Colorado's Clean Affordable Climate Pathways

Summary Report

December 2025

Designed by SSG, December 2025.

Sustainability Solutions Group

Image at the cover and sub-cover:
Panoramic view of Denver, Colorado.
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Indian Peaks Wilderness, Colorado. Photo by John Fielder

Acknowledgements

The analysis and report was completed by:

- Chris Strashok, SSG
- Sebastien Bonelli, SSG
- Yuill Herbert, SSG

With supporting analysis from:

- Wendy Jaglom-Kurtz, RMI

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Summary

Climate change is already affecting Coloradans—more frequent wildfires, increasingly severe drought and heat waves, worsening air quality, and heavy and extreme rainfall causing severe flooding have already resulted in billions of dollars in damages and economic losses.[1] Colorado has taken action to reduce greenhouse gas (GHG) emissions. The State first established science-based statewide GHG emissions reduction targets in law in 2019, and it now has targets to reduce GHG emissions 26% by 2025, 50% by 2030, 65% by 2035, 75% by 2040, 90% by 2045, and 100% by 2050 (all relative to 2005 emissions levels).

This study evaluates and compares the progress expected from Colorado's existing climate and energy policies and examines additional actions the State could take to ensure that the science-based statutory GHG reduction goals are met.

Key insights from this study include:

- Coloradan's energy costs would increase if existing clean energy policies are stopped or rolled back.
- Without further action, Colorado will not meet the statutory climate targets.
- Meeting statutory GHG emissions reduction goals is achievable and economically beneficial and it dramatically reduces local air pollution.
- In every scenario that achieves Colorado's GHG goals, Coloradans' energy bills are lower compared to current energy bills as well as forecast bills under current policies. Scenarios that emphasize energy efficiency and electrification also reduce the number of energy-burdened households in Colorado.

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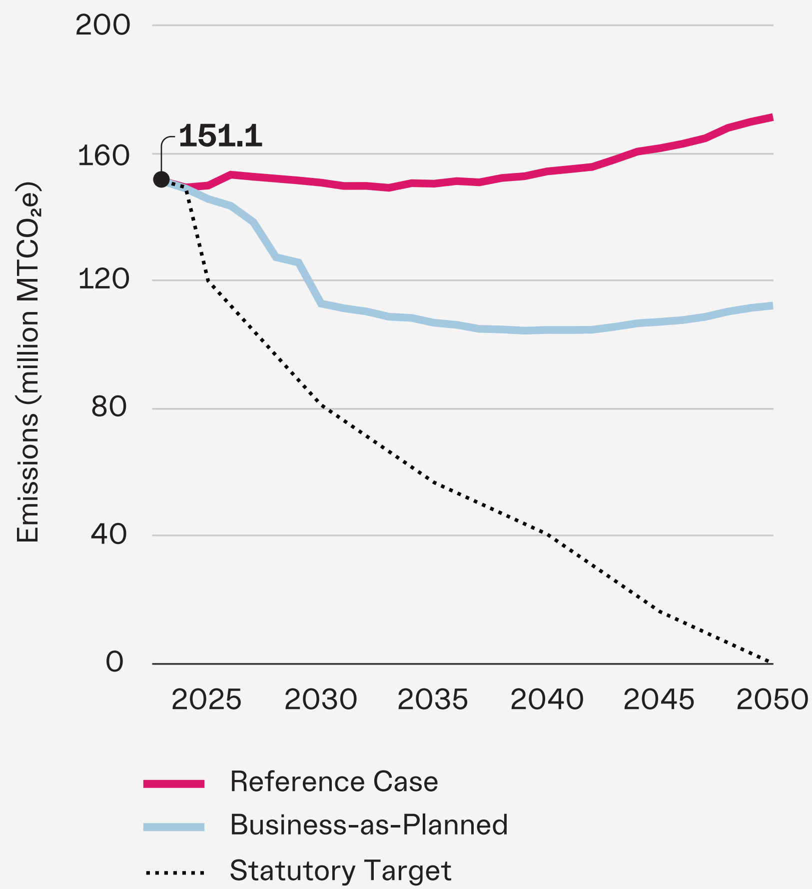
1 While these events cannot be solely attributed to climate change, climate change increases their frequency and severity. In 2021, the Marshall Fire alone caused an estimated $2 billion in damages. Whelton, A. J., Seidel, C., Wham, B. P., Fischer, E. C., Isaacson, K., Jankowski, C., ... & Ley, C. (2023). The Marshall Fire: Scientific and policy needs for water system disaster response. *AWWA Water Science*, *5*(1), e1318.

Policy action to date has reduced GHG emissions, particularly in the electric utility sector. However, despite this significant progress, emissions have increased in other sectors, such as transportation, and as a result, Colorado's 2023 emissions were comparable to its 2005 emissions. By 2030, Colorado's existing climate policies are projected to reduce economy-wide GHG emissions by 25% relative to 2023 emissions, or by 26% relative to 2005 levels. In future years, the gap between the current emissions trajectory and the State's GHG goals widens. Despite significant progress, Colorado is forecasted to miss its climate targets by 26 million $MTCO_2e$ in 2025, 32 million $MTCO_2e$ in 2030, 50 million $MTCO_2e$ in 2035, 64 million $MTCO_2e$ in 2040, 91 million $MTCO_2e$ in 2045, and 112 million $MTCO_2e$ in 2050.

Figure 1.
Projected emissions trajectories under the Reference Case and Business-as-Planned (BAP) scenarios. The Reference Case represents an extrapolation of current population growth and technologies, while Business-as-Planned implements existing climate policies.



The analysis indicates that missing these targets has broad opportunity costs, including higher energy costs, higher levels of energy poverty, higher levels of air pollution, poorer health outcomes, and missed economic development opportunities. It also underscores the fact that additional actions are necessary for the State to achieve its science-based statutory emissions reduction targets.

The study modeled four scenarios for meeting Colorado's 2030 to 2050 climate goals. These four low-carbon ("LC") scenarios demonstrate that meeting these statutory GHG emissions reduction goals is achievable and economically beneficial and dramatically reduces local air pollution. The pathways modeled in the four scenarios rely on varied technology and policy assumptions, and they highlight trade-offs in technologies and policy design.

All the low-carbon scenarios reduce Coloradans' energy bills. Under the Business-as-Planned (BAP) Scenario, customers save over $25 billion over the 2026–2050 period relative to the Reference Case Scenario, a scenario that reflects the repeal of existing clean energy policies. However, the low-carbon scenarios provide even greater benefits, with avoided energy costs of $82 billion–$166 billion relative to the Reference Case Scenario. Every low-carbon scenario shows that GHG reductions aligned with Colorado's targets provides a net economic benefit ranging from $20 billion to $56 billion (NPV), relative to the BAP Scenario, when considering capital, operating, maintenance, and energy costs. When the economic benefits associated with avoided climate change impacts are included, net economic benefits exceed $600 billion in every low carbon scenario.

The low-carbon scenarios all demonstrate economic and air-quality benefits, but the different scenarios illustrate trade-offs between different policy approaches. Key findings of the analysis provide the following information:

- The low-carbon scenario that prioritizes the lowest-cost emissions reductions wherever they can be achieved (LC 3 [least cost]), rather than meeting sector-specific emissions reduction requirements, has the lowest capital costs and the highest economic benefits of all four low-carbon scenarios. Cumulatively, this scenario also achieves the greatest GHG emissions reductions.

- Scenarios that prioritize electrification and energy efficiency (LC 1 [E&E] and LC 3 [least cost]) have lower costs than scenarios that prioritize low-carbon fuels such as green hydrogen and renewable natural gas (LC 2 [LC fuels]).

