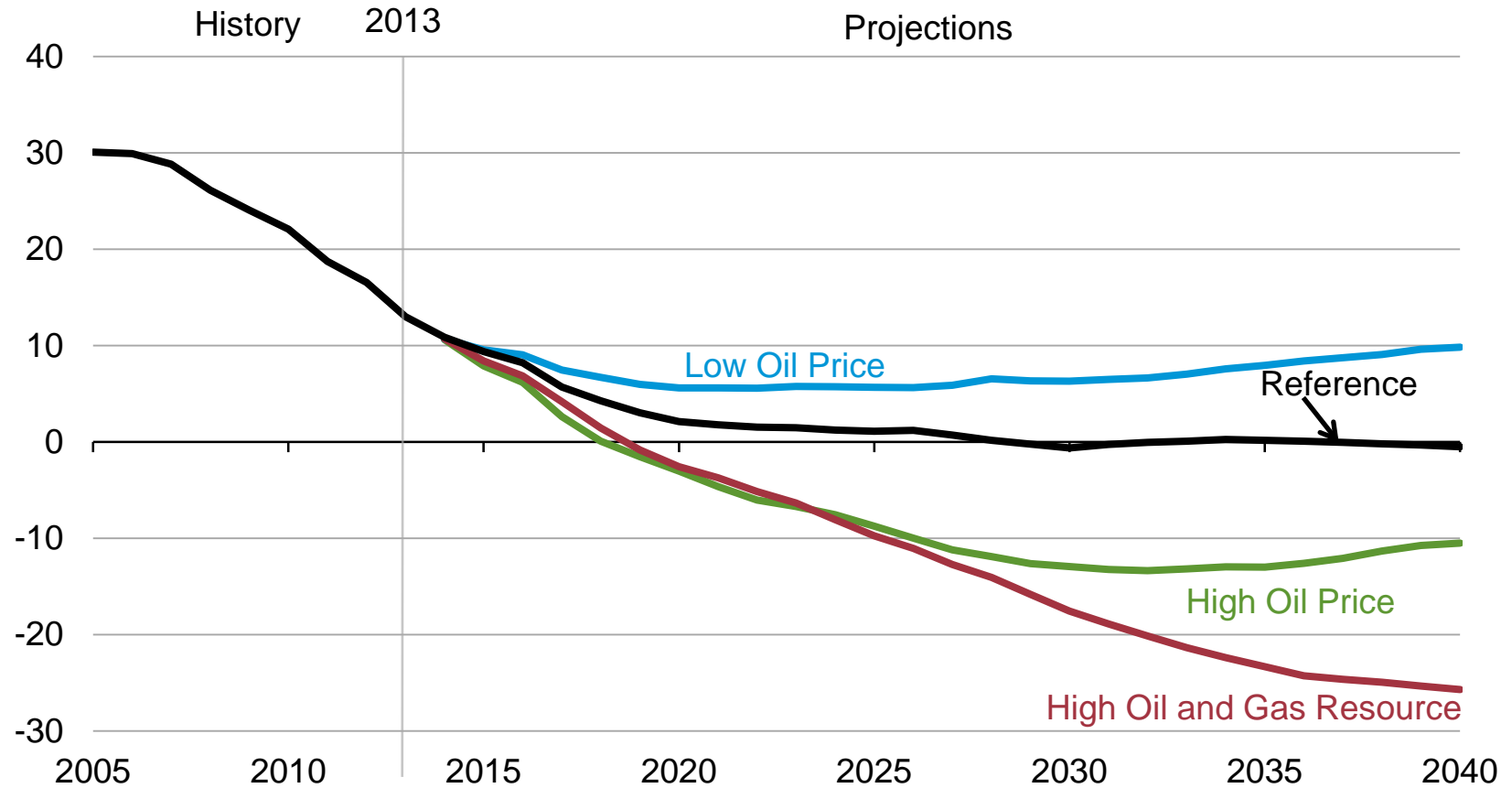
consumption of natural gas in the electric power sector in the U.S.  
billion cubic feet per day



