

# Synapse Electricity Snapshot 2019

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A review of the U.S. electric system through December 2018

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- Renewable capacity is now at 132 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 28 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 1980.
- Natural gas generation surpassed coal generation in every month of 2018, for the first time in history. Historically, the ratio of natural gas generation to coal generation has been strongly tied to the price of natural gas.

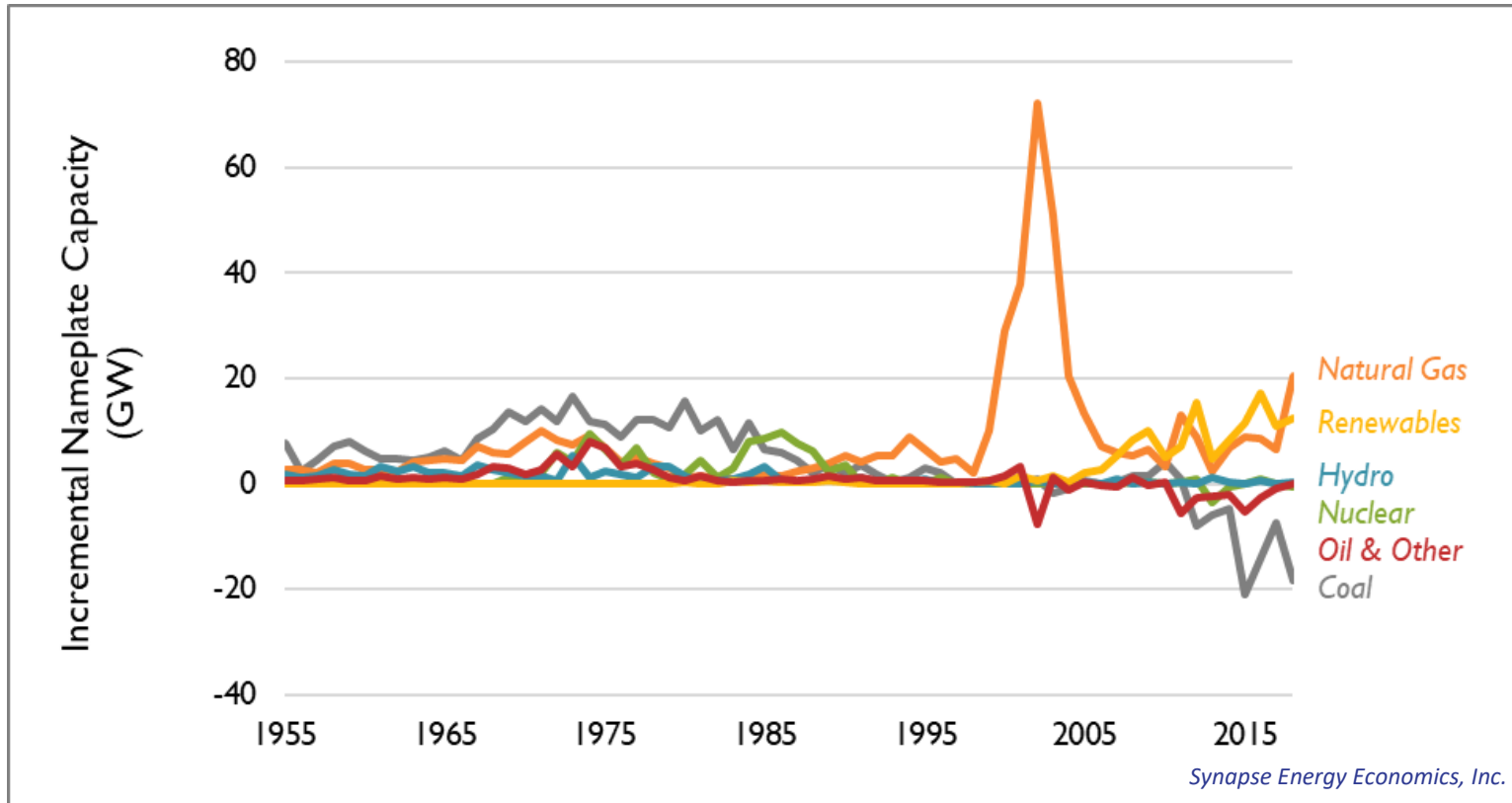
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- Since 2009, annual growth in electric retail sales has averaged 0.2 percent per year.
- 2018 emissions fell by less than 0.2 percent compared to 2017. Since hitting an all-time peak in 2007, electric sector CO<sub>2</sub> emissions have declined to 1,738 million metric tons in 2018, 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 51 percent from 0.17 to 0.08 kg per dollar.
- In 2018, electric vehicles made up 2.1 percent of light-duty vehicle sales.