- Low-carbon scenarios 1, 3, and 4 dramatically reduce local air pollutants that impact public health and the environment (carbon monoxide, nitrogen dioxide, particulate matter, volatile organic compounds, and sulfur dioxide) compared to the BAP Scenario and the Low-Carbon Fuels Scenario (LC 2).

To reduce carbon emissions according to the State's climate targets and to improve energy affordability, the State and all economic actors will need to make strategic near-term capital investments. This analysis shows that such investments will pay significant dividends to the people of Colorado, resulting in **less air pollution; reduced risks, impacts, and costs associated with additional climate warming; lower energy bills; and fewer energy-burdened Colorado households.**

Electric car charging during winter. Photo by Marc Bruxelle / Shutterstock.com

Background

Sustainability Solutions Group (SSG) developed this analysis to understand the impact of Colorado's existing clean energy policies as well as four scenarios that evaluate a suite of solutions designed to achieve the State's science-based statutory economy-wide GHG emissions goals. The model examines the following themes:

- GHG emissions, including annual and cumulative emissions.
- Economic impacts, including capital costs and ongoing operational costs or savings (measured as net present value); the cost per ton of GHG emissions reductions; and impacts on household energy costs.
- Local air pollutants, including projected emissions by county.

SSG modeled six scenarios:

1. **A BAP Scenario** that evaluates the impact of existing clean energy policies. This scenario includes policies that are enforceable today, such as statutory or regulatory requirements, and excludes policies that are goals or are not enforceable. Additionally, during the modeling process, Congress passed Congressional Review Act Resolutions disapproving the waivers for Advanced Clean Cars II, Advanced Clean Trucks, and Low-NOx Omnibus regulations, which require vehicle manufacturers to meet emissions standards for new vehicles. This Congressional action has been challenged by California and other states as unlawful and unconstitutional. As a result, these policies were excluded from the BAP Scenario because of the ongoing litigation related to the rules.
2. **A Reference Case Scenario,** which assumes population and economic growth but no additional changes in Colorado's energy sources or how energy is used in buildings, transportation, electricity, or industry. In other words, the scenario assumes the current fuel mix for electricity, transportation, buildings, and industry does not change over the next 25 years. This scenario is designed to provide a reference point for evaluating the impact of existing policies, as represented in the BAP Scenario.

3. **Low Carbon 1 (LC 1 [E&E]):** This scenario reflects a "high-efficiency, high-electrification" future. It prioritizes policies regarding rapid decarbonization of the electric sector; electrification of end uses, including buildings, transportation, and industry; deep energy retrofits of existing buildings; and high efficiency in new buildings.
4. **Low Carbon 2 (LC 2 [LC fuels]):** This scenario reflects a "low-carbon fuels" future. It includes significant electrification and energy efficiency, but at a lower level than in LC 1 (E&E), and includes higher use of low-carbon fuels such as renewable natural gas and green hydrogen.
5. **Low Carbon 3 (LC 3 [least cost]):** This scenario was crafted to prioritize the lowest-cost emissions reductions first. Notably, because all low-carbon scenarios must meet net-zero emissions in 2050, this scenario ultimately uses almost all the same measures deployed in LC 1 (E&E), but accelerates the lowest-cost reduction opportunities and delays deploying relatively more expensive reduction opportunities.
6. **Low Carbon 4 (LC 4 [sectors]):** This scenario prioritizes meeting a pre-defined sector-specific emissions reductions trajectory, with policy and technology interventions for each sector calibrated to achieve those sector-specific reductions. It deploys interventions from both LC 1 (E&E) and LC 2 (LC fuels) to achieve these sector-specific targets. The emissions reductions by sector add up to the economy-wide goals.

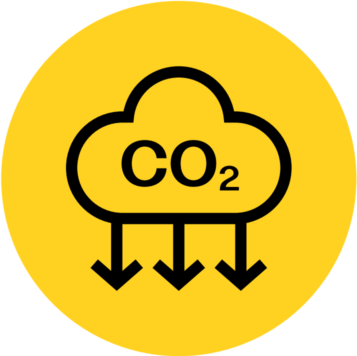
All scenarios account for the effects of increasing population and economic growth. The analysis of these six scenarios was designed to shed light on the impacts of different policy decisions and technology interventions. LC 1 (E&E) and LC 2 (LC fuels) can be compared to understand the emissions, costs, and other impacts of strategies focused on electrification as compared to low-carbon fuels. LC 3 (least cost) and LC 4 (sectors) highlight the implications of requiring individual sectors to achieve certain emission goals, versus allowing flexibility between sectors while prioritizing the lowest-cost reductions. The following sections describe key takeaways from comparing the scenario results.

GHG Emissions and Reductions

Colorado's Current Emissions Trajectory

In 2023, the first year of the analysis, the GHG emissions are estimated at 151 $MMTCO_2e$, excluding emissions associated with land use, land-use change, and forestry (LULUCF).[2] In 2023, the largest emissions sources were transportation (22%), followed by electricity (18%) and oil and natural gas (18%).[3] Colorado's 2023 emissions were approximately equal to the state's 2005 emissions. Despite Colorado's progress in reducing emissions from the electric sector, emissions in other sectors, particularly transportation, have increased since 2005. The estimated emissions in 2023 are also higher than emissions in 2020, the most recent emissions data available at the time of modeling, as reported in Colorado's 2024 Greenhouse Gas Inventory. This likely reflects that in 2020, as a result of COVID-19, transportation-related emissions sharply declined but rebounded by 2023 as COVID-era restrictions and driving behavior patterns returned to previous levels.

