

Implications of low electricity demand growth



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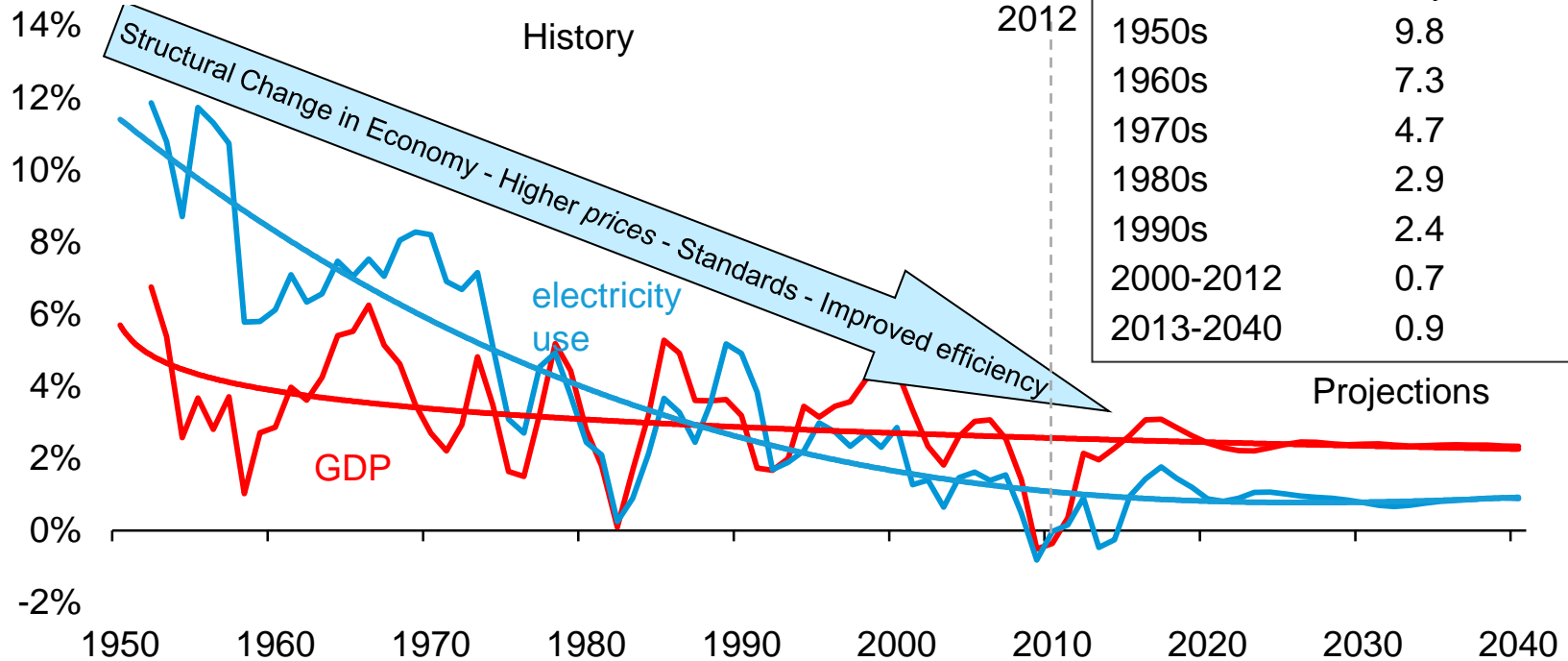
Jim Diefenderfer, Director,

Office of Electricity, Coal, Nuclear, & Renewables Analysis

U.S. Energy Information Administration

Growth in electricity use slows, but still increases by 29% from 2012 to 2040

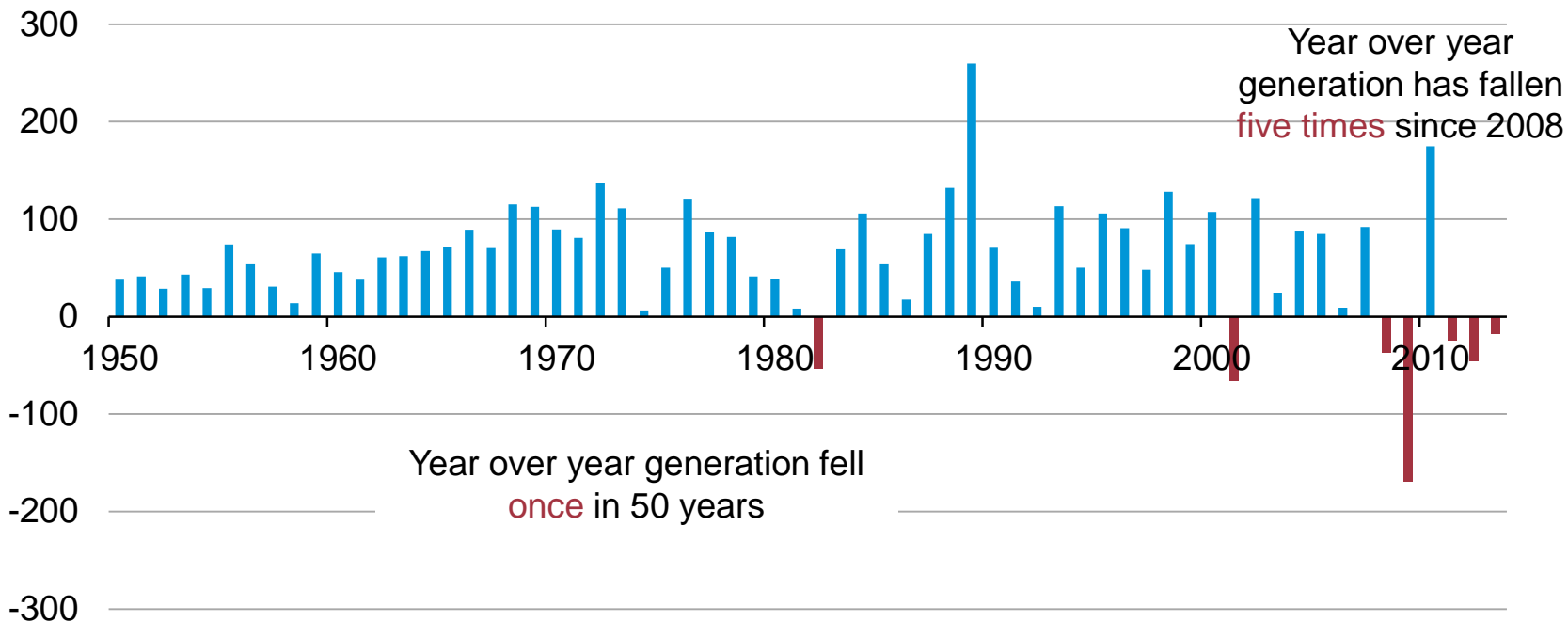
percent growth (3-year compounded annual growth rate)



