

Synapse Electricity Snapshot 2016

A review of the U.S. electric system through December 2015

Released March 3, 2016

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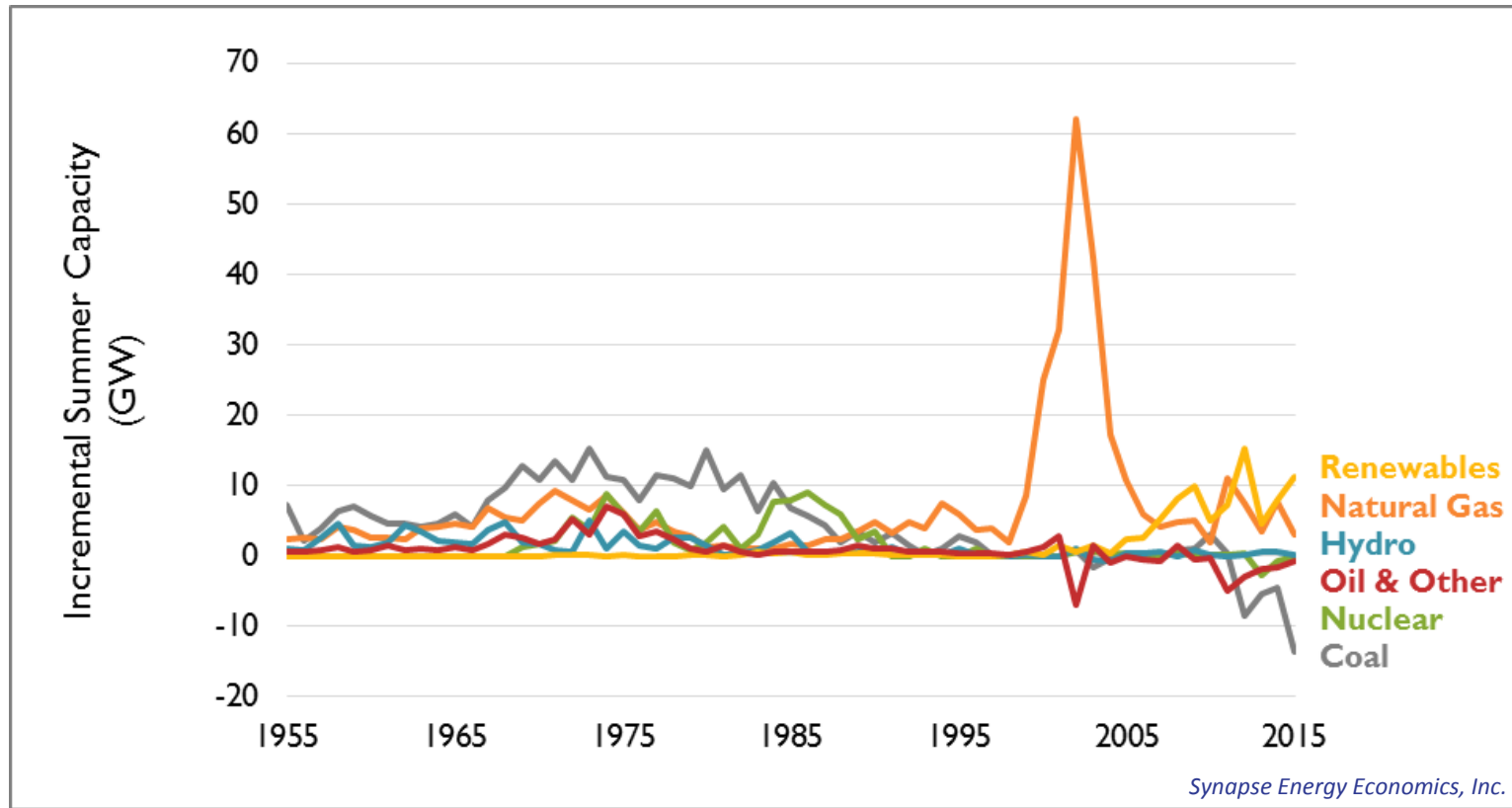
Today's electric system looks remarkably different from how it looked ten—or even five—years ago.

- Renewable, hydro, and nuclear capacities are now equal. Together, all non-CO₂-emitting generating capacity makes up about 30 percent of the nationwide total and accounts for 31 percent of all generation.
- Retirement of old and uneconomic coal plants has led to the lowest level of coal capacity since 1986.
- Annual natural gas generation surpassed coal generation for the last six months of 2015, and came within 1 percent of annual coal generation for the first time in U.S. history.