Source: Natural Gas Monthly, EIA Short-Term Energy Outlook April 2015

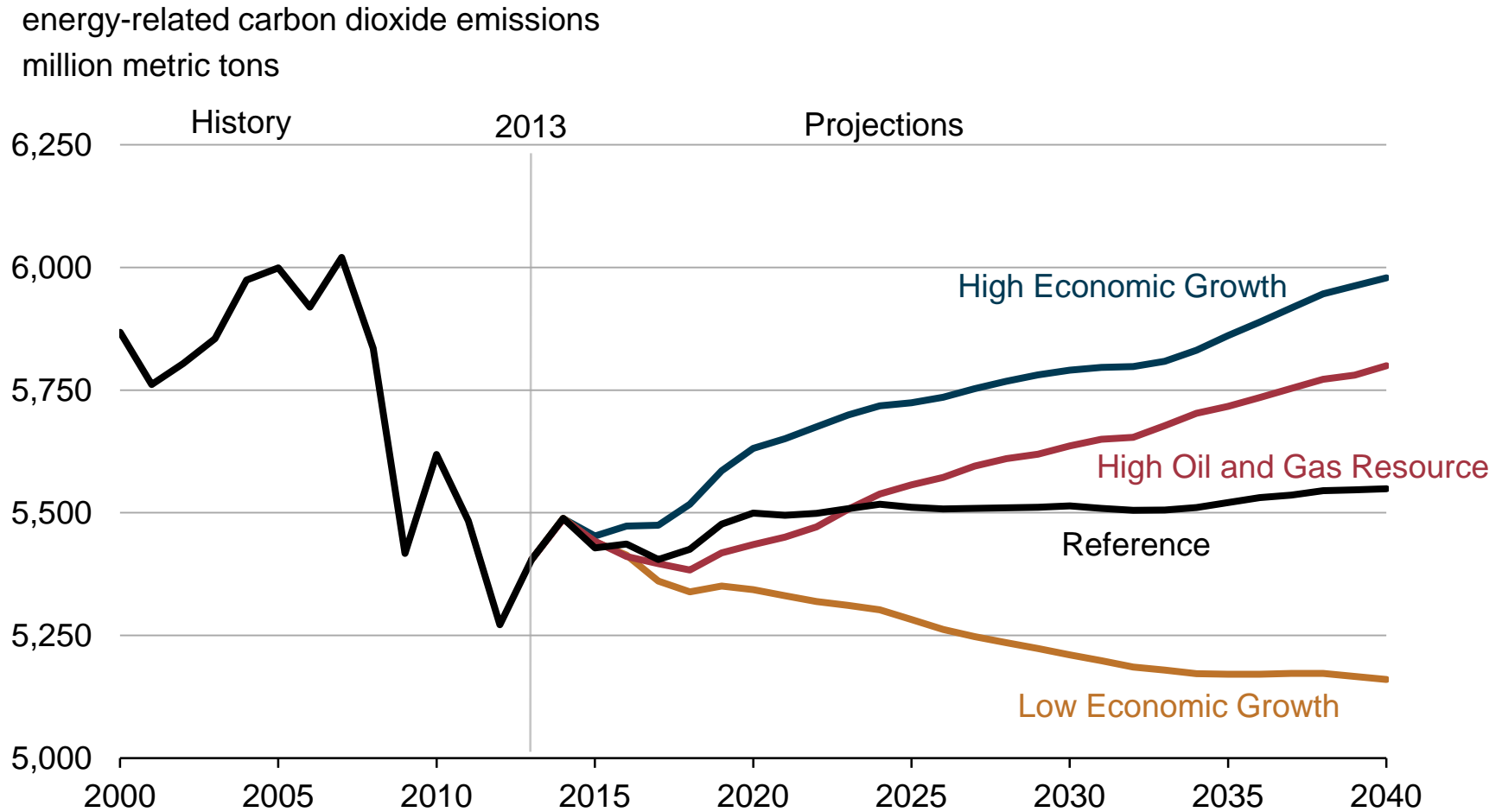
# U.S. net energy imports continue to decline in the near term, reflecting increased oil and natural gas production coupled with slow demand growth

U.S. net energy imports  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2015