Source: EIA, Annual Energy Outlook 2014 Reference Case

Year to year demand for electricity has decreased in 5 of the last 6 years; prior to 2008, demand declined only twice in 58 years

billion kilowatthours



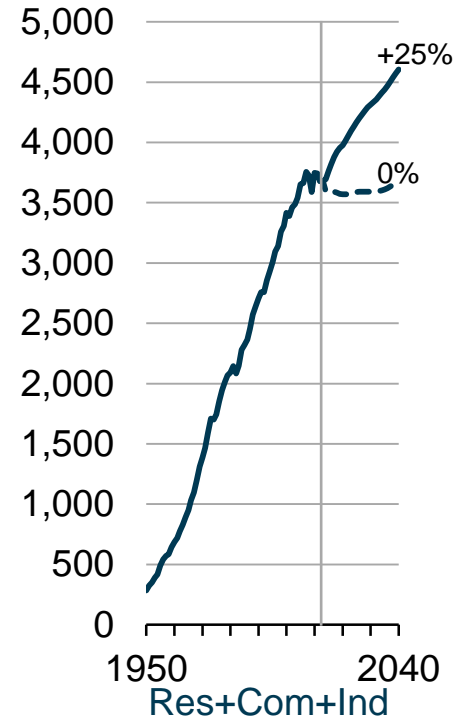
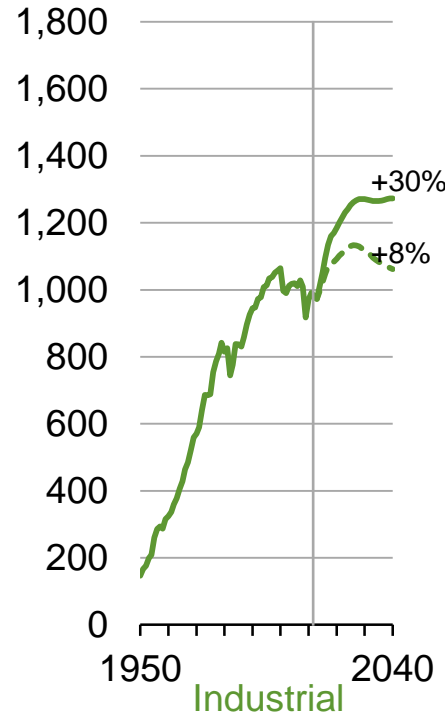
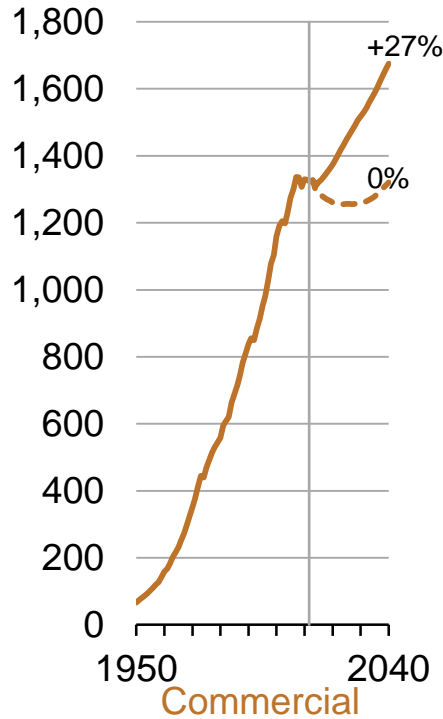
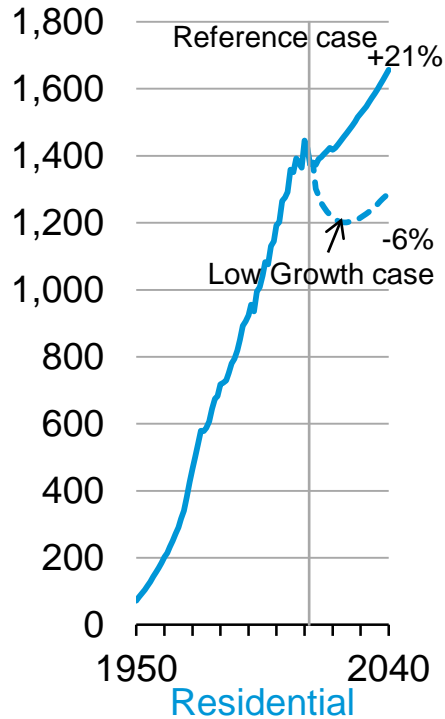
Source: Energy Information Administration, Form EIA-923 and predecessor forms.

What might a low electricity demand growth future look like?

- Assumptions used to achieve low electricity demand growth:
 - Applied best available technology to buildings, and layered on greater industrial motor efficiency
 - Assumptions are technically achievable but not necessarily cost-effective at this time
- Shifts in demand are accompanied by changes in patterns of investment and prices
 - Consumers spend less for electricity, and utility bill savings nearly balance households' increased costs for more efficient equipment, insulation, etc.
 - From 2012-2040, electric generating capacity additions decline by about 50% relative to the *AEO2014* Reference case, while retirements of fossil fuel-fired capacity more than double relative to the *AEO2014* Reference case
 - Lower marginal energy prices in competitive wholesale electricity markets, relative to the *AEO2014* Reference case
 - Declines in residential electricity generation prices are partially offset by near-term increases in transmission and distribution prices

Historical and projected end-use electricity sales

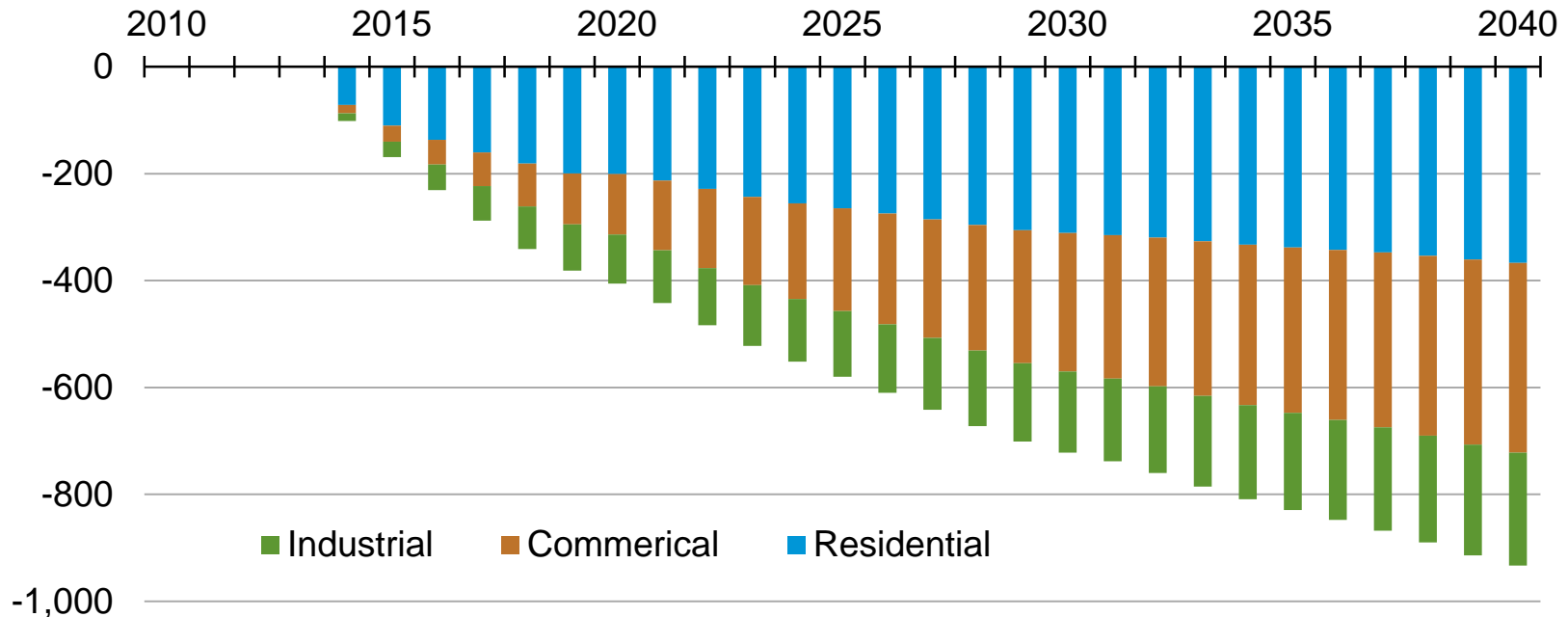
billion kilowatthours (with percent change, 2012-2040)



