

# Electricity Sector Emissions and Expanding Renewable Energy in Colorado

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- U.S. CO<sub>2</sub> equivalent emissions must be reduced 51% by 2030 to remain consistent with the IPCC target of limiting warming to 1.5° Celsius
- In 2019, Colorado legislated targets of reducing emissions “26% by 2025, 50% by 2030, and 90% by 2050 from 2005 levels”
- Electricity generation accounts for roughly 25% of Colorado emissions, and the state’s Renewable Portfolio Standard legislation is targeting an 80% reduction in emissions from electric power by 2030 and 95% by 2050

To avoid catastrophic consequences<sup>1</sup> from climate change, the IPCC advises that global warming must be limited to 1.5° Celsius (C) from pre-industrial times. The University of Maryland Center for Global Sustainability suggests, “emissions reductions of 51% below 2005 levels by 2030 [would] put the U.S. on a trajectory to net-zero emissions in 2050, consistent with limiting global warming to 1.5°C” (Hultman et al. 2021), and in April 2021 the Biden administration announced its intention to meet this target (Friedman and Davenport 2021).

By passing House Bill 19-1261, the Climate Action Plan to Reduce Pollution, Colorado established targets of reducing *overall* emissions “26% by 2025, 50% by 2030, and 90% by 2050 from 2005 levels” (Colorado Department of Transportation, 2021). Renewable Portfolio Standards (RPS) are the primary legislation designed to address emissions in the electricity sector, which accounts for roughly 25% of Colorado emissions (Conservation Colorado, 2022).

Following its start date in 2004, the Colorado RPS mandated that covered entities—utilities and other electricity generators<sup>2</sup>—produce their electricity with a progressively larger share of renewable energy, necessarily reducing reliance on fossil fuels and thereby reducing emissions. Between 2008-2010, investor-owned utilities (IOUs) were required to supply at least 5% of retail electricity sales from eligible energy resources—mostly renewables<sup>3</sup>—while electric cooperatives and municipal utilities were required to supply at least 1% from eligible resources. These mandated shares were progressively increased, reaching 20% and 10% starting in 2020 for IOUs and electric cooperatives and municipal utilities respectively (DSIRE, 2022).

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<sup>1</sup> At 2°C warming, the IPCC predicts more frequent heat waves, food insecurity, drought, flooding, and migration crises, along with greater incidence of disease, reduced GDP growth, sea-level rise, ecosystem loss, and species extinction, together contributing to significant loss of human life. United Nations Secretary-General António Guterres warns us, “We have a choice. Collective action or collective suicide... Half of humanity is in the danger zone from floods, droughts, extreme storms and wildfires. No nation is immune.” (Clifford, 2022).

<sup>2</sup> See DSIRE (2022) for specific criteria on covered entities.

<sup>3</sup> Eligible resources include geothermal, solar thermal, solar photovoltaics, wind, biomass, hydroelectric, landfill gas, anaerobic digestion, and fuel cells using renewable fuels recycled energy. Also eligible, if determined to be emissions neutral, are coal mine methane and pyrolysis of municipal solid waste (DSIRE, 2022).

Over this period, coal-powered electricity has been significantly reduced, from 72% of the total in 2005 to 36% in 2020 (see Figures 1 and 2). As a result, carbon dioxide equivalent emissions (CO<sub>2</sub>e)<sup>4</sup> from coal-powered electricity declined 55% between 2005 and 2020, from 55 million metric tons (MMT) to 24 MMT (see Figure 1). Despite increases in natural gas usage and coinciding emissions, which grew 45%, overall emissions have declined 45%, due to coal's greater emissions intensity relative to natural gas and decreasing share of the energy portfolio (EIA, 2022).

Among renewable energy (RE) sources, solar and wind energy generation have grown the most, increasing by 68,000% and 930% between 2007 and 2020, respectively. However, solar increased from a base of nearly zero (.002 million MWh) to only 1.5 million MWh, whereas wind increased from 1.3 to 13 million MWh (see Figure 1). In 2020, wind accounted for 25% of total electricity, with coal and natural remaining the largest primary energy sources (EIA, 2022).

