

# Synapse Electricity Snapshot 2021

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A review of the U.S. electric system through December 2020

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- Renewable capacity in the United States is now at 173 gigawatts (GW), exceeding both hydro and nuclear capacity. Renewables are the third-largest resource on a capacity basis, behind natural gas and coal. Together, non-CO<sub>2</sub>-emitting generating capacity makes up 31 percent of the nationwide total and accounts for 38 percent of all generation.
- Retirement of old and uneconomic coal plants, coupled with the low marginal costs of other resources like gas, wind, and solar, has led to the lowest level of coal generation since 1972.
- As in 2018 and 2019, in 2020, natural gas generation surpassed coal generation every month.

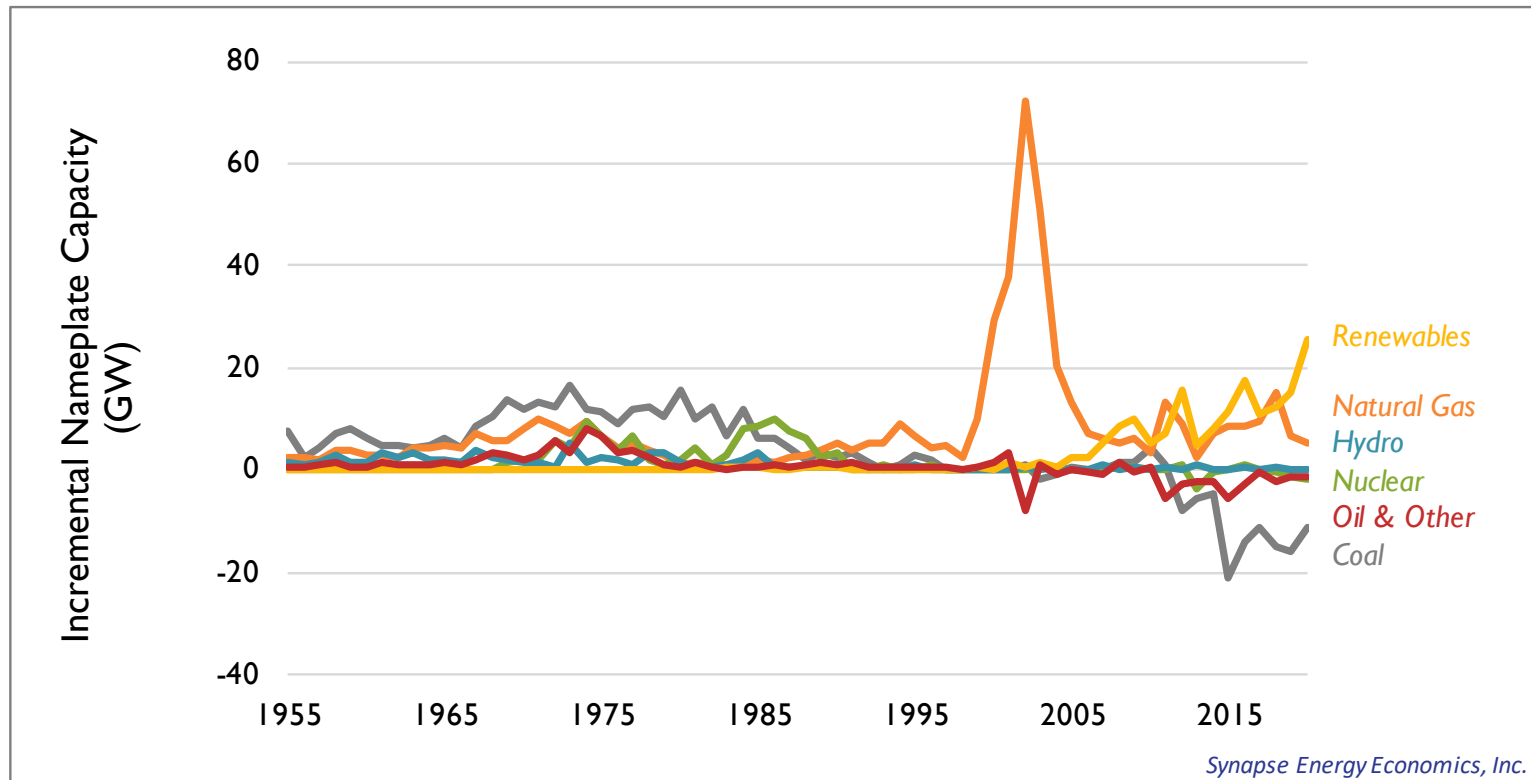
***All values in this document are based on preliminary 2020 data are subject to future updates and revisions.***

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- Except for December, every month in 2020 set a record for the lowest level of observed monthly coal generation since the late 1970s. For the first time since the early 1970s, coal generation dropped below 800 TWh per year. Coal now makes up less than one-fifth of electricity generation in the United States.
- From 2019 to 2020, annual sales decreased by 4 percent, likely due in part to the COVID-19 pandemic.
- Electric-sector CO<sub>2</sub> emissions dropped by 11 percent from 2019 to 2020. This is the largest annual decrease in CO<sub>2</sub> emissions ever observed.
- Since reaching an all-time peak in 2007, electric sector CO<sub>2</sub> emissions have declined to 1,442 million metric tons in 2020, their lowest level since the 1970s.
- Since 1990, CO<sub>2</sub> emitted per dollar of GDP has decreased by 59 percent, from 0.17 to 0.07 kg per dollar.