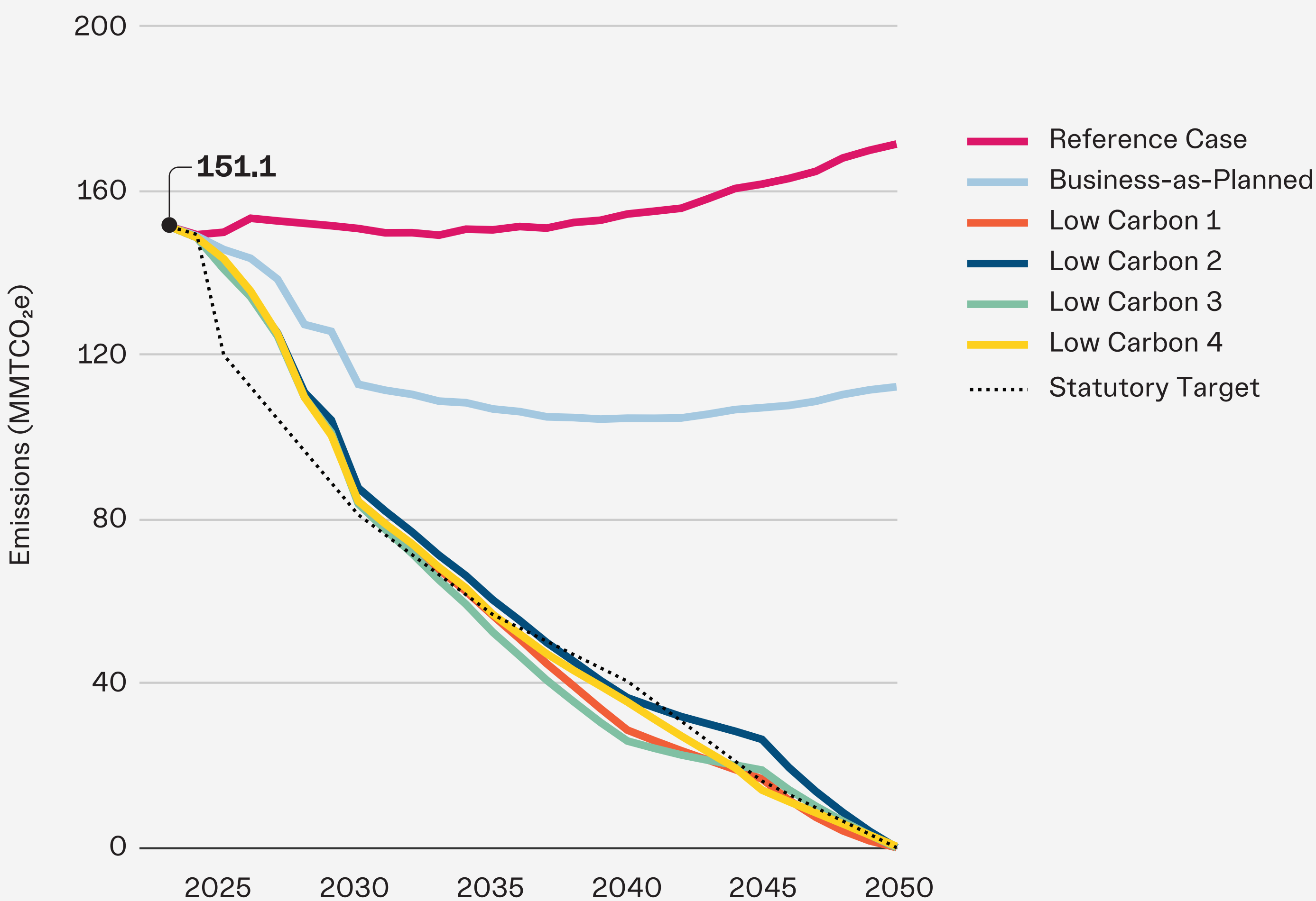
Looking forward, Colorado's current climate policies result in significant emissions reductions relative to the Reference Case Scenario but do not achieve the State's GHG emissions reduction targets. As modeled in the BAP Scenario, under current policy, Colorado's emissions are 141 $MMTCO_2e$ in 2025 and they decline to 112 $MMTCO_2e$ in 2050. In every interim year, Colorado is projected to face a gap between its current trajectory and its emissions reduction goals. These gaps amount to 26 $MMTCO_2e$ in 2025, 32 $MMTCO_2e$ in 2030, 50 $MMTCO_2e$ in 2035, 64 $MMTCO_2e$ in 2040, 91 $MMTCO_2e$ in 2045, and 112 $MMTCO_2e$ in 2050 (Figure 2).



2 In all scenarios, there is uncertainty about emissions associated with land use, land use change, and forestry (LULUCF), which are thought to be largely due to changing emissions associated with Colorado's forests. In 2023, LULUCF emissions were estimated at approximately 13 $MMTCO_2e$. While the remainder of this analysis excludes LULUCF emissions, it highlights a critical gap in both research and policy that must be addressed.

3 SSG relied on various sources of data to estimate 2023 GHG emissions because there is a multi-year lag between when emissions occur and when the data is publicly available. SSG relied in part on reported emissions data (for point sources), as well as fuel consumption (for transportation and buildings), etc. For details, see the full report.

Figure 2.
Projected emissions trajectories under the Reference Case and BAP scenarios and the four low-carbon scenarios. Colorado's statutory economy-wide emissions reduction goals are also shown.

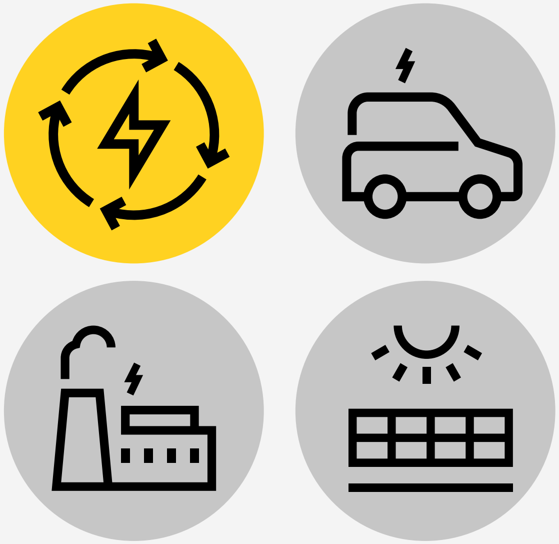


Low-Carbon Scenarios

The four low-carbon scenarios largely achieve Colorado's climate targets from 2030 through 2050, but no scenario achieves the 2025 economy-wide goal.[4] The different low-carbon scenarios achieve differing levels of cumulative emissions reductions. For example, LC 3 (least cost) reduces cumulative emissions by 61 $MMTCO_2e$ more than LC 4 (sectors) between 2026 and 2050. LC 3 (least cost), which was designed to meet Colorado's economy-wide climate targets at the lowest cost, also has the lowest cumulative emissions out of all four low-carbon scenarios.

Every low-carbon scenario shares certain characteristics. First, the low-carbon energy system is an efficient energy system compared to the BAP Scenario. Energy use overall (measured in Million British Thermal Units or MMBtu) declines by nearly half between 2023 and 2050 in the low-carbon scenarios, despite significant population growth in the state. Second, the low-carbon energy system is dominated by electricity. Between 2023 and 2050, electricity consumption doubles or nearly doubles in each scenario as electricity increasingly powers homes, businesses, and transportation. However, relative to the BAP Scenario, grid electricity consumption in LC scenarios increases by between 2% and 8% by 2050, except in LC 2, which has an increase of 14%. Key actions across all scenarios include decarbonizing the electric grid and electrifying transportation, residential and commercial buildings, and industry. Colorado has reserves of the energy sources on which the low-carbon scenarios depend—solar, geothermal, and wind.

All low-carbon scenarios rely on carbon removal strategies to achieve net-zero emissions between 2045 and 2050. Carbon removal negates residual emissions in hard-to-decarbonize sectors such as agriculture and industrial processes. Scenarios with higher amounts of low-carbon liquid fuels, such as LC 2 (LC fuels), rely more heavily on carbon removal in later years. Given that atmospheric carbon removal strategies like direct air capture are novel and relatively unproven at scale, greater reliance on these strategies adds risk and uncertainty to the effectiveness and cost of achieving the State's GHG goals. Accelerating action to reduce GHG emissions increases cumulative GHG pollution reductions and minimizes the reliance on uncertain carbon removal strategies to achieve net zero.



4 Emissions under LC 2 (LC fuels) are slightly higher than the state-wide goal in 2045.

The differences between the low-carbon scenarios are also illustrative. LC 1 (E&E) models high levels of efficiency, including retrofitting existing residential and commercial buildings, building district energy systems, installing rooftop photovoltaics (PVs), and supporting mode shifting (e.g., from single-passenger vehicle trips to e-bikes and mass transit). LC 2 (LC fuels) has lower levels of investment in residential building retrofits but comparable levels of investment in residential electric appliances. LC 2 (LC fuels) also has less investment in mode-shifting measures, such as passenger rail and e-bikes, but includes investments in rural transit. As a result, electricity demand and vehicle miles traveled (VMT) are notably higher under LC 2 (LC fuels) compared with the other low-carbon scenarios. Both LC 3 (least cost) and LC 4 (sectors) share many similarities with LC 1 (E&E) but have lower levels of investment in residential building retrofits. Finally, green hydrogen is used across all four low-carbon scenarios, either in the industrial sector (LC 1 [E&E]) or in the industrial and transportation sectors (LC 2 [LC fuels], LC 3 [least cost], and LC 4 [sectors]). Figure 3 illustrates the emissions reductions expected under the BAP Scenario and additional incremental reductions modeled under LC 3 (least cost); the cumulative reductions are also described in Table 1.

