

# Synapse Electricity Snapshot 2018

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A review of the U.S. electric system through December 2017

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- Renewable capacity is now at 120 gigawatts (GW), exceeding both hydro and nuclear capacity. Renewables are now the third-largest resource on a capacity basis, behind natural gas and coal. Together, non-CO<sub>2</sub>-emitting generating capacity makes up 27 percent of the nationwide total and accounts for 35 percent of all generation.
- Retirement of old and uneconomic coal plants has led to the lowest level of coal capacity since 1982.
- Natural gas generation surpassed coal generation for 9 out of the 12 months of 2017. Historically, the ratio of natural gas generation to coal generation has been strongly tied to the price of natural gas.

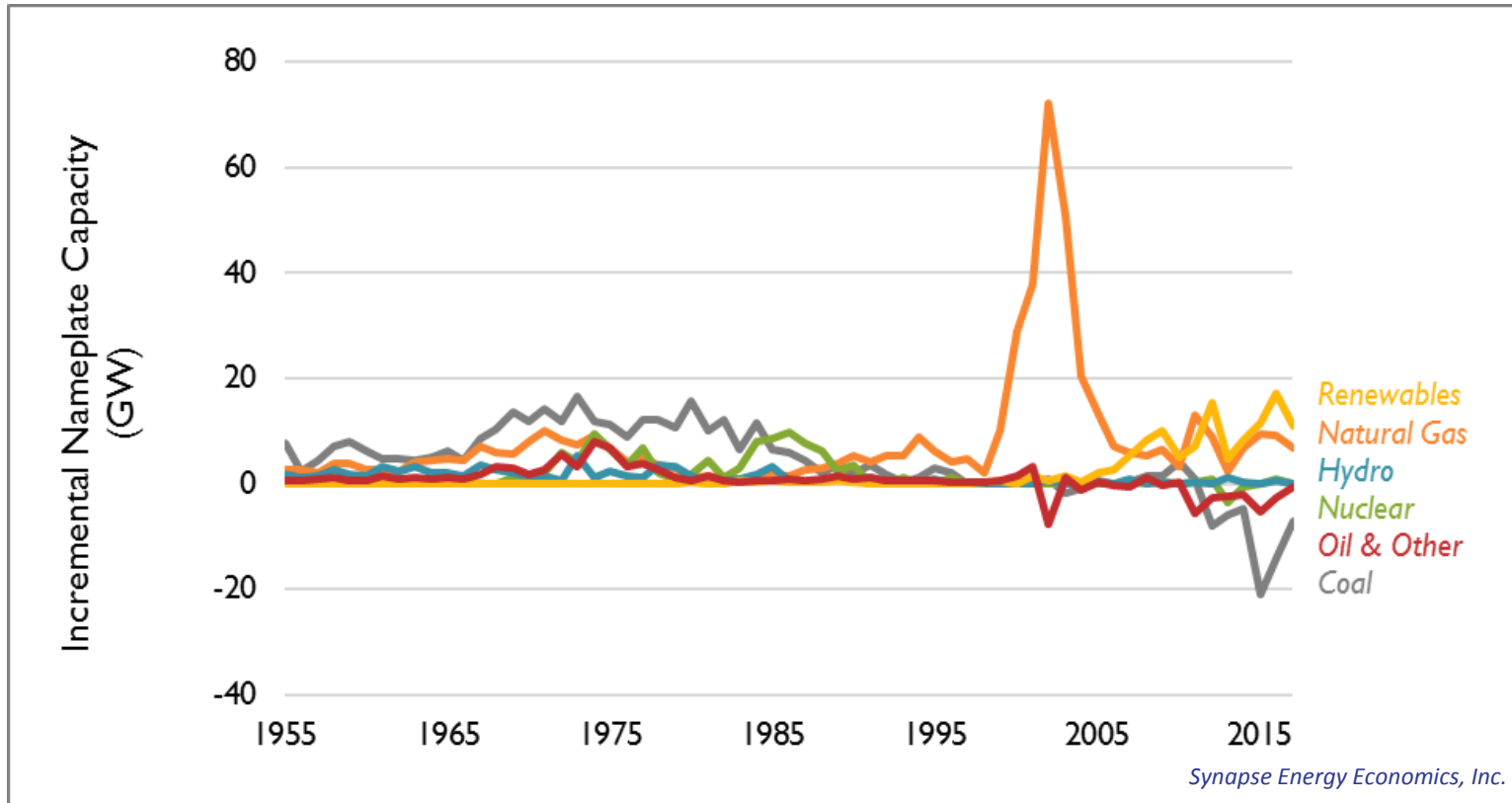
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- Since 2008, annual growth in electric retail sales has averaged -0.2 percent per year.
- Since hitting an all-time peak in 2007, electric sector CO<sub>2</sub> emissions have declined to 1,740 million metric tons in 2017, their lowest level since 1987. Electric sector CO<sub>2</sub> emissions are now below 1990 levels.
- Since 1990, the kg of CO<sub>2</sub> emitted per dollar of GDP has decreased by 49 percent from 0.18 to 0.09 kg per dollar.