Looking ahead, Colorado will require that utilities serving 500,000 or more customers generate 100% of their electricity with eligible sources by 2050, provided that meeting the requirement is “technically and economically feasible and in the public interest.” (NCLS, 2022). This would include the largest utility in Colorado, Public Service Company of Colorado—a subsidiary of Xcel Energy—that accounts for 52% of electricity consumption. Moreover, the current administration's goal is to reduce emissions 80% below 2005 levels by 2030. However, the 2030 target is not legally binding for all utilities<sup>5</sup> (Colorado Department of Transportation, 2021).

If the 2030 targets are to be achieved, coal-fired power plants will need to be retired ahead of schedule and replaced with less carbon-intensive alternatives (Colorado Department of Transportation, 2021). Additionally, assuming that negative emissions technology is not deployed at scale<sup>6</sup>, the 2050 net zero target will require eliminating all fossil fuel-powered electricity generation, including a reversal of recent natural gas expansion.

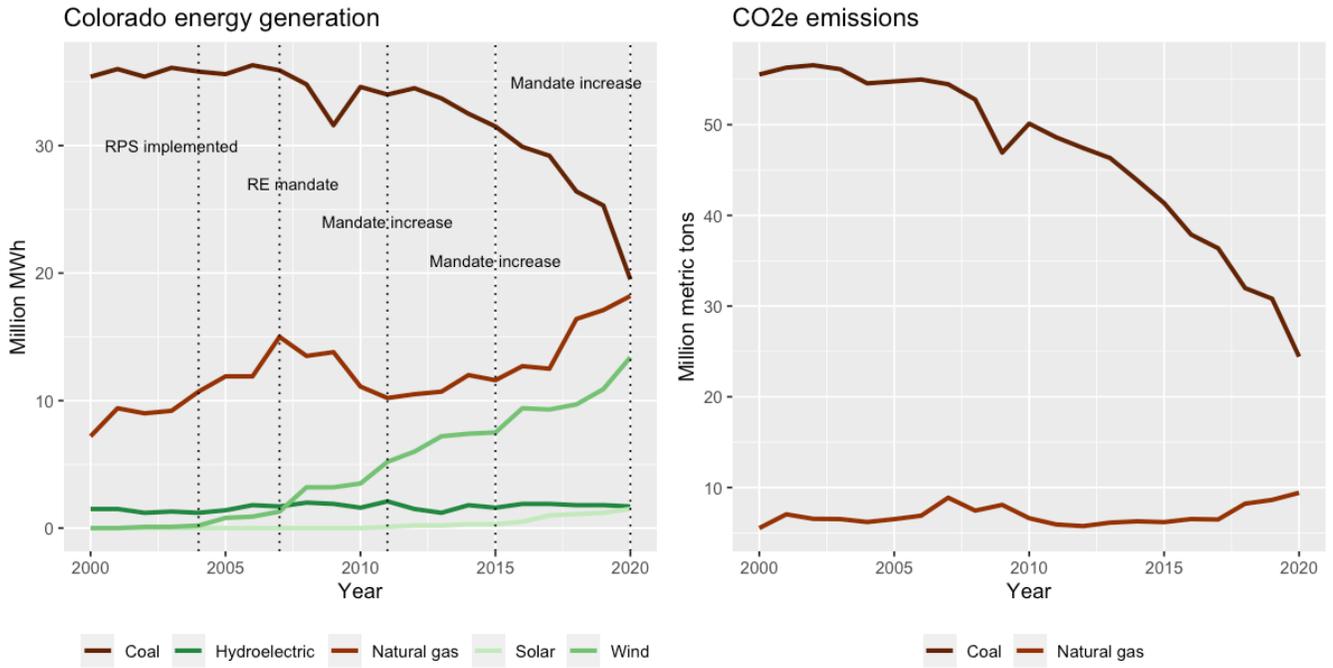
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<sup>4</sup> This CO<sub>2</sub>e figure includes carbon dioxide and nitrogen oxide, but excludes methane, based on data availability from EIA (2022).