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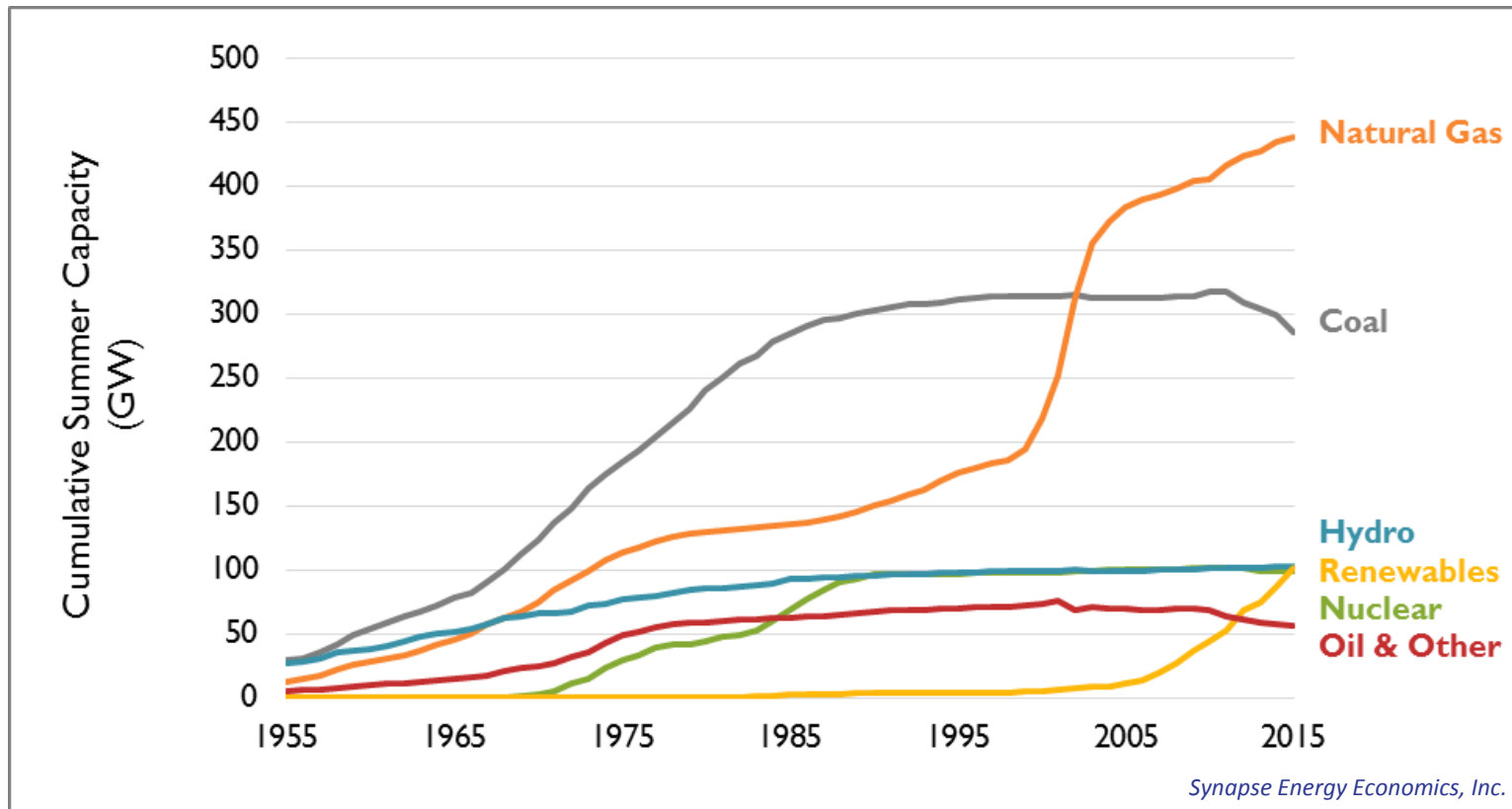
- Since 2005, annual growth in electric retail sales has averaged just 0.2 percent per year.
- Since hitting an all-time peak in 2007, electric sector CO₂ emissions have declined to 1,894 million metric tons in 2015, their lowest level since 1995.
- Since 1990, the total economic value produced for every metric ton of CO₂ emitted has increased by 73 percent from \$5,500 to \$9,500.

Coal capacity has fallen to its lowest level in thirty years



While coal, oil, and nuclear generation are in decline, renewables and natural gas capacity grow every year. Since 2012, more renewable capacity has been added each year than any other resource.

Renewable energy capacity now equals both hydroelectric and nuclear capacity



In 2015, renewable resources reached 9.5 percent of total U.S. generating capacity. Since 2005, 80 GW of renewables have come into operation, compared to 65 GW of natural gas over the same period.

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

	Installed		Retired		Net (installed less retired)	
	2014	2015	2014	2015	2014	2015
Coal	0.1	0.0	4.5	13.7	-4.4	-13.7
Natural Gas	8.3	6.1	3.9	2.9	4.4	3.1
Nuclear	-	-	0.6	-	-0.6	0.0
Hydro	0.2	0.2	0.1	0.1	0.0	0.1
Renewables	8.2	11.3	0.1	0.1	8.2	11.3
Geothermal	0.0	0.0	-	0.0	0.0	0.0
Storage	0.0	0.1	-	-	0.0	0.1
Solar	3.6	3.5	0.0	-	3.6	3.5
Wind	4.6	7.7	0.1	0.0	4.5	7.6
DG - Solar					3.6	3.7
DG - Wind					0.0	0.0
Oil and Other	0.3	0.3	1.2	1.1	-0.9	-0.8
Biomass	0.1	0.1	0.1	0.0	0.0	0.1
Oil	0.1	0.0	1.0	1.0	-1.0	-0.9
MSW	0.1	0.1	0.0	0.1	0.1	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0
Total	17.1	17.8	10.4	17.9	6.7	-0.1