***All values in this document are based on preliminary 2017 data and are subject to updates.***

# Coal capacity continues to plummet below 1980s levels

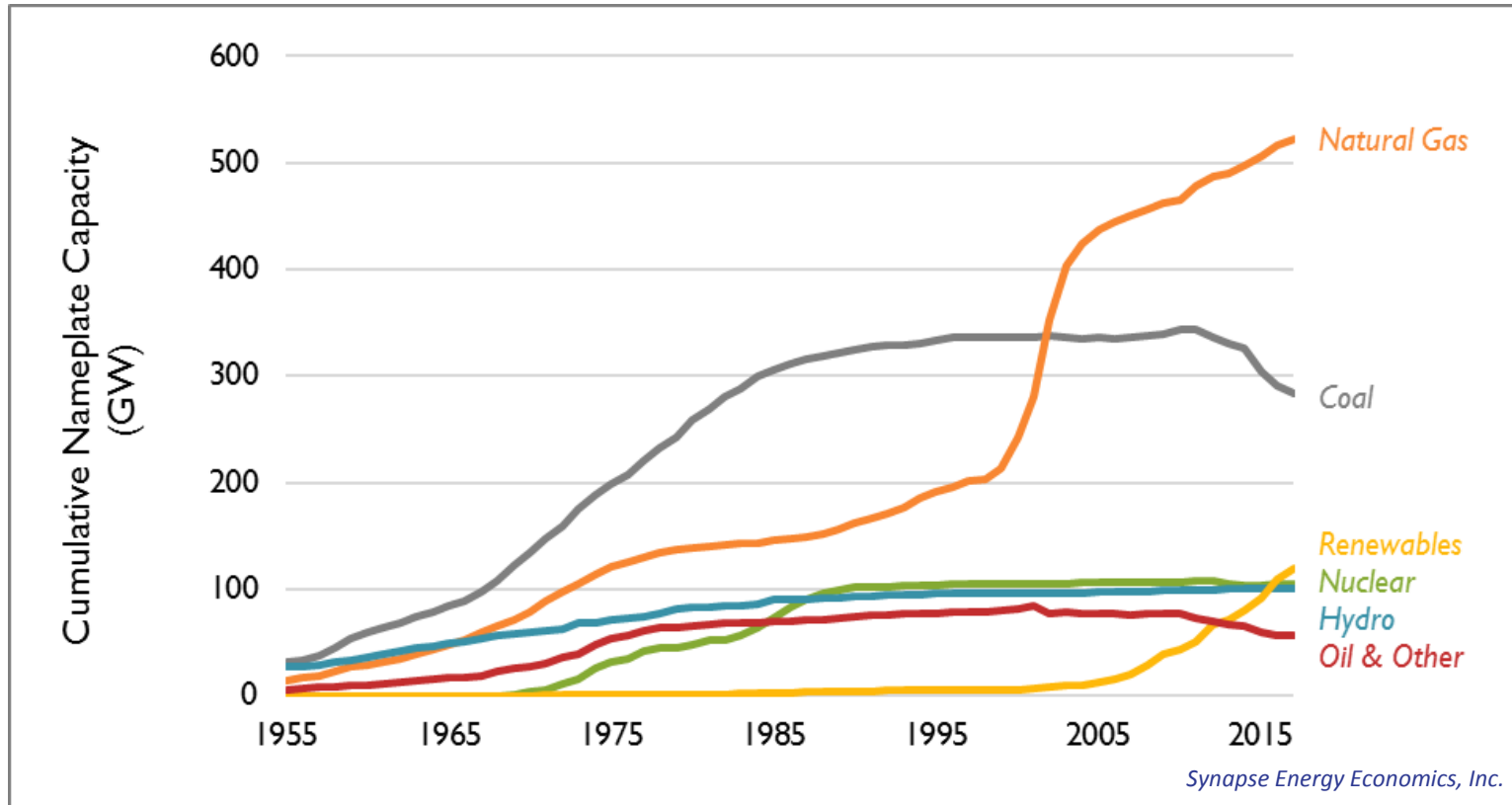


*Note: This figure displays net nameplate values for utility-scale generators; annual capacity retirements are subtracted from annual capacity additions.*

*In this and all other figures, "Renewables" contains wind, solar, geothermal, and storage. "Oil and Other" contains oil, biomass, and other misc. fuel types.*

While coal capacity and oil capacity are in decline, renewable and natural gas capacity grow every year. Renewable capacity additions were lower in 2016 than in 2017, but were still higher than any other resource type.

# Renewable energy capacity now surpasses both hydroelectric and nuclear capacity



*Note: This figure displays net nameplate values for utility-scale generators; annual capacity retirements are subtracted from annual capacity additions.*

In 2016, renewable resources reached 10 percent of total U.S. generating capacity. In the 10 years since 2008, renewables have increased by 91 GW, compared to a 67 GW increase in natural gas over the same period. 54 GW of coal retired over these 10 years.

## More new net capacity came from renewables than from any other resource—including natural gas

	Installed		Retired		Net (installed less retired)	
	2016	2017	2016	2017	2016	2017
Coal	0.1	-	8.7	6.9	-8.6	-6.9
Natural Gas	9.9	10.5	8.5	4.4	1.4	6.1
Nuclear	1.3	-	0.5	-	0.8	0.0
Hydro	0.4	0.2	0.1	0.1	0.3	0.1
Renewables	17.0	11.2	0.1	0.2	16.9	11.0
<i>Geothermal</i>	-	0.0	0.0	0.1	0.0	-0.1
<i>Storage</i>	0.2	0.1	0.0	-	0.2	0.1
<i>Solar</i>	8.0	4.7	0.0	-	8.0	4.7
<i>Wind</i>	8.8	6.3	0.1	0.0	8.7	6.3
Oil and Other	0.2	0.2	1.5	0.9	-1.3	-0.7
<i>Biomass</i>	0.0	0.1	0.2	0.1	-0.2	0.1
<i>Oil</i>	0.1	0.0	1.2	0.8	-1.1	-0.8
<i>MSW</i>	0.1	0.1	0.0	0.0	0.1	0.1
<i>Other</i>	0.0	-	0.0	-	0.0	0.0
<b>Total</b>	<b>28.8</b>	<b>22.1</b>	<b>19.3</b>	<b>12.5</b>	<b>9.4</b>	<b>9.7</b>