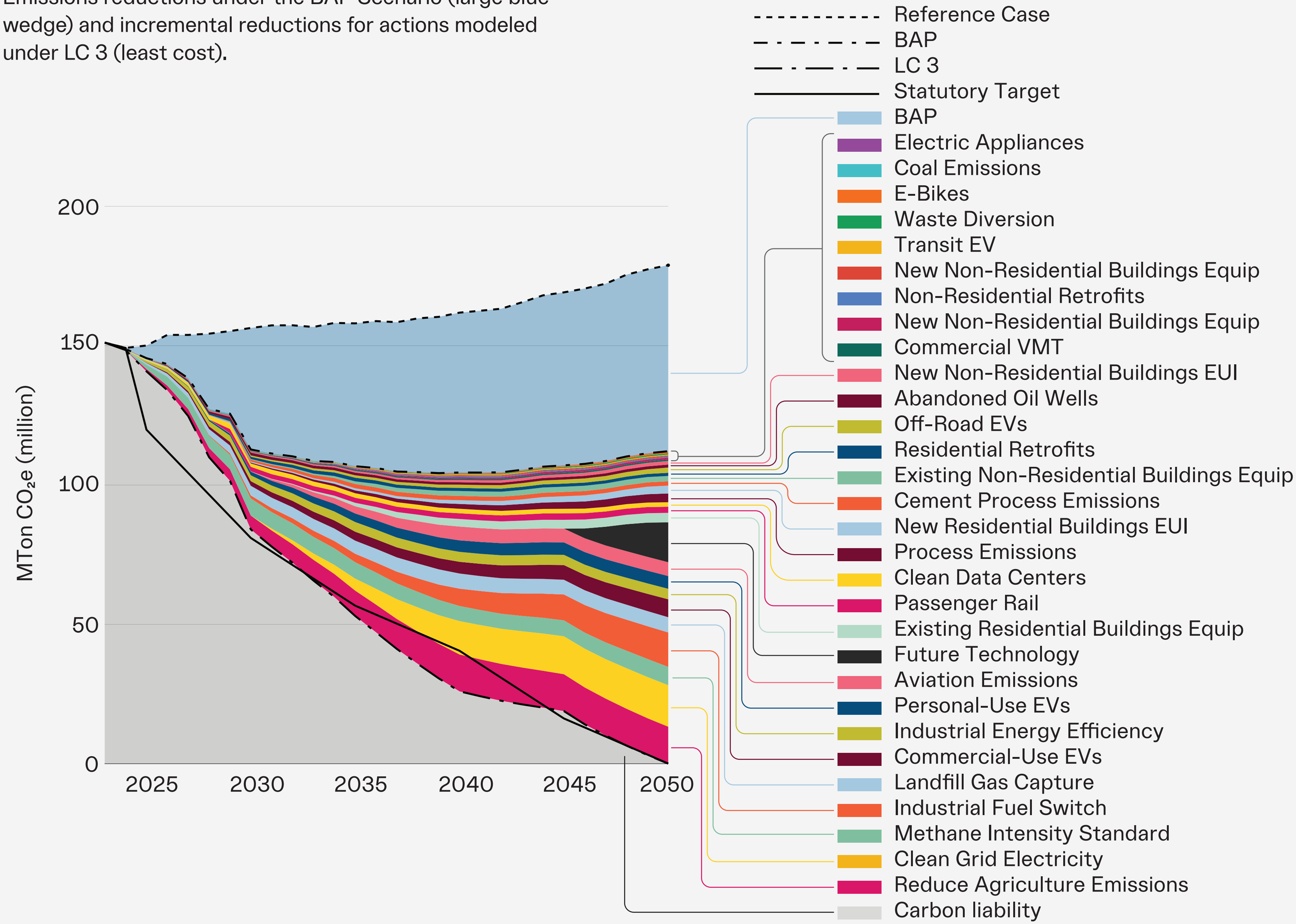
Dolores River Canyon in Montrose County, Colorado. Photo by John Fielder

Table 1.
Key priority actions and the modeled $MMTCO_2e$ cumulative emissions reductions (2023–2050) for select measures under LC 3.

Sector	Key Priority Actions	Cumulative Abatement (2023-2050) million $MTCO_2e$
Transportation	Electrify personal and commercial vehicles	169
	Reduce aviation emissions	78
	Promote alternative forms of transportation, including bus, train, and e-bikes	49
	Reduce vehicle miles traveled	10
Industry	Industrial fuel switch	133
	Industrial energy efficiency	79
	Process emissions	30
Agriculture	Emissions reductions from a combination of the following: ▪ No-till/reduced tillage ▪ Enhanced-efficiency fertilizers (EEFs)/4R nutrient management ▪ Manure digesters ▪ Enteric methane inhibitors (e.g., Bovaer, seaweed) ▪ Rotational improved grazing ▪ Agroforestry/tree planting (shelterbelts, riparian) ▪ Biochar soil amendment	245
Electricity	Decarbonize electricity generation	193
	Ensure new data centers are powered with clean energy	39
Residential and Commercial	Electrify end uses, including space and water heating	95
	Improve energy efficiency of existing buildings and establish rigorous efficiency standards for new buildings	83
Oil and Gas	Reduce methane leakage from oil and gas production	163
Waste	Divert waste and capture landfill gas	118

Figure 3.

Emissions reductions under the BAP Scenario (large blue wedge) and incremental reductions for actions modeled under LC 3 (least cost).



Economic Impacts

Overall, the low-carbon scenarios save money for ratepayers, operators, and others across Colorado. The low-carbon scenarios all require an incremental capital investment, but the analysis does not identify **which actor** provides the capital or the mechanism to drive that capital. Additionally, these types of investments are generally financed. For example, investments in higher performance homes can be spread out over time to align with savings from maintenance and energy costs. A green bank can provide low-interest loans to residents or businesses wanting to invest in heat pumps or electric vehicle (EV) charging infrastructure. Electric utilities can invest private sector capital in new clean electricity resources. The State may raise revenue to fund programs through a program that levies a tax or fee on pollution,[5] or it may implement emissions regulations that stimulate private investment in pollution reductions. In short, clean energy investments can be funded through a variety of mechanisms and sources.