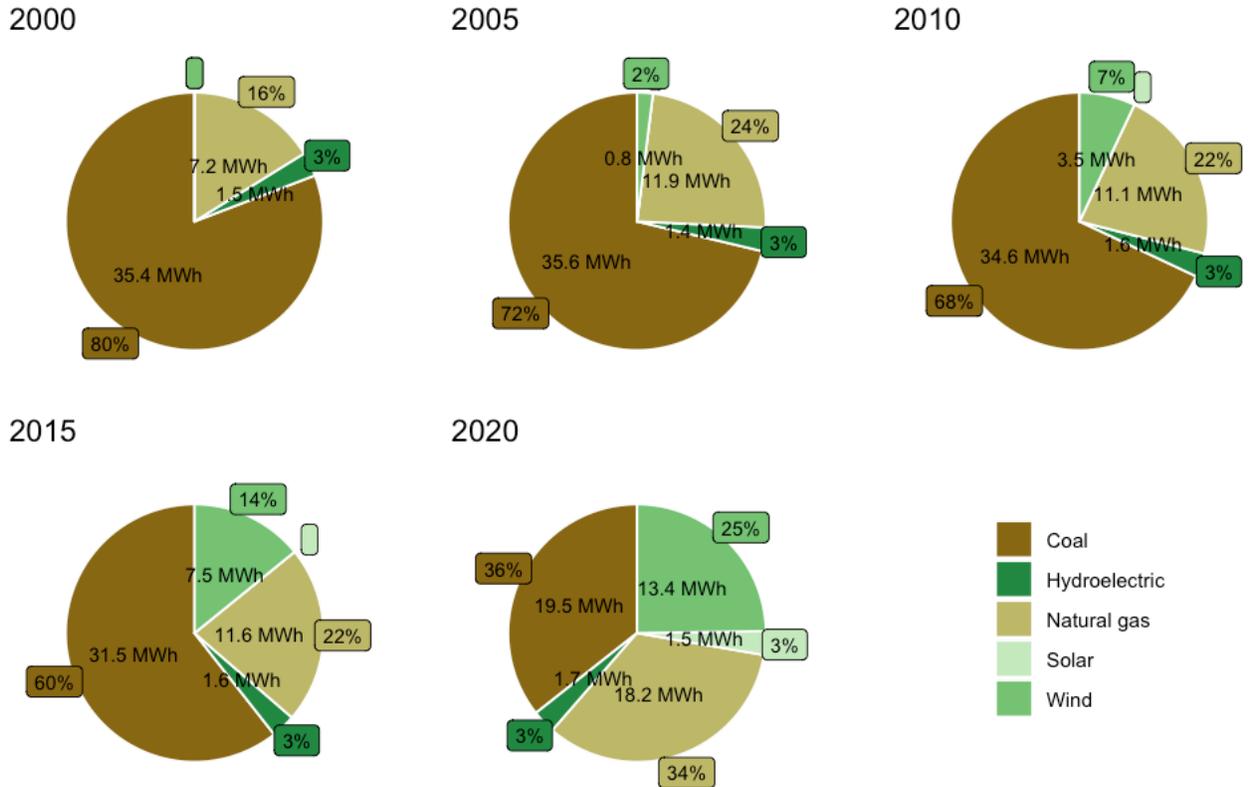
<sup>5</sup> In 2019, SB 19-236 was passed, requiring that Xcel Energy submit a Clean Energy Plan detailing how the 2030 will be achieved (Colorado Department of Transportation, 2021).

<sup>6</sup> Proving commercially unviable, the primary negative emissions technology, carbon capture and storage, has not been implemented at scale in the United States (Calma, 2022).