# More renewable energy was installed in 2020 than in any other year

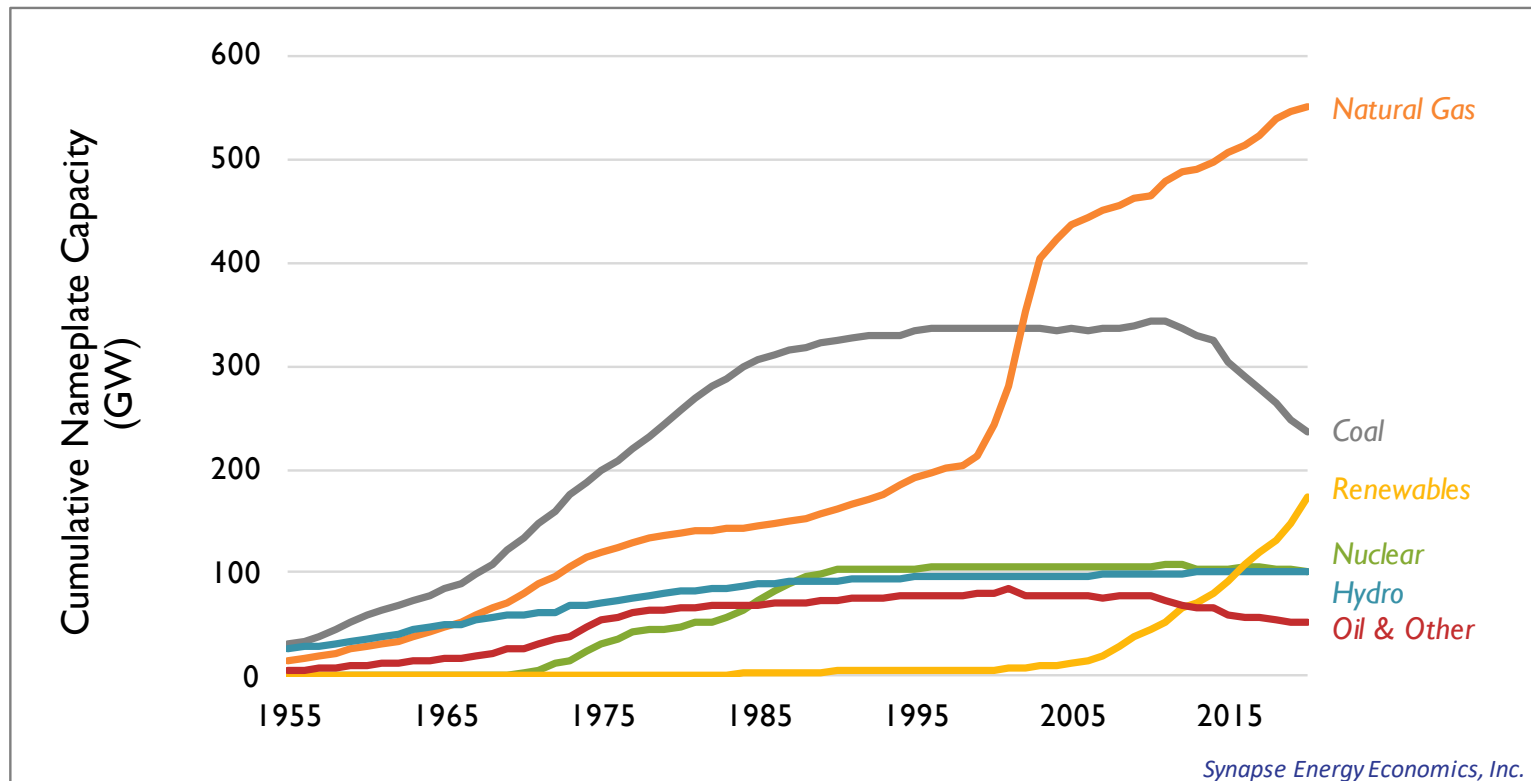


Note: This figure displays net nameplate values for utility-scale generators; annual capacity retirements are subtracted from annual capacity additions.

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

New renewable capacity installations exceeded 2019 levels by almost 70 percent. Further, new renewable capacity installations were double that of 2018 installations. Coal retirements exceeded 10 GW for the sixth consecutive year.

# 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 2020, renewable resources reached 14 percent of total U.S. generating capacity. In the 10 years since 2011, renewables have increased by 122 GW, compared to a 73 GW increase in natural gas over the same period.