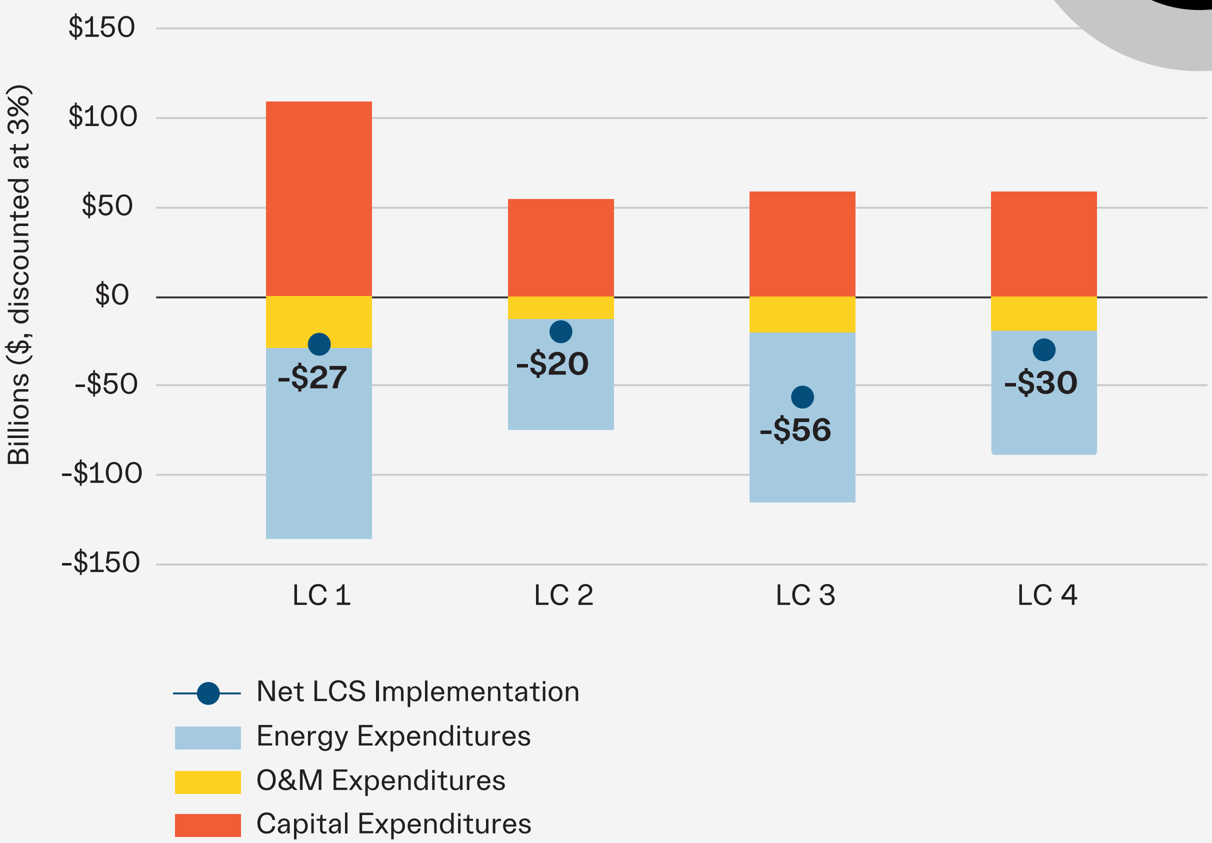
Each scenario, including the Reference Case and BAP scenarios, requires up-front capital investments. The low-carbon scenarios generate savings in the form of reduced energy bills and annual operating and maintenance (O&M) costs. Figure 4 illustrates the present values of energy costs, O&M costs, and capital costs relative to the BAP Scenario, as well as the net present value of the scenario (dark blue).[6] Over the 25-year period modeled (2025–2050), LC 2, LC 3, and LC 4 each have average annual capital investments of $3 billion–3.3 billion; in comparison, LC 1 (E&E) has higher average annual capital costs of $5.9 billion (undiscounted). LC 1 (E&E) and LC 3 (least cost) have the largest average annual O&M and energy cost savings, at $2.9 billion and $2.6 billion, respectively. With financing, each low-carbon scenario, except LC 4 (sectors), has net economic benefits from year 1.

5 This analysis did not evaluate specific policy mechanisms for raising revenue consistent with requirements under Colorado's Taxpayer Bill of Rights.

6 The net present value analysis uses a 3% discount rate. Negative values represent savings, while positive values indicate costs.

Figure 4.

The present value of costs and savings from capital investments, energy costs, and O&M costs. Dark blue dots represent net costs. Negative values represent savings, while positive values represent costs. Costs are discounted at a 3% rate.



On net, LC 3 (least cost) demonstrates the greatest economic benefit: every ton of CO_2e reduced generates a net benefit of $35. In other words, **reducing greenhouse gas emissions saves Coloradans money** by reducing annual expenditures for energy and O&M. Table 2 shows the cost savings per ton of CO_2 reduced relative to the BAP Scenario. The middle column shows the economic benefits, excluding the social cost of carbon; if the social cost of carbon is included, every scenario demonstrates an even greater overall benefit from reducing emissions.

Table 2.
Cost (savings) associated with reducing GHG emissions under each low-carbon scenario.
Negative costs represent savings. All figures are net present value, calculated using a 3% discount rate.

	Net cost/savings per MTon of GHG ($/MTCO$_2$e) pollution reduced, relative to BAP (negative means savings)	
Scenario	Without Social Cost of Carbon	With Social Cost of Carbon
LC 1 (high efficiency, high electrification)	-$17	-$439
LC 2 (high low-carbon fuels)	-$14	-$423
LC 3 (least-cost strategies prioritized)	-$35	-$471
LC 4 (achieve sector-specific goals)	-$19	-$464

Reducing GHG emissions reduces energy bills and energy burden. Three low-carbon scenarios—LC 1 (E&E), LC 3 (least cost), and LC 4 (sectors)—reduce the number of energy-burdened households by 27% by 2050. LC 2 (LC fuels), which emphasizes low-carbon fuels such as renewable natural gas (RNG) and green hydrogen, does not reduce the number of energy-burdened households. LC 1 (E&E), LC 3 (least cost), and LC 4 (sectors) also reduce household energy expenditures by roughly 19%–22% between 2025 and 2050, while LC 2 (LC fuels) reduces energy bills by 9%. In other words, policies that prioritize low-carbon fuels generate less economic benefit than policies that prioritize electrification. Figure 5 shows the change in household energy expenditures, by county, between 2025 and 2050 under the Business-as-Planned, LC 1 (E&E), and LC 3 (least cost) scenarios. In 2025, households in many counties pay, on average, $5,000/year in energy bills. Under LC 1 (E&E) and LC 3 (least cost), annual energy bills are much lower across the state, with average household energy costs in the $1,000–$3,000 range in 2050 (all shown in 2025$).

Figure 5.
Average energy cost per household in 2023 and in 2050 under the BAP, LC 1 (E&E), and LC 3 (least cost) scenarios.