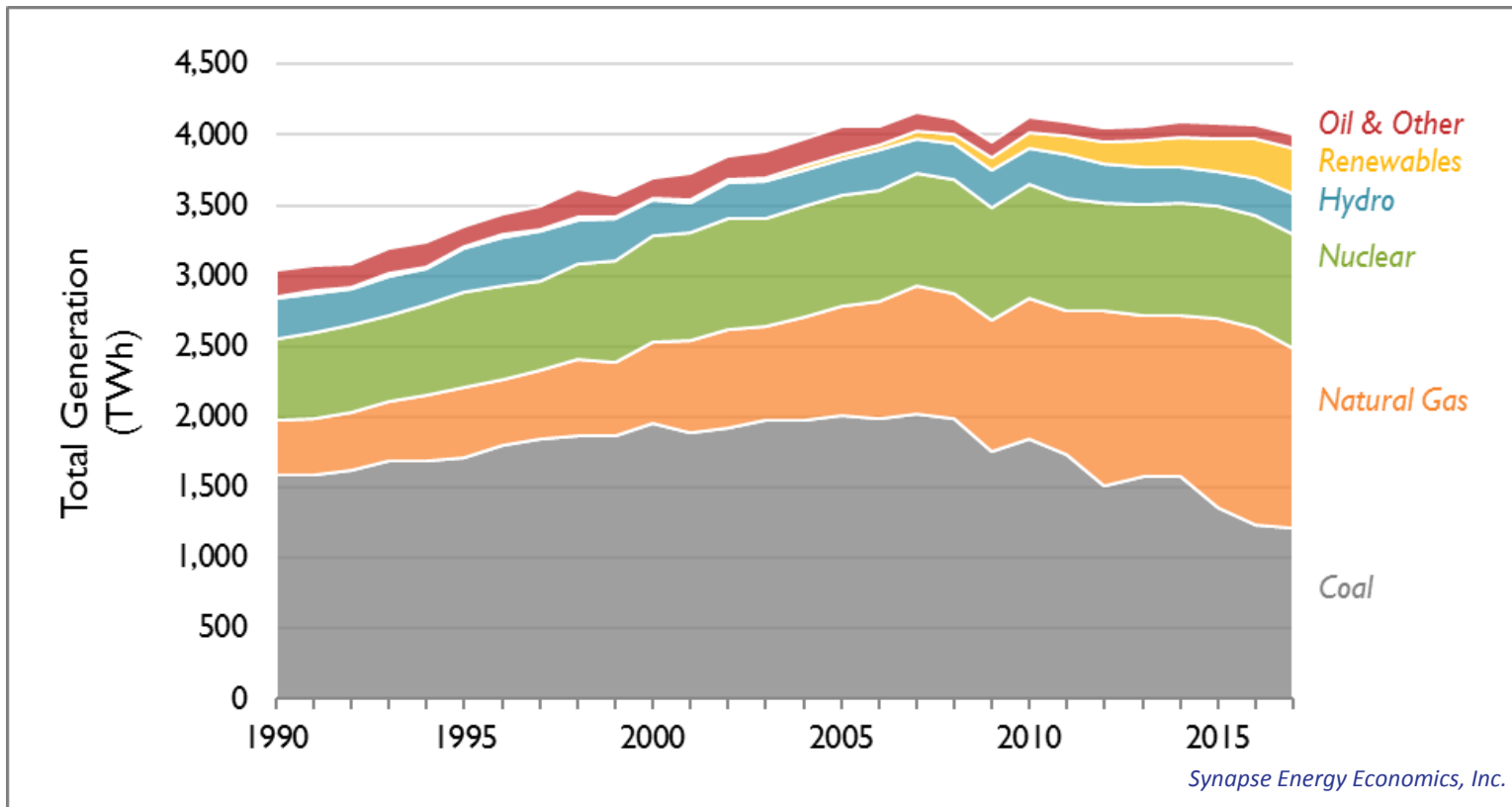
In 2017, the majority of renewable net capacity additions came from wind at 6.3 GW. Solar was close behind at 4.7 GW. Note that this does not include distributed renewable capacity additions.

## Coal capacity is at its lowest point since 1982

	State	Retired Capacity (Nameplate MW)
1	Kentucky	1,408
2	Massachusetts	1,125
3	New Mexico	924
4	New Jersey	653
5	Ohio	610
-	Other states	2,177
	<b>Total</b>	<b>6,897</b>

Just under 7 GW of coal retired in 2017. Coal retirements took place in 14 states. Since 2008, 54 GW of coal has retired (a decrease of 16 percent).