107 GW of coal was retired over this same 10-year period.

# In 2020, renewables represented the largest category of net capacity additions with over 25 GW added

Capacity (GW)	Installed		Retired		Net (installed less retired)	
	2019	2020	2019	2020	2019	2020
Coal	-	<0.1	14.4	10.2	-14.4	-10.1
Natural Gas	8.6	7.3	4.9	3.0	3.8	4.3
Nuclear	-	-	1.7	2.0	-1.7	-2.0
Hydro	<0.1	0.2	0.1	<0.1	-0.1	0.1
Renewables	15.0	25.3	0.1	0.1	14.8	25.1
<i>Geothermal</i>	<0.1	<0.1	<0.1	-	<0.1	<0.1
<i>Storage</i>	0.2	0.4	<0.1	<0.1	0.2	0.4
<i>Solar</i>	5.5	10.2	<0.1	-	5.5	10.2
<i>Wind</i>	9.3	14.6	0.1	0.1	9.2	14.5
Oil and Other	0.3	0.1	1.2	1.5	-1.0	-1.4
<i>Biomass</i>	0.2	0.1	0.6	<0.1	-0.4	<0.1
<i>Oil</i>	<0.1	<0.1	0.4	1.3	-0.4	-1.3
<i>MSW</i>	<0.1	<0.1	0.2	0.1	-0.2	-0.1
<i>Other</i>	0.1	-	<0.1	-	<0.1	<0.1
<b>Total</b>	<b>23.9</b>	<b>32.8</b>	<b>22.4</b>	<b>16.7</b>	<b>1.5</b>	<b>16.1</b>

In 2020, renewables were the largest category of capacity additions with a net 25 GW of installations—including over 10 GW from solar and almost 15 GW from wind.

Natural gas placed second, with over 4 GW of net capacity additions, slightly more than in 2019.

Over 10 GW of coal retired in 2020, down from 14 GW of retirements in 2019.

## Coal capacity is at its lowest level since 1978

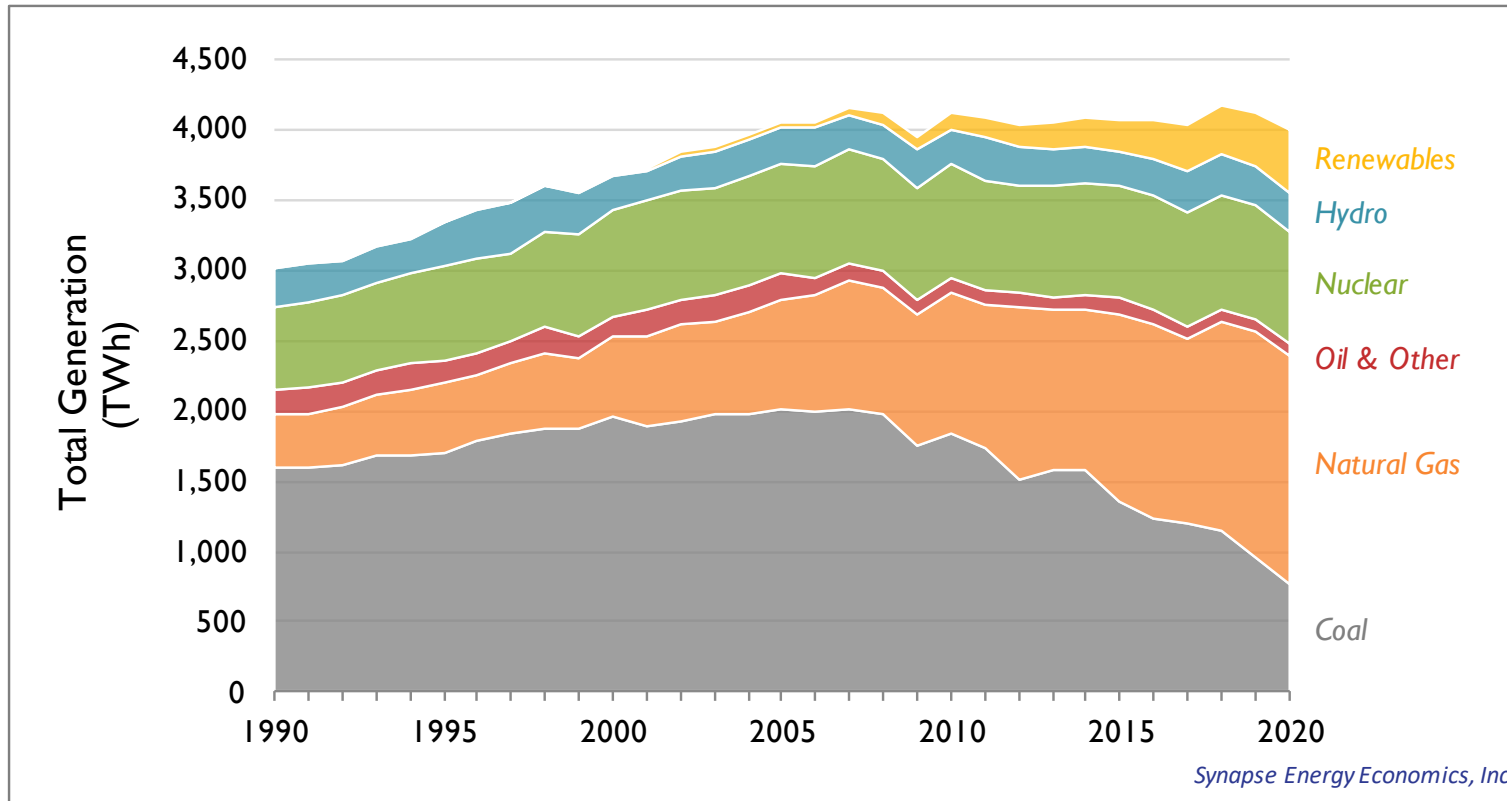
	State	Retired Capacity (Nameplate MW)
1	Ohio	1,603
2	Kentucky	1,596
3	Washington	730
4	Maryland	724
5	Texas	720
-	Other States	4,781
	<b>Total</b>	<b>10,154</b>

Over 10 GW of coal retired in 2020.