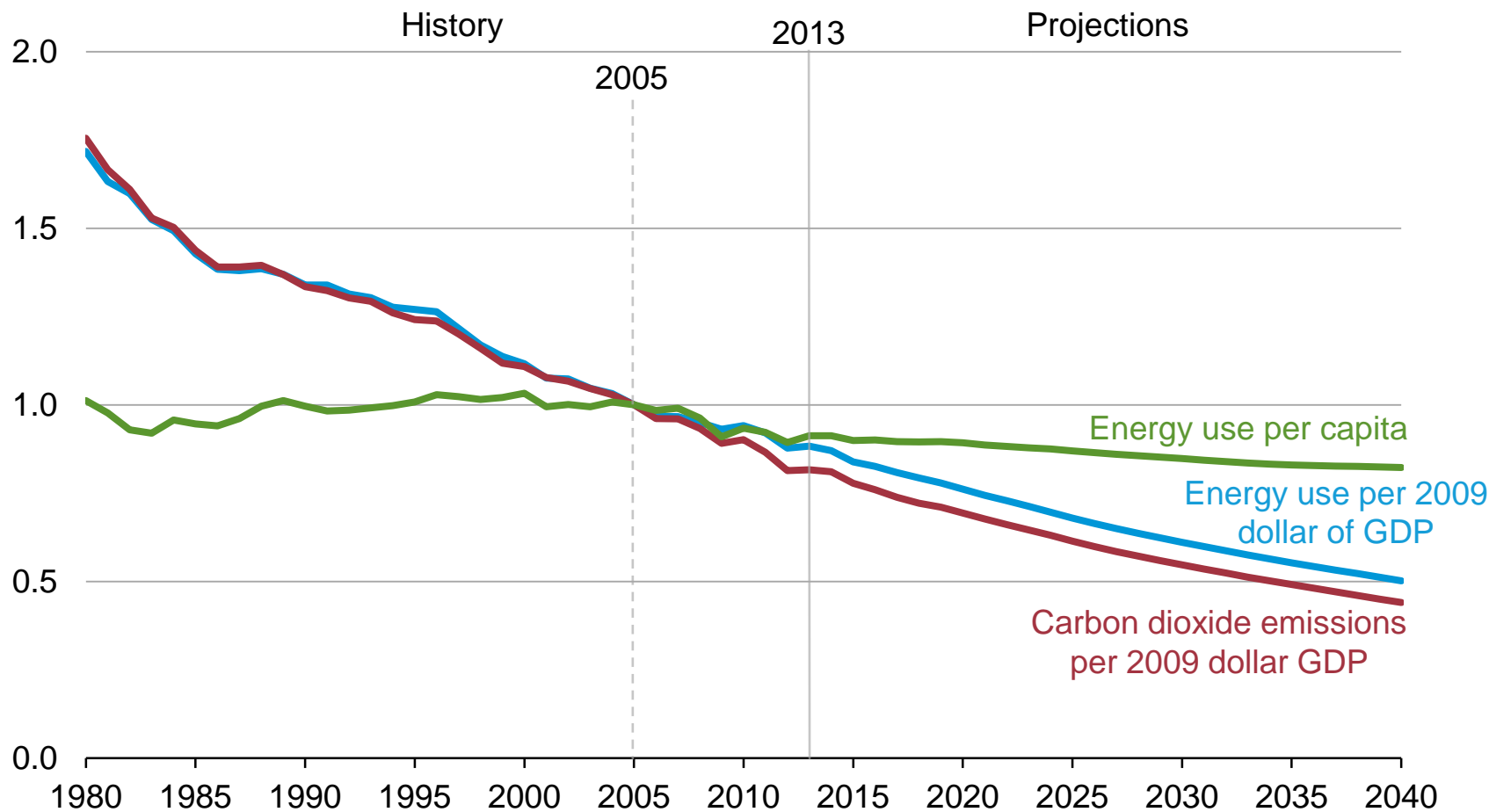
# CO<sub>2</sub> emissions are sensitive to the influence of future economic growth and energy price trends on energy consumption



Source: EIA, Annual Energy Outlook 2015

# CO<sub>2</sub> emissions per dollar of GDP decline faster than energy use per dollar of GDP with a shift towards lower-carbon fuels

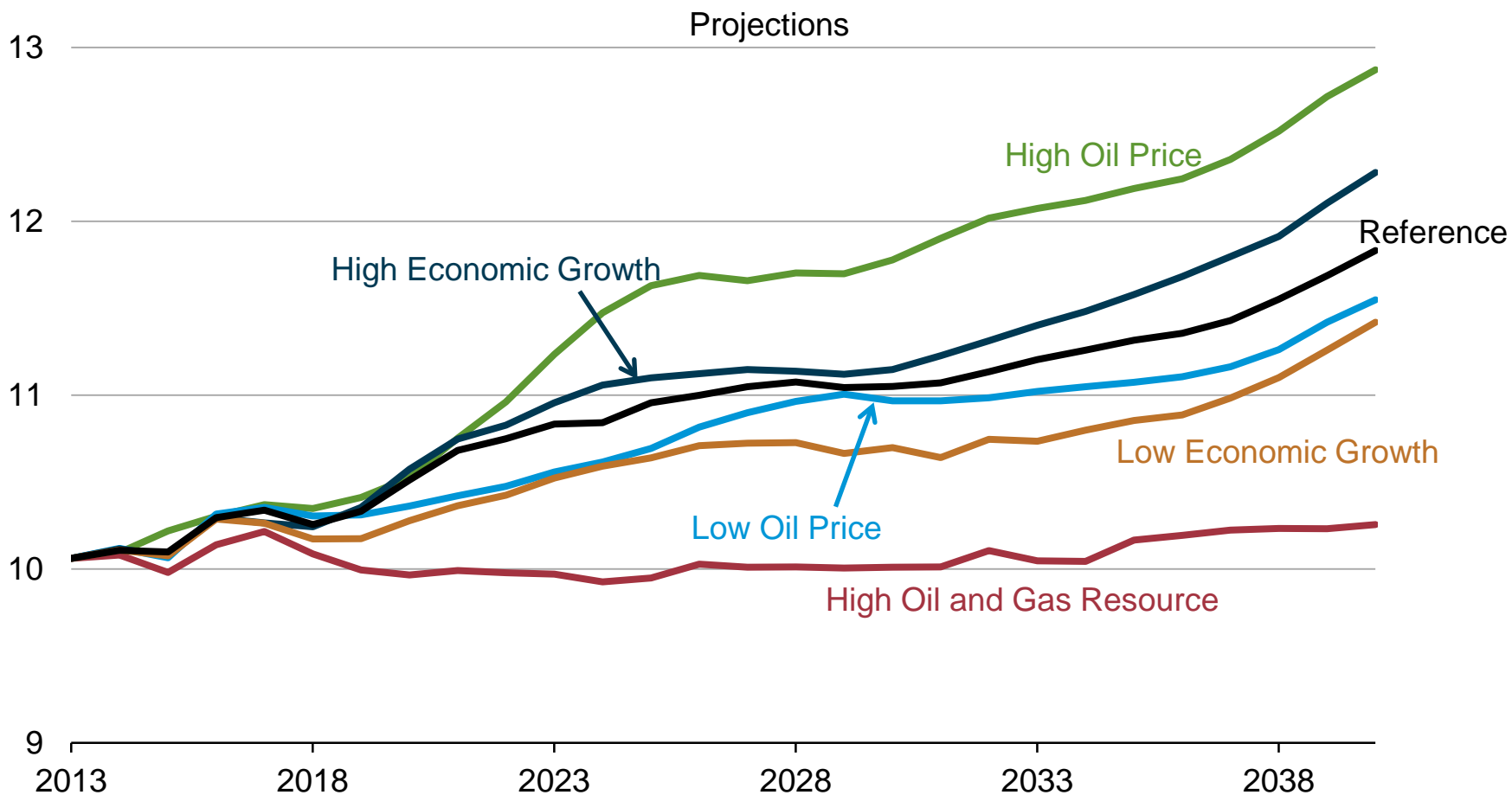
energy and emission intensity  
index, 2005=1



