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Regional Energy Inventory

2019 data for Eagle, Garfield and Pitkin counties, Colorado

KEY FINDINGS

Regional energy use by buildings and industry

- Electricity: 1.86 billion kilowatt-hours (kWh)
- Natural gas: 119.5 million therms

Regional spending on energy for buildings and industry

- Electricity: $193 million
- Natural gas: $72 million
- Total: $265 million combined electricity and natural gas

Carbon emissions in carbon dioxide equivalent (CO2e)

- Electricity: 848,360 metric tons CO2e
- Natural gas: 639,122 metric tons CO2e
- Total: 1,487,482 metric tons CO2e

Solar capacity (2020)

- Existing installed community-scale: 8.4 megawatts
- Existing installed net-metered: 24.1 megawatts

2.1 Introduction

To learn how much of the electricity used in the three-county region could be produced locally, the project team conducted an inventory of 2019 energy use in Eagle, Garfield and Pitkin counties. The inventory compiled energy use in buildings and industry for electricity and for natural gas, using data from energy utilities serving the region.

This 2019 data sets regional baselines for energy use, types of energy fuels, types of users, energy costs and resulting greenhouse gas (GHG) emissions.

Taking a regional look at energy use allows us to:

- Identify anomalies in energy use and cost.
- Simplify data collection efforts for towns and cities in the region.
- Design energy policies in the context of regional opportunities and challenges.

Because of the difficulty in gathering localized data, the inventory does not measure:

- Transportation energy use from vehicles or aviation.
- Emissions from sources such as agriculture, landfills, cement manufacturing and dispersed use of propane.
- Per-capita energy usage, due to the prevalence of residences not occupied full-time.[1]

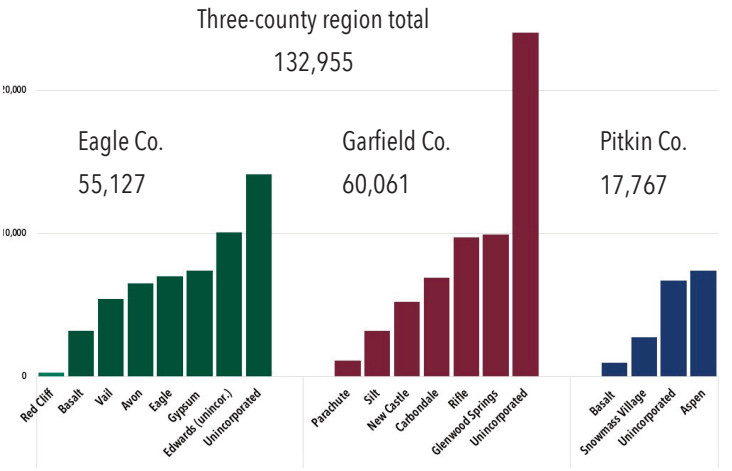
State law prohibits utilities from releasing energy usage data from single, identifiable users. To account for this use, the inventory uses proxy usage and cost numbers. Refer to Methods section 2.9, for an explanation of how proxy energy usage was calculated.

2.2 Regional Demographics

Located on Colorado's Western Slope, the economy driving the three-county region is a mix of agriculture, ski and summer resorts, and natural gas production.

Each county is home to several municipalities, along with suburban development in surrounding unincorporated areas.

Figure 1. Population distribution by community for Eagle, Garfield and Pitkin counties, 2019



(Note: incorporated town of Basalt straddles the Eagle-Pitkin county line)

[1] The region's thriving tourism and recreation industry attracts thousands of part-time residents. Energy usage patterns are different for residences occupied full-time compared to those occupied part-time. The rate of residences occupied part-time is 39% in Pitkin County, 38% in Eagle County and 10% in Garfield County.

2.3 Regional Energy Baselines

2.3.1 Energy Utility Service Territories

Understanding energy use and conducting energy inventories in the three-county region is complicated by the multiple utilities and the division of their service territories.

