UNIVERSITY OF COLORADO *LEEDS SCHOOL OF BUSINESS*

COLORADO BUSINESS REVIEW

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"Colorado will sustain job growth in 2025..."

COLORADO ECONOMIC SUMMARY

Employment in Colorado is estimated to have increased 1.6%, or 46,800 jobs, in 2024, pushing the economy to new peaks. Colorado will sustain job growth in 2025, albeit at a more modest pace, increasing by another 36,700 jobs (1.2%). Of the 11 industry groups in the state, 10 are projected to add jobs in 2025; the exception is Information, which continues to face long-standing industry challenges. In 2025, Educational and Health Services is projected to add the most jobs, while the fastest pace of job growth (percentage terms) is projected in Natural Resources and Mining.

Agriculture

High production costs and lower crop prices will remain a headwind for the Agriculture sector in 2025. The outlook for crop farmers is grim, as market prices for many of Colorado's field crops were lower in 2024 than in 2023, and prices are expected to remain unfavorable in 2025. Conversely, beef, egg, and dairy growers experienced a good year, led by Colorado's strong cattle production. Colorado's 2024 net farm income is estimated to decrease 10.5%, but grow 12.2% in 2025.

IN THIS ISSUE

Natural Resources and Mining

Colorado's natural resources and mining sector valuation is estimated to at $17.5 billion in 2024, a nearly 7% decrease from the 2023 sector valuation of $18.7 billion, and a notable 37% below the valuation in 2022. Colorado's total value of oil and gas production is estimated to be $14.9 billion in 2024, down 6.5% from 2023 due to a modest decrease in physical output and muted prices. The value of natural resources and mining is projected to increase modestly (1%) in 2025.

Construction

In 2024, total construction activity is estimated at $19.3 billion in 2024, representing a decline of 15% from 2023, primarily driven by declines in multifamily and nonresidential sectors. While single-family permits increased and are expected to rise further in 2025 due to higher in-migration and declining interest rates, multifamily construction permits decreased significantly. While the multifamily slowdown was attributed to high interest rates, softening rental markets, and increased regulations in local governments, demand is expected to improve as in-migration increases and single-family homes remain relatively unaffordable. Nonresidential building construction is expected to decline slightly while nonbuilding construction activity is expected to increase, driven by large renewable energy utility projects.

Manufacturing

Much like the rest of the nation, Colorado's manufacturing sector has struggled with the effect of high interest rates, high costs of raw materials and inputs, a slower housing market, and reduced demand for durable goods. Overarching market dynamics, including a persistent skills gap and an ongoing push to automation have influenced several of the manufacturing subsectors. Given these challenges, manufacturing in Colorado is expected to slightly contract in 2024, driven by losses in nondurable goods and flat employment in durable goods. Despite the expected losses in the near term, easing interest rates, federal investment in renewable energy, and growth in food products and beverages are expected to generate modest employment gains in the state in 2025.

Trade, Transportation, and Utilities

The uniqueness of this large sector covering a wide array of companies continues to bolster the industry as the largest in the state. While growth in retail trade sales slowed in the first half of 2024, it is projected to positively rebound over the second half of 2024. Warehouse employment in the state surged before and during the pandemic but has normalized in 2024. In addition, the market penetration of electric vehicles in the state continues to increase. As one of the largest employment sectors in Colorado, the industry remains an anchor of the Colorado economy; however, growth will remain very slow in 2025.

Information

After experiencing a rebound in 2021 and 2022, employment in the Information sector has softened, losing 1,700 jobs in 2023, with additional job losses expected in 2024 and 2025. Information's recent employment losses have been driven by declines in telecommunications and software publishing. Several industry headwinds include the rapid gains in AI and other technological advancements, oversaturated markets, and shifting consumer preferences. One potential bright spot in the Information sector is the Data Processing, Hosting, and Related Services subsector which has experienced recent employment growth. Employment in the sector is expected to decline in 2024 and again in 2025 as long-term declines in traditional publishing and telecommunications industries persist.

Financial Activities

Financial Activities outperformed other industries in 2024 but is expected to continue to increase at a slower rate in 2025. Commercial banking has been strong in 2024, and commercial real estate markets are expected to improve more broadly in 2025. The health of this sector will continue to be directly linked to monetary and fiscal policy actions in the near term.