Coal retirements took place in 18 states.

Since 2011, 107 GW of coal has retired (a decrease of 31 percent).

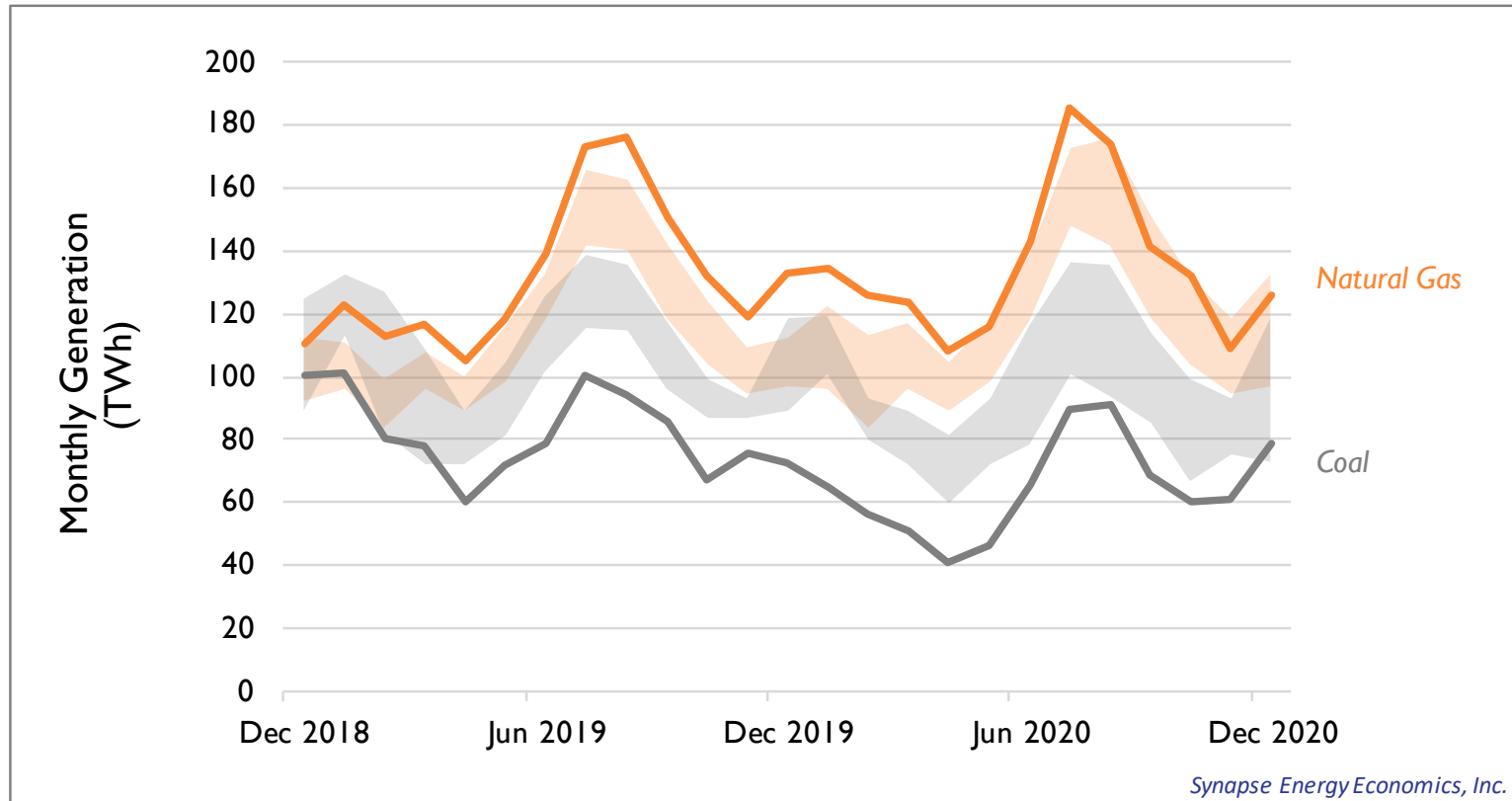
# Coal generation is at its lowest level since 1972



In 2020, the amount of electricity generated from natural gas was more than twice that from coal. Since 2011, total annual U.S. generation has declined by an average of 0.3 percent per year. For the first time since the early 1970s, coal generation dropped below 800 TWh per year. Coal now makes up less than one-fifth of electricity generation in the U.S.