***All values in this document are based on preliminary 2018 data and are subject to updates.***

# Coal capacity continues to plummet below 1980s levels



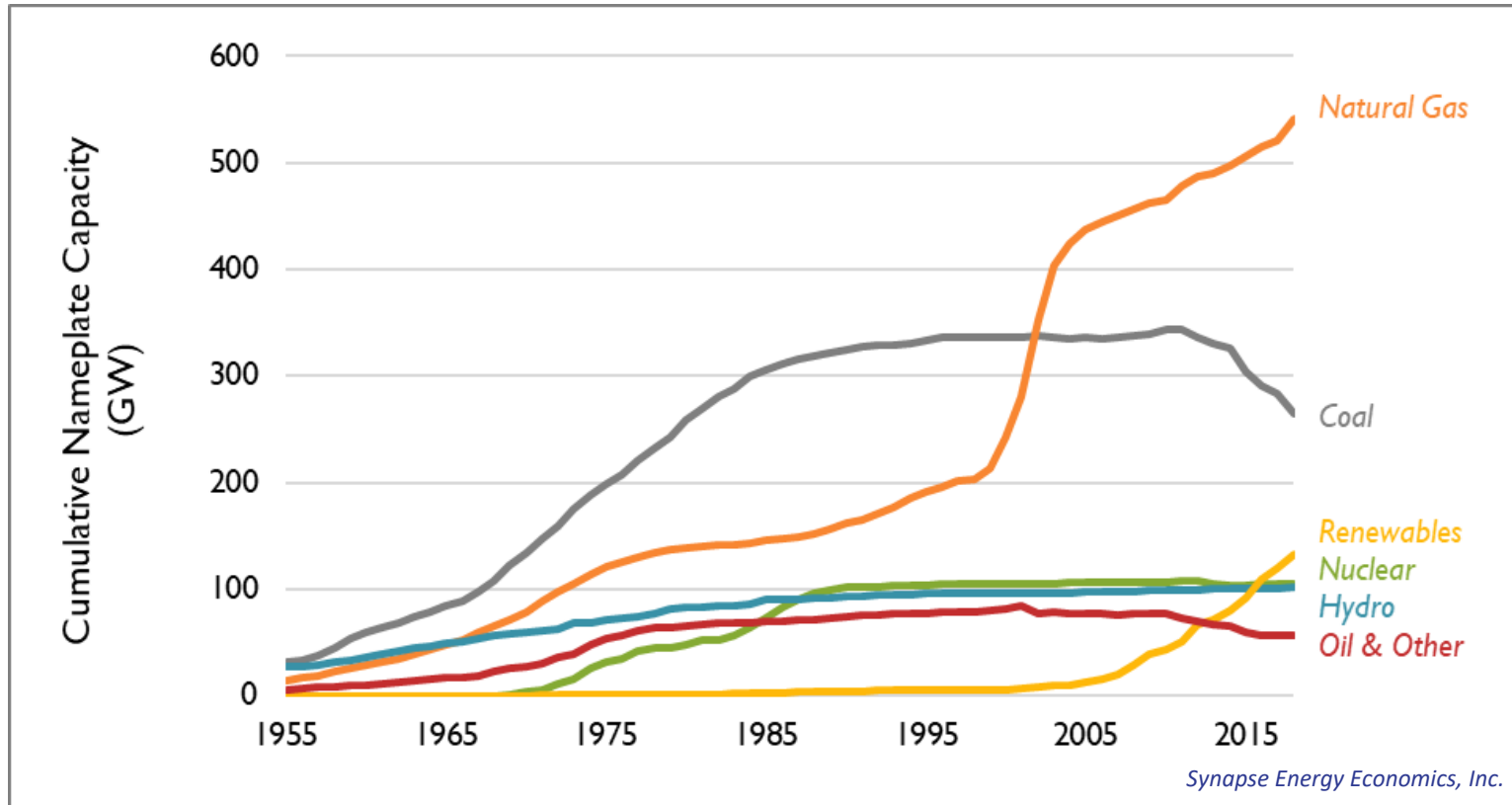
*Note: This figure displays net nameplate values for utility-scale generators; annual capacity retirements are subtracted from annual capacity additions.*

*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.

2018 was the third-highest year in history for renewable capacity additions.

# 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 2018, renewable resources reached 11 percent of total U.S. generating capacity. In the 10 years since 2009, renewables have increased by 93 GW, compared to a 79 GW increase in natural gas over the same period. 74 GW of coal retired over these 10 years.

## For the first time since 2011, natural gas led in net capacity additions

Capacity (GW)	Installed		Retired		Net (installed less retired)	
	2017	2018	2017	2018	2017	2018
Coal	-	-	6.9	14.2	-6.9	-14.2
Natural Gas	10.5	21.6	4.4	5.3	6.1	16.3
Nuclear	-	-	-	0.6	0.0	-0.6
Hydro	0.2	0.1	0.1	0.0	0.1	0.1
Renewables	11.2	12.0	0.2	0.0	11.0	12.0
<i>Geothermal</i>	0.0	0.1	0.1	0.0	-0.1	0.1
<i>Storage</i>	0.1	0.2	-	0.0	0.1	0.2
<i>Solar</i>	4.7	5.0	-	-	4.7	5.0
<i>Wind</i>	6.3	6.7	0.0	0.0	6.3	6.6
Oil and Other	0.2	0.1	0.9	0.7	-0.7	-0.6
<i>Biomass</i>	0.1	0.1	0.1	0.3	0.1	-0.2
<i>Oil</i>	0.0	0.0	0.8	0.4	-0.8	-0.4
<i>MSW</i>	0.1	0.0	0.0	0.1	0.1	0.0
<i>Other</i>	-	0.0	-	-	0.0	0.0
<b>Total</b>	<b>22.1</b>	<b>33.9</b>	<b>12.5</b>	<b>20.9</b>	<b>9.7</b>	<b>13.0</b>

In 2018, the majority of net capacity additions came from natural gas at 16.3 GW—over 2.5 times the natural gas capacity that was installed in 2017.

Renewables were the second highest category of capacity additions at 12 GW. Over 14 GW of coal retired in 2018.