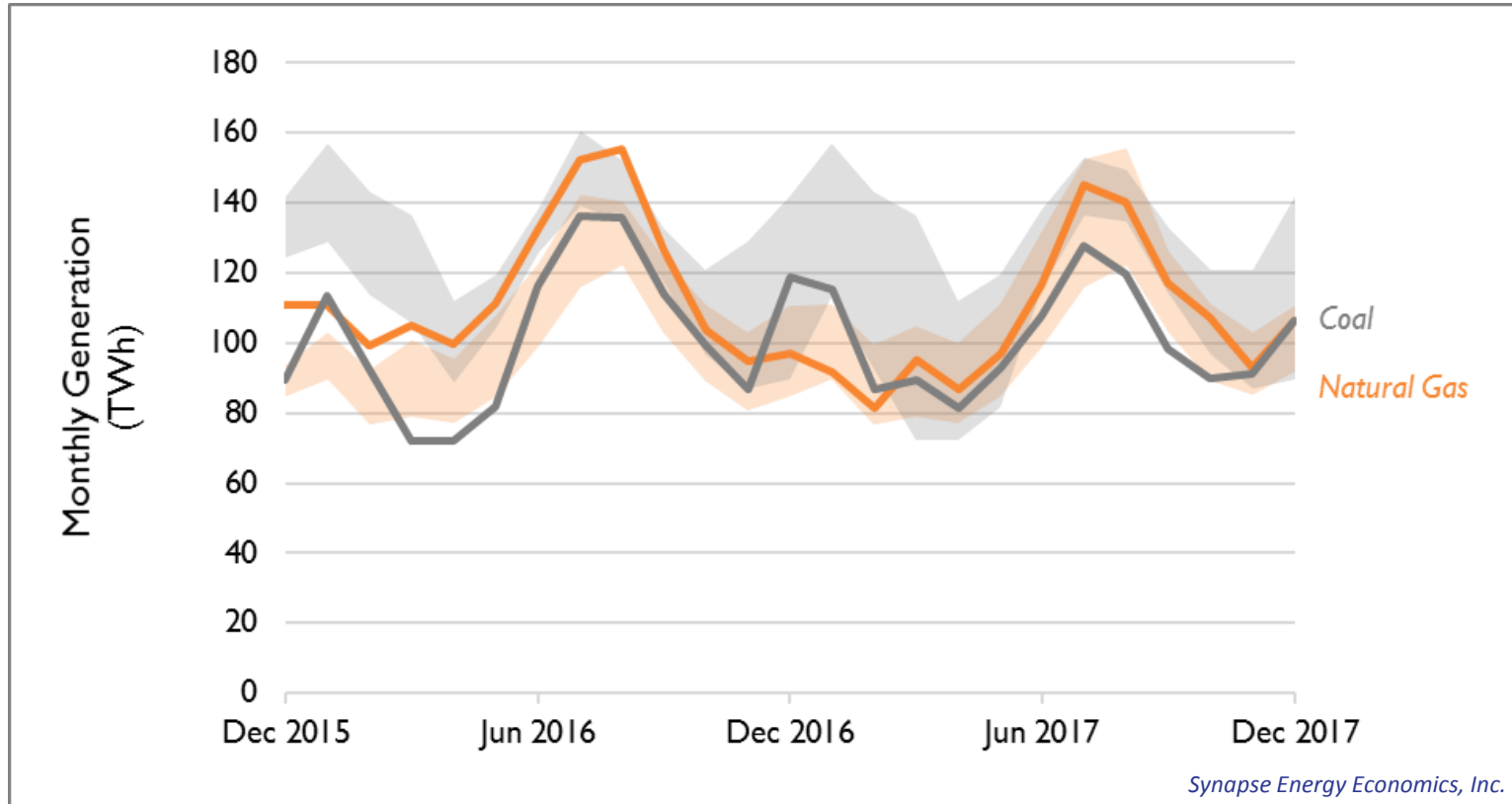
## Coal generation is at its lowest level since 1982



In 2017, the amount of electricity generated from natural gas exceeded that from coal by 6 percent, down from 12 percent in 2016. Since 2007, total annual U.S. generation has actually been negative, with an average annual growth rate of -0.35 percent per year.



# For 9 out of 12 months in 2017, natural gas generation exceeded coal generation

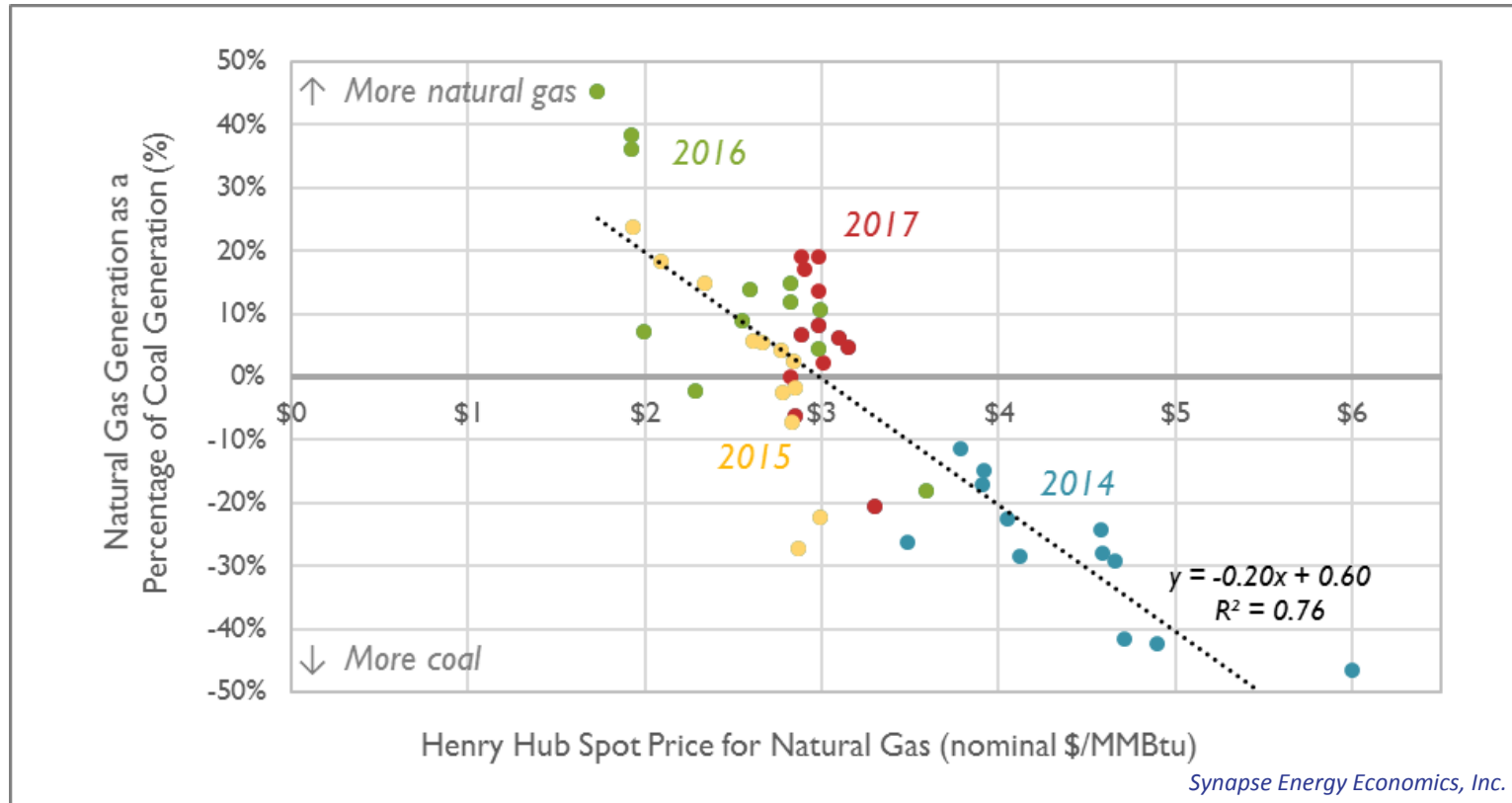


Note: This figure shows monthly generation compared to the previous four-year range.

