

# **Adding Up the Energy Bills**

**The annual cost of using energy  
in Garfield County in 2009  
and  
Economic opportunity  
through increased energy efficiency**

**Garfield County Energy Inventory  
June 2010**



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**Prepared for the Garfield New Energy Communities Initiative**

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**The Garfield New Energy Communities Initiative is a collaborative effort** of nine government partners in Garfield County, Colorado: Garfield County, Town of Carbondale, City of Glenwood Springs, Town of New Castle, Town of Silt, City of Rifle, Town of Parachute, Garfield County Public Library District, and the Roaring Fork Transportation Authority.

The Initiative also engages school districts, Colorado Mountain College, chambers of commerce, businesses and nonprofits in clean energy projects and efforts.

The purpose of the Initiative is to help households, businesses and local governments reduce energy costs and tap the economic benefits of energy efficiency, renewable energy and energy efficient transportation.

The Initiative was launched with a New Energy Communities Initiative grant from the Colorado Department of Local Affairs, by funding from the nine partner governments, and by grants from the Governor's Energy Office. Sponsorships and contributions from business and nonprofit organizations also support Initiative programs.

The Initiative is managed by CLEER, Clean Energy Economy for the Region, a nonprofit organization with a team of professionals and firms who deliver the clean energy programs and services described in the Initiative grant. The team is also working with the NECI partners to develop an enduring energy efficiency and renewable energy program that will carry on beyond the original initiative.

## Executive Summary

This energy inventory reports the results of a study by the Garfield New Energy Communities Initiative (G-NECI) to quantify the total energy use and spending by Garfield County households, businesses, institutions and governments, using 2009 as a baseline year.

The purpose is to better understand how and where energy is used and baseline quantities, so all sectors can identify opportunities to increase efficiency, reduce costs and emissions, and track progress on energy efficiency. The inventory will also guide the G-NECI Advisory Board in the ongoing strategic development of clean energy programs for a strong and resilient economy.

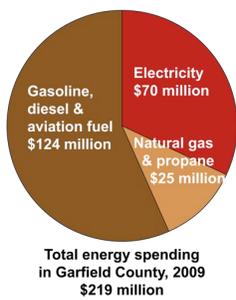
The energy inventory takes a broad look at the building and transportation sectors and breaks them down by energy source and by user groups: residential, commercial and government. It tallies this information and calculates for the resulting greenhouse gas emissions as well.

In most cases, the data was acquired directly from the utilities and retail fuel distributors. For some transportation fuels, assumptions and estimates were necessary, which are noted.

**Table 1. Garfield County 2009 Energy Inventory General Results**

2009 total cost of energy for residents and businesses	\$219 million
2009 total for electricity	\$70 million
2009 total for natural gas and propane	\$25 million
2009 total for gasoline, diesel and aviation fuel	\$124 million
2008 estimated Garfield County population	57,050
2009 annual cost of energy spent per capita	\$3,586
Energy costs as a percentage of 2008 pre-tax median income (\$56,767)	6.3%
Percentage of energy cost for utility energy (electricity, natural gas, propane)	46%
Percentage of energy cost for transportation of goods, services, people	54%
U.S. Consumer Price Index energy cost increase 2000 to 2010	6.5%
U.S. Consumer Price Index 12-month energy cost increase, May '09 – April '10	18.5%

**Figure 1. Total energy spending in Garfield County, 2009**



The inventory estimated building energy and transportation energy. The total cost of energy used in Garfield County in 2009 was \$219 million.

Utilities and propane suppliers provided estimates of 2009 sales within the county to residential and commercial customers. The utility and propane expenditures in 2009 were \$95 million.

Transportation energy was gathered from local airport fuel receipts and estimated from Colorado Dept. of Transportation data on Garfield County vehicle-miles-traveled (VMT). Total transportation fuel expense in 2009 was an estimated \$124 million, based on a total VMT of 802 million miles.

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**Table 2. Garfield County 2009 Energy Use, Cost, and Emissions Summary**

Garfield County 2009	Physical units		Energy equivalent		Cost		CO <sub>2</sub> equivalent	
			Million BTU	%	Dollars	%	Tons CO <sub>2</sub> e	%
Electricity	908,604,809	kWh	3,100,161	25.5	\$70,375,223	32.2	782,913	53.3
Natural gas	20,327,199	therms	2,065,138	17.0	\$19,726,936	9.0	135,760	9.2
Propane	2,141,039	gallons	196,957	1.6	\$4,891,386	2.2	14,304	1.0
<b>Total utility energy</b>			<b>5,362,256</b>	<b>44.2</b>	<b>\$94,993,545</b>	<b>43.4</b>	<b>932,977</b>	<b>63.5</b>
Gasoline & diesel	51,542,912	gallons	6,639,486	54.7	\$119,218,642	54.5	524,987	35.8
Aviation fuel	1,002,718	gallons	134,283	1.1	\$4,423,607	2.0	10,476	0.7
<b>Total transp. energy</b>	<b>52,545,630</b>	gallons	<b>6,773,770</b>	<b>55.8</b>	<b>\$123,642,249</b>	<b>56.6</b>	<b>543,463</b>	<b>36.5</b>
<b>Total energy</b>			<b>12,136,026</b>	<b>100</b>	<b>\$218,635,793</b>	<b>100</b>	<b>1,468,440</b>	<b>100</b>