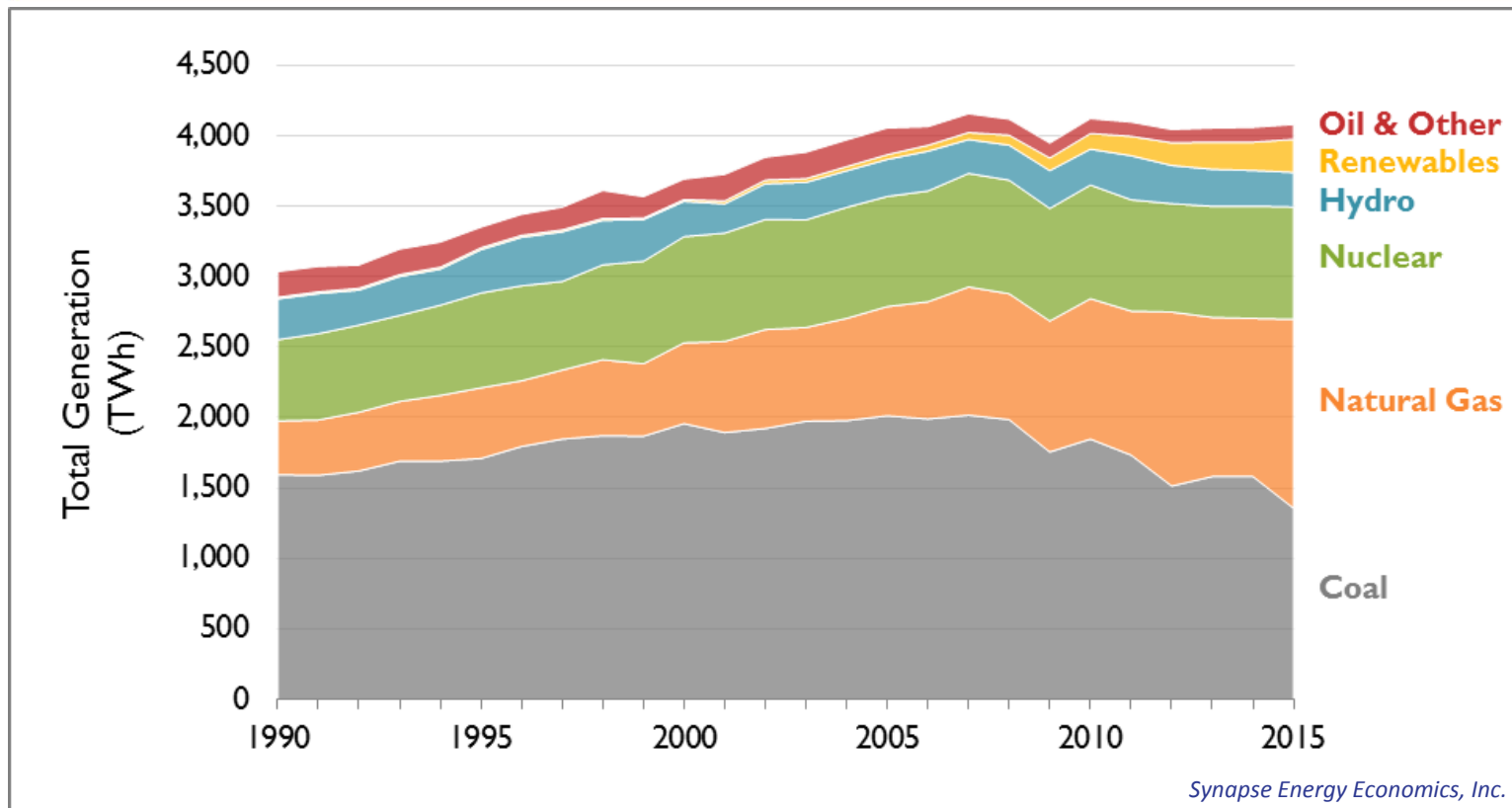
In 2015, the majority of renewable net capacity additions came from wind at 7.6 GW. Solar was close behind, at 7.2 GW. In 2015, solar additions were evenly split between utility-scale and distributed installations.

Coal capacity is at its lowest point since 1985

State	Retired Capacity (Summer MW)
Ohio	2,659
Georgia	2,062
Kentucky	1,570
Indiana	1,200
West Virginia	1,193
Virginia	1,150
Other states	3,903
Total	13,737

Nearly 14 GW of coal retired in 2015 and six states had coal retirements greater than 1 GW. Since 2012, 35 GW of coal has retired.