For example, the December 2017 coal line is compared to the range of coal generation (grey shaded area) in Dec. 2013, Dec. 2014, Dec. 2015, and Dec. 2016.

In 2017, monthly coal generation was typically below historical ranges, while natural gas generation was near the average for each month.

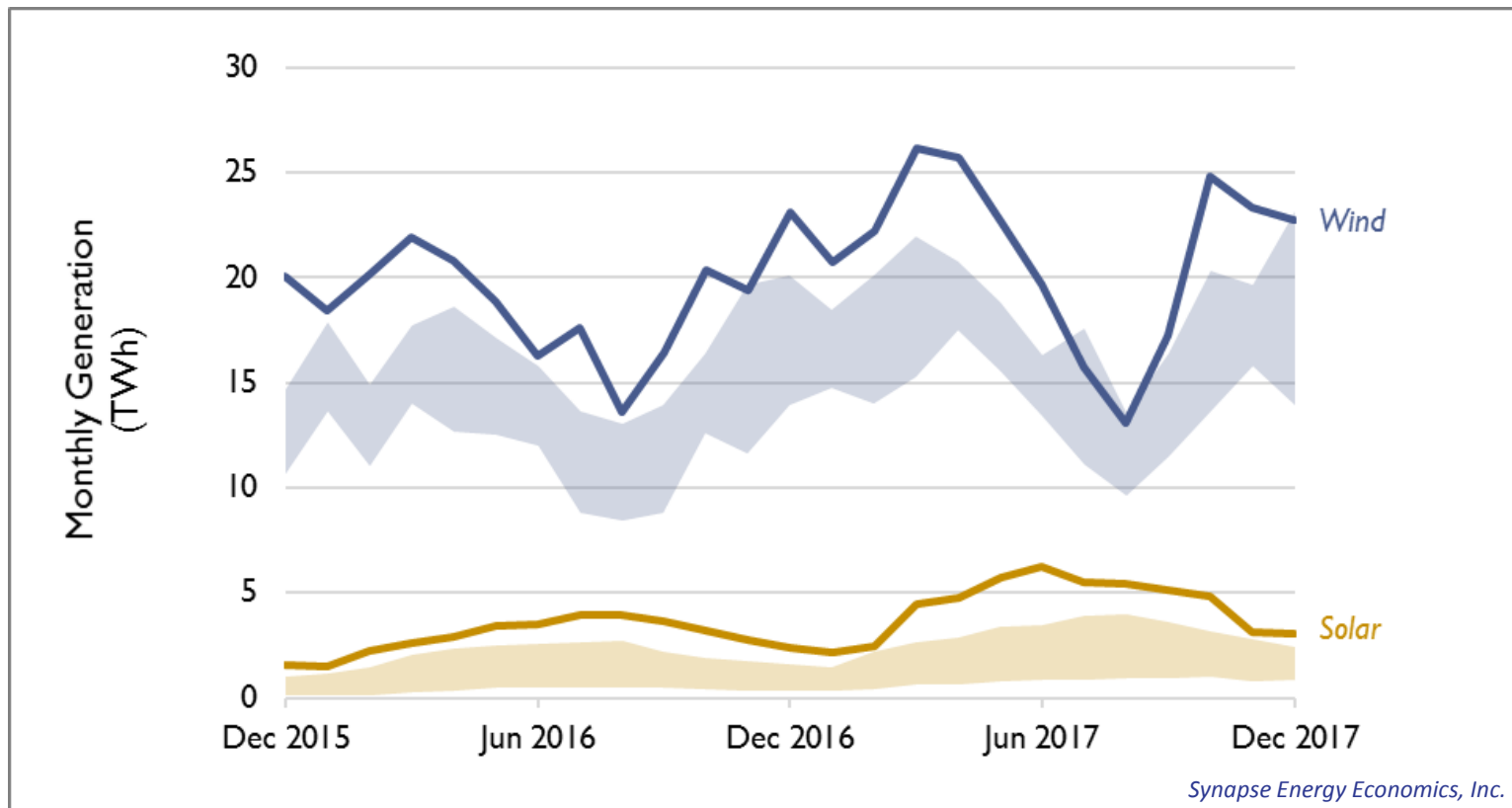
# The ratio of natural gas generation to coal generation strongly depends on the price of natural gas



Note: Each circle represents a data point for a single month within the demarcated year.

On a national basis, when the price of natural gas is below \$3 per MMBtu, natural gas generation has historically exceeded coal generation.