If all Garfield County energy users became 20 percent more energy efficient, the savings would equal \$43 million per year. This money would stay in the local economy, providing ongoing economic stimulus: more money than the county's 2007 farm revenue of \$32 million or its hunting and fishing revenue of \$32 million. Furthermore, energy efficiency can improve the county's economic stability by reducing exposure to energy price increases, as shown in Table 1 to be dramatic in the last 12 months.

A 20 percent efficiency goal is not out of reach. Energy savings of 30 percent have already been estimated for G-NECI's commercial energy efficiency program. The State of Colorado is targeting energy savings of 20 percent by 2012 and three local governments are targeting a range of goals for 20 to 30 percent reductions in energy and emissions, with target dates ranging from 2012 to 2020. Long-term goals for local governments include efforts to reduce emissions 80 percent by 2050.

Creating countywide targets for energy savings is the next step. Targets serve as a catalyst for driving energy efficiency improvements, help measure progress over time, and show the scale of work necessary for those communities that have adopted emissions goals.

G-NECI already has programs underway targeted at increasing energy efficiency for the commercial, residential, government and transportation sectors. These programs have demonstrated the ability for residents, business owners and governmental entities to reduce energy use in a cost effective manner. Full deployment of the G-NECI programs for each sector beyond demonstration scale can help achieve energy and economic targets.

## I. Purpose and Scope

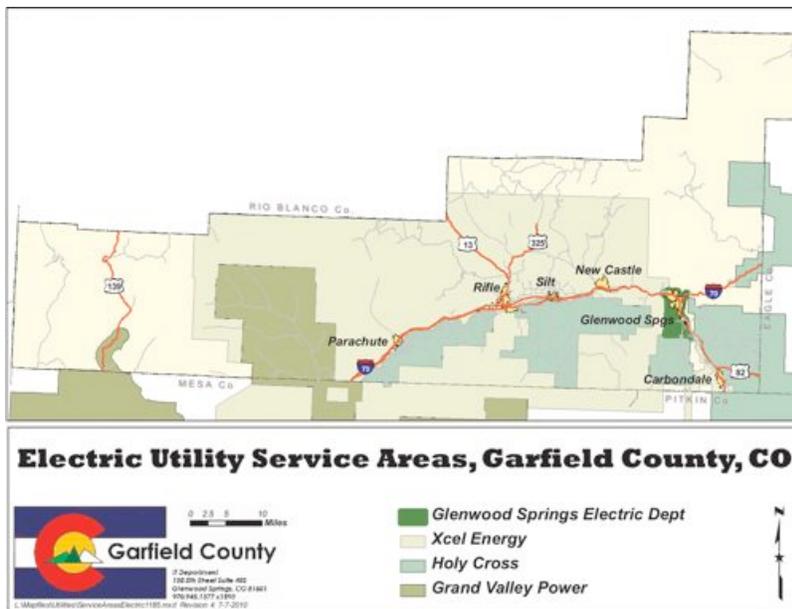
The purpose of this energy inventory is to better understand how and where energy is being used by residents, businesses, community institutions and governments in Garfield County, as well as the amount of money spent on energy. By identifying energy costs by sector and by fuel, we can estimate the financial benefits of energy efficiency. Data on energy use and spending provided in this inventory sets a baseline for tracking progress in energy efficiency. The inventory will also guide the G-NECI Advisory Board in the ongoing further development of clean energy programs for a strong, resilient economy.

Garfield County's county borders were used as a geographic boundary for this study. All cities, towns and rural areas inside the county are counted together as part of the study.