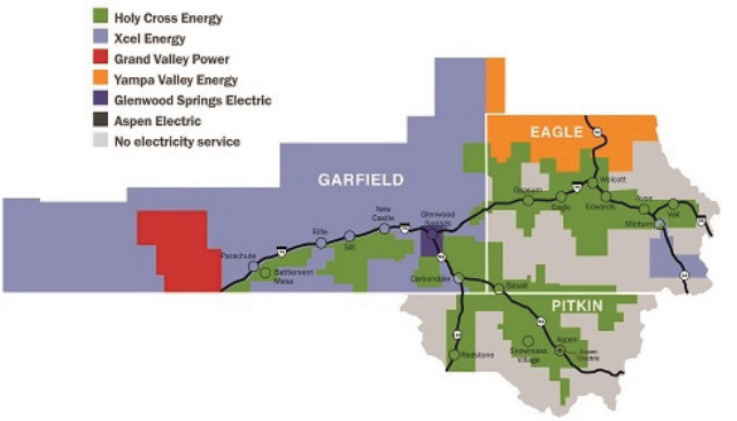
Electric utilities: 7

Xcel Energy
Holy Cross Energy
Aspen Municipal Utility
Glenwood Springs Electric
Grand Valley Power
Yampa Valley Energy

Natural gas utilities: 2

Xcel Energy
Black Hills Energy

Figure 2: Electric utilities service territories



2.3.2 Electric Utilities:

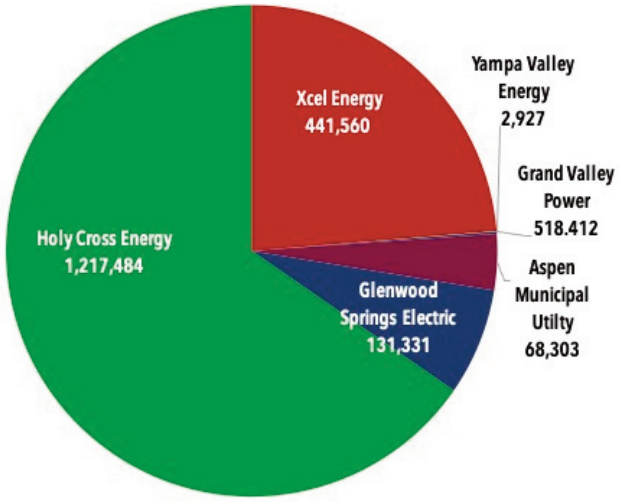
Customers and Kilowatt-Hours

There are 67,885 residential customers and 15,766 commercial customers in the region. Xcel Energy and Holy Cross Energy are the dominant providers of electricity in the region, serving 90% of residential customers and 85% of commercial customers.

Table 1: Electric utility customers and electricity provided in 2019

Electric utility	Total customers	Megawatt-hours sold
Holy Cross Energy	57,727	1,217,484
Xcel Energy	16,626	441,560
Glenwood Springs Electric	6,195	131,331
Aspen Municipal Utility	3,057	68,302
Yampa Valley Energy	Not provided	2,927
Grand Valley Power	46	518
TOTAL	**83,651**	**1,859,590**

Figure 3: Megawatt-hours supplied by electric utility, 2019



2.3.3 Natural Gas Utilities:

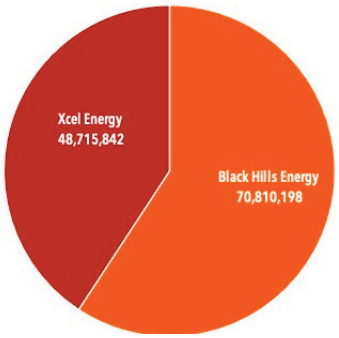
Customers and Therms

There are 50,659 residential customers and 7,987 commercial customers in the region. Black Hills Energy is the dominant provider of natural gas in the region, serving 68% of residential customers and 75% of commercial customers.