# In 2017, wind made up more than 4/5 of total renewable generation

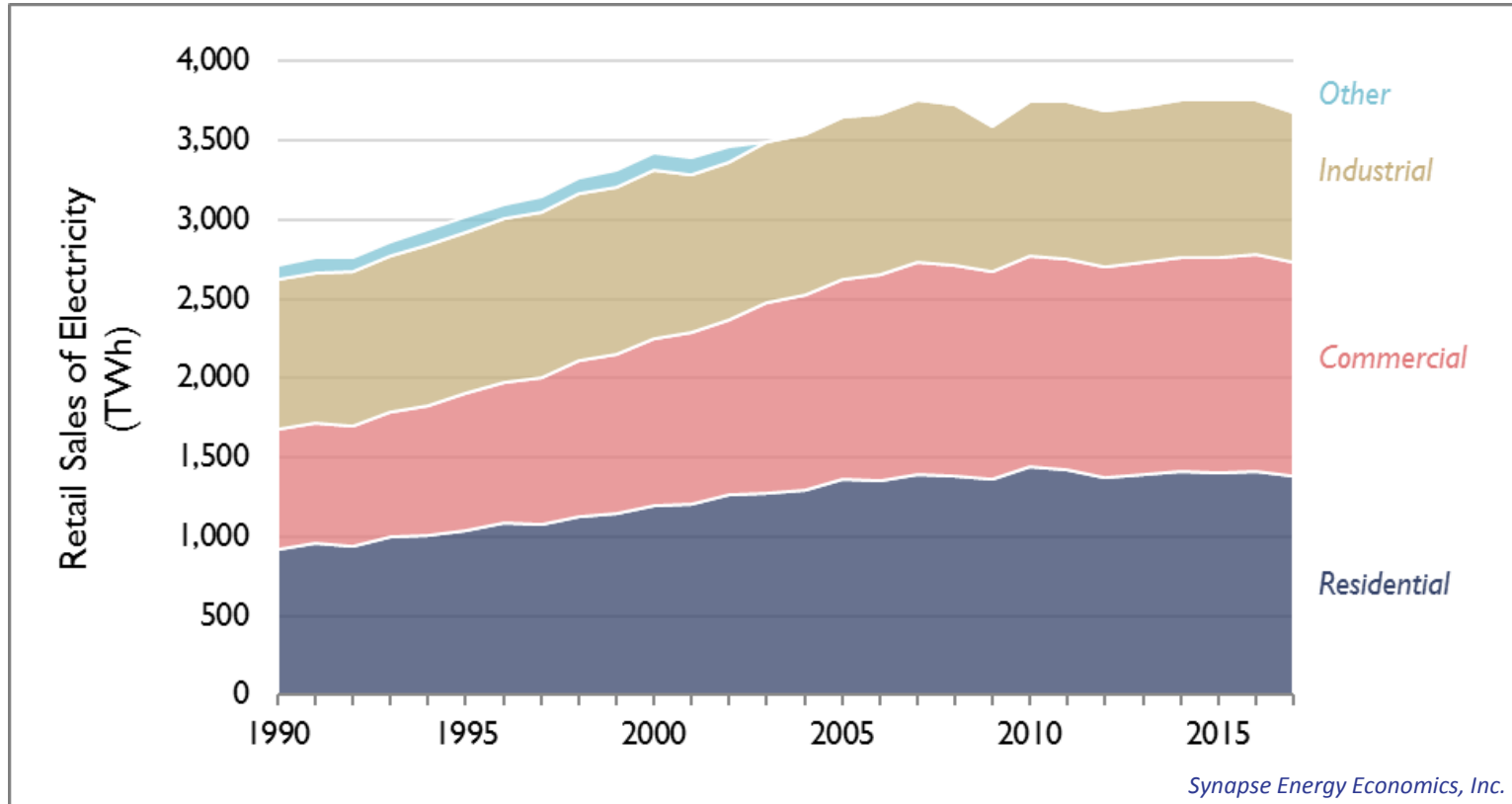


Note: This figure shows monthly generation compared to the previous four-year range.

For example, the December 2017 wind line is compared to the range of wind generation (purple shaded area) in Dec. 2013, Dec. 2014, Dec. 2015, and Dec. 2016).

Annual wind generation increased by 12 percent in 2017, relative to 2016. At the same time, annual utility-scale solar generation grew by 47 percent. Both wind and solar reached historical peaks for monthly generation at some point in 2017 (March for wind, and April for solar).

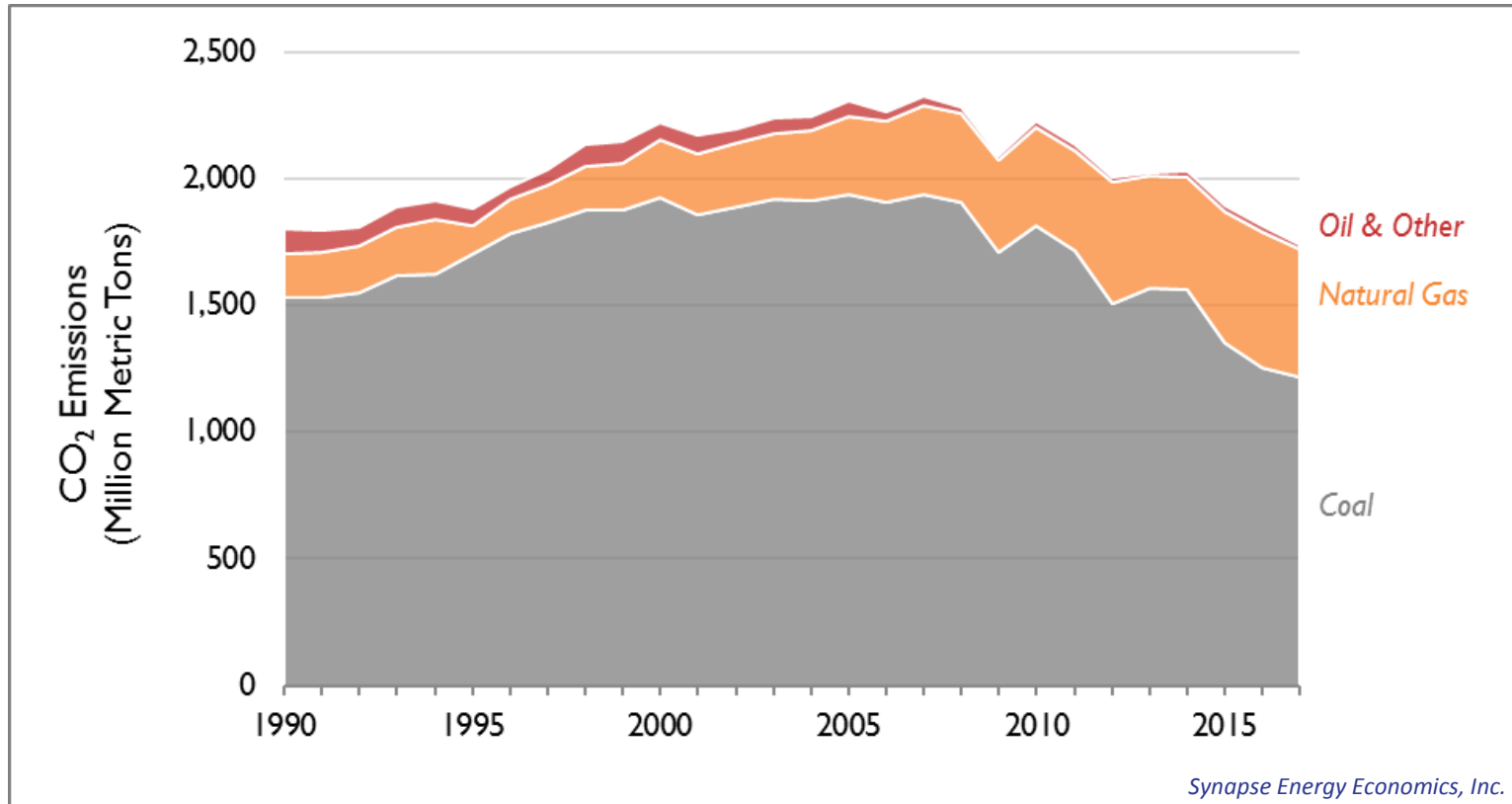
# Retail sales have been flat since 2008, with an average annual growth rate of -0.2 percent