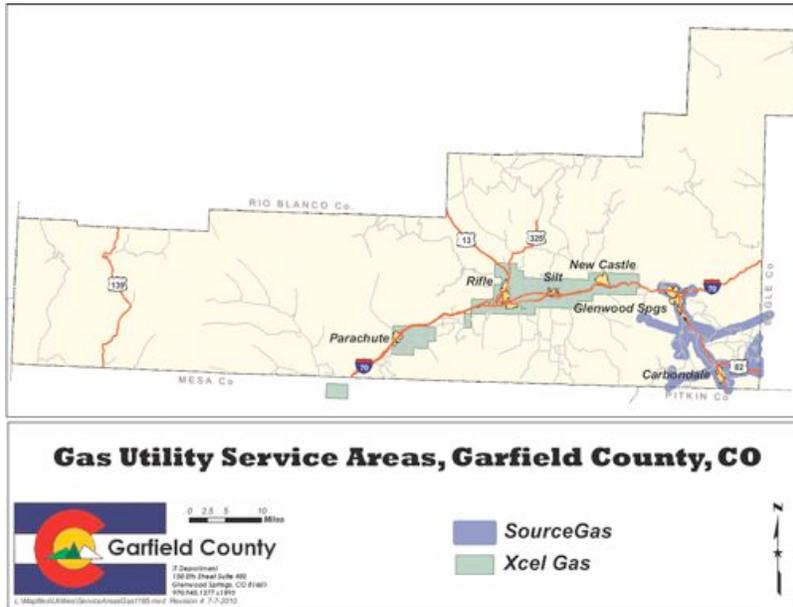
An attempt was made to report on the amount of energy sold inside each town and city boundaries, but this town-level data was not available from all utilities, so it is not reported here. Some attempts were also made to 'benchmark' energy use/costs against comparable counties, but few counties have assembled such data, so making an accurate comparison is difficult.

Transportation energy use was calculated from total Vehicle Miles Traveled (VMT) for state highways and I-70 within Garfield County as reported by the Colorado Department of Transportation (CDOT). Data is not available for VMT on city streets within cities and towns from CDOT or any other source. As a result, this report underestimates transportation energy use.

**Figure 2. County borders, major roads and utility service areas in Garfield County**



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Maps prepared by Garfield County GIS Team, using source data from Holy Cross Energy, SourceGas, Xcel Energy, Glenwood Springs Electric Dept. and Grand Valley Power.

Within the county’s geographic boundaries, this report measured quantity, cost, and emissions associated with energy delivered by utilities and from transportation fuels. Data was collected as follows:

Electricity	kilowatt hours sold by utilities
Natural Gas	therms sold by utilities
Propane	gallons sold by retailers
Transportation Fuel	gallons of gasoline, diesel by VMT estimation
Aviation Fuel	gallons by airport sales in Rifle and Glenwood Springs

The inventory does not include on-site industrial energy and emissions associated with natural gas extraction. Accounting for energy use on-site by exploration and production activities is difficult to measure, as energy is often produced from diesel generators and varies greatly as drilling activity rises and falls with market demand and prices.

This current inventory does not attempt to estimate the amount of this additional energy use. A 2008 study prepared for La Plata County, Colorado, *Baseline Greenhouse Gas Emission Profile and Forecast*, indicates that more than 60 percent of La Plata County’s greenhouse gas emissions are due to gas industry exploration and production.<sup>1</sup>

<sup>1</sup> *Baseline Greenhouse Gas Emission Profile and Forecast*, April 3, 2008, The Brendle Group. Online at [www.co.laplata.co.us/node/578](http://www.co.laplata.co.us/node/578)

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Natural gas industry energy uses and emission sources excluded from this inventory:

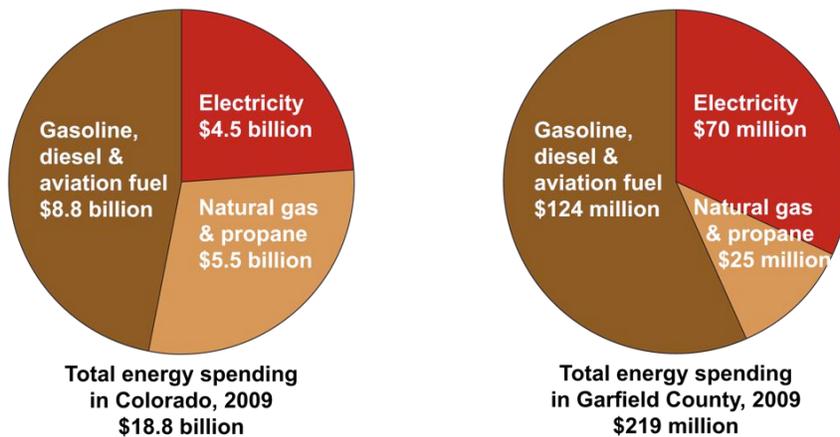
Exploration energy	gallons of diesel used by well-pad generators
Production energy	therms of produced natural gas used in field operations
Industrial emissions	CO <sub>2</sub> -equivalent of fugitive methane (escaped natural gas) and venting of entrained CO <sub>2</sub> produced with natural gas

## II. Energy Costs in General

According to the most recent data available from the U.S. Department of Energy, the energy costs for all Colorado users in 2008 was split roughly in half, with slightly less than half spent for transportation energy (gasoline, diesel and aviation fuel) and slightly more than half spent on utility energy (natural gas, electricity and propane), at a total cost of \$18.8 billion.