# Coal generation continues to decline



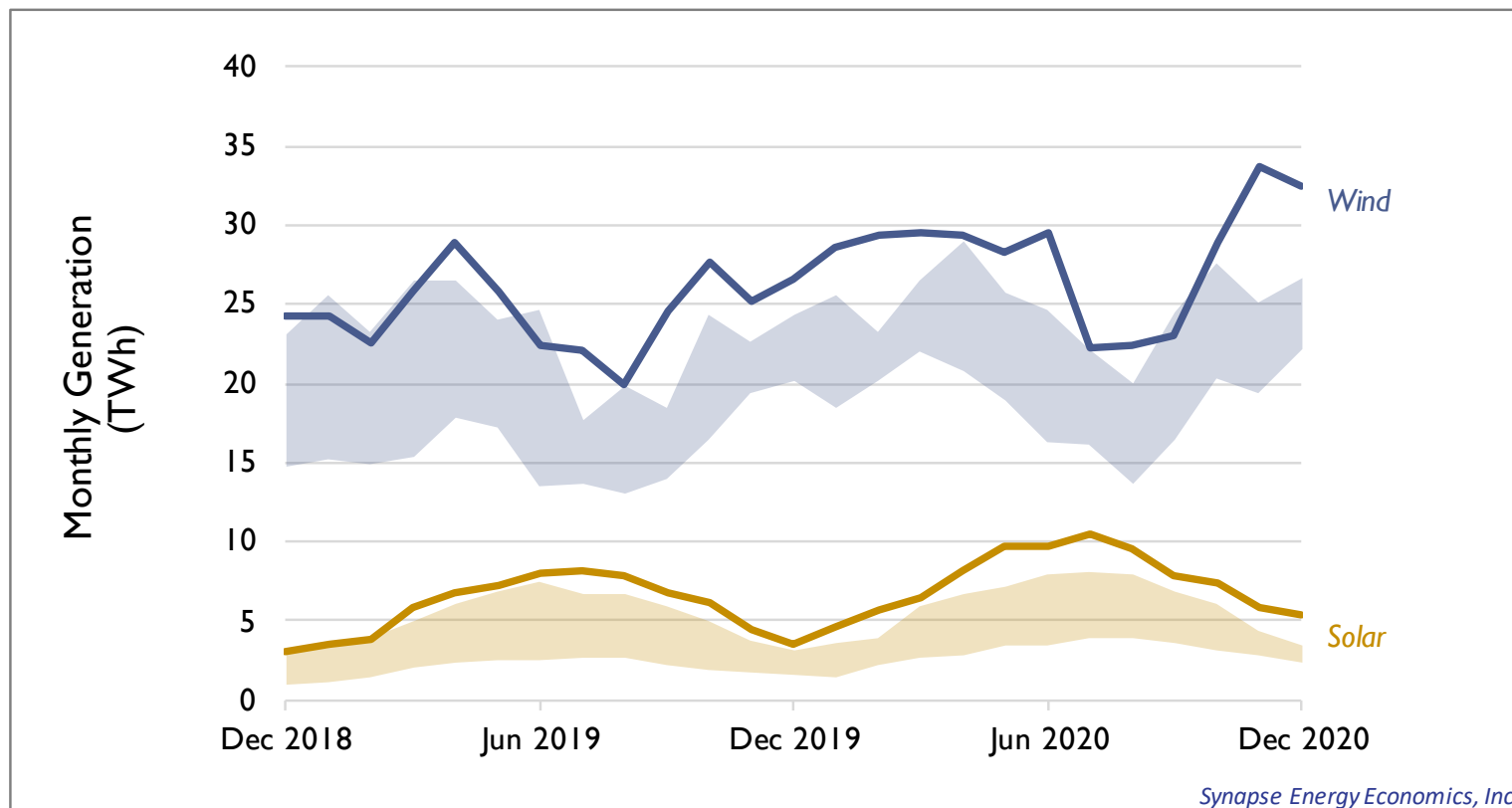
*Note: This figure shows monthly generation compared to the previous four-year range.*

*For example, the December 2020 coal line is compared to the range of coal generation (grey shaded area) in Dec. 2016, Dec. 2017, Dec. 2018, and Dec. 2019.*

Except for December, every month in 2020 set a record for the lowest amount of coal generation observed during that month since the 1970s.

As in 2018 and 2019, natural gas generation exceeded coal generation in every month of 2020.