Table 2: Natural gas utility customers and therms provided in 2019

Natural gas utility	Total customers	Therms sold
Black Hills Energy	40,249	70,810,198
Xcel Energy	18,388	48,715,842
TOTAL	**58,637**	**119,526,040**

Figure 4: Therms supplied by natural gas utility, 2019



2.4 Merging Electricity and Natural Gas into BTUs

British Thermal Units (BTUs) is a measure of heat content and a way of converting energy sources and fuels into a common unit. Converting kilowatt-hours of electricity and therms of natural gas to BTUs provides an overall picture of energy use in buildings and industry. One million BTUs is abbreviated as mmBtu.

- One therm of natural gas equals 100,000 BTUs
- One kilowatt-hour of electricity equals 3,412 BTUs

2.5 Regional Energy Usage

In 2019, buildings and industry in the region used:

- Electricity: 1.86 billion kilowatt-hours or 6,346,000 mmBTUs
- Natural gas: 119.5 million therms or 11,952,000 mmBTUs.
- Combined total in BTUs: 18,258,118 mmBTUs

Figure 5: Regional energy use by fuel type and by utility in mmBTUs, 2019

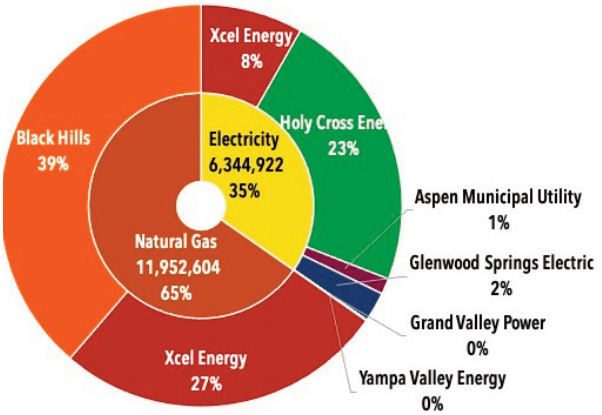


Figure 6: Electricity in megawatt-hours used by county and by sector, 2019

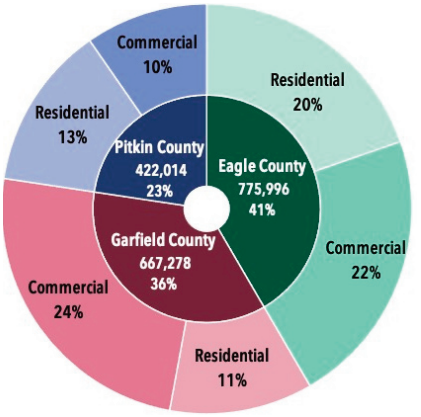
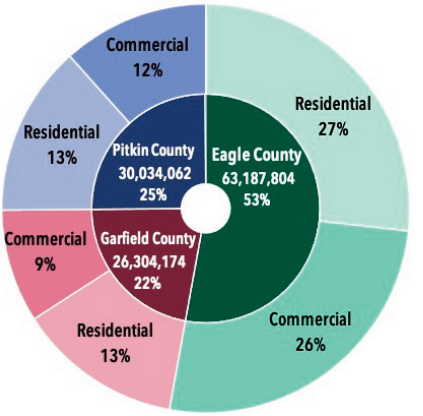


Figure 7: Natural gas in therms used by county and by sector, 2019



2.6 Regional Energy Costs

In 2019, utility customers in Garfield, Eagle and Pitkin counties spent $193 million for electricity and $72 million for natural gas, for an estimated total of $265 million. Half of all energy sales were by Holy Cross Energy.

While electricity accounted for 35% of regional energy use (Figure 5), it accounted for 73% of regional energy spending.

By county, energy costs totaled $114 million in Eagle County, $84 million in Garfield County and $66 million in Pitkin County.