Research conducted for this inventory estimates the cost of energy for all users in Garfield County in 2009 to be \$219 million, with 57 percent of the cost for transportation energy and 43 percent of the cost for utility energy.

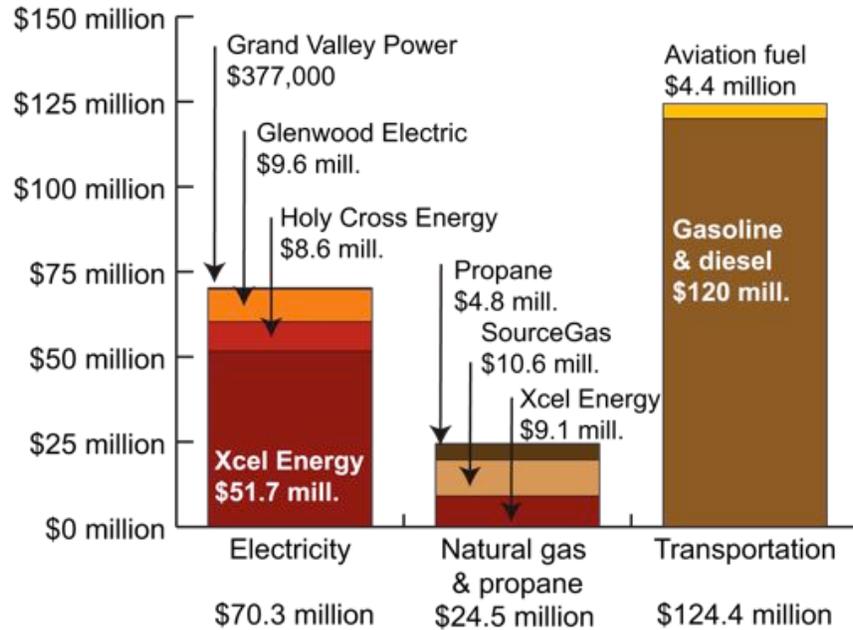
**Figure 3. Total energy costs in Colorado and in Garfield County**



Sources: U.S. Energy Information Administration for statewide data, G-NECI inventory for Garfield County data

Compared to state wide energy use, Garfield transportation costs are a larger share of the total cost of energy. This is likely due to the distance between communities, frequent travel between communities for jobs, housing, commerce, and education; and an interstate as major artery.

**Figure 4. Total energy costs in Garfield County, by type of energy and by utility**



### III. Utility Energy Costs

There are four electric utilities and two natural gas utilities serving Garfield County. Three propane retailers deliver energy to areas of the county not served by natural gas utilities.

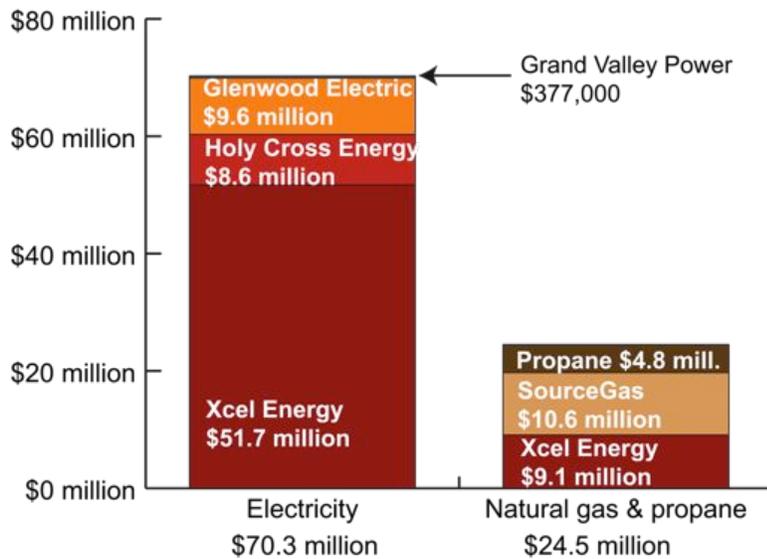
Electric utilities: Glenwood Springs Electric, Grand Valley Rural Power, Holy Cross Energy, Xcel Energy

Natural gas utilities: SourceGas, Xcel Energy

Propane retailers: AmeriGas, Cross Propane, FerrellGas

The majority of spending on utility energy is for electricity. It is 74 percent of the utility energy cost mix, and 32 percent of the total energy cost in the county. Natural gas is 21 percent of the utility energy cost mix, and 9 percent of the total energy cost in the county. Propane is 5 percent of the utility energy cost mix, and 2 percent of the total energy cost in the county.