## Coal capacity is at its lowest level since 1980

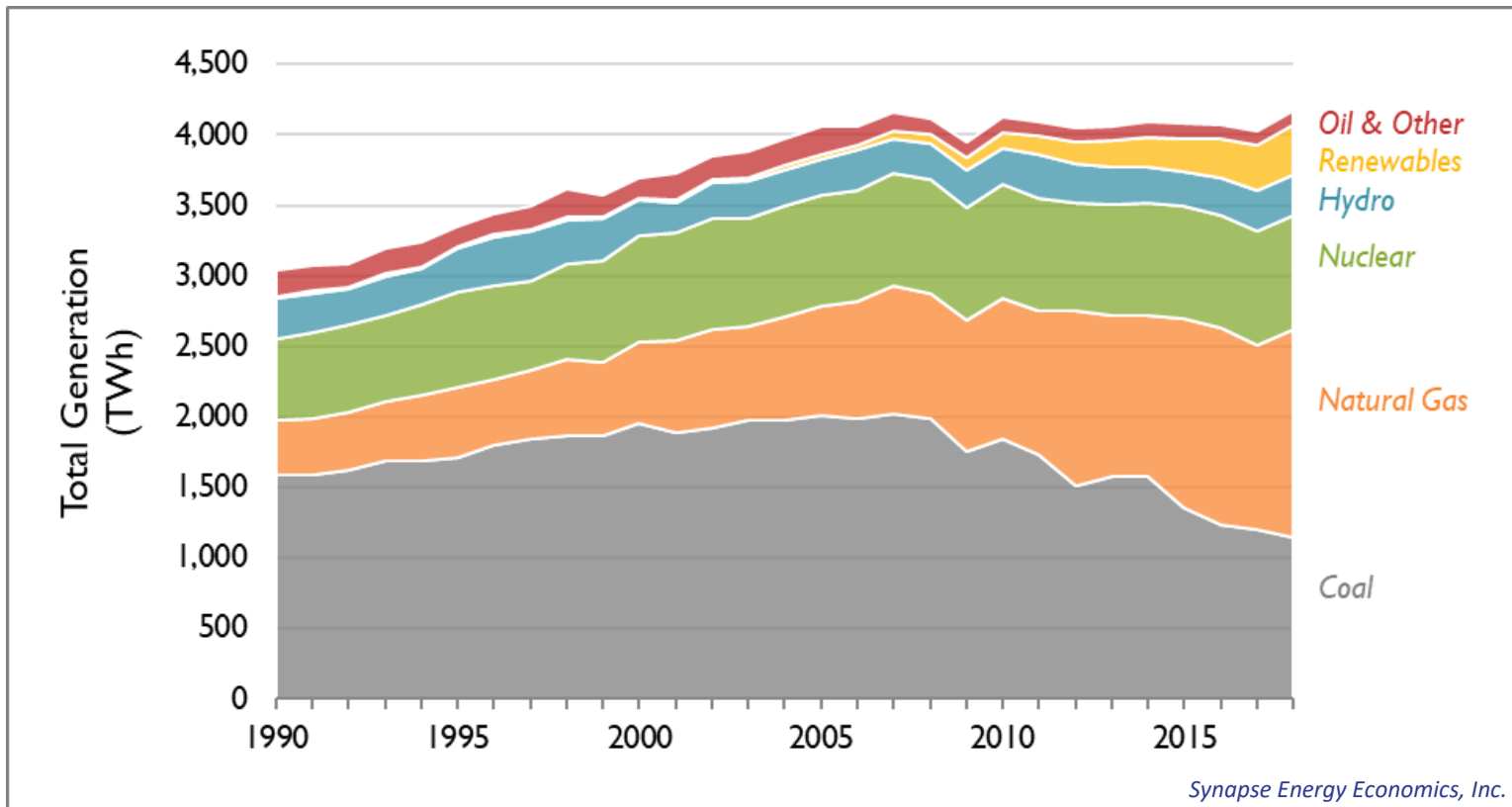
	State	Retired Capacity (Nameplate MW)
1	Texas	4,419
2	Ohio	2,491
3	Florida	2,322
4	Wisconsin	1,815
5	Tennessee	990
-	Other States	2,139
	<b>Total</b>	<b>14,177</b>

Over 14 GW of coal retired in 2018.

Coal retirements took place in 11 states.

Since 2009, 74 GW of coal has retired (a decrease of 22 percent).

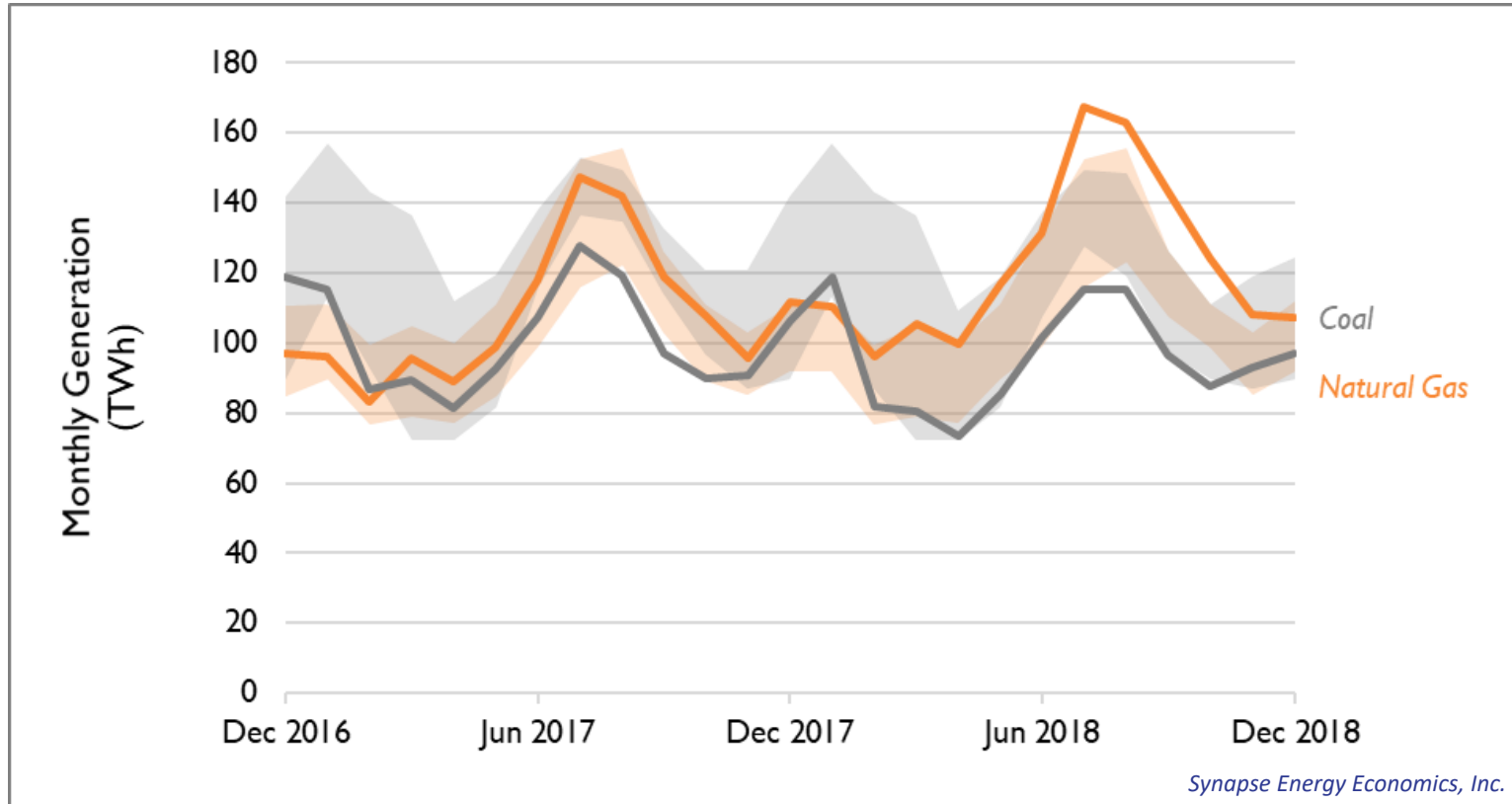
## Coal generation is at its lowest level since 1979



In 2018, the amount of electricity generated from natural gas exceeded that from coal by 29 percent, up from 8 percent in 2017. Since 2009, total annual U.S. generation has increased by less than 0.2 percent per year.