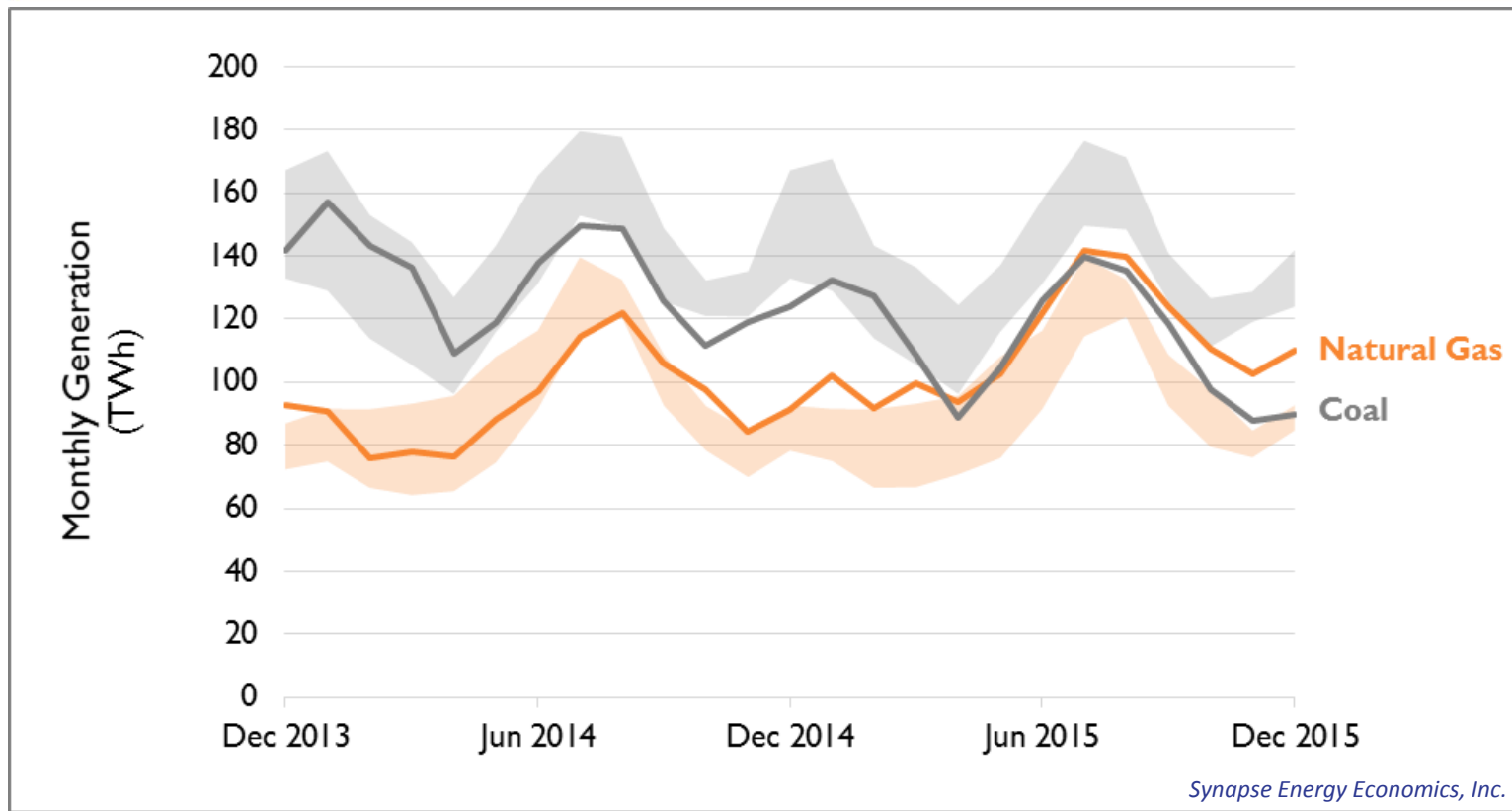
Coal generation is at its lowest level since 1984



In 2015, the amount of electricity generated from natural gas was just 1 percent lower than that from coal.

Since 2005, total annual U.S. generation has remained flat, with an average annual growth rate of less than 0.1 percent per year.