In Garfield County, energy costs for commercial customers totaled more than residential customers. In Eagle and Pitkin counties, residential totals were higher than commercial.

Figure 8: Regional energy cost by utility in millions of US dollars, 2019

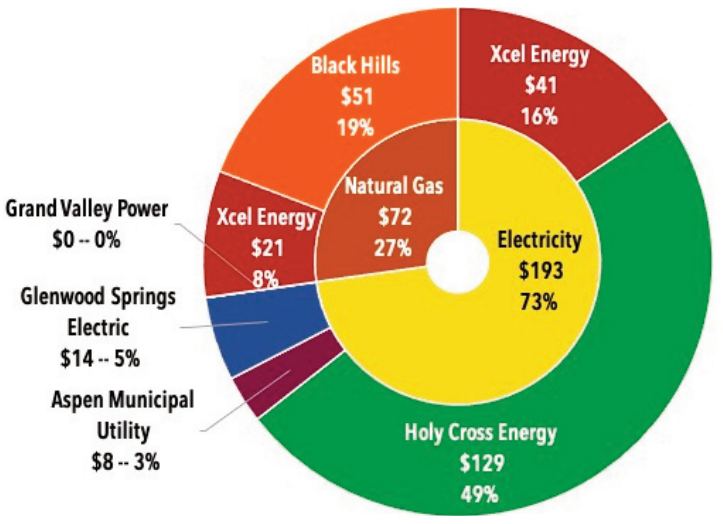
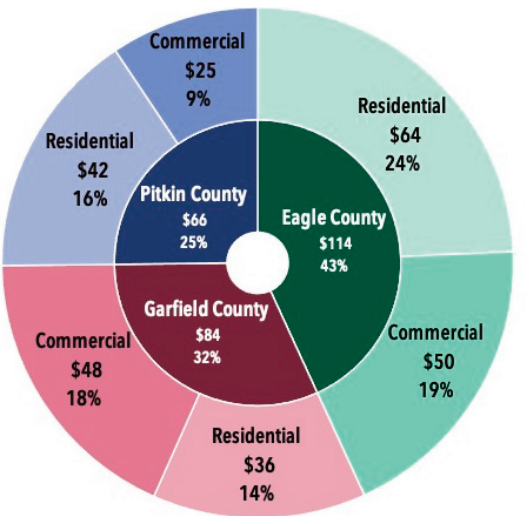


Figure 9: Regional energy cost by county and by sector in millions of US dollars, 2019



2.7 Regional Solar Inventory

2.7.1 Net-Metered Solar Systems

The three-county region has been a leader in the state and country for more than 20 years in creating programs and policies that encourage installation of net-metered solar systems.

Table 3. Net-metered solar capacity in the region, by utility, 2020

	Generating capacity in kilowatts (kW)	Est. generation per year in megawatt-hours (MWh)
Holy Cross Energy	16,740 kW	25,110 MWh
Xcel Energy	6,458 kW	9,687 MWh
Glenwood Springs	936 kW	1,404 MWh
TOTAL	**24,134 kW**	**36,201 MWh**

Net-metered systems refer to the solar that is installed on rooftops or adjacent land and provide electricity to the building or facility that is on that site.

Systems can be sized to provide up to 120% of the energy used on that site, but the actual percentage varies greatly.

Net-metered systems use energy produced by the on-site solar during the day, and may draw electricity from the grid at night or when under snow cover. These systems use meters that spin forward and backward.

Utilities measure the net energy use, hence the "net metering" description. Utilities typically sell little to no net energy to net-metered customers.

Therefore, most of these systems and the renewable energy they produce are not reported in the fuel mix offered by electric utilities.

The only systems reported in a utility fuel mix are those enrolled in Xcel Energy's Solar*Rewards program.