In many states, sustained lower sales are linked to increases in energy efficiency measures and behind-the-meter solar.

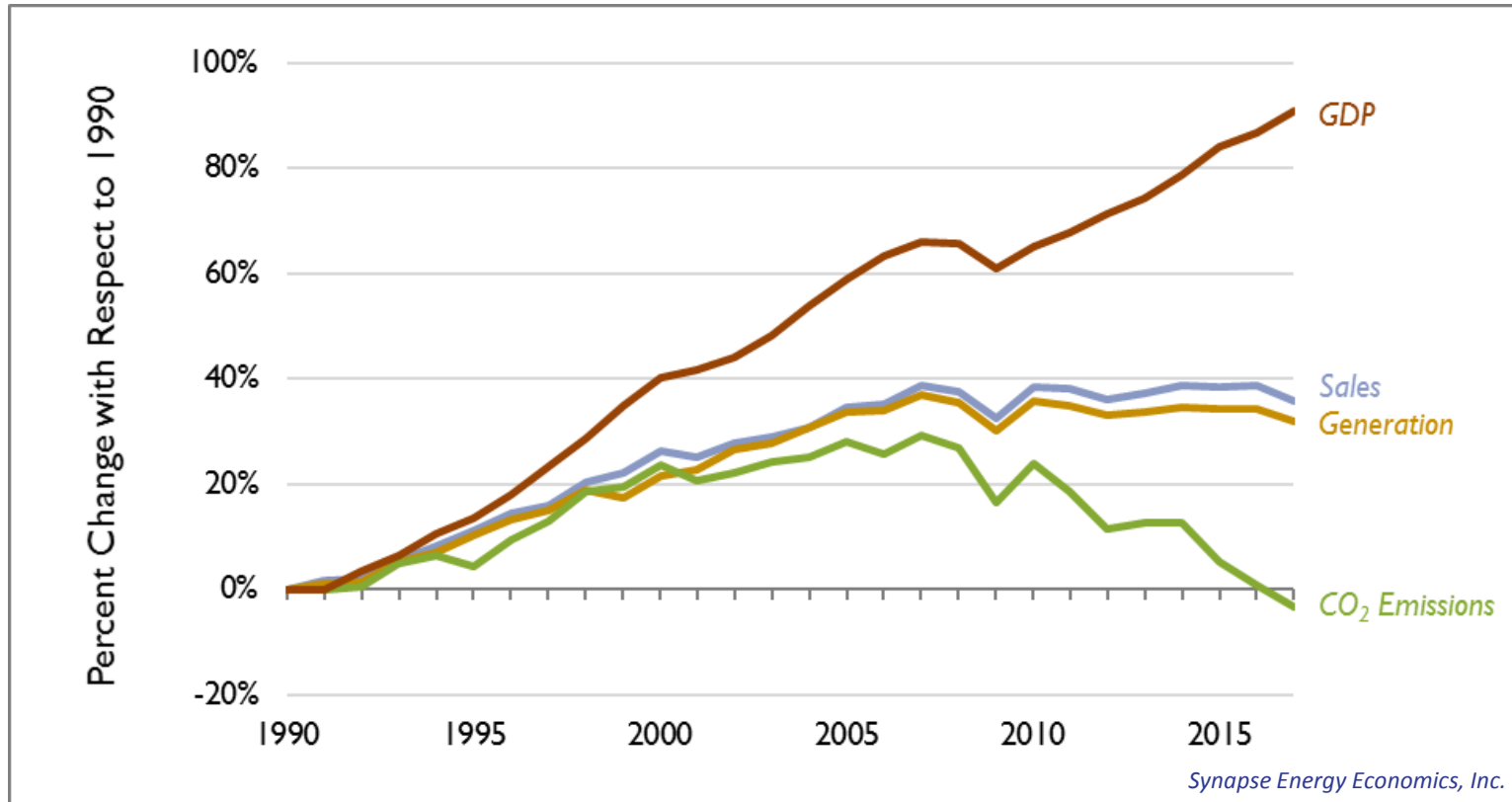
From 2016 to 2017, annual sales decreased by 2 percent, in part due to a warmer-than-typical winter and a cooler-than-typical summer.