For the last six months in 2015, natural gas generation exceeded coal generation

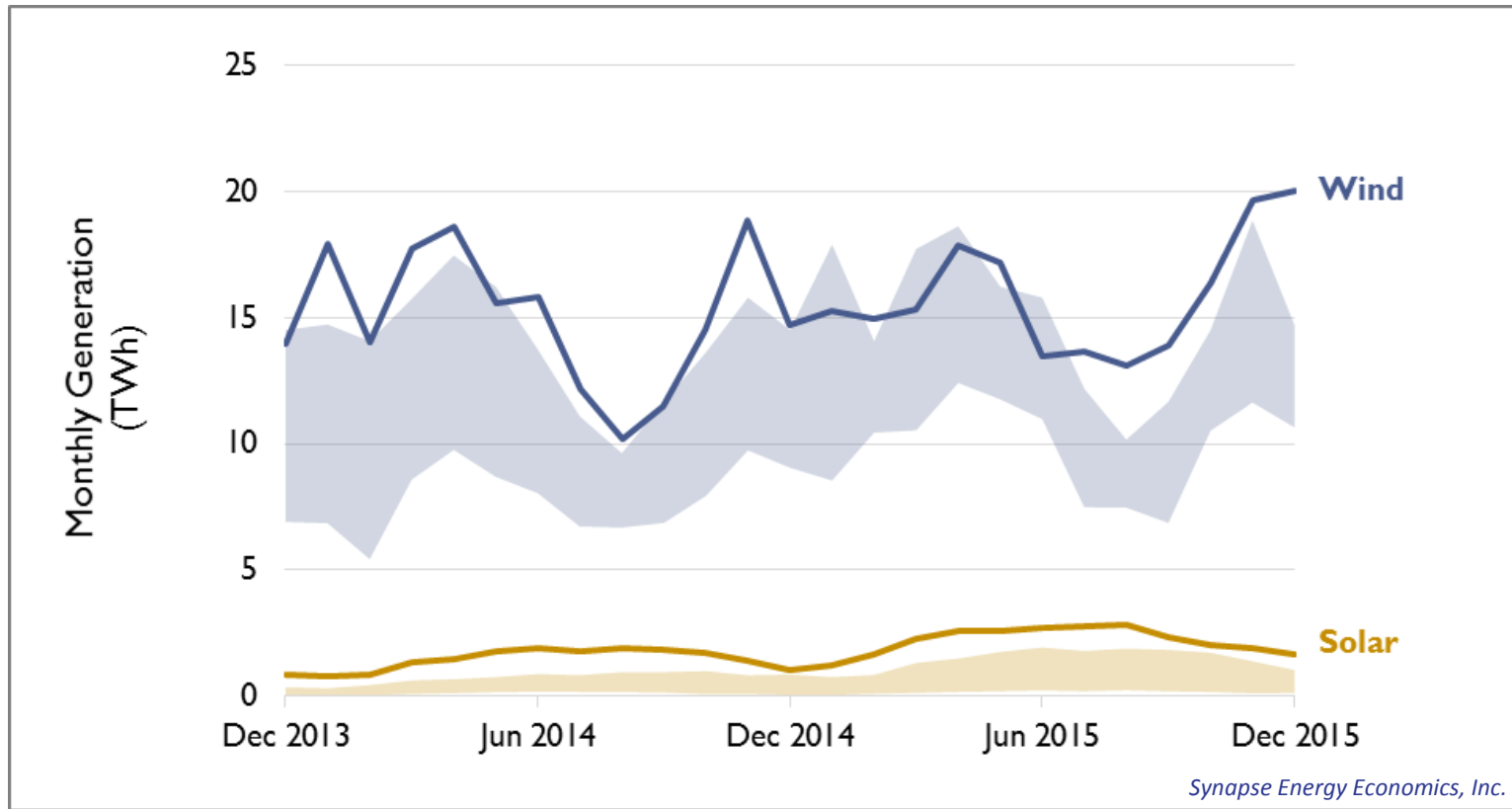


Note: This figure shows monthly generation compared to the previous four-year range.

For example, the December 2015 coal line is compared to the range of coal generation (grey shaded area) in Dec. 2011, Dec. 2012, Dec. 2013, and Dec. 2014).

In the second half of 2015 U.S. monthly natural gas generation surpassed coal generation—an unprecedented occurrence. If trends in coal retirements and gas additions continue, natural gas generation will grow in dominance.