# For all 12 months in 2018, natural gas generation exceeded coal generation

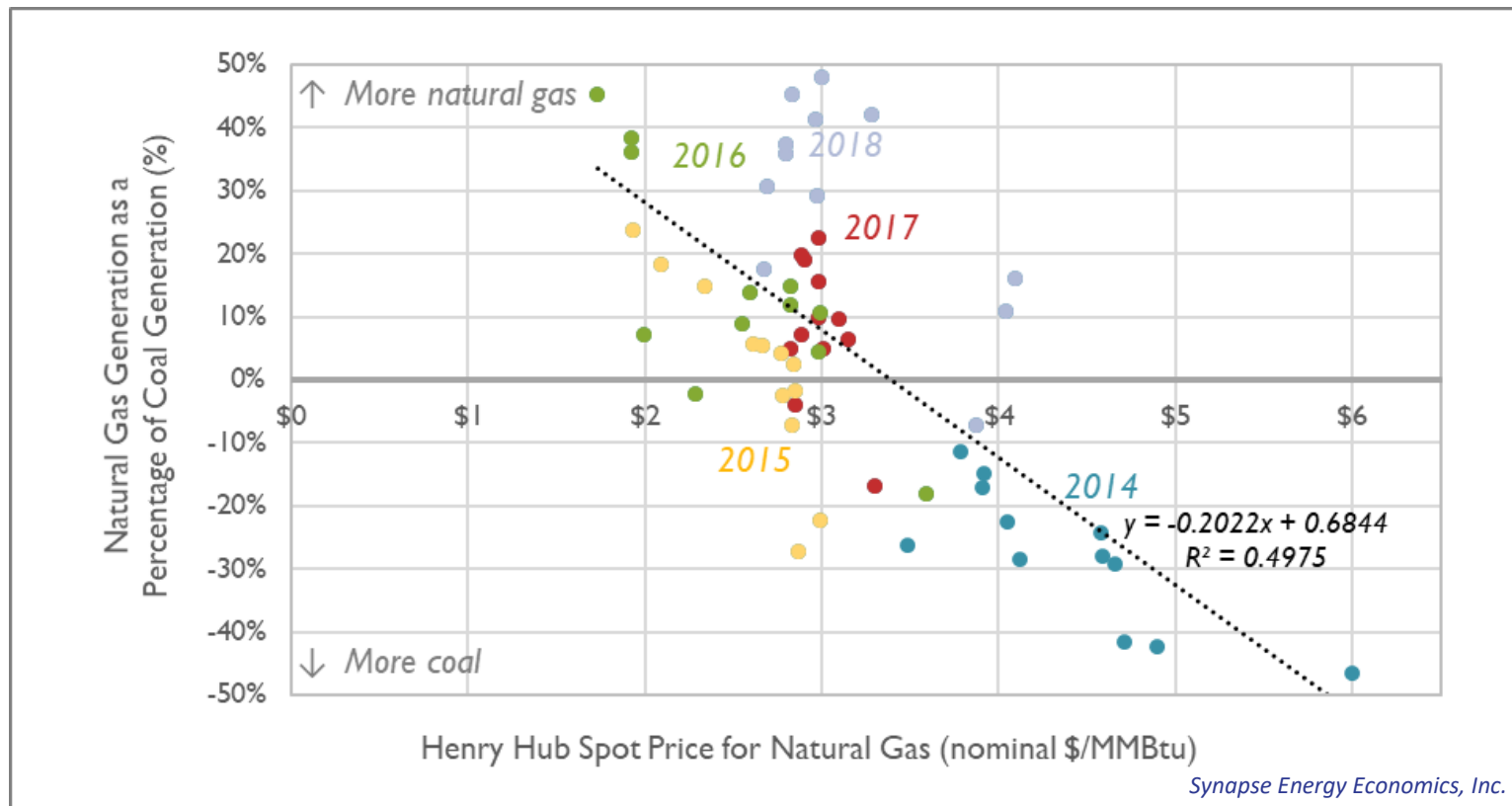


Note: This figure shows monthly generation compared to the previous four-year range.

For example, the December 2018 coal line is compared to the range of coal generation (grey shaded area) in Dec. 2014, Dec. 2015, Dec. 2016, and Dec. 2017.

In 2018, monthly coal generation was typically below historical ranges, while natural gas generation often exceeded the maximum range historically observed for each month.