Source: EIA, Monthly Energy Review and Annual Energy Outlook 2014

Low Growth case compared to Reference case: industrial, commercial, and residential sectors each contribute to demand decrease

Difference between electricity sales, Reference case, and Low Growth case
billion kilowatthours



Source: EIA, Annual Energy Outlook 2014

Average annual electricity demand growth rates vary across regions

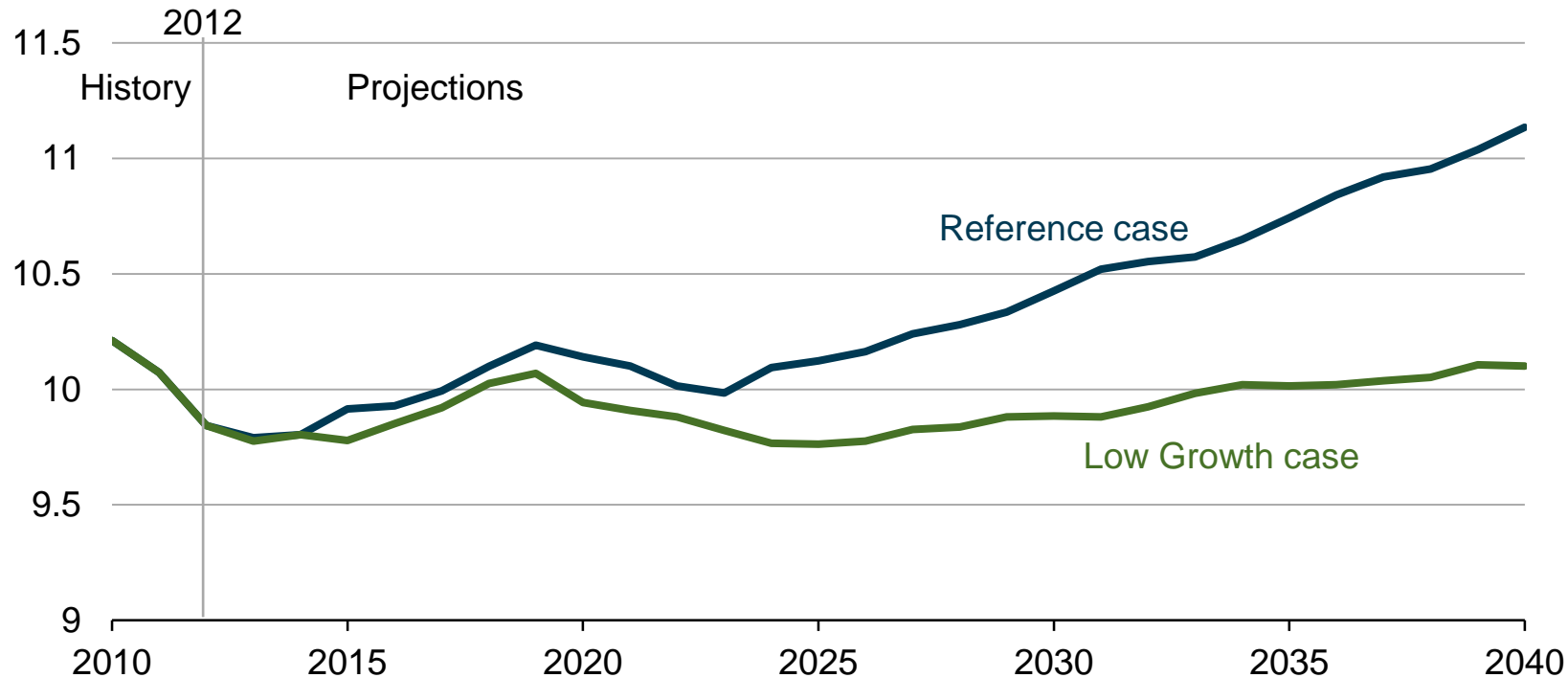
	2012 - 2040
Region	Reference case
Total U.S.	0.80%
New York City	0.10%
Long Island	0.10%
Upstate New York	0.20%
New England	0.30%
Eastern Wisconsin	0.50%
Mid Atlantic	0.50%
Lower Michigan	0.50%
Great Lakes	0.60%
Mississippi Basin	0.60%
Northern Plains	0.70%
Central Plains	0.70%
California	0.90%
Texas	1.00%
Florida	1.00%
Mississippi Delta	1.00%
Alabama/Georgia	1.00%
Tennessee Valley	1.00%
Virginia Carolina	1.00%
Southern Plains	1.00%
Northwest	1.00%
Arizona/New Mexico	1.30%
Rocky Mountain	1.30%

	2012 - 2040
Region	Low Growth case
Total U.S.	0.00%
New York City	-0.70%
Long Island	-0.70%
New England	-0.60%
Upstate New York	-0.60%
Lower Michigan	-0.40%
Eastern Wisconsin	-0.30%
Mid Atlantic	-0.30%
Great Lakes	-0.30%
Mississippi Basin	-0.20%
Northern Plains	-0.10%
Central Plains	-0.10%
Florida	0.10%
Alabama/Georgia	0.10%
Virginia Carolina	0.10%
Texas	0.20%
Mississippi Delta	0.20%
Tennessee Valley	0.20%
Southern Plains	0.20%
California	0.20%
Northwest	0.40%
Arizona/New Mexico	0.50%
Rocky Mountain	0.50%