2.7.2 Utility-Scale and Community-Scale Solar

Utilities add larger quantities of solar energy to their fuel mix through utility-scale and community-scale solar arrays. These are typically built by a private developer, with the produced energy or the array itself sold to utilities through a power-purchase agreement. Arrays may also be built and owned by the utility itself.

Utility-scale solar is typically 15 MW or more in size, covering 75 or more acres and connected directly to regional transmission lines. If the array is not owned by the utility, its power is sold directly to a utility. There are currently no utility-scale solar arrays in the three-county region. Xcel Energy and Holy Cross Energy buy renewable electricity under contracts with utility-scale arrays located elsewhere.

Table 4. Community-scale solar arrays and capacity in the region, by utility, existing and in process

	Solar arrays	Generating capacity in kilowatts (kW)	Est. generation per year megawatt-hours (MWh)
EXISTING			
Holy Cross Energy	4	6,440 kW	11,592 MWh
Xcel Energy	2	2,000 kW	3,600 MWh
Existing subtotal	6	8.4 MW	15,192 MWh
IN PROCESS			
Holy Cross Energy	3	24.5 MW	44,516 MWh
Xcel Energy	4	6.75 MW	12,265 MWh
In process subtotal	7	31.25 MW	56,781 MWh
TOTAL	**13**	**39.65 MW**	**71,973 MWh**

Community-scale solar is typically 1 MW to 15 MW in size, built on parcels of 5 to 75 acres, and connected to the distribution grid. These projects often enroll subscribers that purchase power from the project to offset grid use elsewhere.

The six community-scale solar projects in the region are included in the fuel mix reported by Xcel and Holy Cross. These make up 0.8% of total usage in the three-county region. Currently, most subscribers of the six community-scale solar projects in the region are local governments and large commercial customers using 20-year purchase contracts.

Under state law, 5% of the capacity from community-scale solar projects is required to provide energy for low-income household customers. Some community scale solar projects are dedicated entirely to low-income subscribers.

In this region, Xcel and Holy Cross each have an array dedicated for low-income customers. Xcel's array is 100 kW, and the Holy Cross array is 145 kW. A developer is currently building another dedicated array of 750 kW for Xcel Energy. Grand Valley Power has a 29 kW community array on its grid dedicated to serve some of its low-income customers, who are all in Mesa County.

2.8 Carbon Emissions

2.8.1 Fuel Mix

Calculating carbon emissions produced from energy used in buildings depends on carbon intensity of electricity and natural gas used.

All natural gas has the same carbon intensity when it is burned. The carbon intensity of electricity varies by utility, based on its fuel mix, which can include coal, natural gas, wind, hydropower and solar.

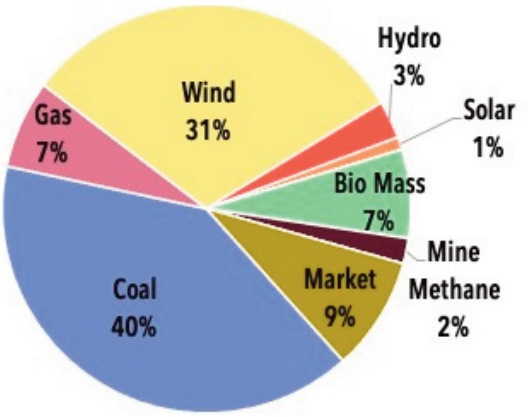
The region's electric utilities use a range of fuel mixes.

Through wholesale contracts, Aspen Municipal Utility and Glenwood Springs Electric provide 100% renewable energy powered by wind farms and a small amount of hydroelectricity.

Xcel Energy and Holy Cross Energy generate electricity from a variety of fossil and renewable sources. Wind energy is currently the dominant source of renewable energy used by these two utilities.

Grand Valley Power, an electric co-op serving far western Garfield County (along with rural areas in Mesa County), does not release its fuel mix or carbon intensity. The co-op does have distributed solar and community solar gardens on its grid.