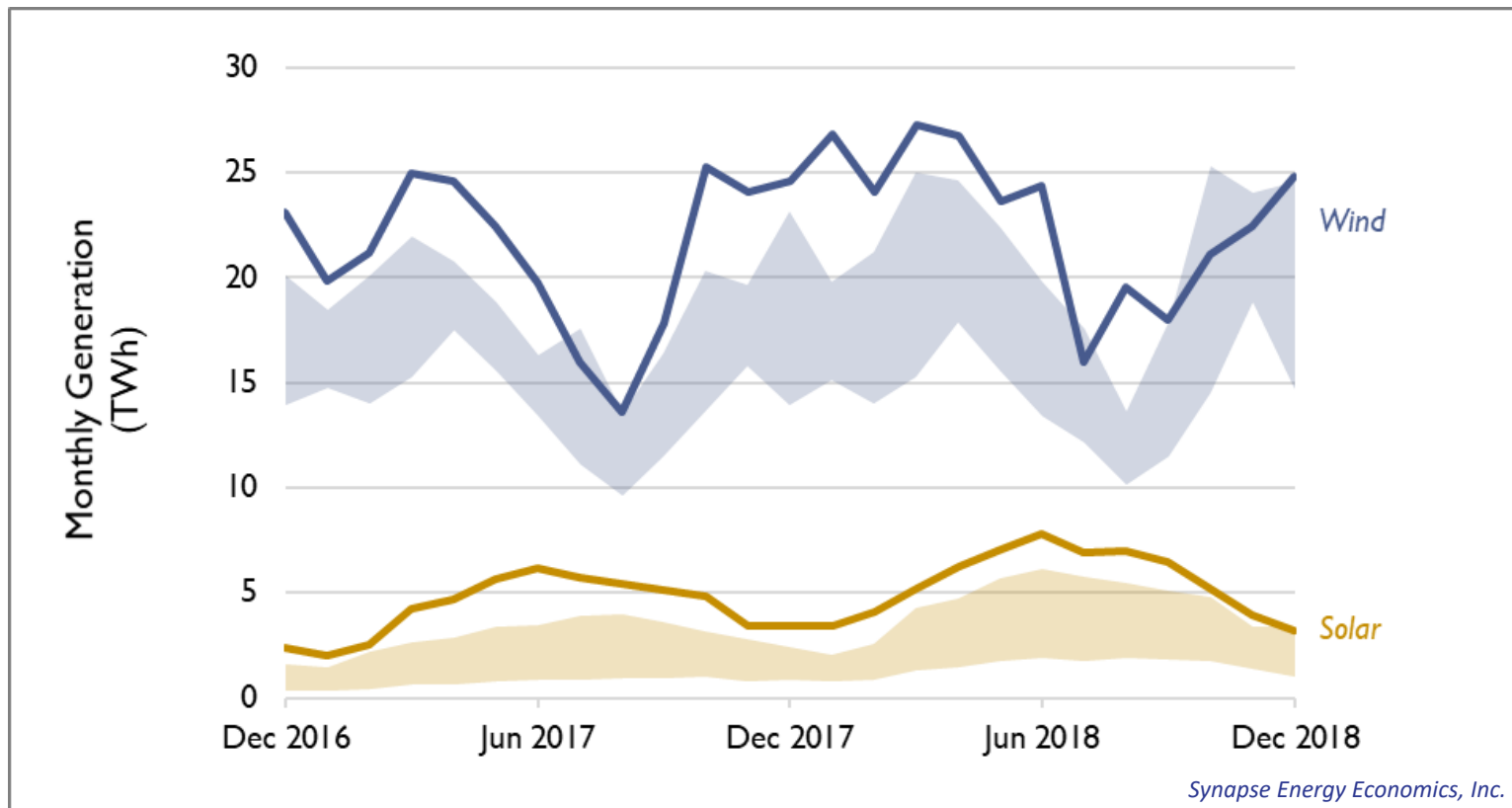
# The ratio of natural gas generation to coal generation strongly depends on the price of natural gas



On a national basis, when the price of natural gas is below \$3.40 per MMBtu, natural gas generation has historically exceeded coal generation.

This relationship is becoming increasingly uncorrelated as the quantity of natural gas capacity increases and coal plants retire.

# In 2018, wind made up about 4/5 of total renewable generation



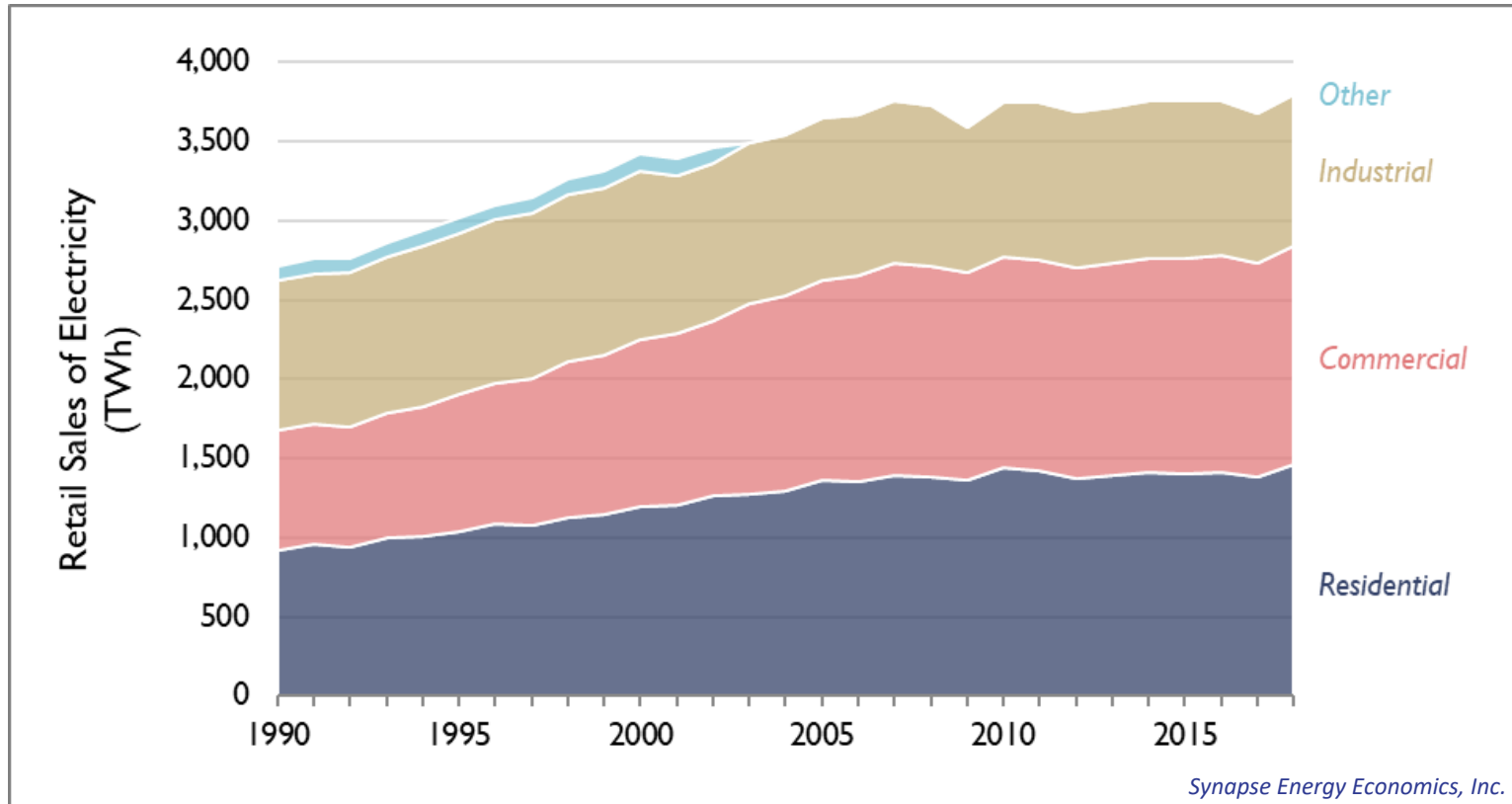
*Note: This figure shows monthly generation compared to the previous four-year range.*