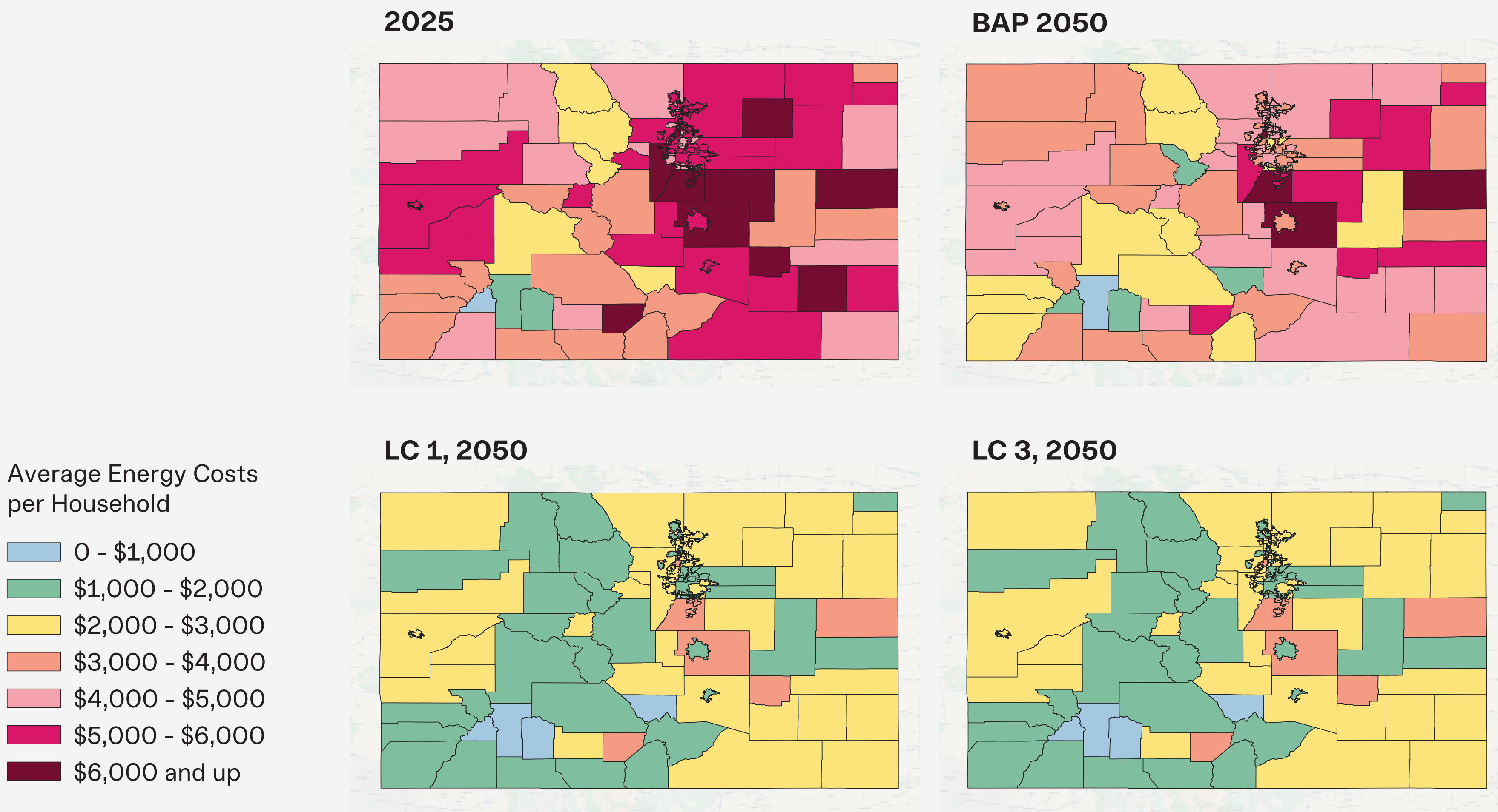
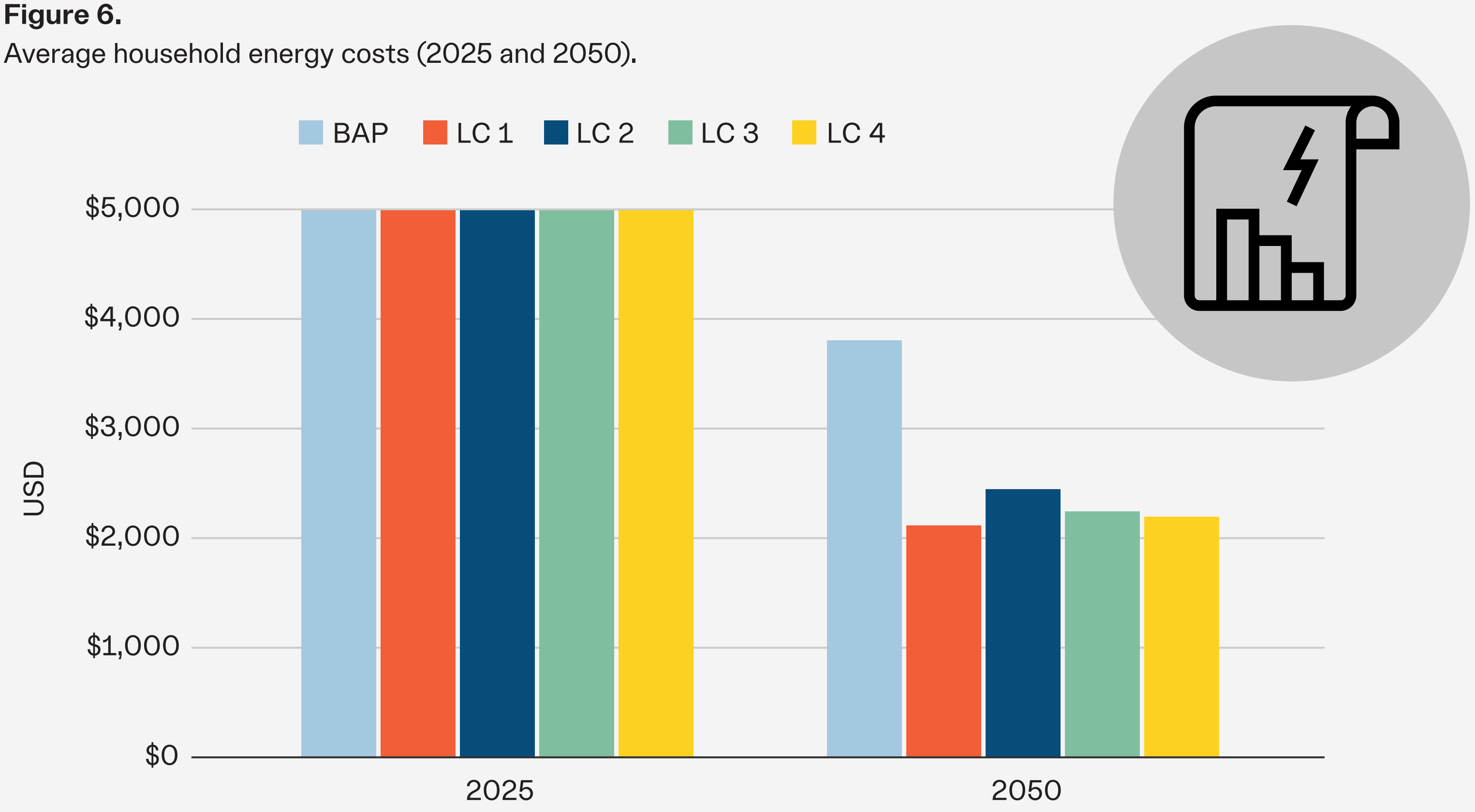


Figure 6.
Average household energy costs (2025 and 2050).



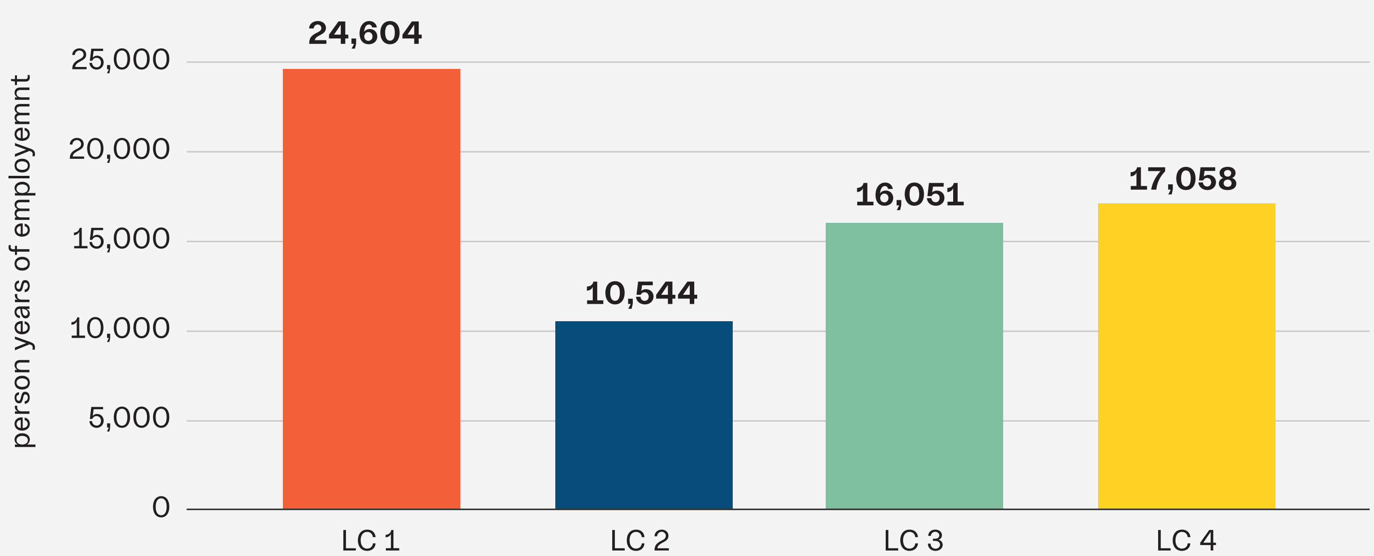
This analysis uses a social discount rate of 3%. A higher discount rate places less value on future savings or costs—using a higher discount rate places less value on future energy and O&M savings, and more value on the near-term capital expenditures. Even when using a higher discount rate of 6%, LC 3 (least cost) provides a strong net benefit for reducing emissions (net present value of -$13/ton of CO_2e avoided). LC 4 (sectors) also has a net benefit, albeit lower than LC 3 (least cost); LC 1 (E&E) has a net cost; and LC 2 (LC fuels) essentially breaks even. The discount rate is analogous to the interest a person or business would pay on a loan. Given that some scenarios shift from positive benefits to net costs when applying a higher discount rate, it is critical to facilitate low-interest loans or financing for low-carbon projects.