Professional and Business Services

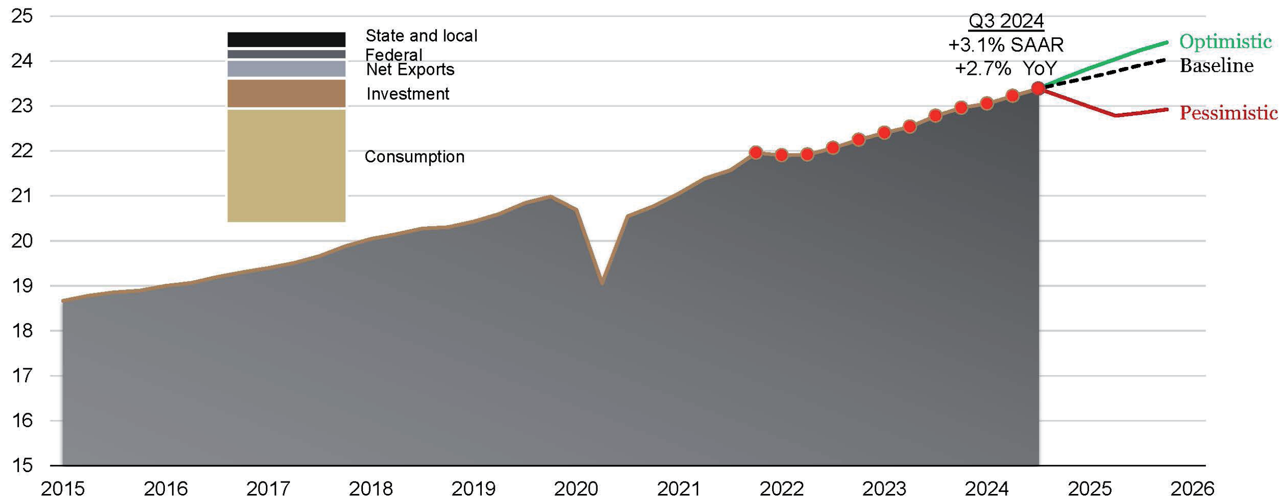
The sector continues to be a strength within the Colorado economy—at the end of 2023, it was the 2nd-largest private sector industry with about 17% of total jobs in the state—and it recovered quickly from the pandemic-induced downturn. The highly skilled and highly educated workforce continues to increasingly be sourced and managed remotely, offering more flexibility to employees and reducing overhead cost for offices. Employment in the sector has moderated in recent years, and that trend is expected to continue in 2024 and 2025, but Colorado's position as one of the most innovative, educated, and entrepreneurial states bodes well for the sector.

Education and Health Services

While employment in the Health Care and Social Assistance subsector increased significantly in Q1 2024, driven by large growth in ambulatory care, a number of issues persist. The number of uninsured patients in the state is likely to increase as the full effect of Medicaid redeterminations are realized in the aftermath of the pandemic. In addition, Colorado's aging population

U.S. Real GDP

U.S. Quarterly GDP, $ Trillions



Sources: Bureau of Economic Analysis and Moody's Analyctics

will have widespread ramifications for the health care landscape within the state. Growth in private education services in the year ahead will continue to be influenced by the ability of schools to adjust to the changing demands of online learning and potentially declining enrollment. Employment in Education and Health Services is expected to grow 3.7% in 2024 and grow by an additional 2.3% in 2025.

Leisure and Hospitality

The Leisure and Hospitality industry fully recouped its pandemic-era job losses, growing 4% in 2023. Despite recent employment gains, the industry is expected to continue to be constrained by pandemic-era challenges, and Colorado restaurants continue to face high operational costs, labor challenges, and legislative changes that have led to reduced profitability and closures. Tourism in Colorado continues to be strong, and the Colorado skiing industry experienced its 2nd-busiest winter in the 2023/24 season. Industry employment is expected to post modest growth in 2025, as the industry faces persistent economic challenges.

Other Services

Businesses in this sector (e.g., hair and nail care, religious organizations) will continue to be intrinsically linked with the economy, demographics of the Colorado population, disposable income, and consumer confidence. This industry has experienced steady employment growth in recent years and is expected to continue growing as unionization increases and demand for vehicle maintenance persists.

Government

After a relatively slow rebound from the pandemic, Government employment increased 5.2% in 2023, reaching a new employment peak. As the sector continues its recovery in 2024, government entities at all levels continue to face lingering challenges, including higher costs, the end of pandemic-era federal funding, worker shortages, and flat tax revenues. Federal government employment may post modest growth in 2025 while state government employment remains flat. Local government is projected to increase 2.1%.

National and Colorado Trends

• National real GDP grew an estimated 2.7% in 2024. U.S. real GDP is projected to grow 2.3% in 2025, with consumption, investment, and government spending all adding to overall growth.

• Consumers appear to have worked through headwinds that risked a disruption in consumption. Personal consumption grew an estimated 2.7% in 2024, and moderate growth is projected to continue in 2025, at 2.6%.