# In 2020, wind made up about 4/5 of total renewable generation



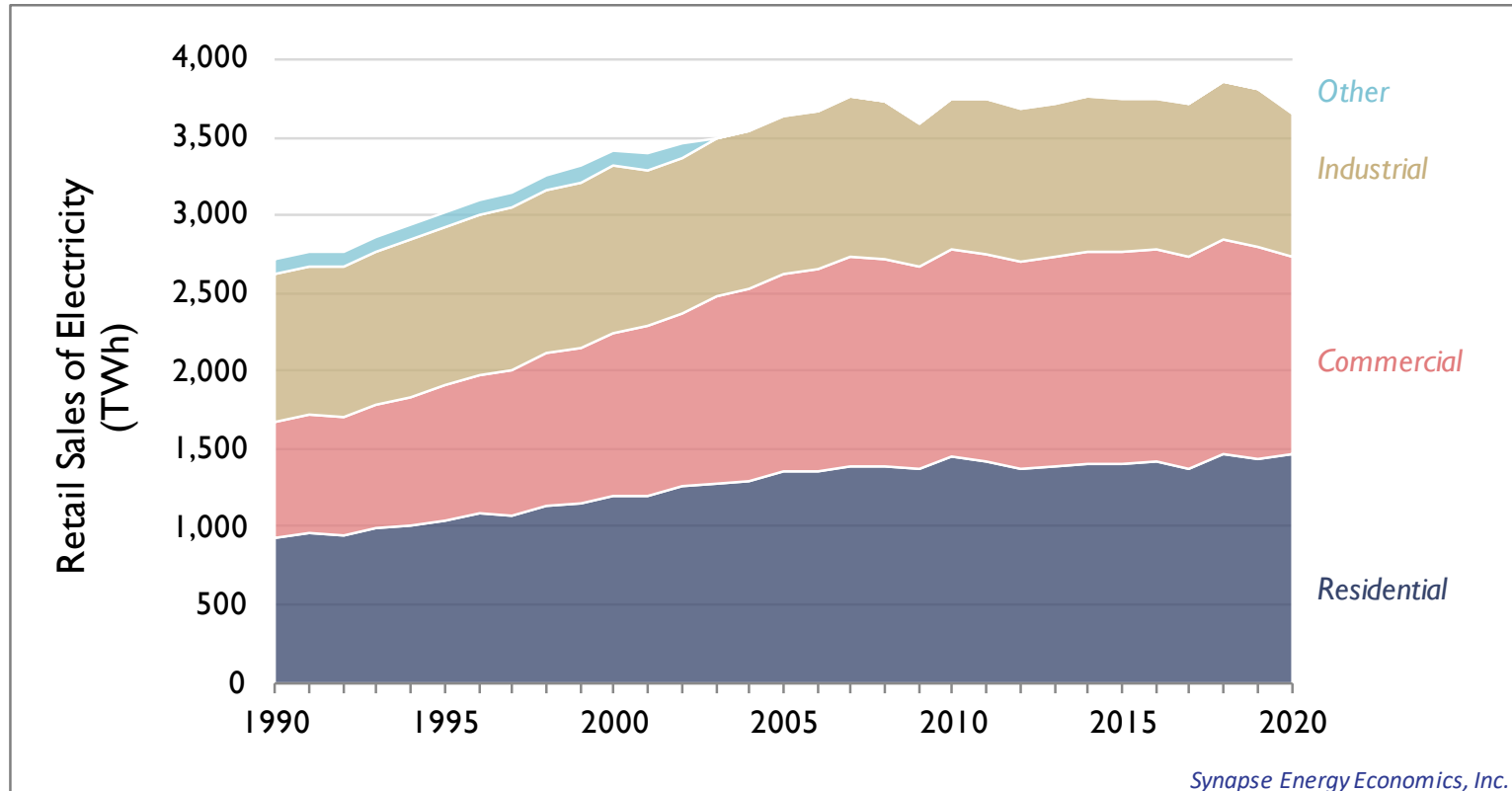
Note: This figure shows monthly generation compared to the previous four-year range.

For example, the December 2020 wind line is compared to the range of wind generation (purple shaded area) in Dec. 2016, Dec. 2017, Dec. 2018, and Dec. 2019).

Annual wind generation increased by 14 percent in 2020, relative to 2019. At the same time, annual utility-scale solar generation grew by 26 percent.

Both wind and solar reached historical peaks for monthly generation in 2020 (November for wind, and July for solar).

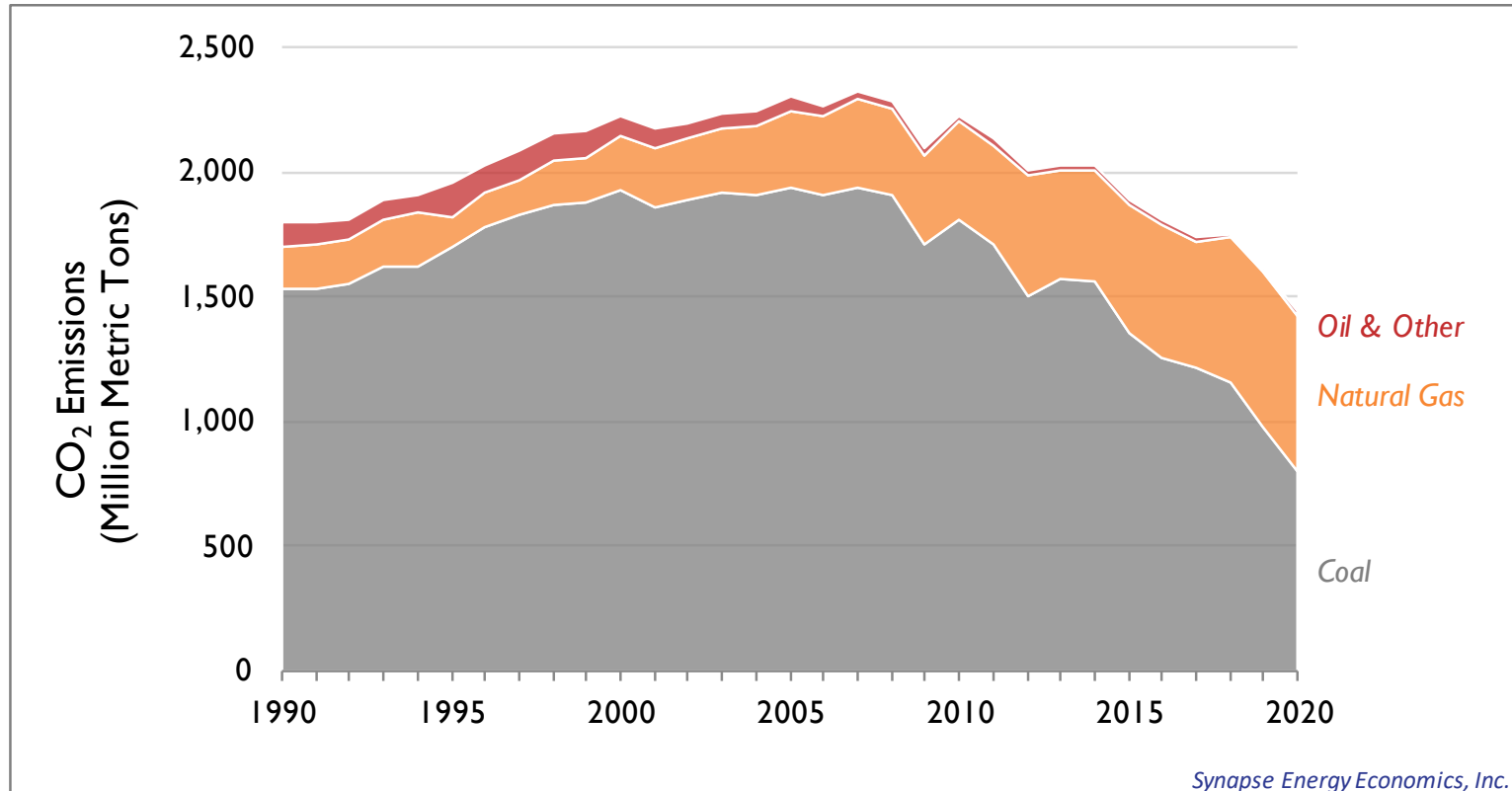
# Retail sales have declined an average of 0.2 percent per year since 2011