Projected end-use electricity prices are lower in the Low Growth case

Average end-use electricity price, all sectors

2012 cents per kilowatthour

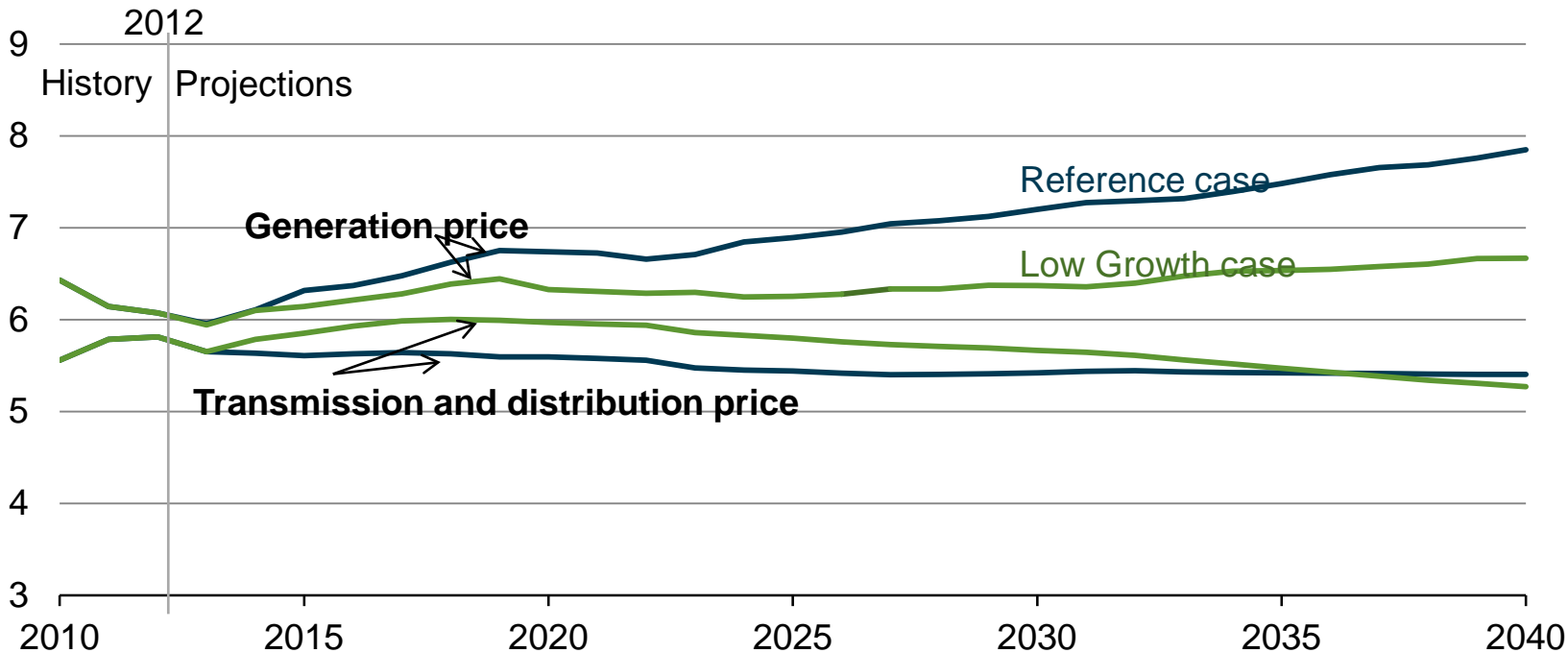


Source: EIA, Annual Energy Outlook 2014

Declines in residential electricity generation prices are partially offset by near-term increases in transmission and distribution prices

Average electricity price components, residential sector

2012 cents per kilowatthour

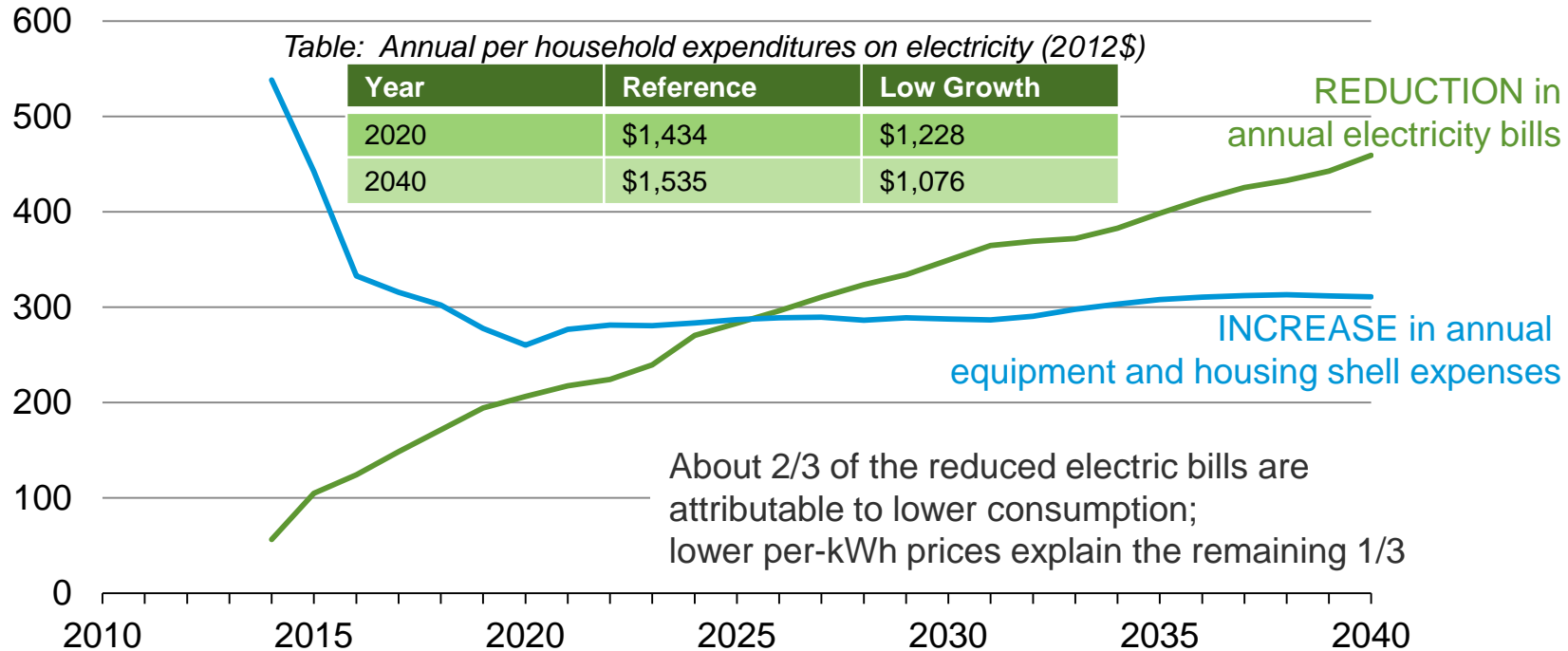


Source: EIA, Annual Energy Outlook 2014

Utility bill savings nearly balance households' increased costs for more efficient equipment, insulation

Change in per-household expenditures and electric bills relative to Reference case