Figure 10: Holy Cross Energy electricity fuel mix, 2019



BioMass: Generating electricity by burning woody materials. A 12 mW biomass plant located in Gypsum, Eagle County, provides power to Holy Cross Energy.
Mine Methane: Generating electricity by burning methane captured from an underground coal mine. Holy Cross partnered with other entities to develop a 3 mW mine methane project in Somerset, Gunnison County.

Figure 11: Xcel Energy electricity fuel mix, 2019

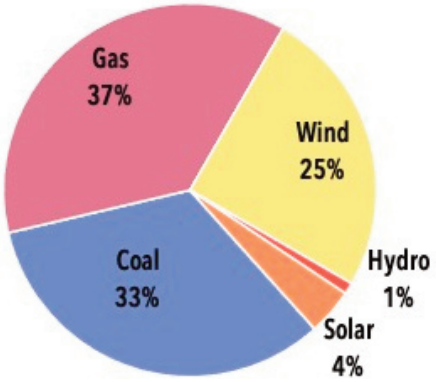


Figure 12: Aspen Municipal Utility electricity fuel mix, 2019

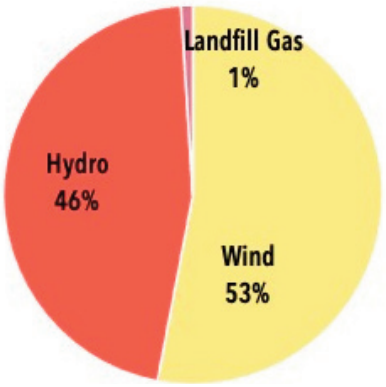
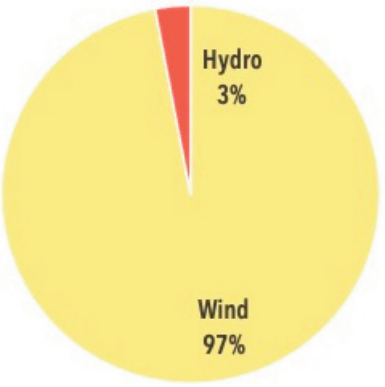


Figure 13: Glenwood Springs Electric electricity fuel mix, 2019



2.8.2 Carbon Dioxide Equivalent (CO2e)

Carbon dioxide equivalent is a common measurement for carbon emissions. Extracting and burning fossil fuels releases multiple types of greenhouse gases, including carbon, methane, and nitrogen oxide. Each of these gases have different carbon densities.

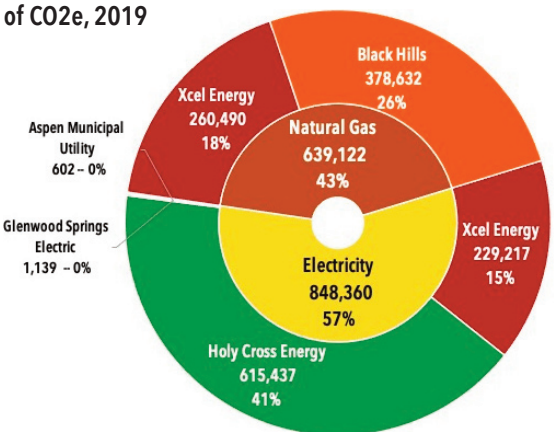
Using carbon dioxide equivalent (CO2e) is a way to compare emissions from various sources using the same metric. Regional emissions are calculated in this report as CO2e.

2.8.3 Regional Emissions

Based on the amount of energy used in buildings and industry, and factoring in the fuel mix of the two large electric utilities, this inventory estimates the three-county region produced 1.56 million metric tons of CO2e in 2019.

Emissions from electricity made up slightly more than half of emissions, at 54%, while emissions from natural gas were 46%.

Figure 14: Regional emissions by utility in metric tons of CO2e, 2019



* Glenwood Springs Electric and Aspen Utility purchase 100% renewable energy. Their CO2e emissions are 0%.