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

From 2019 to 2020, annual sales decreased by 4 percent, likely due in part to the COVID-19 pandemic. Commercial and industrial sales decreased while residential sales increased.

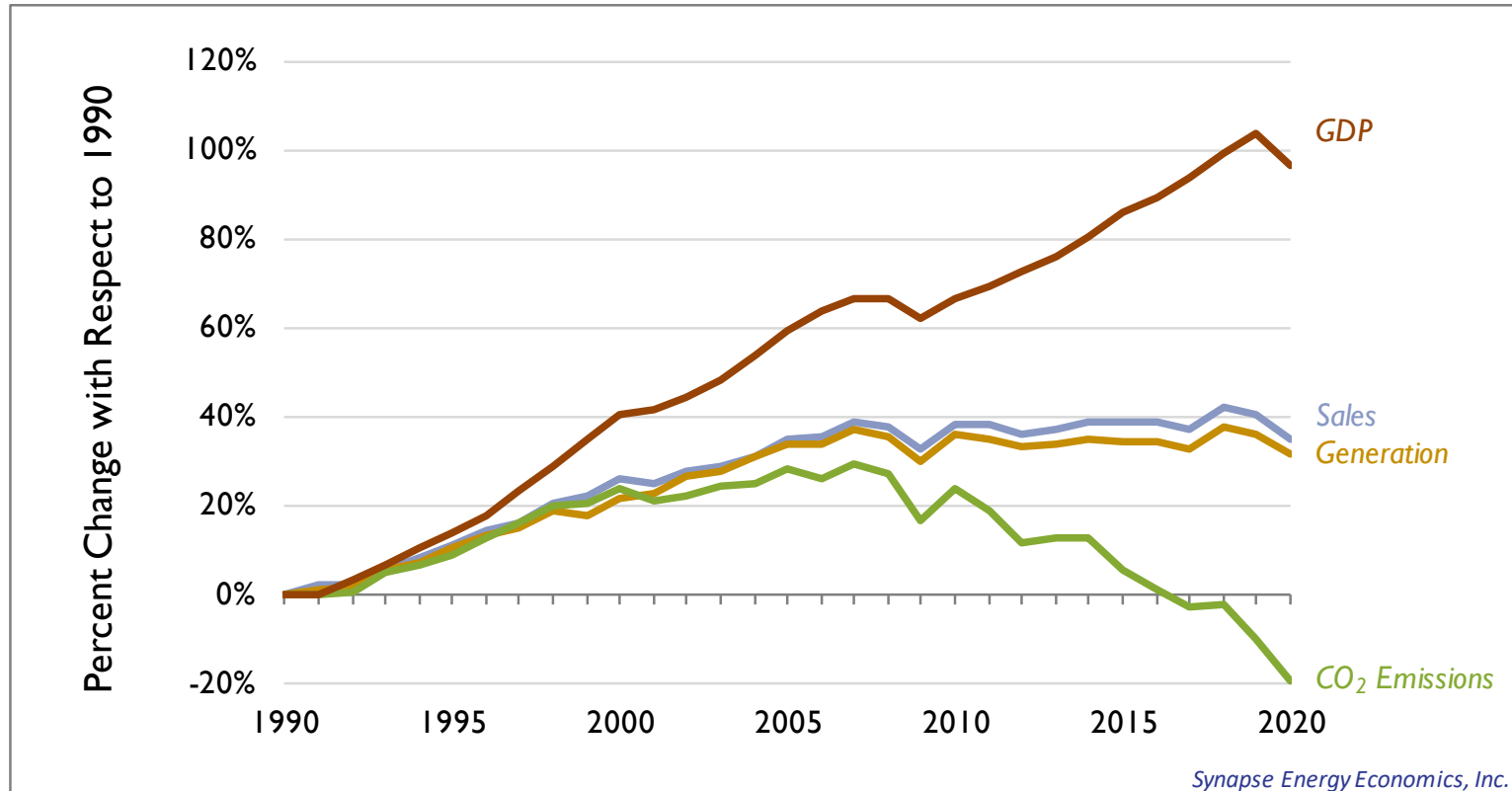
# U.S. electric-sector CO<sub>2</sub> emissions are at their lowest levels since the 1970s



Since hitting an all-time peak in 2007, CO<sub>2</sub> emissions from the electric sector have dropped by 38 percent.