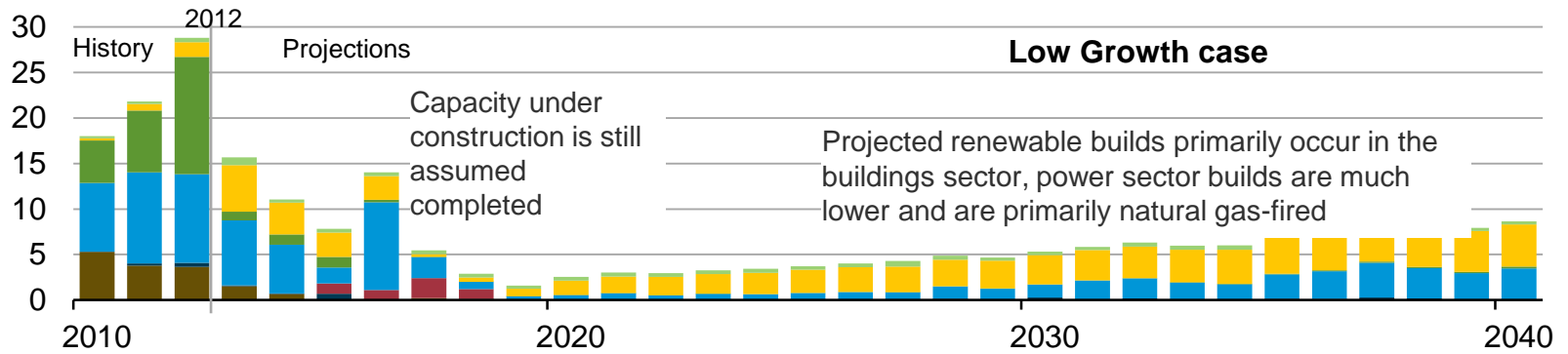
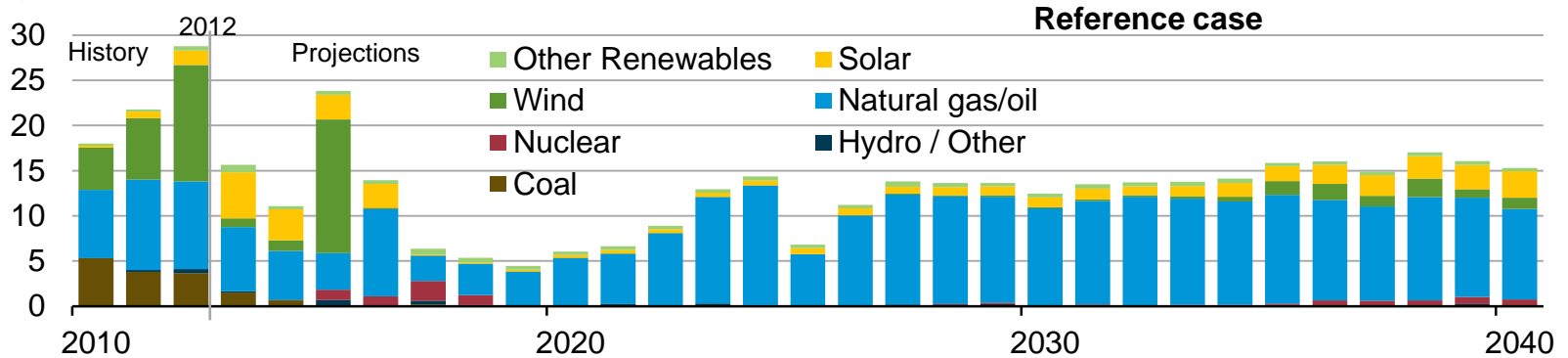
2012\$ per year



Source: EIA, Annual Energy Outlook 2014

Capacity additions decline dramatically in the Low Growth case

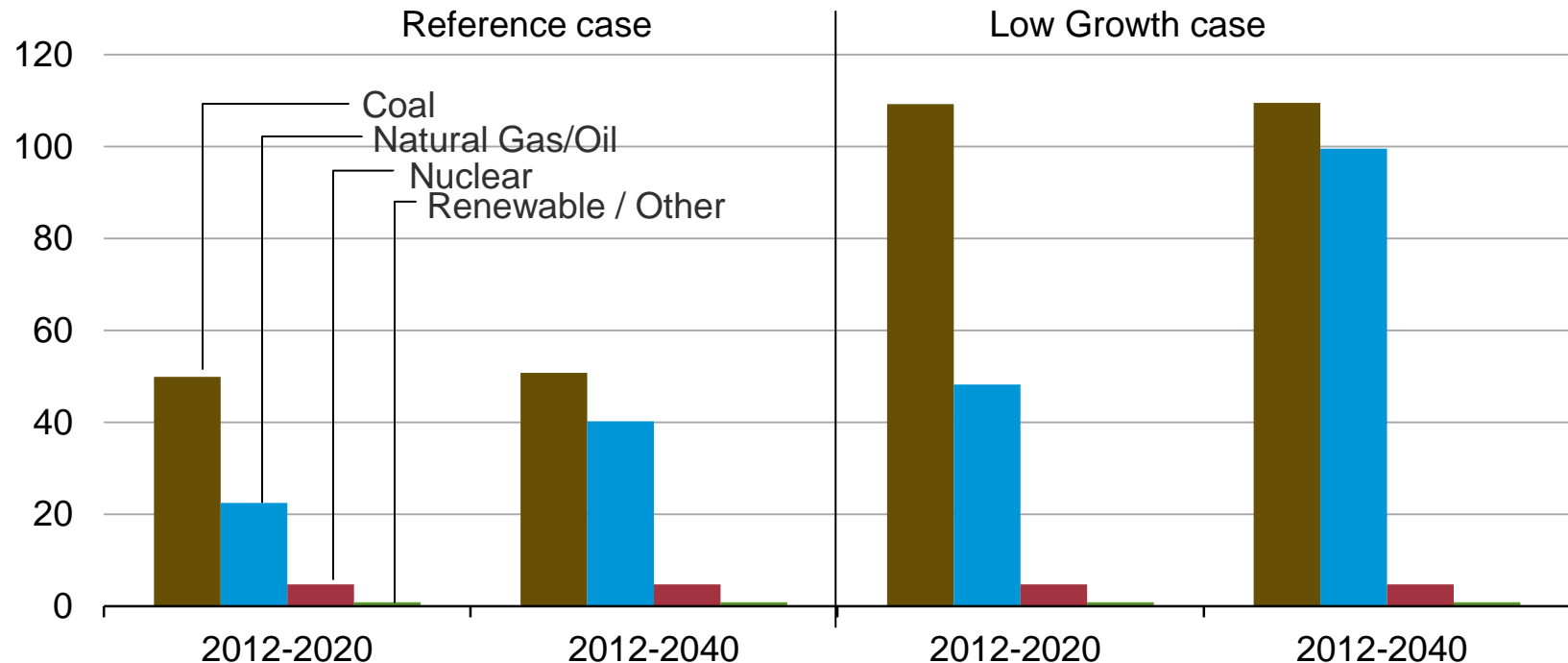
U.S. electricity generation capacity additions
gigawatts