Finally, the clean energy actions and investments present new employment opportunities. LC 1 (E&E) results in an average of 24,600 jobs created per year, which is more than in LC 2 (LC fuels) (10,500), LC 3 (least cost) (16,100), and LC 4 (sectors) (17,100) (Figure 7). The job projections are calculated based on the incremental increase in capital expenditures in each of the sectors.

Decarbonizing Colorado's economy will also save Coloradans money. All of the low-carbon scenarios have strong net economic benefits for Coloradans. LC 3 (least cost) has the best financial return, requiring half the capital investments of LC 1 (E&E) and resulting in twice the savings per $MTCO_2e$ of emissions reduced. Additionally, the low-carbon scenarios provide resilience against future price swings in energy costs.

Figure 7.

Average annual person-years of employment (2025–2050).



Air Pollution

Local air pollutants are largely a function of combusting fossil fuels. Local air pollution, such as ground-level ozone (smog) and PM2.5, can cause health impacts such as asthma, particularly in vulnerable populations. Currently, large portions of the Colorado Front Range do not comply with federal air-quality standards for ozone.

All four low-carbon scenarios result in reductions in local air pollutants. In scenarios LC 1 (E&E), LC 3 (least cost), and LC 4 (sectors), local air pollutants are sharply reduced by 2040 and virtually eliminated by 2050. In LC 2 (LC fuels), local air pollutants are reduced relative to the BAP Scenario but remain in 2040 and 2050 because the scenario includes higher levels of RNG combustion in the transportation sector and in the residential and commercial sectors. Table 3 lists the pollutants by scenario in 2050. Figure 8 shows the air pollution per capita by county in 2050, with blue indicating lower levels per capita and yellow representing higher levels of pollution per capita.

At industrial facilities, GHG emissions and local air pollutants are reduced as a result of converting fossil-fuel-based processes to electricity and green hydrogen or relying on carbon capture and sequestration. Even if industrial facilities export their products (e.g., refined petroleum) to other states, air pollution is almost eliminated by 2050 under LC 1 (E&E), LC 3 (least cost), and LC 4 (sectors).

Colorado's I-70 through Denver. Photo by Kristina Blokhin/stock.adobe.com

Table 3.
Local air pollutants (Mtons), by scenario, in 2050.

	CO	HC	NOx	PM10	PM2_5	SO_2	VOC
BAP	441,200	9,472	92,424	22,080	14,634	4,768	41,865
LC1	10,377	39	1,935	2,551	2,347	178	2,371
LC2	241,759	60	13,329	5,605	4,847	299	20,638
LC3	2,183	43	844	1,345	942	147	1,048
LC4	2,207	43	884	1,345	942	147	1,050

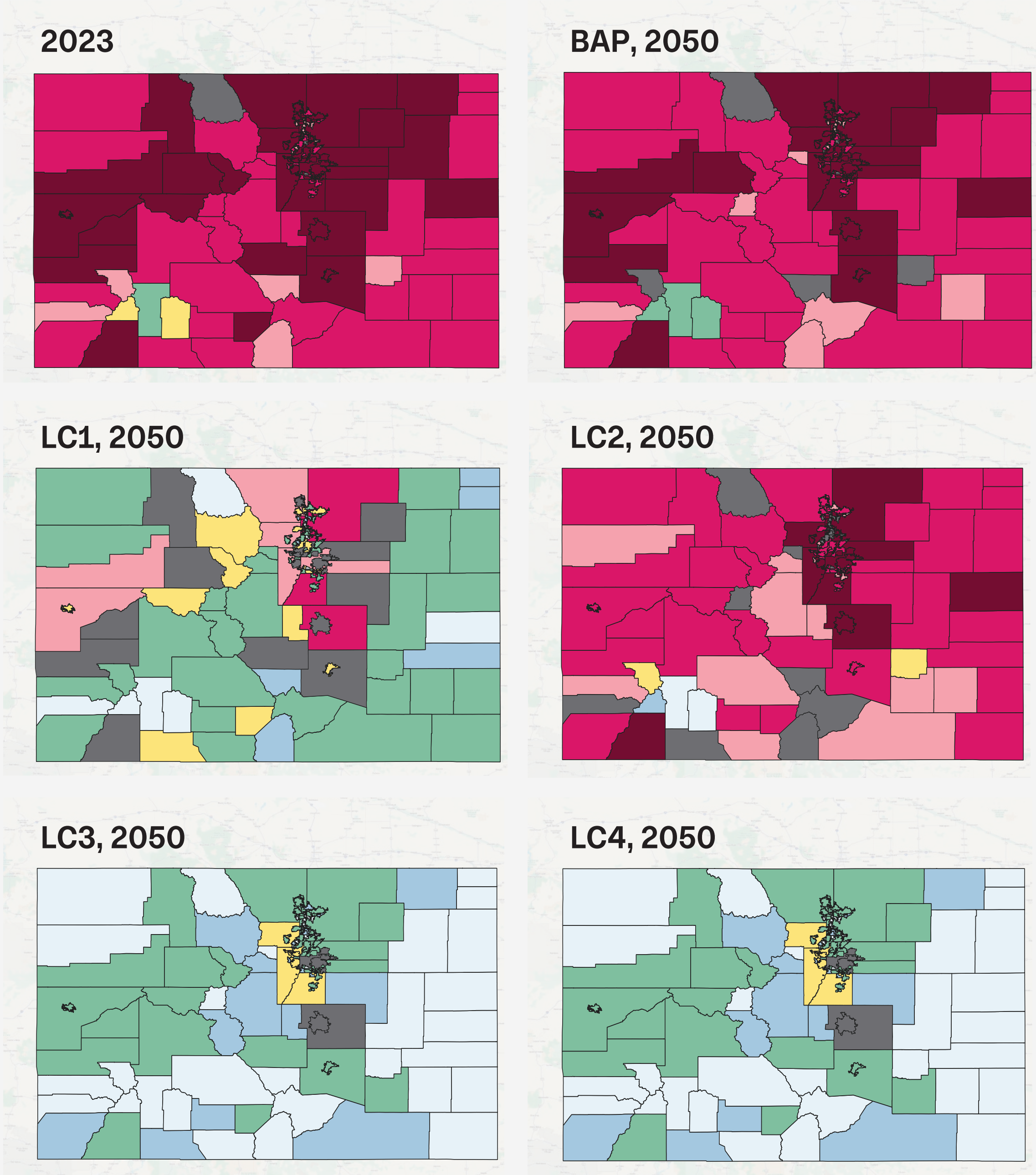
Based on the reduction in air pollutants, annual avoided health costs were determined using the Environmental Protection Agency's (EPA) COBRA[7] model. All four scenarios show substantial savings in health costs, illustrated in Table 4. Many of these costs are currently borne by individuals living in high-pollution areas and Disproportionately Impacted Communities (DICs), as shown in the maps below.