2.8.4 County-Level Emissions

Looking at CO2e emissions in the region by county, we see a split similar to that in energy usage in BTUs (see Figure 6).

Eagle County energy use produced 50% of emissions, while Garfield County produced 28% and Pitkin County produced 22% of emissions.

The commercial sector produced a greater share of emissions in Eagle and Garfield counties, while the residential sector produced a greater share in Pitkin County.

Eagle County's emissions and energy usage as reported are about equal to Pitkin and Garfield counties combined. This is likely due to a larger number of lodging and residential units in Eagle County.

It's also important to note that energy use in Garfield County includes proxy estimates for four large energy users (see Section 2.9), and may not be fully accounted for.

Figure 15: Regional CO2e emissions by county and by sector in metric tons, 2019

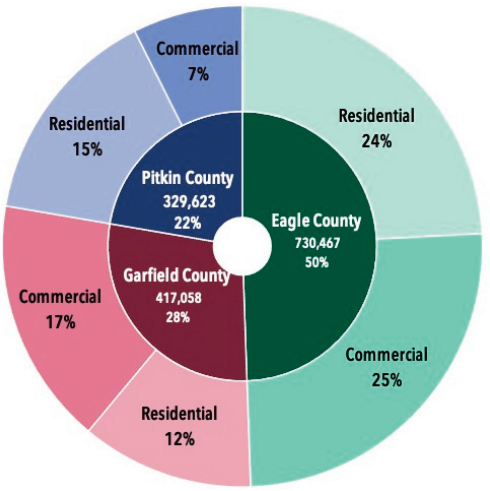


Figure 16: Eagle County CO2e emissions, 2019: 730,467 metric tons

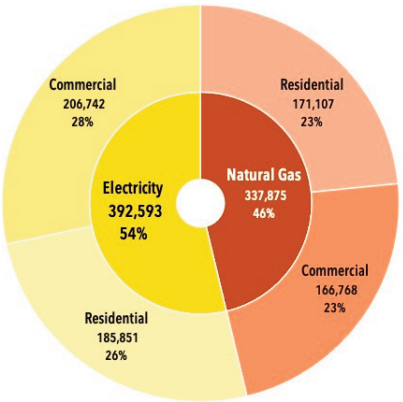


Figure 17: Garfield County CO2e emissions, 2019: 417,058 metric tons

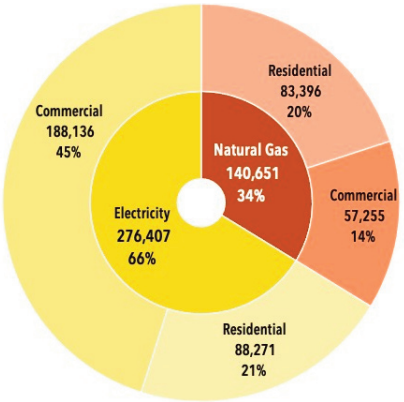
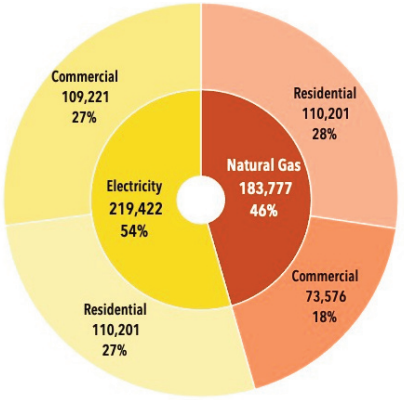