**Figure 5. Electricity, natural gas and propane energy costs in Garfield County by utility provider**

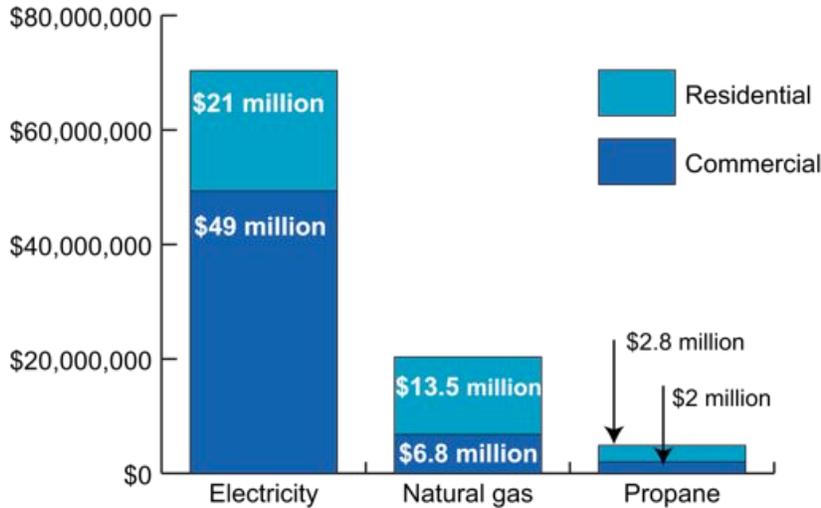


The energy inventory research team solicited information about residential and commercial customers as part of its data request to utilities. Figure 6 (*next page*) shows that a majority of the electricity cost is shouldered by commercial customers, while a majority of the natural gas cost results from residential sector usage.

This is likely due to two major factors. First is the prevalence of residential neighborhoods served by the natural gas grid and a larger number of residential structures compared to commercial buildings. Second is the tendency for commercial customers to have a larger portion of their energy spent on needs that can only be served by electric power, such as refrigeration systems, air conditioning and circulation systems, lighting, pumps and specialty equipment.

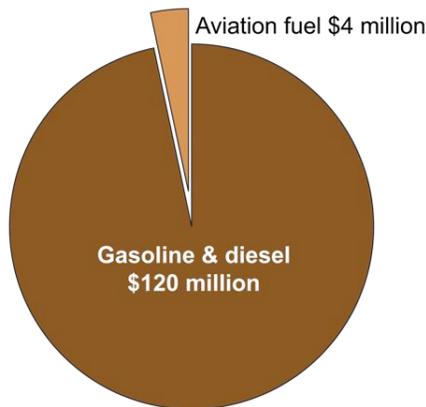
Understanding this breakdown can guide efforts to work with utilities and their residential and commercial customers to save energy. A focus on natural gas savings will require residential sector involvement to achieve high impact, whereas an electricity savings program must fully involve the commercial sector.

**Figure 6. Electricity, natural gas and propane energy costs in Garfield County by customer sector**



## IV. Transportation Energy

**Figure 7. Transportation energy costs in Garfield County**



Transportation energy costs represents more than half of all the energy dollars spent in the county. Of the \$124 million spent on transportation fuels, \$4 million was spent at the two regional airports for aviation.

No regularly scheduled commercial flights serve Garfield County, so private air travel bears the vast majority of the costs of air transport to, from and within the county.

Airport managers provided actual data on annual fuel sales.

Motor vehicle transportation costs were estimated to be \$120 million in 2009 based on CDOT data on vehicle miles traveled (VMT) on certain roads within the county. Actual cost data was not available from fuel sales, as there is no agency or trade organization that tracks fuel sales on a county-by-county basis.

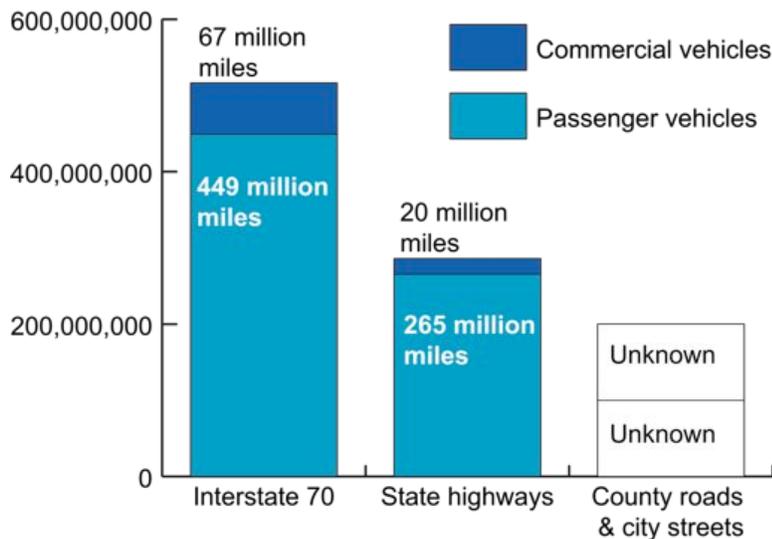
During attempts to contact local fuel wholesalers, the inventory research team learned that a large number of vendors deliver fuel to the county and there is no way to know exactly which

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fuel vendors serve the county. An effort to extract Garfield County data from state fuel tax receipts was unsuccessful because state government only tracks these revenues at a statewide level.