Source: EIA, Annual Energy Outlook 2014

More fossil capacity is retired in the Low Growth case

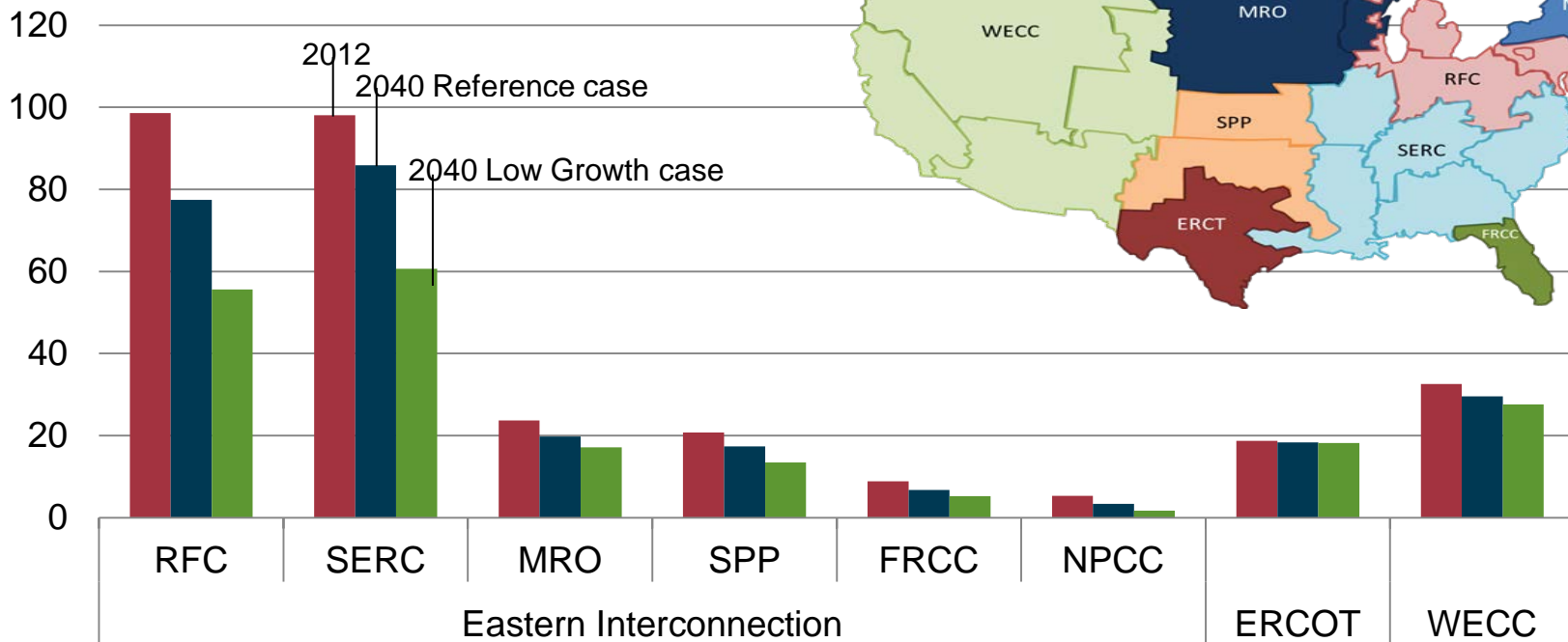
U.S. electric power sector capacity retirements
gigawatts (cumulative)



Source: EIA, Annual Energy Outlook 2014

Coal-fired capacity is substantially reduced under lower demand, particularly in Eastern Interconnection regions

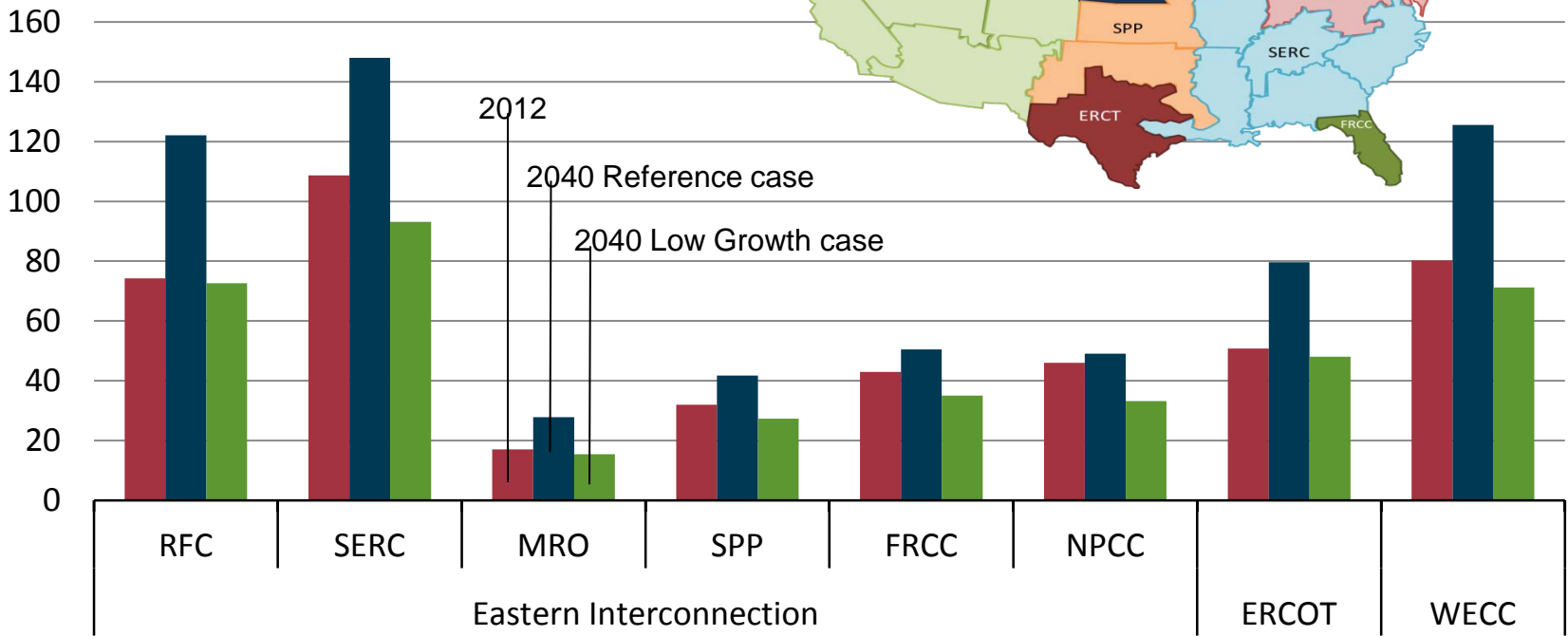
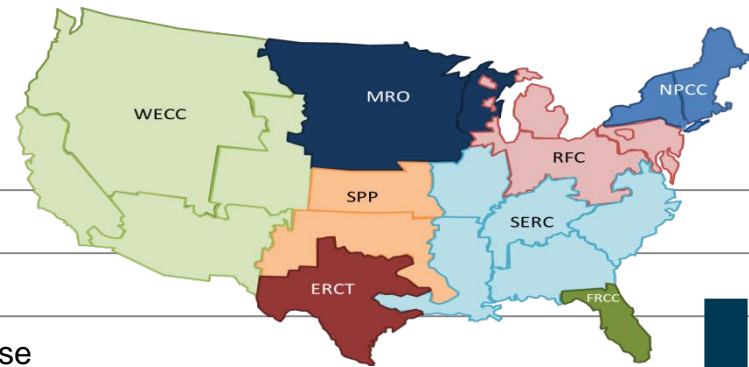
Installed capacity electric power sector
gigawatts



Source: EIA, Annual Energy Outlook 2014

Natural gas/oil capacity is substantially reduced under lower demand across all regions