# U.S. electric-sector CO<sub>2</sub> emissions are at their lowest levels since 1987



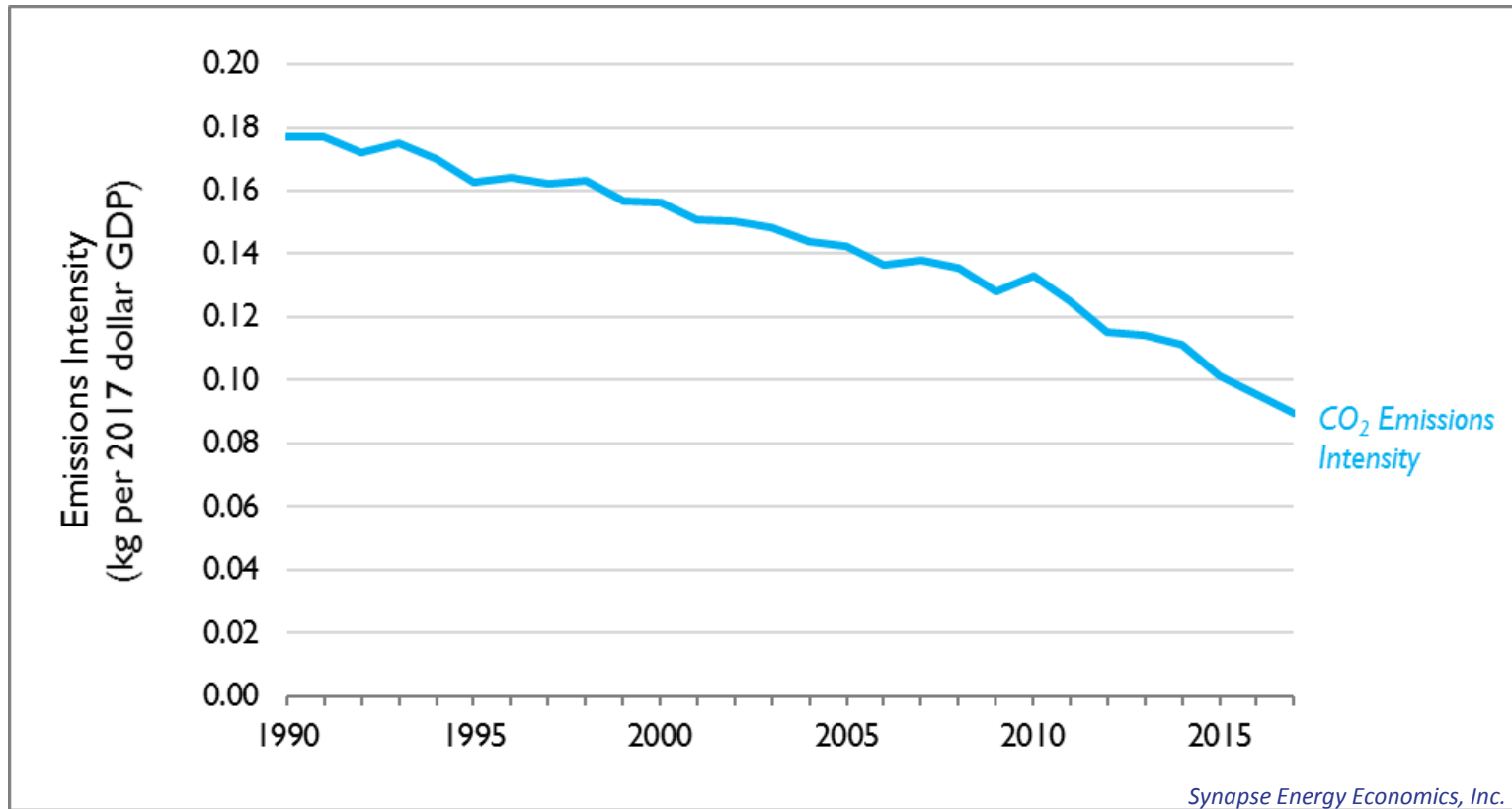
Since hitting an all-time peak in 2007, CO<sub>2</sub> have dropped by 25 percent. In 2017, coal represented 30 percent of generation, but 70 percent of CO<sub>2</sub> emissions.

# Electric sales and CO<sub>2</sub> emissions are increasingly unrelated to GDP growth



GDP has increased by 91 percent compared to 1990, while CO<sub>2</sub> emissions have fallen below 1990 levels. Retail sales and generation have grown by 36 percent and 32 percent, respectively.

# Carbon intensity (kg of CO<sub>2</sub> per dollar of GDP) continues to drop



Since 1990, the kg of CO<sub>2</sub> produced per dollar of GDP has dropped by 49 percent from 0.18 to 0.09 kg/\$.

Economic growth continues to require fewer and fewer emissions.

# Notes and Sources

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All 2017 values are preliminary and are subject to future updates and revisions.

"Renewables" contains wind, solar, geothermal, and storage, unless defined otherwise.

"Oil and Other" contains oil, biomass, petcoke, solid waste, landfill gas, tires, purchases, and other miscellaneous fuel types.

**Generation:** All generation values are utility-scale and do not include distributed generation (e.g., rooftop PV) or energy efficiency. Generation values are from the U.S. Energy Information Agency (EIA), form EIA 923, 1990-2017.

**Capacity:** All capacity values are utility-scale nameplate capacity. These values do not include distributed generation (e.g., rooftop PV) or energy efficiency. Capacity values are from EIA 860 and EIA Electric Power Monthly, 2001-2017.

**Sales:** Prior to 2003, "other" sales included sales to transportation, public street and highway lighting, sales to public authorities, agricultural irrigations, and other miscellaneous sales. After 2003, this category only includes sales to transportation—all other miscellaneous sales types were re-distributed to either the industrial, commercial, or residential sectors. Sales values are from EIA 826, 1990-2017.

**Emissions:** CO<sub>2</sub> emission values for 1995-2017 are from U.S. Environmental Protection Agency Air Markets Program Data. CO<sub>2</sub> emission values prior to 1995 are electric sector emissions from EIA's State Carbon Dioxide Emissions database.

**Gross Domestic Product:** GDP values are from the Bureau of Economic Analysis, National Economic Accounts, accessed February 2018.

**Natural gas prices:** Monthly natural gas prices are from EIA's Henry Hub Natural Gas Spot Price dataset.

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