To calculate motor vehicle energy use, the research team determined that the best available method was to use CDOT traffic statistics for Garfield County. As seen in Figure 8, CDOT data does not include county roads or city streets. Because of this missing information, our estimate is inherently conservative and is very likely an underestimate of the total transportation energy use. The VMT data in Figure 8 was combined with regional traffic surveys to estimate vehicle miles traveled per vehicle type, including cars, motorcycles, pickups, and medium and heavy trucks.

**Figure 8. Vehicle Miles Traveled (VMT) by Road Type and Vehicle Type**

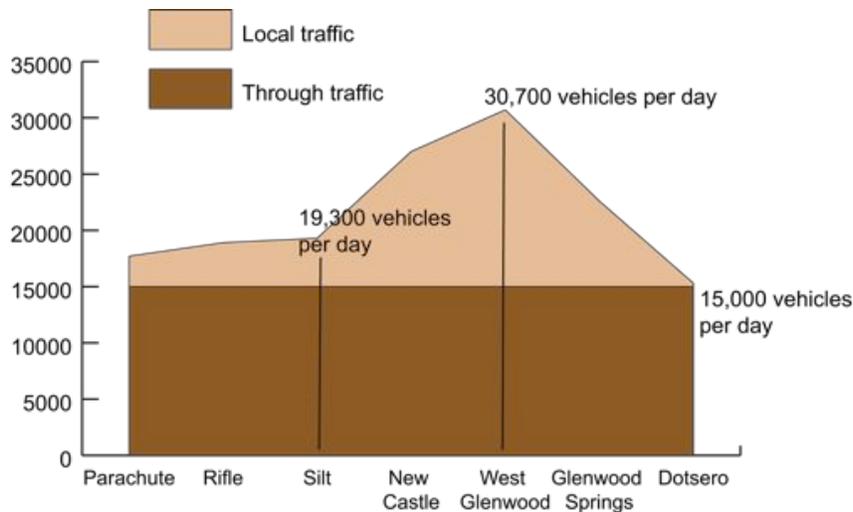


CDOT data was also used to help determine if including 100 percent of the traffic on I-70 was reasonable. The research team assumed that traffic counts measured east of Dotsero and west of Parachute represent traffic that is either passing all the way through, or is destination traffic arriving or departing in Garfield County. From this reference, the team calculated the increase in traffic between these two points as very likely to be local traffic.

As shown in Figure 9, annual average daily traffic on I-70 in the area of New Castle to Glenwood Springs consists of approximately 50 percent local traffic. Because of the economic importance of I-70 to the region for destination traffic, the high percentage of local traffic on I-70, and the built-in-underestimation due to missing city street traffic, the inventory chose to include 100 percent of I-70 traffic to represent the county's total vehicle miles traveled.

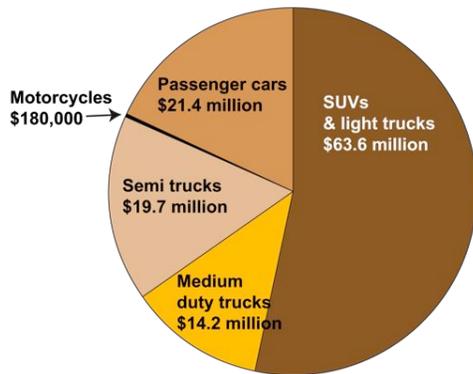
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**Figure 9. Local and through traffic on Interstate 70 in Garfield County**



Using fuel economy estimates by vehicle type from the U.S. Department of Energy, miles traveled each year from Figure 8 were converted into gallons used. DOE data on fuel price averages for 2009 was then used to compute the cost of energy used to provide transportation in Garfield County, shown in Figure 10.

**Figure 10. Transportation energy costs in Garfield County by vehicle type**



The majority of the cost of transportation fuels in Garfield County is for passenger cars, SUVs, vans or light trucks. Together these vehicle types consumed \$80 million in fuel in 2009, while moving passengers and goods.

By simple steps such as combining trips or driving just 5 mph slower, savings of 5 percent or more are easily possible with existing vehicles. A simple 5 percent reduction would save area residents and businesses \$4 million per year, again largely keeping that money within the county for other economic activity.