**Figure 1**



**Figure 2: Colorado electricity generation by sector (MWh)**



In terms of total electricity consumption in 2016, commercial usage accounted for the greatest share, at 20 million MWh, followed by the residential and industrial sectors, at 16.6 and 13.7 million MWh, respectively. On a per capita basis, San Juan, Mineral, and Kiowa counties had the highest industrial usage, at 98.38, 94.53, and 25.66 MWh per capita (see Figure 3). San Juan, Pitkin, and Cheyenne counties registered the highest commercial usage—12.29, 9.16, and 8.58 MWh per capita (see Figure 3)—while Mineral, Washington, and Sedgwick counties had the highest residential usage—5.02, 4.66, and 4.58 (OEDI, 2022).

Of note, the counties listed above are among the least populous in Colorado, whereas the most populous counties tend to have lower per capita consumption levels (see Table 1 and Figure 3).

**Table 1: Electricity consumption of most populous counties, ranked**

County	Residential MWh per capita	Residential rank (of 64)	Commercial MWh per capita	Commercial rank (of 64)	Industrial MWh per capita	Industrial rank (of 64)
El Paso	3.12	49	2.09	56	1.02	58
Denver	2.83	57	5.84	13	3.25	35
Arapahoe	3.07	50	3.79	32	2.04	45

**Figure 3: Colorado electricity consumption by sector per capita (MWh) – 2016**

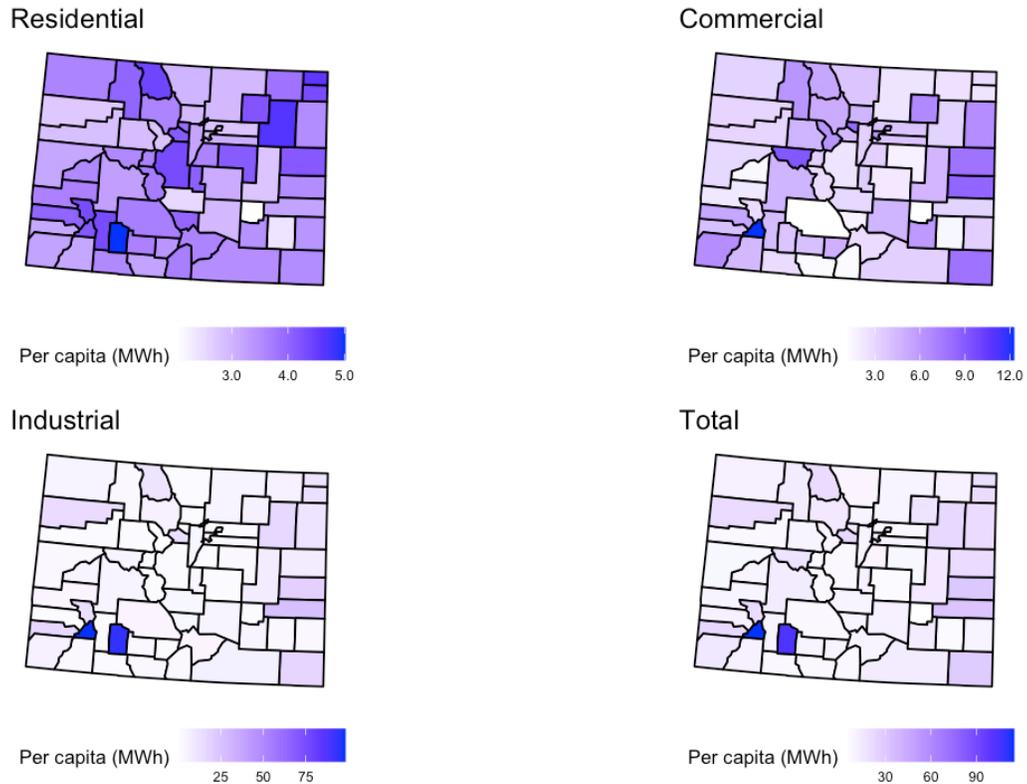


Figure 4: Colorado counties



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