Source: EIA, Annual Energy Outlook 2015 Reference case

# Electricity prices increase with rising fuel costs and expenditures for electric transmission and distribution infrastructure

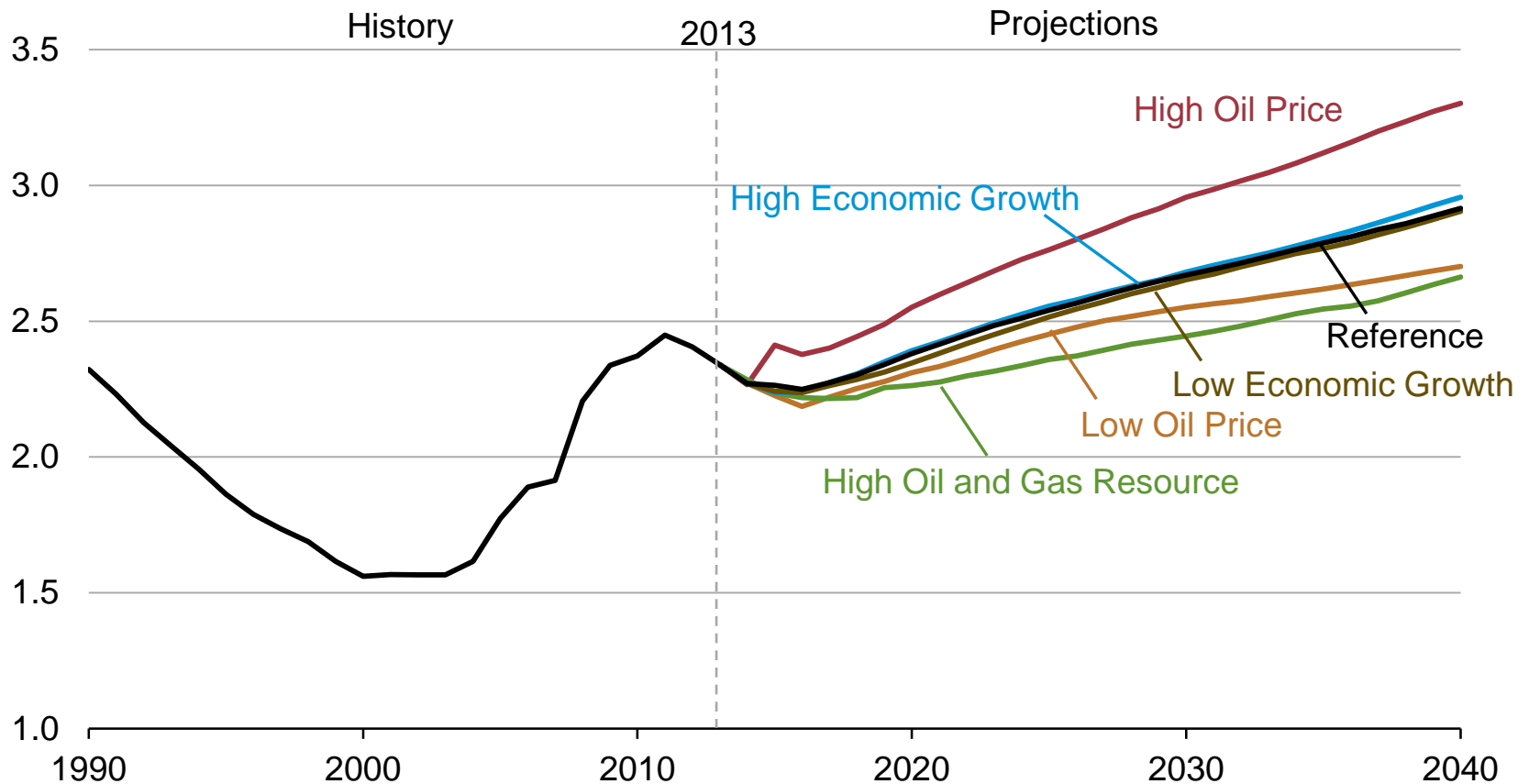
average retail electricity prices  
2013 cents per kilowatthour