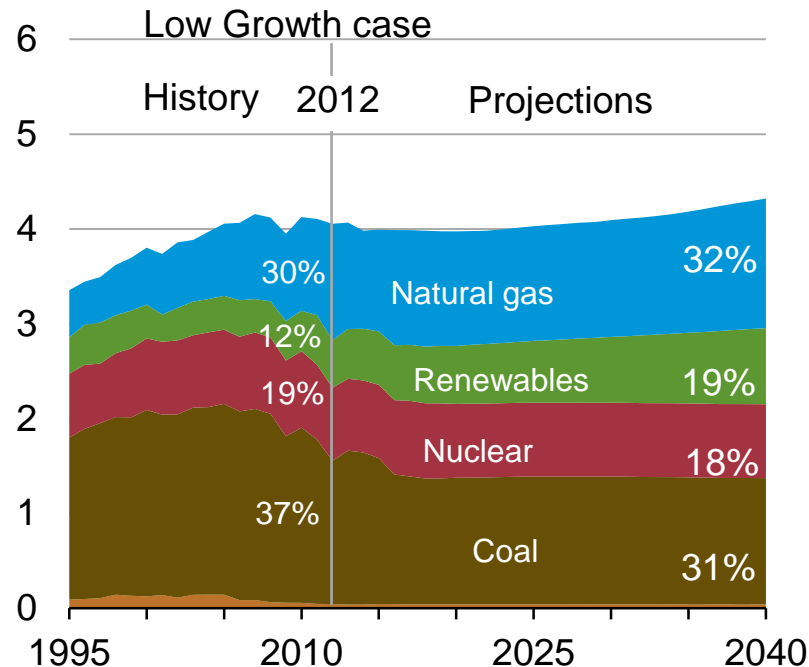
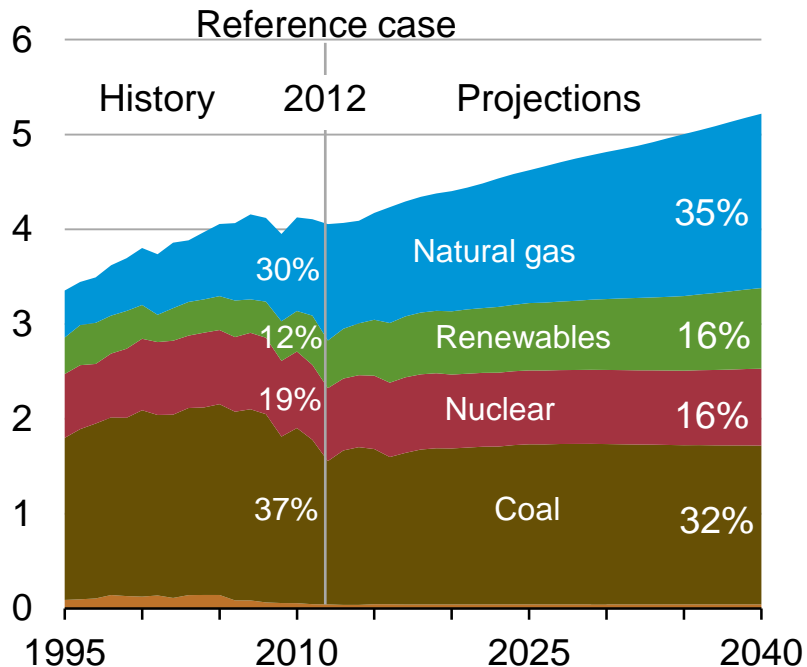
Installed capacity electric power sector
gigawatts



Source: EIA, Annual Energy Outlook 2014

Gas generation grows much more slowly in the Low Growth case

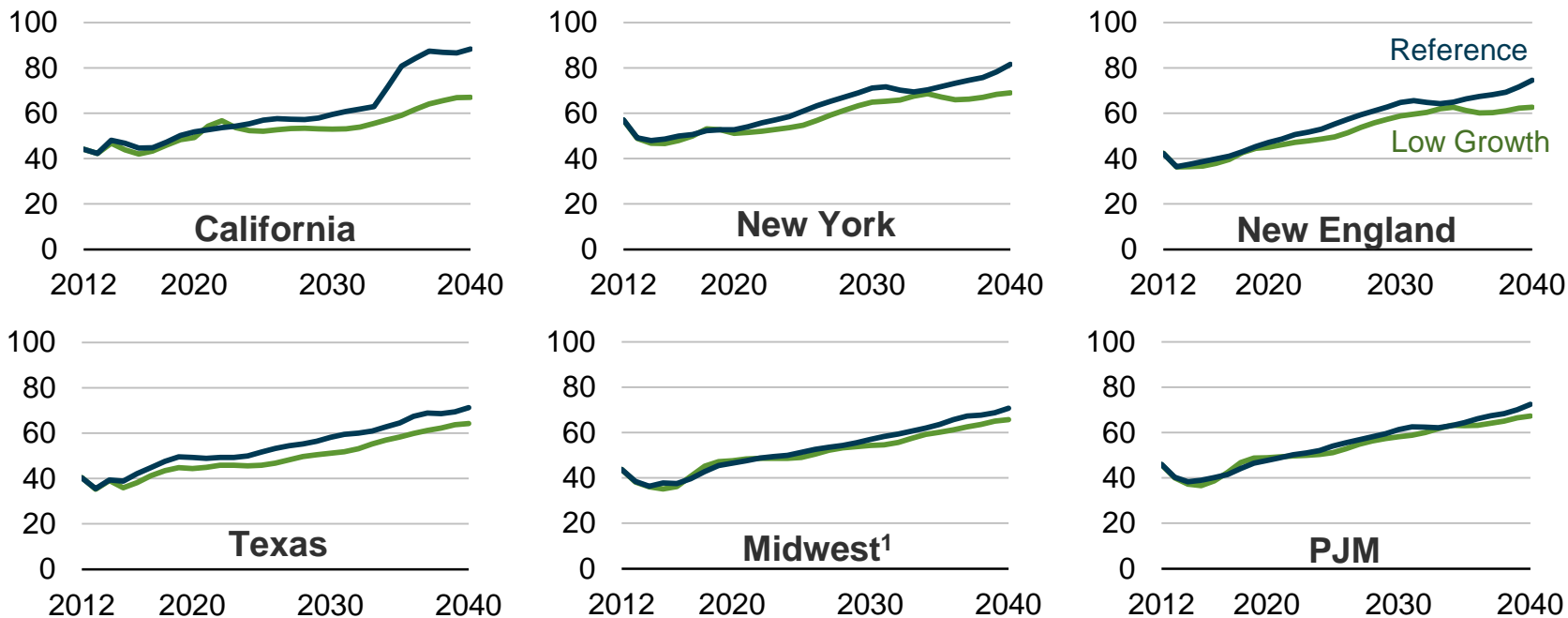
U.S. electricity net generation
trillion kilowatthours



Source: EIA, Annual Energy Outlook 2014

In the long term, lower demand growth leads to lower energy prices in competitive wholesale electricity markets