Medium duty trucks, such as box-style delivery trucks, and large tractor-trailer trucks account for 11 percent of the county's total VMT on area roads. Because of their lower fuel economy, which average 6 mpg, their fuel cost was an estimated 29 percent of the motor vehicle total.

## V. Energy Costs for Garfield NECI Partner Governments

To assist G-NECI partners in creating a baseline of energy use, the inventory research team collected the 2009 costs of purchasing vehicle fuel and utility energy. The total cost of energy to G-NECI partners, excluding the Roaring Fork Transportation Authority and including the three school districts in Garfield County, was more than \$5.7 million in 2009.

**Table 3. Energy Costs to Garfield NECI Partner Governments and school districts, 2009**

<b>Partner</b>	<b>Vehicle Fuel</b>	<b>Utility Energy</b>	<b>Total Energy</b>
Garfield County	\$692,547	\$595,089	\$1,287,636
Library District *	\$19,300	\$36,576	\$55,876
Parachute	\$30,520	\$119,085	\$149,605
Rifle	\$100,700	\$633,671	\$734,371
Silt	\$44,058	\$149,688	\$193,746
New Castle	\$47,896	\$164,260	\$212,156
Glenwood Springs	\$172,712	\$611,649	\$784,360
Carbondale	\$53,425	\$324,837	\$378,262
Garfield 16 SD	\$44,031	\$337,880	\$381,911
Garfield Re-2 SD	\$154,541	\$504,945	\$659,486
Roaring Fork Re-1 SD **	\$202,497	\$735,643	\$938,140
<b>G-NECI TOTAL</b>	<b>\$1,562,226</b>	<b>\$4,213,321</b>	<b>\$5,775,546</b>

\* Garfield Library District did not own any vehicles in 2009. Fuel expenses represent mileage reimbursements rather than actual fuel purchases.

\*\* Roaring Fork School District figures exclude costs associated with schools in Basalt.

The opportunity to reduce costs through energy efficient government operations is well known and has been achieved in western Colorado for both utility energy and vehicle energy costs.

Utility savings of 20 percent are a state goal, and savings of 25 percent with a 14 percent return on investment were identified within local businesses as part of the G-NECI 2009-10 Commercial Audit & Retrofit Demonstration project. Energy savings achieved without building or equipment upgrades are already being realized in the Roaring Fork School District through G-NECI's ENERGY STAR Schools pilot program.

Savings can be achieved through data-driven active energy management, proper building commissioning and staff training, and equipment retrofits. If the G-NECI partners reduced utility energy costs by 20 percent, the savings would be more than \$750,000 per year.

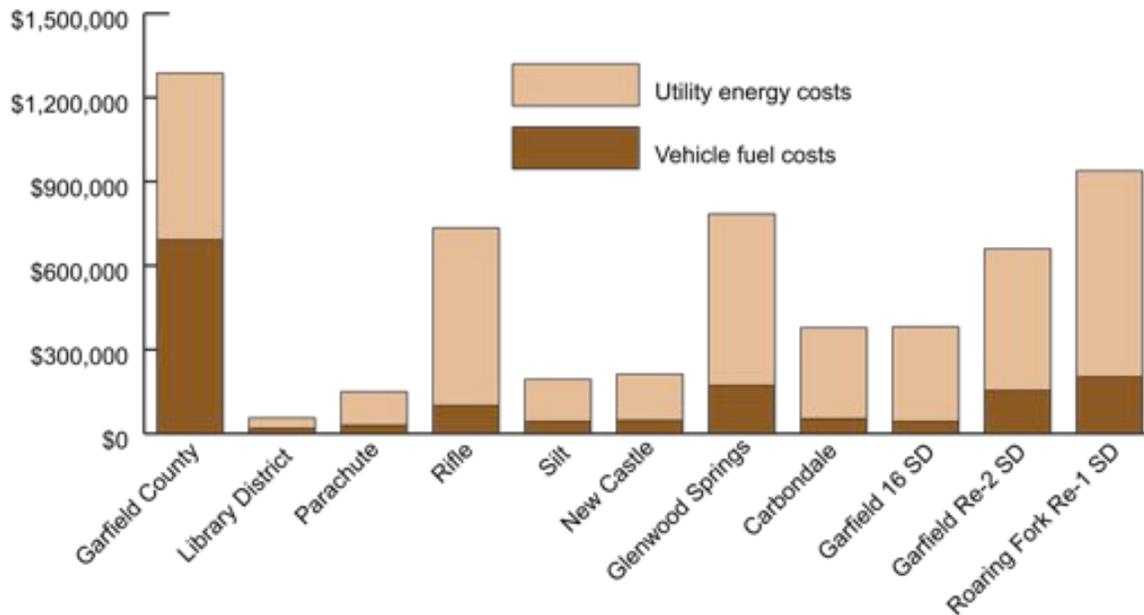
In vehicle energy use, the State of Colorado is halfway to its goal of 25 percent petroleum reduction, and Eagle County reduced its gasoline use for light-duty vehicles by 30 percent in just

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three years. Savings can be achieved by using existing fleet vehicles more efficiently, efficient maintenance, purchasing on a life-cycle cost basis, and adopting new technologies and fuels.