Table 4.
Average annual avoided health costs (million USD, 2025–2050) by scenario.

	LC1	LC2	LC3	LC4
Avoided Health Costs	$2,100	$1,980	$2,230	$2,160

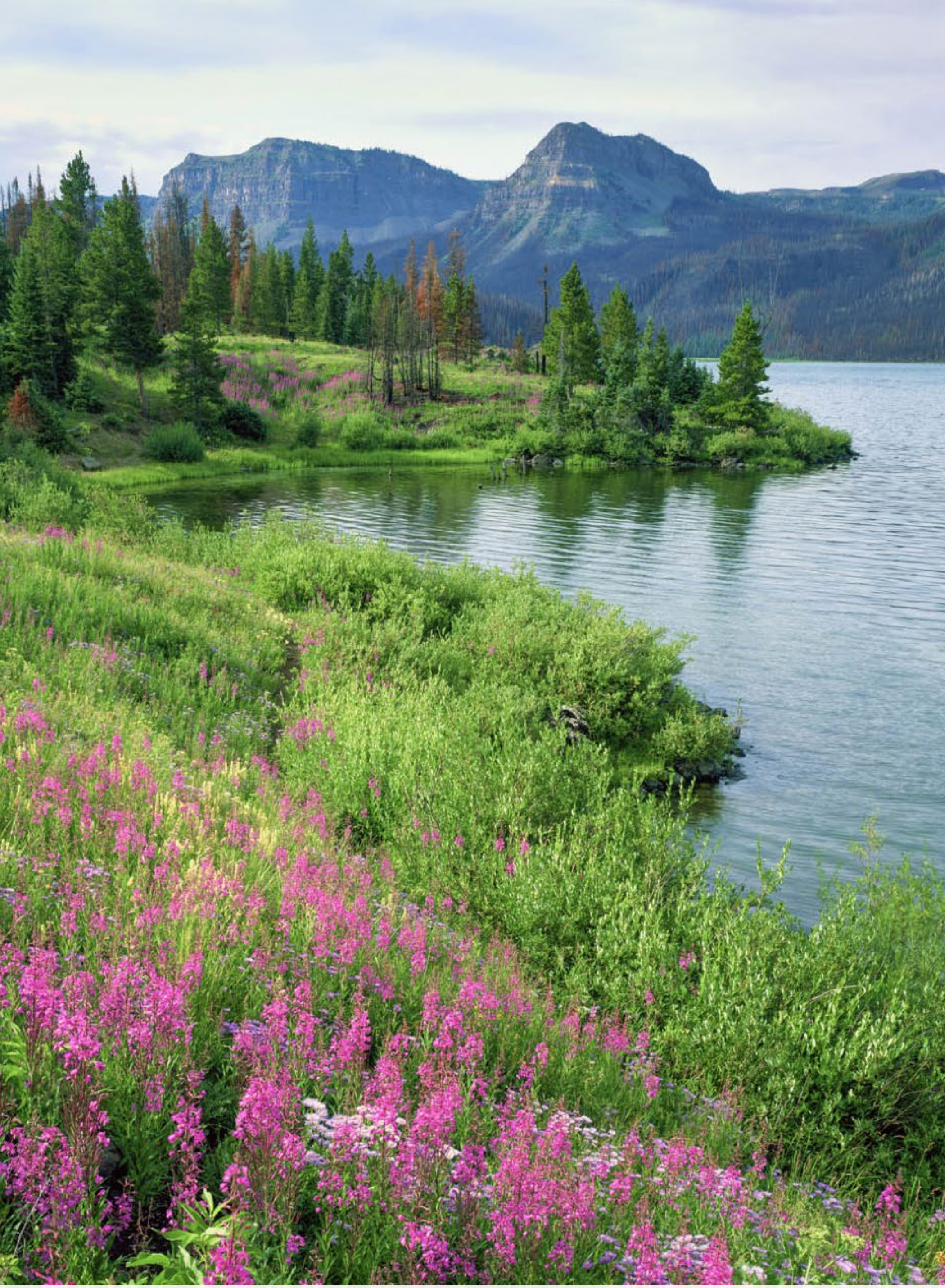
7 EPA's CO–Benefits Risk Assessment (COBRA) screening model explores how changes in air pollution from clean energy policies and programs, including energy efficiency and renewable energy, can affect human health at the county, state, regional, or national levels - What is COBRA? | US EPA.

Figure 8.
Total local air pollutants by zone, MTon.



Criteria Air Pollutants - MTon

- 0 - 5
- 5 - 10
- 10 - 50
- 50 - 100
- 100 - 500
- 500 - 1000
- 1000 - 5000
- 5000 and up



Flat Tops Wilderness, Colorado.
Photo by John Fielder

Glenwood Springs, Colorado.
Photo by MaciejBledowski/stock.adobe.com

Conclusions

Achieving Colorado's greenhouse gas emissions reductions targets will provide diverse benefits: Coloradans will pay less in energy bills and see a net economic gain, and local air pollution will be virtually eliminated. The low-carbon scenarios provide key insights about how to proceed:

- Climate policies that provide deep emissions reductions can reduce energy costs for Colorado families. New capital deployment or reallocation will be critical to achieving the State's climate targets. The State may raise revenue to fund this investment through a program that levies a tax or fee on pollution, or it may implement emissions regulations that stimulate private investment in pollution reductions. This investment pays dividends in reducing customers' energy bills, reducing the number of households that are energy burdened, and providing overall net economic benefits.
- Colorado should establish policies to stimulate investments into clean energy solutions, raise revenue to help meet the State's climate targets, and ensure that consumers see an immediate economic benefit from low-carbon investments.
- Climate policies can drive significant reductions in air pollution and health benefits. Enacting policies that prioritize reducing harmful co-pollution together with reductions in GHG emissions, especially in disproportionately impacted communities as defined by the Colorado Environmental Justice Act, is essential to a just climate future.
- Policies that focus on electrification of homes, businesses, and transportation provide greater economic and pollution benefits than policies that rely more on low-carbon fuels to power those end uses, though green hydrogen plays a modest role in every low-carbon future.
- Energy efficiency is important across the scenarios. Prioritizing measures like deep energy retrofits of residential homes has a high up-front cost, but it reduces household energy expenditures, increasing energy affordability.
- Strategies that prioritize the lowest-cost emissions reduction opportunities first, including by allowing flexibility in the sectors in which those reductions are achieved, can enable Colorado to accelerate pollution reductions and reduce greater cumulative pollution overall. This is demonstrated by LC 3 (least cost)—designed to achieve Colorado's economy-wide climate targets at the least cost, which reduces the most cumulative GHG emissions out of all four low-carbon scenarios.

- Emissions associated with LULUCF (forestry) are uncertain, both in terms of their magnitude and the measures to reduce them. Additional investments in research are required to better understand the source and mitigation potential for these emissions.
- All scenarios rely on carbon removal strategies in the latter years to address the remaining emissions in certain particularly hard-to-abate sectors (e.g., from industrial processes). The level of reliance on carbon removal varies—scenarios that rely more heavily on carbon removal (LC 2 [LC fuels]) pose a much greater risk to consumer costs and achieving the statutory GHG goals.

While Colorado has made progress in reducing emissions, under the BAP Scenario, the state is not on track to achieve the statutory reduction goals. Accordingly, additional efforts are required to address climate pollution as early as possible. These efforts will deliver multiple dividends beyond GHG emissions reductions in terms of economic benefits and reductions in air pollution across the state.

Colorado Springs, Colorado. Photo by Neil/stock.adobe.com

Colorado's Clean Affordable Climate Pathways

Summary Report

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