In 2015, wind made up more than 4/5 of total renewable generation

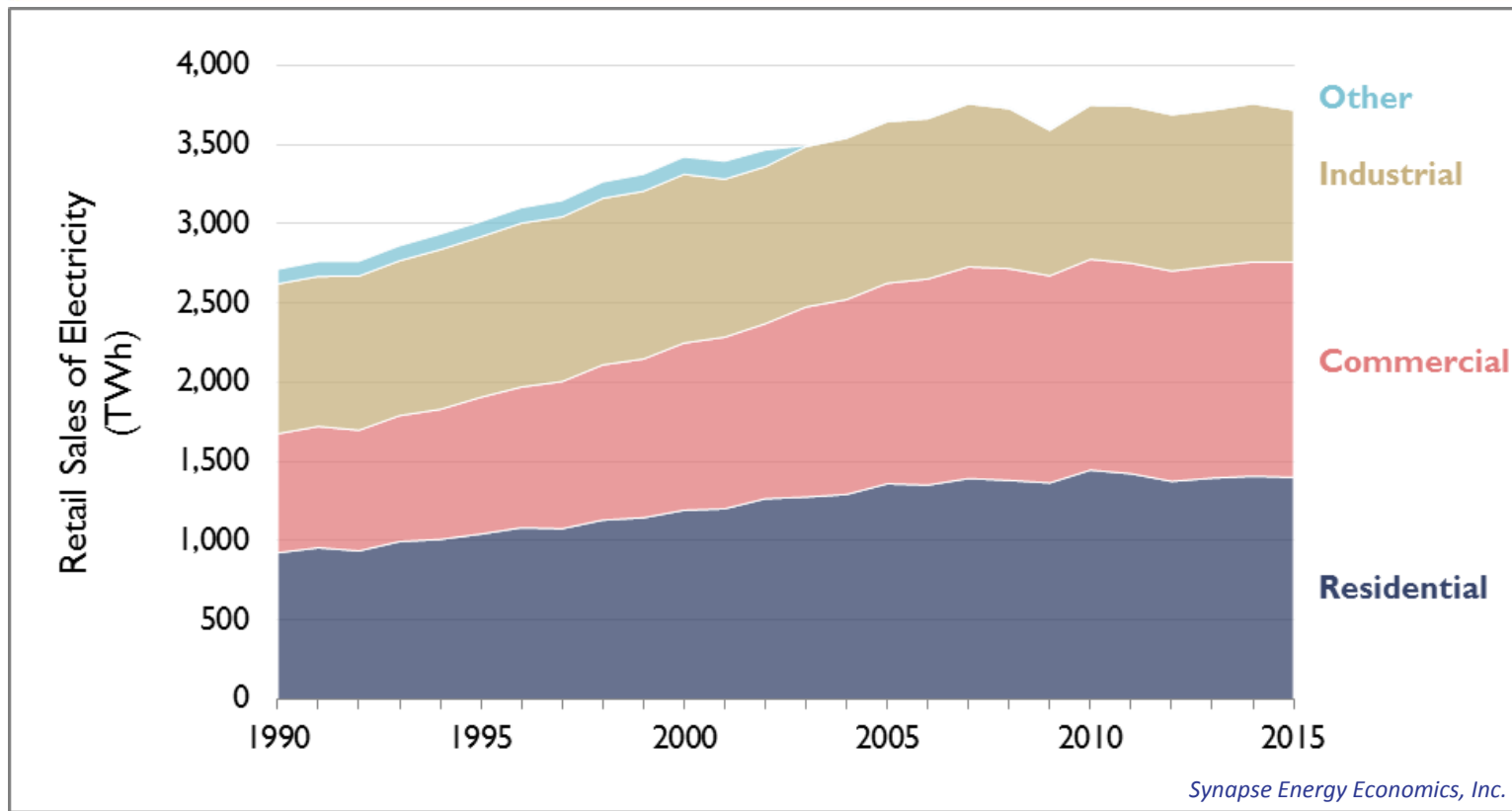


Note: This figure shows monthly generation compared to the previous four-year range.

For example, the December 2015 wind line is compared to the range of wind generation (purple shaded area) in Dec. 2011, Dec. 2012, Dec. 2013, and Dec. 2014).

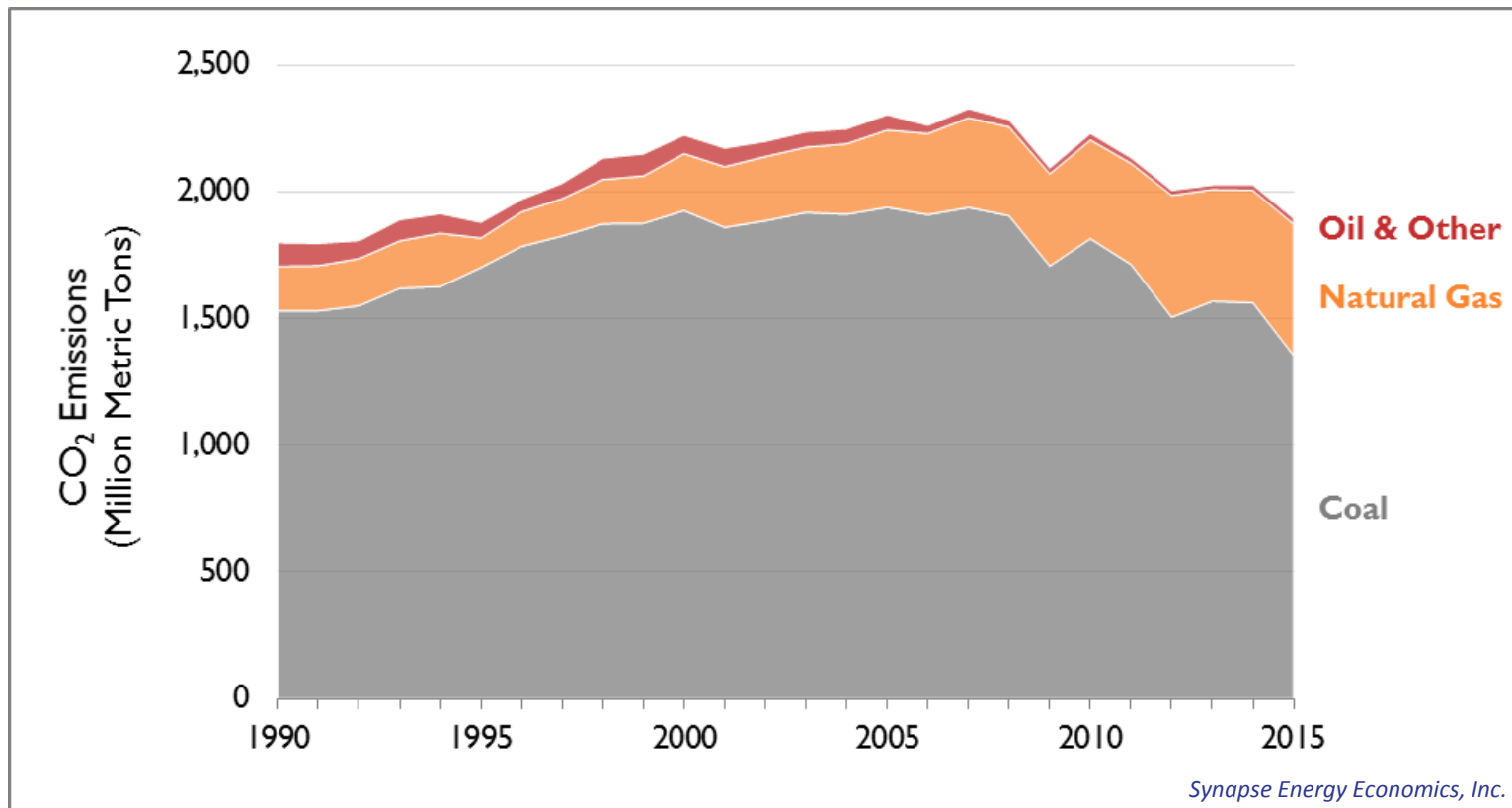
Wind reached 82 percent of total renewable generation in 2015. At the same time, annual solar generation grew from 9 GWh in 2013, to 18 in 2014, to 26 in 2015.