*For example, the December 2018 wind line is compared to the range of wind generation (purple shaded area) in Dec. 2014, Dec. 2015, Dec. 2016, and Dec. 2017).*

Annual wind generation increased by 8 percent in 2018, relative to 2017. At the same time, annual utility-scale solar generation grew by 25 percent.

Both wind and solar reached historical peaks for monthly generation at some point in 2018 (March for wind and June for solar).

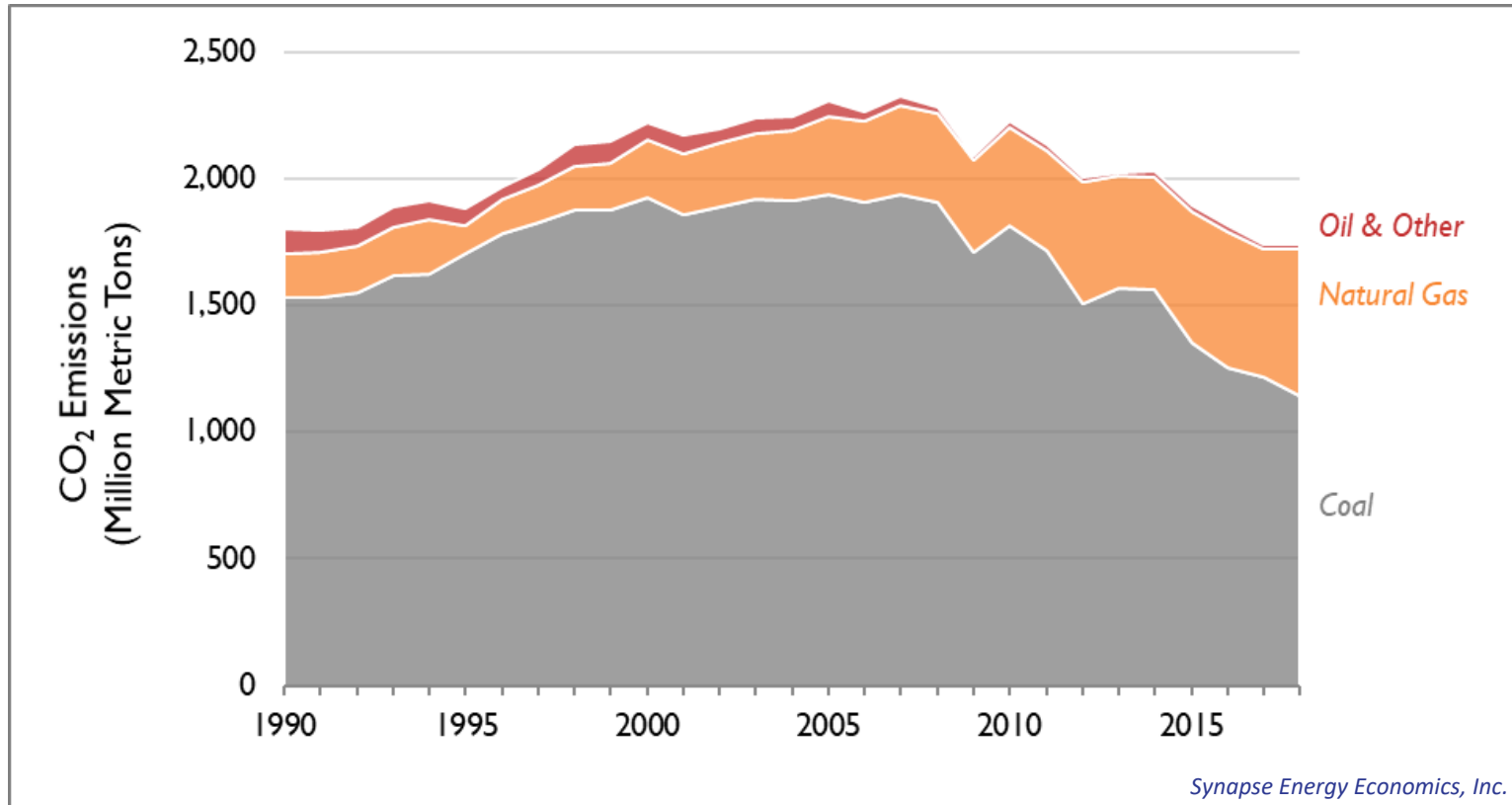
# Retail sales have been flat since 2009, with an average annual growth rate of 0.2 percent



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

From 2017 to 2018, annual sales increased by 3 percent, in part due to a colder-than-typical winter and a warmer-than-typical summer.