Source: EIA, Annual Energy Outlook 2015

# Average delivered coal prices to electric generators in six cases, 1990-2040

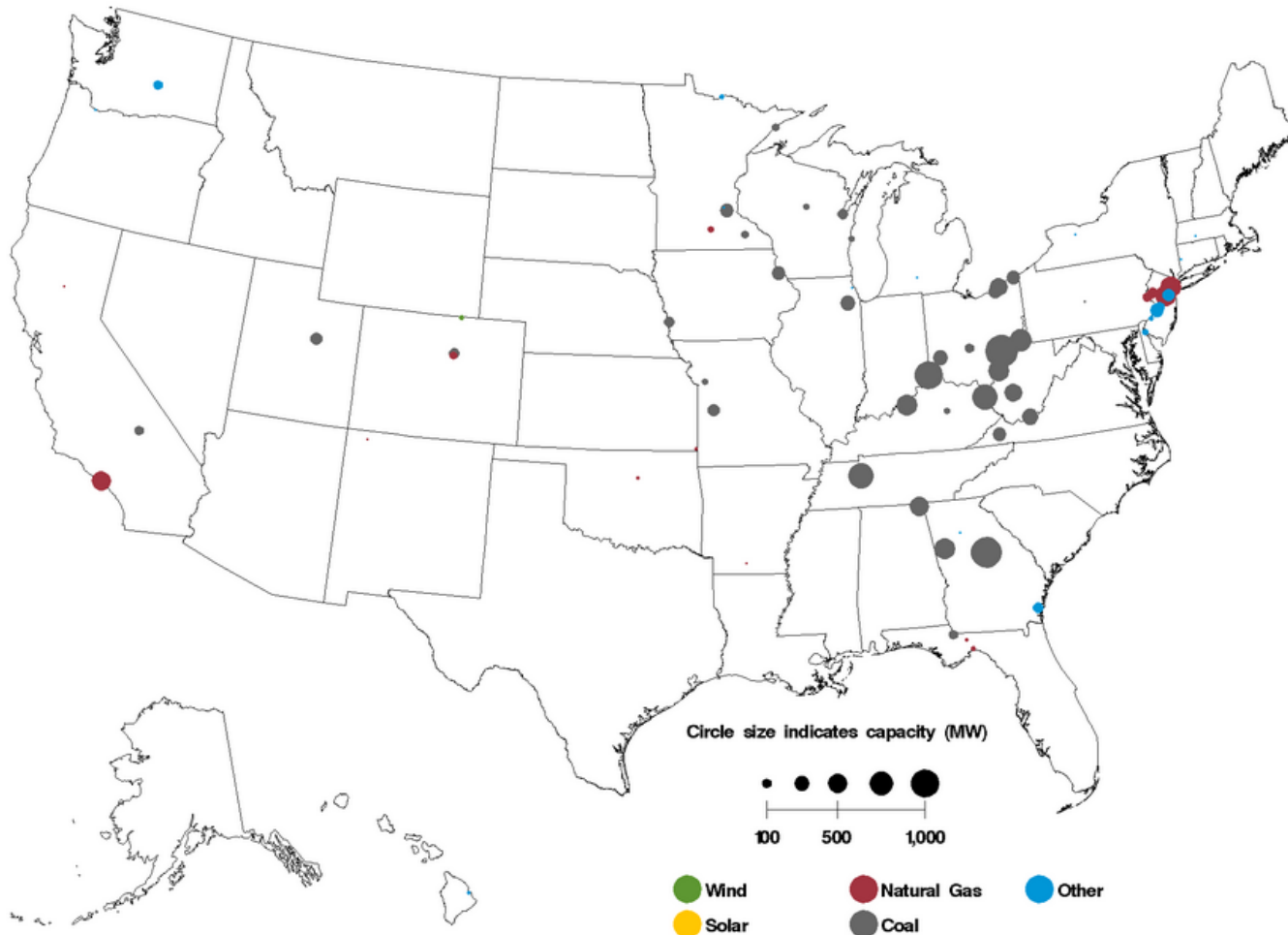
average delivered coal price  
2013 dollars per million Btu



Source: EIA, Annual Energy Outlook 2015

# From April through June 2015, over 10.6 GW of coal generation capacity is scheduled to retire

Utility Scale Generating Units Planned to Retire from February 2015 to January 2016