Figure 18: Pitkin County CO2e emissions, 2019: 329,623 metric tons



2.8.5 Community-Level Emissions

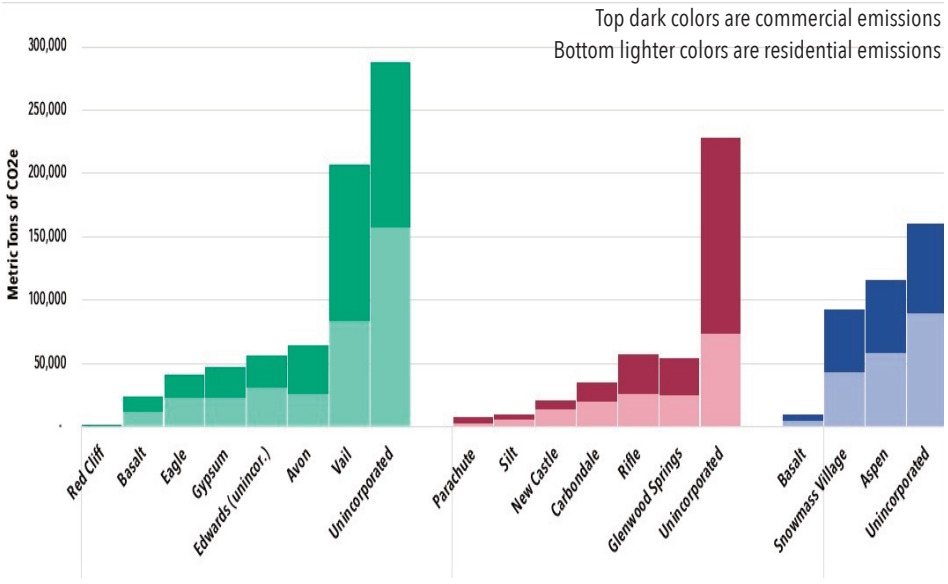
Energy use and carbon emissions in the region are higher in Eagle and Garfield counties compared to Pitkin County.

Eagle and Garfield have larger populations and more energy-intensive industries.

Emissions in Vail and unincorporated Eagle County are tied to ski resorts, including lifts, snowmaking and on-mountain facilities, and to extensive lodging facilities.

Emissions in unincorporated Garfield County are tied to residential use and to the oil and gas industry, including pipeline compressor stations.

Figure 19: Emissions by community and sector in metric tons of CO2e, 2019



2.9 Methods

This energy inventory specifically measures energy use in buildings and industry, sometimes referred to as the "built environment." The U.S. Energy Information Administration estimates that in Colorado, buildings account for 70.3% of all energy use. Energy usage is divided by residential and commercial customers.

Demographic data is from the U.S. Census Bureau 2014-2019 American Community Survey, five-year estimates.

Energy usage and cost data was collected from data teams at the seven electricity and natural gas utilities that serve the region.

Emission levels were calculated using utility data and the associated carbon density factors.

Propane is used in some rural areas of the region, but was not measured in this inventory. Propane accounts for a small share of energy use in this region, sales occur irregularly, and by numerous vendors. Tracking this small increment of energy usage is beyond the scope of this inventory.

Proxy energy was calculated to account for certain very large energy users. Colorado law prevents utilities from releasing energy data for customers that use more than 15% of the total amount within a requested area. Xcel Energy noted three such commercial electricity customers in Garfield County and one in Eagle County.

To account for energy usage by these excluded customers, we added in proxy usage and cost numbers. Although they are likely an underestimation, the proxy number for each excluded customer is equal to 15% of the total provided electricity usage and cost numbers for the requested area. These four excluded customers were assumed to be located in unincorporated Eagle and Garfield counties.

Energy data for Redcliff commercial customers was also excluded because the customer count in the town's commercial sector did not meet the minimum threshold for Xcel Energy to release any data. Xcel withheld data for 17 commercial electrical customers and nine commercial natural gas customers. To create a proxy number, we used Redcliff's commercial energy use from the Eagle County energy inventories of 2014 and 2017.

2.10 Acknowledgments

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Justin Forman, City of Aspen Utilities Department

Mike Beyer, Yampa Valley Power

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