Average marginal energy prices 2012\$ per megawatthour

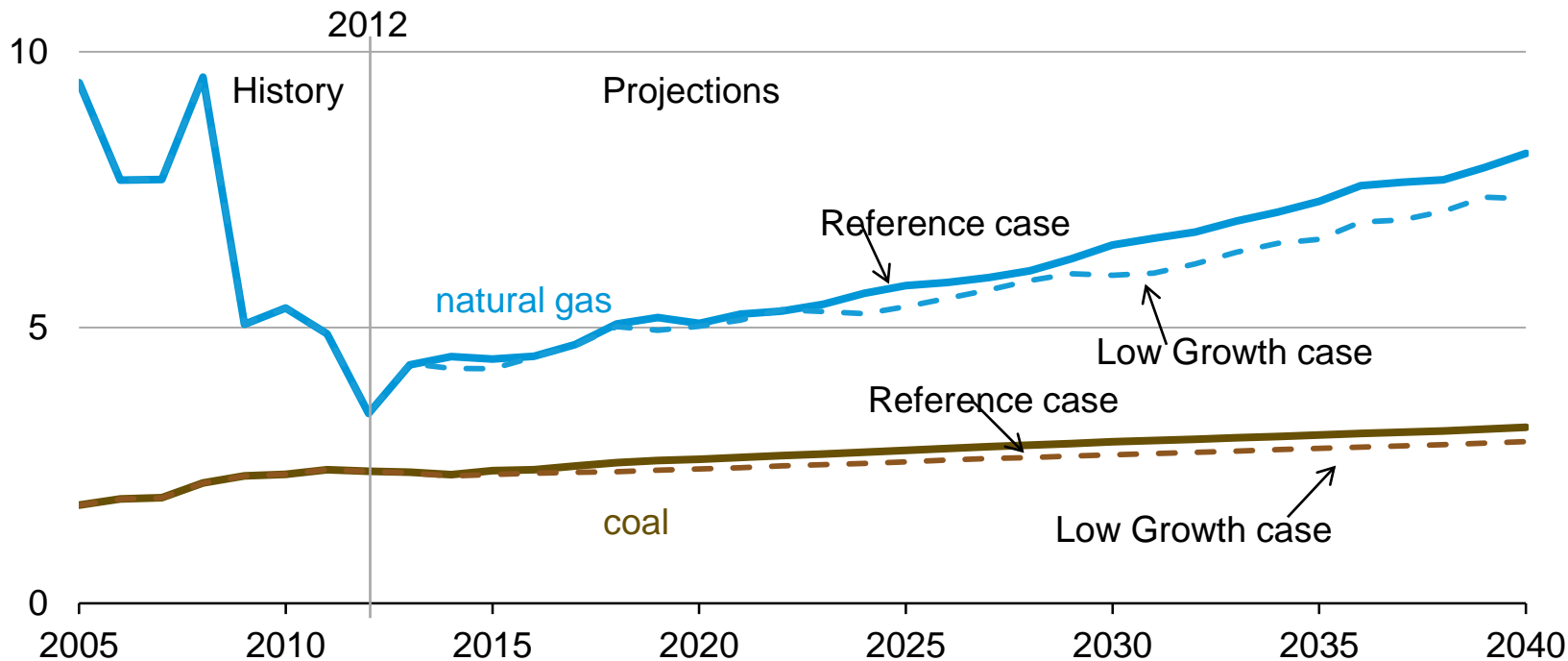


Source: EIA, Annual Energy Outlook 2014, electricity model regions averaged to approximate existing ISOs/RTOs

¹ The "Midwest" region combines the electricity model regions used to approximate the Midcontinent ISO (MISO) and the Southwest Power Pool (SPP).

Delivered coal and natural gas prices are reduced in the Low Growth case

Average delivered fuel prices to electric power plants
2012\$ per million Btu

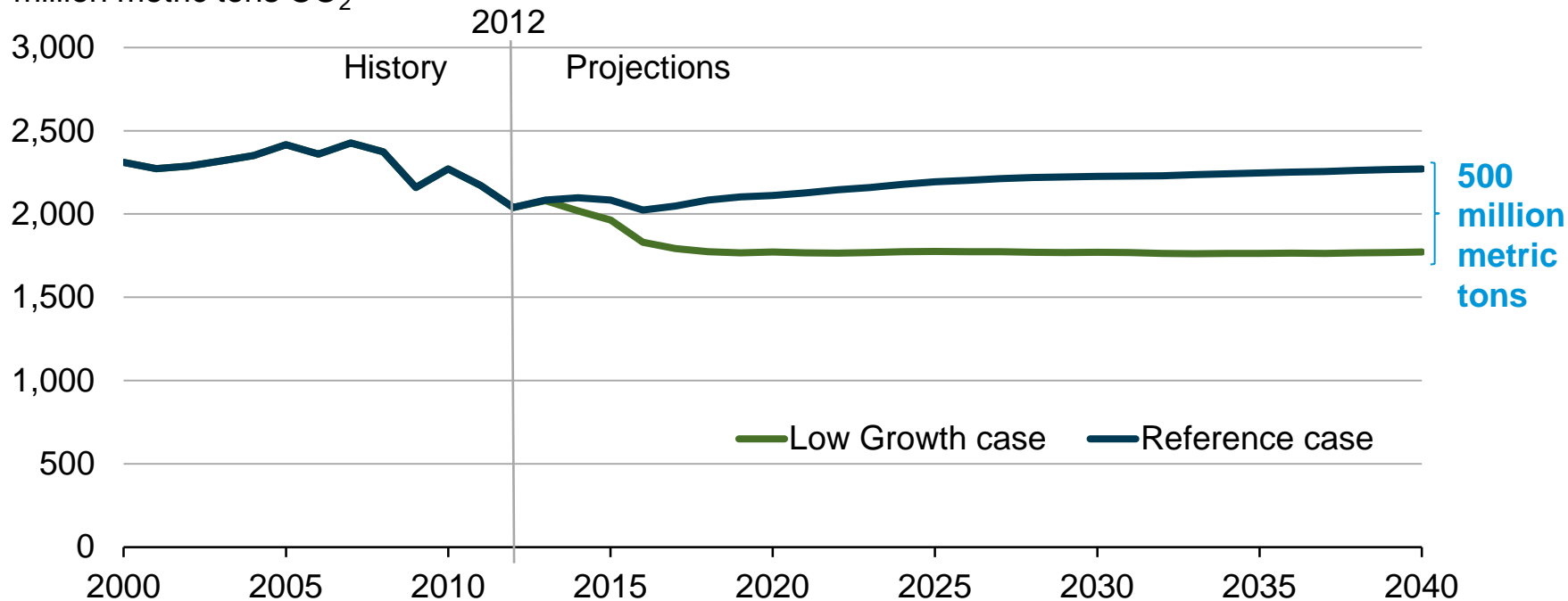


Source: EIA, Annual Energy Outlook 2014

In the Low Growth case, total carbon dioxide emissions from the electric power sector in 2040 are 22% below the Reference case

Total carbon dioxide emissions

million metric tons CO₂



Source: EIA, Annual Energy Outlook 2014

For more information

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

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

Annual Energy Outlook | www.eia.gov/aeo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy

Issues in Focus: Implications of low electricity demand growth |
http://www.eia.gov/forecasts/aeo/elec_demand.cfm