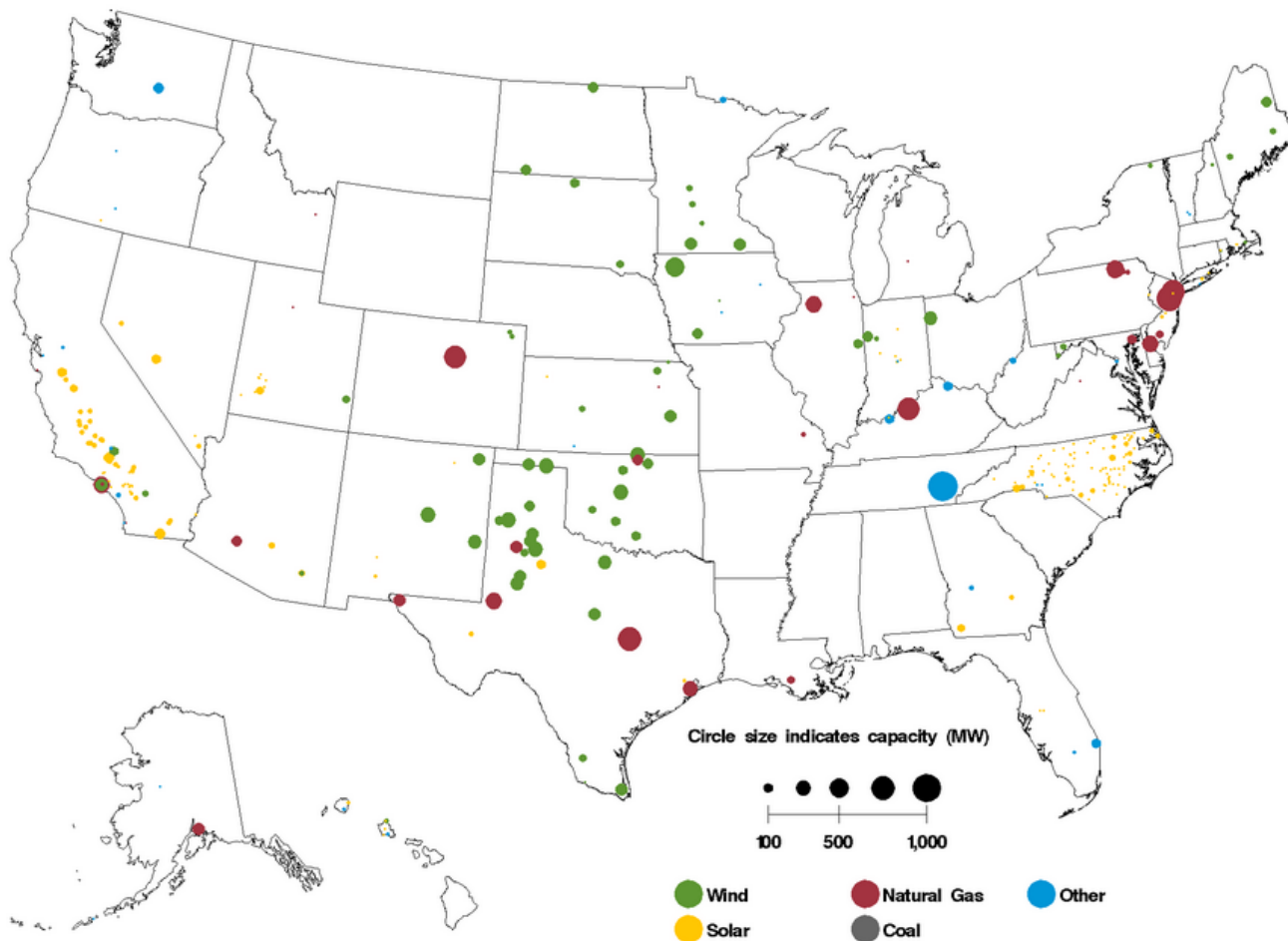


Sources: U.S. Energy Information Administration, Form EIA-860, 'Annual Electric Generator Report' and Form EIA-860M, 'Monthly Update to the Annual Electric Generator Report.'



# From April through October 2015, nearly 4.1 GW of natural gas generation capacity is under construction

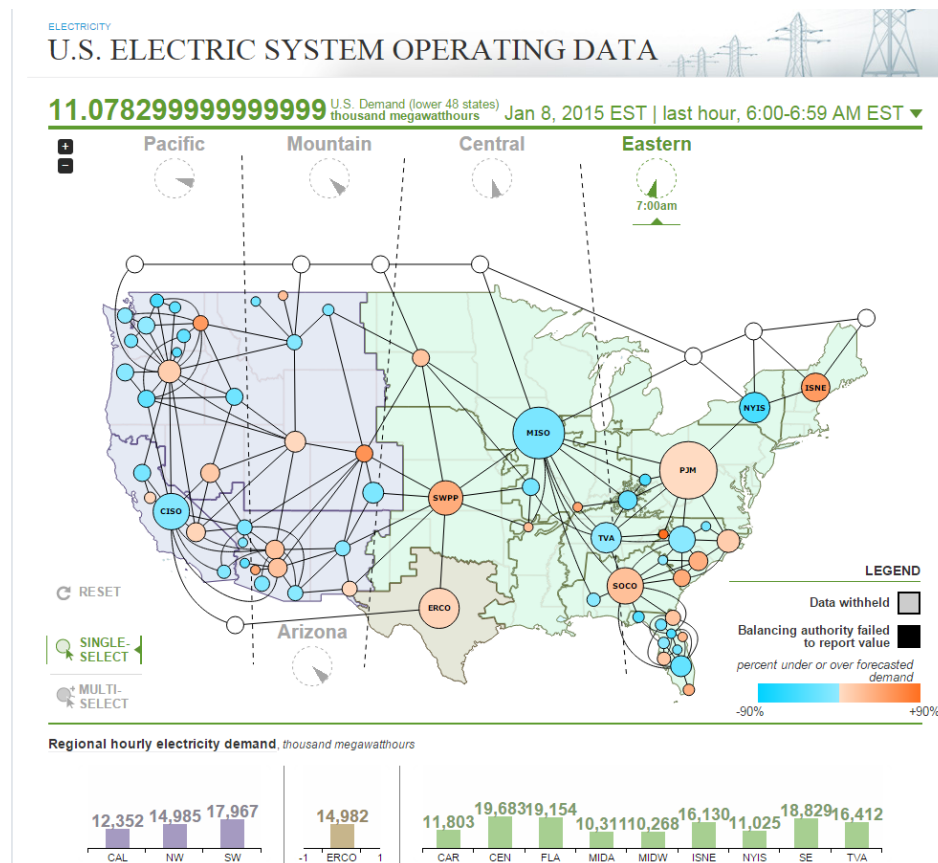
Utility Scale Generating Units Planned to Come Online from February 2015 to January 2016