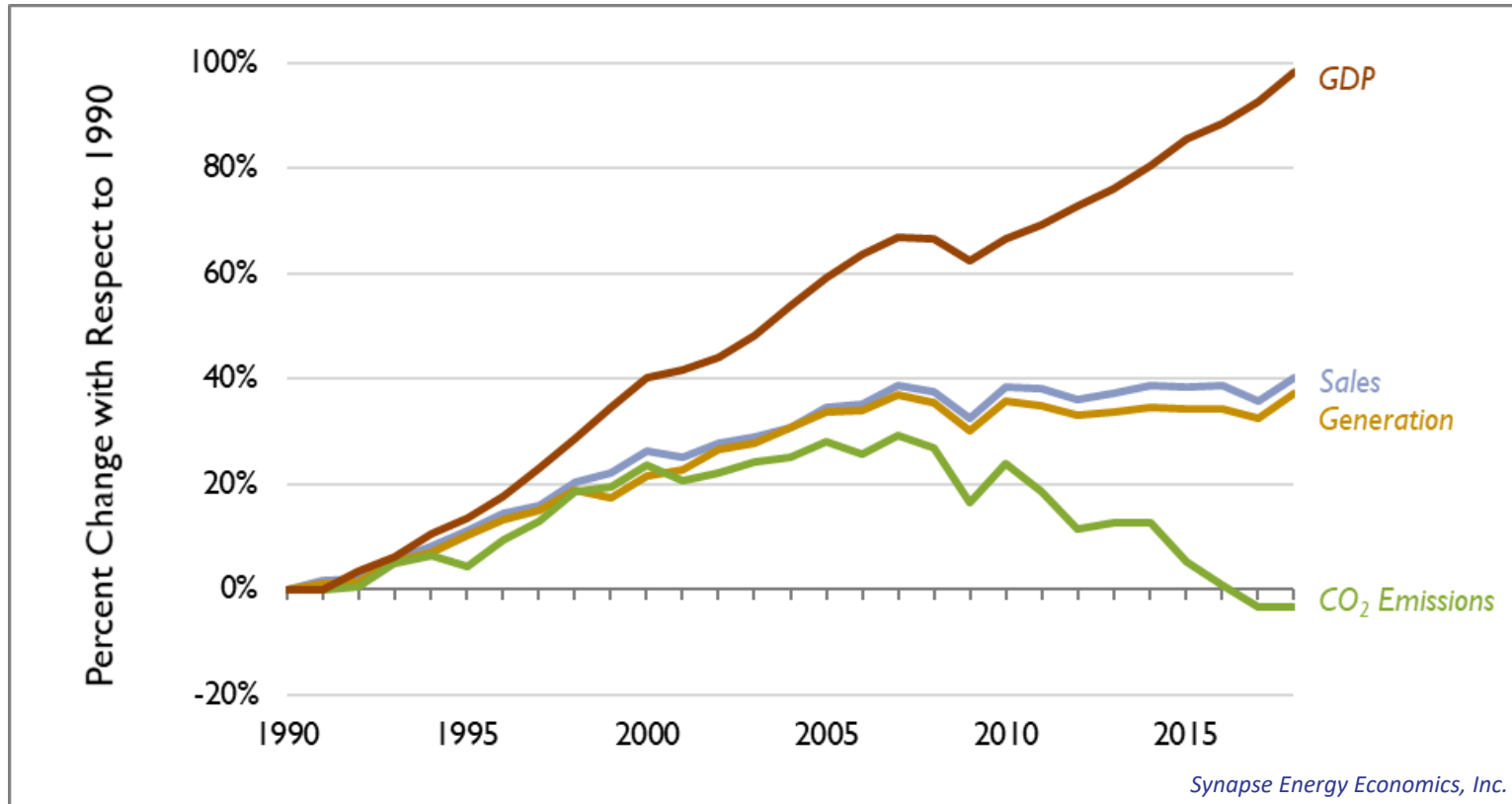
# U.S. electric-sector CO<sub>2</sub> emissions are at their lowest levels since 1987



Since hitting an all-time peak in 2007, CO<sub>2</sub> emissions have dropped by 25 percent.

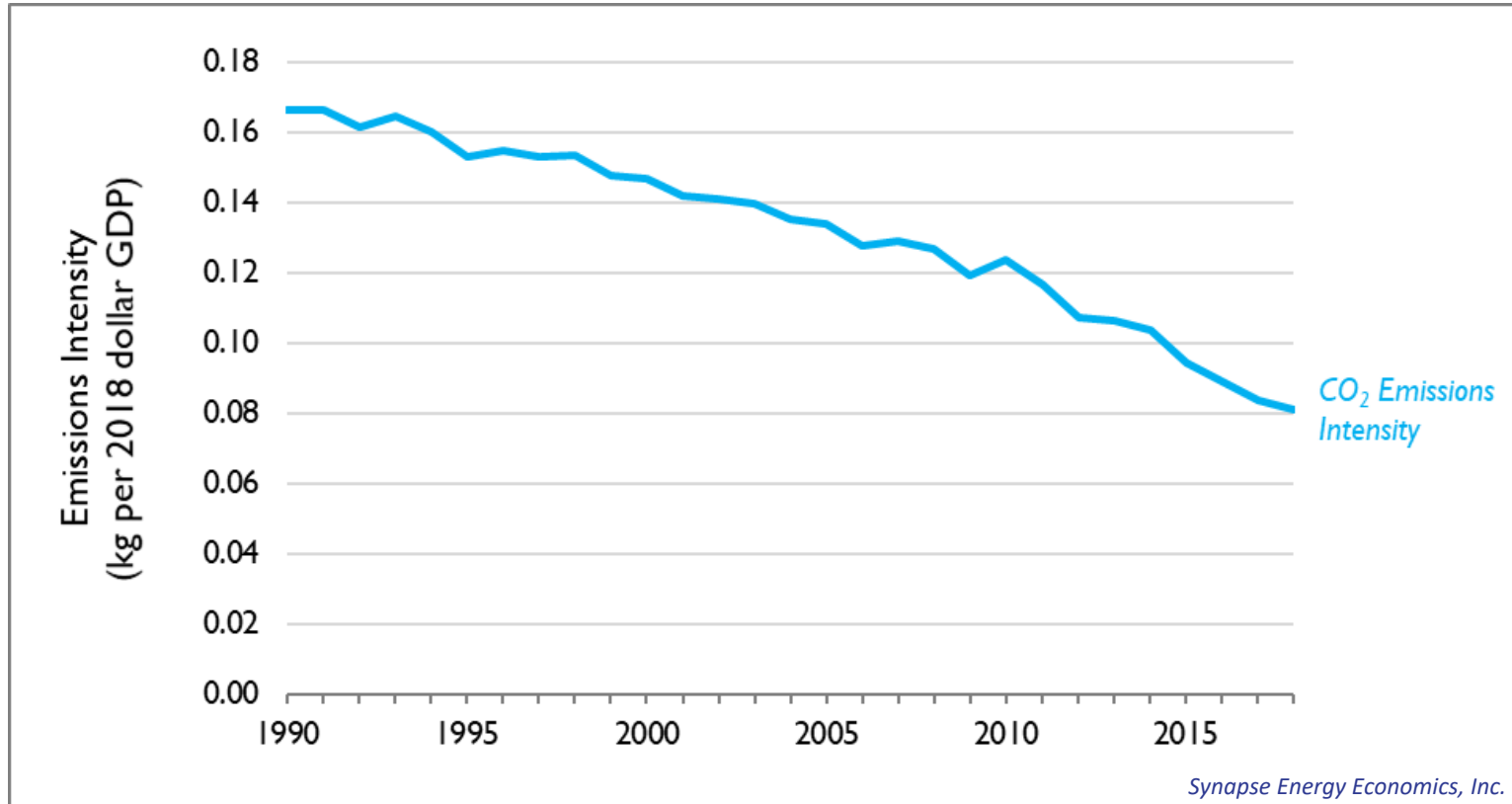
In 2018, coal represented 29 percent of generation, compared to two-thirds of CO<sub>2</sub> emissions.