Electric-sector CO<sub>2</sub> emissions dropped by 11 percent from 2019 to 2020. This is the largest single-year decrease in CO<sub>2</sub> emissions ever observed for this sector.

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

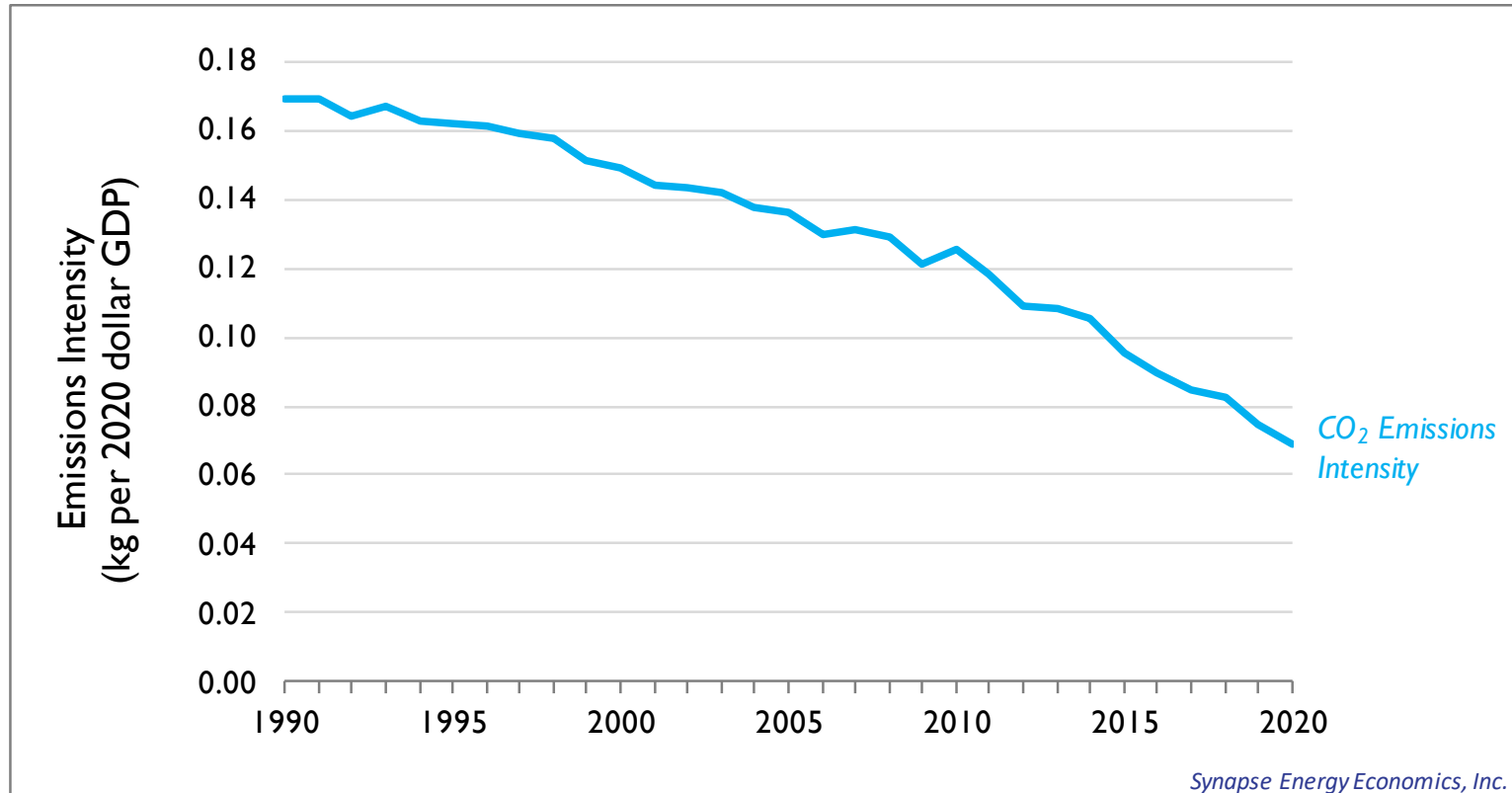


Despite an economic contraction due to the COVID-19 pandemic, GDP has increased by 97 percent compared to 1990.

Meanwhile, CO<sub>2</sub> emissions continue to fall below 1990 levels.

Both retail sales and generation have grown by 32 percent since 1990, yet have remained largely constant since 2006.

# Carbon intensity (CO<sub>2</sub> per GDP) continues to decline



Note: GDP values are described in 2020 dollars.

Since 1990, the kg of CO<sub>2</sub> emitted per dollar of GDP has fallen by 59 percent, from 0.17 to 0.07 kg/\$.

# Notes and Sources

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All 2020 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, 1990-2020.

**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, 2001-2020.

**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, 1990-2020.

**Emissions:** CO<sub>2</sub> emission values for 1995-2020 are from U.S. Environmental Protection Agency Air Markets Program Data (note that data only includes emissions from plants that are 25 MW or larger). 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 2020.

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

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