Sources: U.S. Energy Information Administration, Form EIA-860, 'Annual Electric Generator Report' and Form EIA-860M, 'Monthly Update to the Annual Electric Generator Report.'

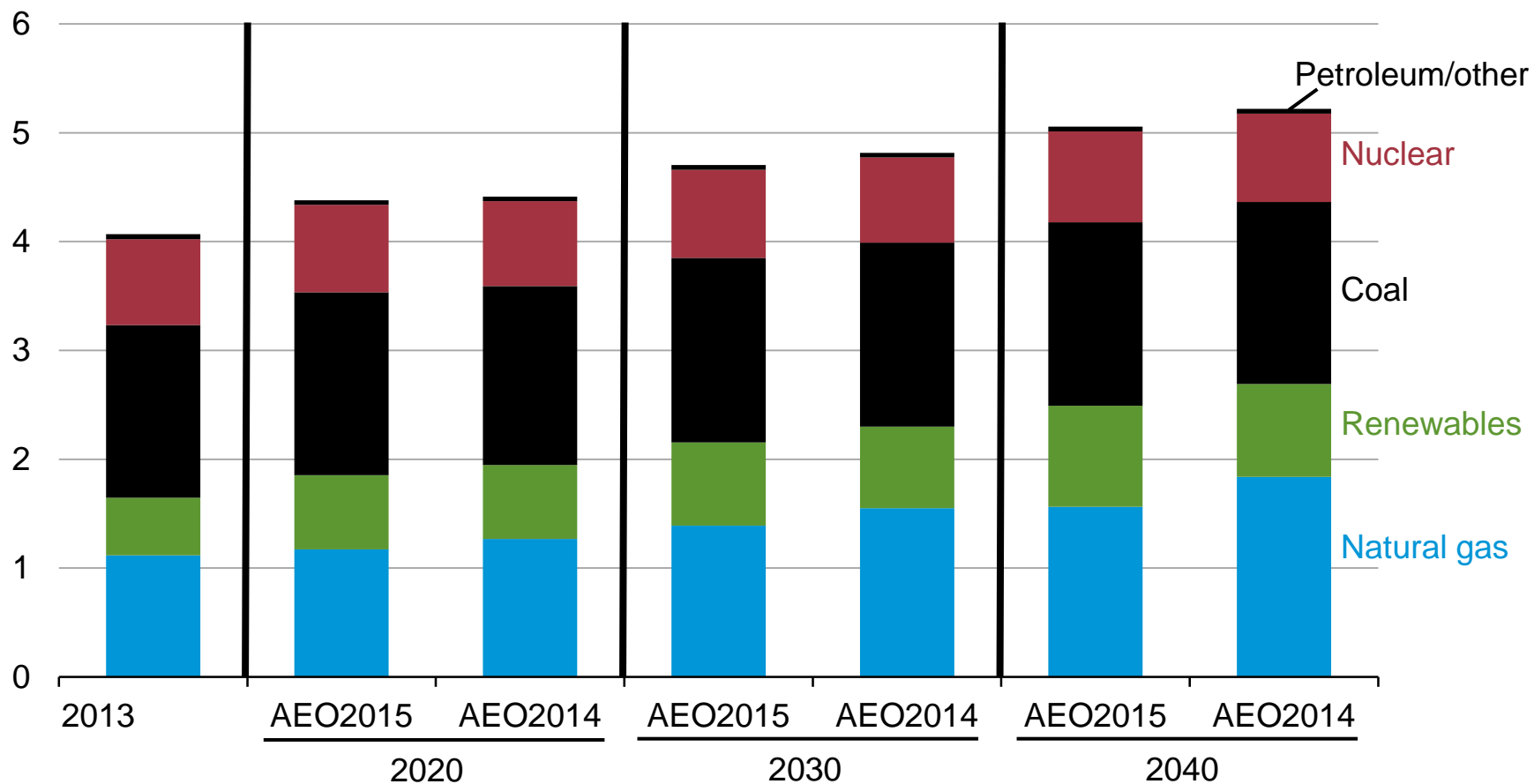
# Upcoming: EIA-930—hourly survey of electricity balancing authorities