Using G-NECI’s model Efficient Fleet Policy is estimated to achieve 30 percent in energy cost savings, and would amount to a total savings for G-NECI partners of more than \$450,000 compared to 2009 expenses.

**Figure 11. Vehicle Fuel Cost and Utility Energy Cost for Garfield NECI partner governments and Garfield school districts, 2009 (not including RFTA)**



Altogether, G-NECI partners could save an estimated \$1.2 million per year on energy with proven energy efficiency techniques already in use locally, regionally and nationally.

## VI. Carbon calculations for Garfield County energy use

Burning fossil fuels for energy produces carbon dioxide and other emissions that are causing the earth’s greenhouse gas concentrations to rise. Each source of energy produces different levels of greenhouse gases. Generally, coal-fired electricity produces the highest level of carbon emissions. Gasoline produces a medium level of emissions, while natural gas and propane produce the lowest level of emissions per energy unit.

Many electric utilities lower the “carbon intensity” of the electricity they sell by adding hydropower, wind, solar or nuclear energy to their portfolio.

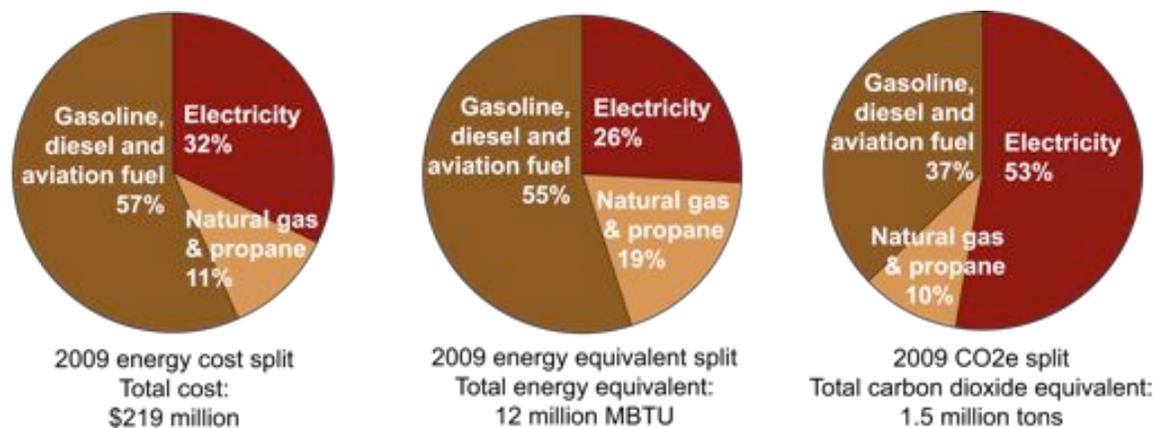
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By using “carbon factors” related to each energy type, it is possible to estimate the total tons of CO<sub>2</sub>-equivalent emissions (CO<sub>2</sub>e) produced by the energy use in Garfield County. To make this estimate, the research team gathered the carbon intensity levels for each electric utility, and used established carbon factors for natural gas, propane, gasoline and diesel.

Greenhouse gas emissions related to energy use in Garfield County were 1.5 million tons CO<sub>2</sub>e in 2009. The most recent U.S. Energy Information Administration data states that total estimated U.S. emissions for 2008 year were 7.7 billion tons, and in 2006 the United States emitted 20 percent of total global emissions.

As the two charts in Figure 12 show, Garfield County energy consumers spent more on gasoline and less on electricity, but that level of energy consumption contributed more emissions from electricity than from gasoline. In both comparisons, spending and emissions from natural gas and propane (excluding the natural gas industry) are far lower than from gasoline or electricity.

**Figure 12. Comparison: energy costs (left), energy unit equivalents (center) and greenhouse gas emissions (right) by energy type, based on 2009 consumption in Garfield County.**



Of total Garfield County greenhouse gas emissions, 53 percent come from electricity use, 9 percent from natural gas, and 1 percent from propane, 36 percent from gasoline and diesel, and 1 percent from aviation fuel. Any efficiency gains in usage of utility energy or transportation energy will reduce the county’s total greenhouse gas emissions.

**Note:** This inventory focuses only on emissions related to utility energy and transportation energy. A full accounting of greenhouse gas emissions for Garfield County would also include other emissions sources such as landfills, agriculture and the natural gas industry.