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



GDP has increased by 98 percent compared to 1990, while CO<sub>2</sub> emissions have fallen below 1990 levels. Retail sales and generation have grown by 40 percent and 37 percent, respectively, and have remained largely constant since 2006.

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

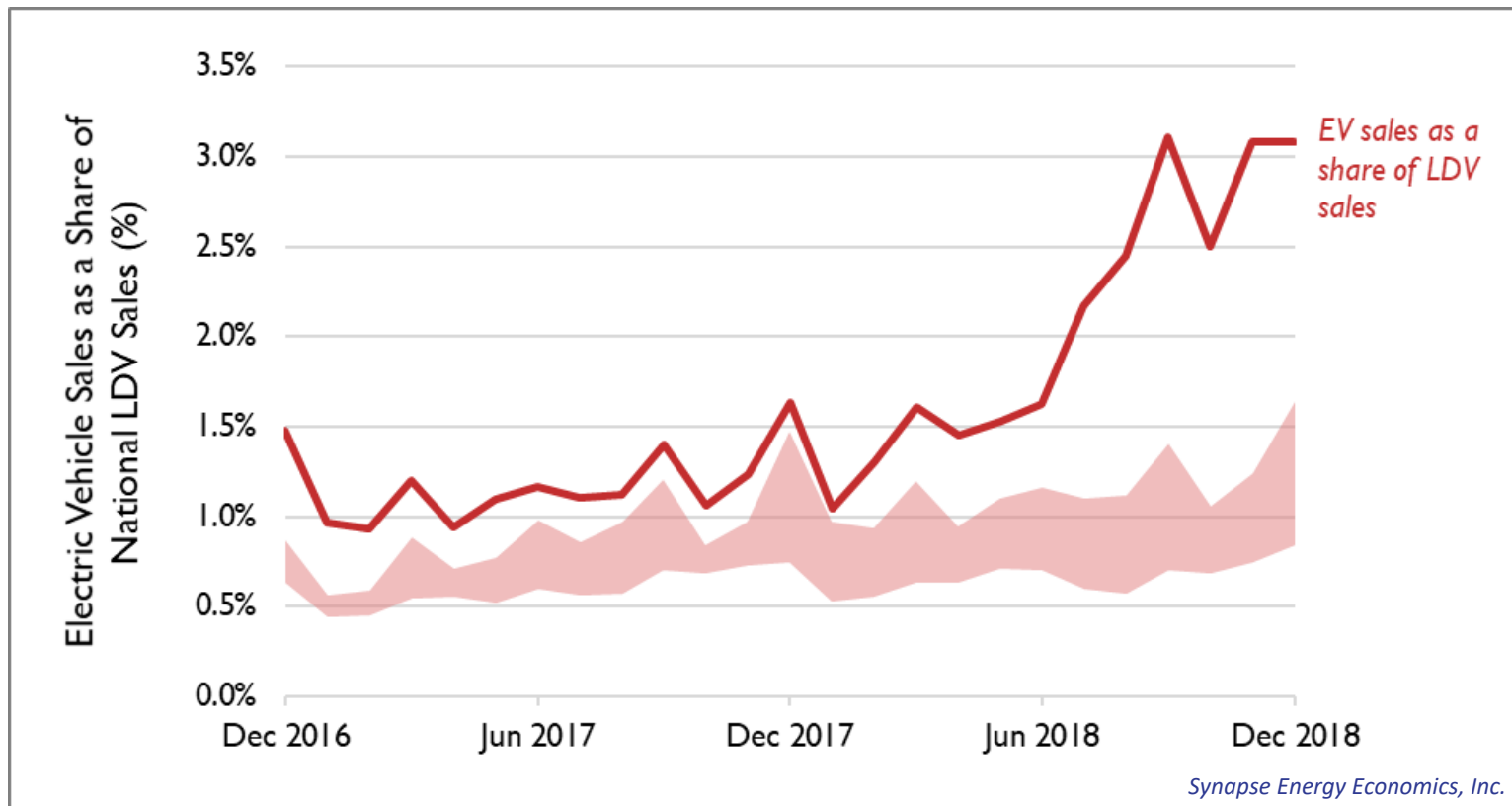


*Note: GDP values are reported in 2018 dollars.*

Since 1990, the kg of CO<sub>2</sub> produced per dollar of GDP has dropped by 51 percent from 0.17 to 0.08 kg/\$.

Economic growth continues to require fewer and fewer emissions.

# In 2018, electric vehicles made up 2.1 percent of all light-duty vehicle sales



The share of light-duty vehicle (cars, SUVs, and pickup trucks) sales that were partially or fully plug-in electric exceeded 3.0 percent for 3 months in 2018.

The total number of EVs sold in 2018 increased by 1.8 times relative to 2017.



# Notes and Sources

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All 2018 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, 1990-2018.

**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, 2001-2018.

**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, 1990-2018.

**Emissions:** CO<sub>2</sub> emission values for 1995-2018 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 2019.

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

**Electric vehicles:** EV sales data from insideevs.com. All vehicle sales data from Federal Reserve Bank of St. Louis.

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