- First near-real time report for EIA
- Dashboard view of the U.S. power grid
- Highly anticipated by EIA customers
- Status: dev largely complete; awaiting OES data to continue
- Launch: TBD



# Electricity generation by fuel in the AEO2015 and AEO2014 Reference cases, 2013, 2020, 2030, and 2040

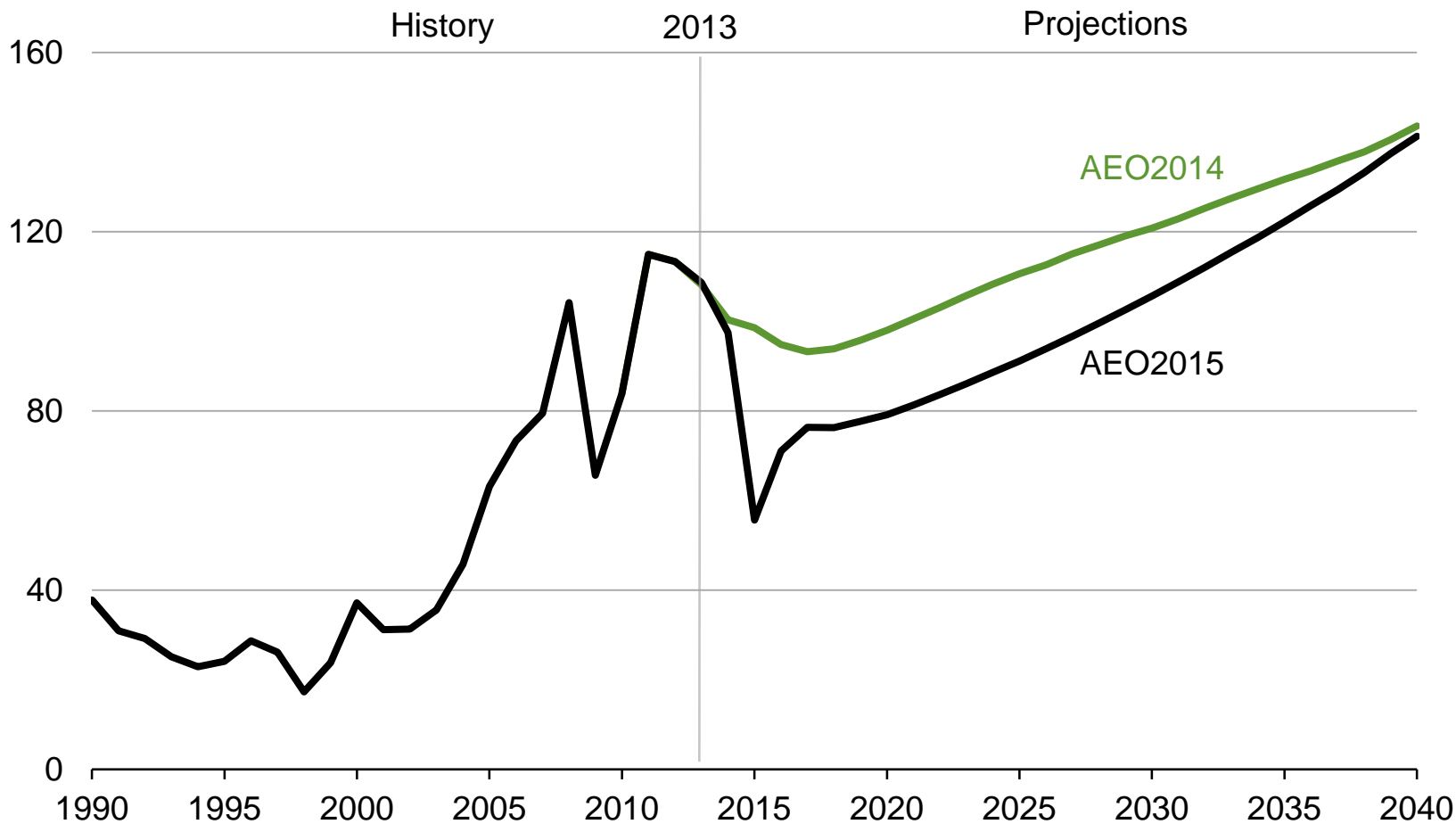
electricity net generation  
trillion kilowatthours



Source: EIA, Annual Energy Outlook 2015 and EIA, Annual Energy Outlook 2014

# Crude oil price projection is lower in the AEO2015 Reference case than in AEO2014, particularly in the near term

Brent crude oil spot price  
2013 dollars per barrel



Source: EIA, Annual Energy Outlook 2015 Reference case and Annual Energy Outlook 2014 Reference case