Retail sales have been flat since 2005, with an average annual growth rate of just 0.2 percent



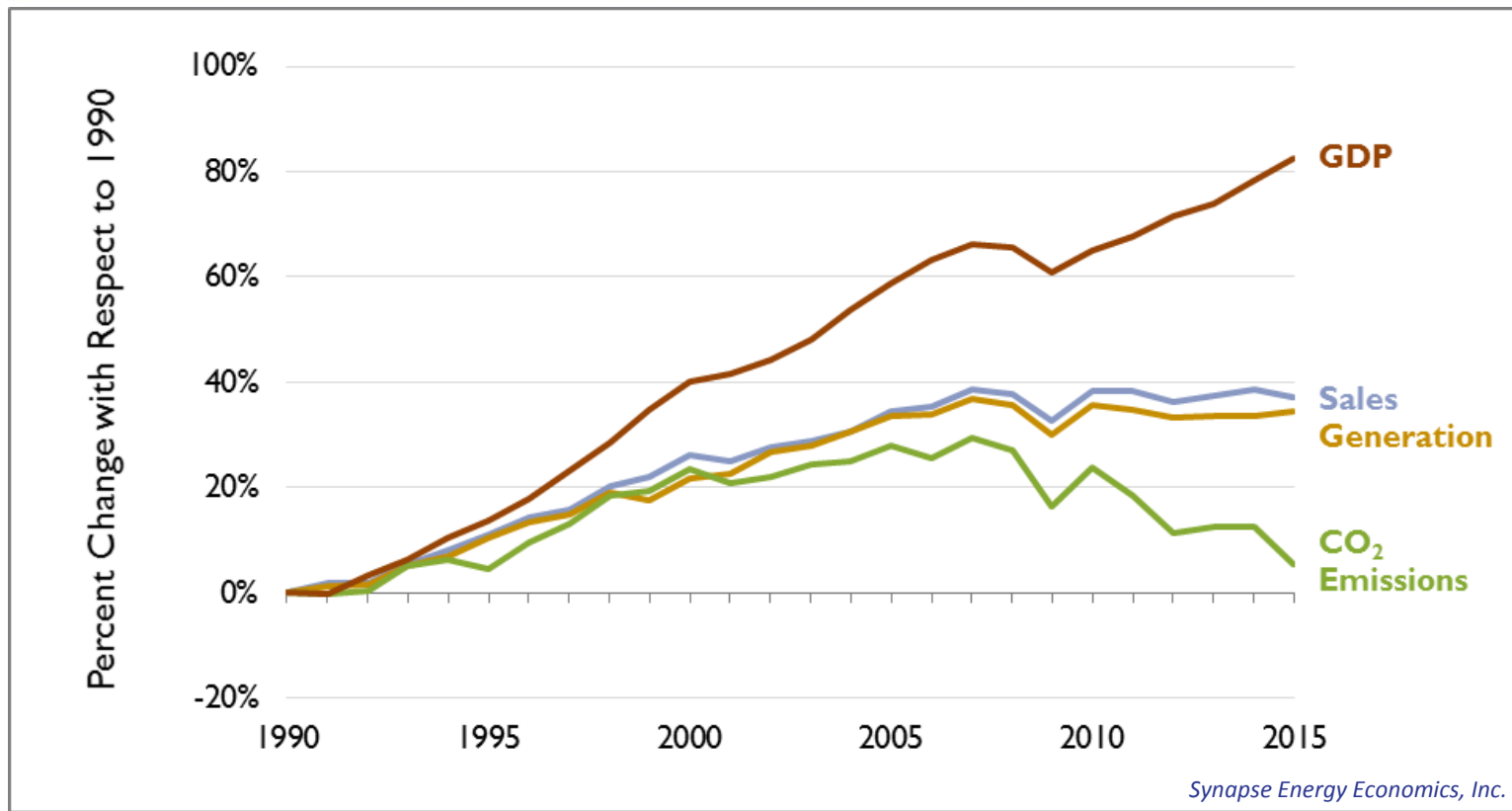
In many states, lower sales are linked to increases in energy efficiency measures. In 2015 the residential sector accounted for 40 percent of total retail sales; the commercial sector, 35 percent; and the industrial sector, 25 percent.

U.S. electric-sector CO₂ emissions are at their lowest levels since 1995



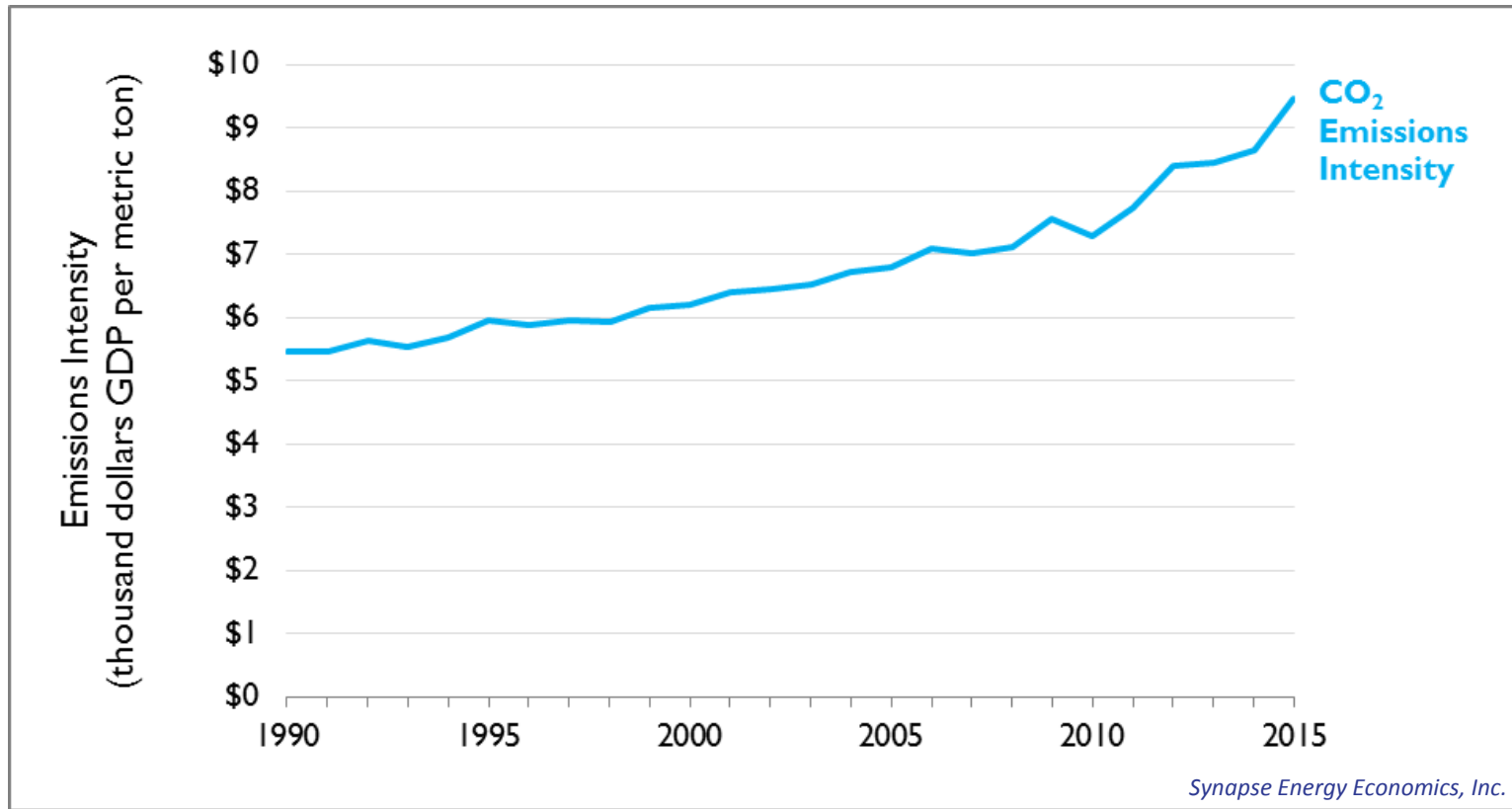
Since hitting an all-time peak in 2007, nationwide CO₂ emissions from electric generation have fallen to 1995 levels. In 2015, half of fossil fuel generation but only 27 percent of CO₂ emissions came from natural gas.

Electric sales and CO₂ emissions are increasingly unrelated to GDP growth



GDP has increased by 92 percent compared to 1990, while CO₂ emissions have only increased by 5 percent. Retail sales and generation have grown by 37 percent and 34 percent, respectively.

Carbon intensity (dollars of GDP per metric ton of CO₂) is on the rise



Note: GDP values are reported in 2015 dollars.

Far from requiring more emissions to support economic growth, since 1990, U.S. GDP produced from a single metric ton of CO₂ has grown by 73 percent from \$5,500 to \$9,500.

Notes and Sources

All 2015 values are preliminary and are subject to future updates and revisions.

"Renewables" contains wind, solar, and geothermal.

"Oil and Other" contains oil, petcoke, biomass, 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 EIA 923, 1990-2015.

Capacity: All capacity values include utility-scale capacity and net-metered distributed generation, but not energy efficiency or non-net-metered distributed generation. Capacity values are from EIA 860, EIA 826, and EIA Electric Power Monthly, 2001-2015.

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, 1990-2015.

Emissions: CO₂ emission values for 1995-2015 are from EPA Air Markets Program Data. CO₂ emission values prior to 1995 are from EIA's State Carbon Dioxide Emissions database.

GDP: GDP values are from the Bureau of Economic Analysis, National Economic Accounts, accessed March 2016.

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