• Rising interest rate policies were deployed to manage high inflation. The higher interest rates had a cooling effect on investment. Fed policy reversed in the second half of 2024 with two initial rate cuts summing to 0.75%. The lower cost of borrowing could boost residential and nonresidential fixed investment if the longer end of the yield curve responds accordingly.

• Employment growth in Colorado is projected at 36,700 in 2025, with jobs added in ten of the 11 major industries.

• In 2025, Colorado is projected to add 51,400 people, according to the State Demography Office. Growth will come from net migration (32,700) and from the natural increase (18,700).

THE ECONOMIC COMPETITIVENESS OF COLORADO'S KEY INDUSTRIES

The 60th annual Colorado Business Economic Outlook Forum in December provided a platform for insightful discussions about the state's economic trajectory.

One of the three breakout sessions, titled The Economic Competitiveness of Colorado's Key Industries, featured a panel that spoke about the development of Colorado's key industry clusters, advancements in quantum computing, and strategies for climate resiliency.

Moderated by Clif Harald, Principal of First Flatiron Consulting, the panel included Michelle Hadwiger, Director of Global Business Development at the Colorado Office of Economic Development and International Trade; Hanna Scovill, Senior Manager of Economic Competitiveness at Metro Denver EDC; Wendy Lea, Board Director at Elevate Quantum and Co-Founder of TechHubNow!; and Mike Freeman, CEO and Principal Investigator of the NSF CO-WY Climate Resilience Engine.

Setting the Stage

Harald opened the session by reflecting on the evolution of Colorado's key industries over the past few decades. He highlighted the state's transition from reliance on agriculture and mining to the diversification seen in the 1960s and 1970s, with the defense, energy, real estate, construction, and tourism industries gaining prominence. By the 1990s, Colorado had emerged as a leader in telecom, biosciences, and IT. Harald emphasized the state's ability to adapt through innovation and diversification, positioning it better than most to address economic challenges and increased competition from cities like Austin and Seattle. He underscored the importance of industry clusters—networks of geographically concentrated companies and resources—in enhancing productivity, driving innovation, and attracting business and talent.

Insights from the Panelists

Hadwiger emphasized the importance of positioning Colorado as a business destination that attracts external investment, supports job creation, and enhances the state's competitiveness in the global market. Hadwiger explained how the identification of industry clusters has evolved in the state. A version of cluster identification in 2012 provided some information but has shifted to a more strategic and multi-dimensional approach in recent years. The new approach identified 16 key industries which were divided into foundational and lifestyle groupings.

Foundational industries, which include construction, health care, and education, align closely with the state's global development plans, while lifestyle industries, including tourism, play a vital role in talent attraction and retention. Using a quantitative and qualitative approach, key industries are analyzed based on their relative economic impact to the state, their comparative advantage among other states, and their potential for strategic alignment. To illustrate the importance and significance of the clusters, Hadwiger emphasized the cluster rationale for aerospace, defense, and security. Hadwiger noted that Colorado has long been a leader in this cluster and has a talent pool that is supported by top-ranked university programs, and is strengthened by industry giants such as Lockheed Martin, Northrop Grumman, and Ball Aerospace. These factors, along with strong veteran presence and military infrastructure in the state, create a pathway that will allow the state to advance high-tech industries.

Scovill continued the conversation of key industry engagement by providing an overview of the Metro Denver Economic Development Corporation (EDC). Scovill discussed the Metro Denver EDC's nine industry clusters and two lifestyle verticals, which collectively represent all "primary jobs" in the region. Health care and Wellness, IT-Software, and Aerospace are key drivers, representing approximately 20% of employment in the region. Aerospace, Scovill noted, is particularly bolstered by the presence of the Denver International Airport, the third-busiest airport in the nation. More recently, Metro Denver EDC has been simultaneously focused on worker shortage issues in the state, highlighting the need to continue to increase the pace of innovation of key clusters to allow for talent retention and talent development in the labor force.

One area of potentially significant growth in the state is quantum, which was championed by Lea during her presentation. Lea brought a forward-looking perspective, focusing on Colorado's burgeoning quantum technology sector. She outlined the sector's transformative potential, describing quantum computing as a foundational platform that could revolutionize industries like energy, life sciences, and space in the state. Lea discussed the opportunities presented by the CHIPS Act and Tech Hubs initiative, noting Elevate Quantum's progress, including its Phase 1 designation and awarded Phase 2 funding. She emphasized the accessibility of quantum jobs, half of which are expected to not require advanced degrees. Lea concluded her remarks by highlighting an ambitious roadmap for 2034, including the creation of 50 quantum startups, 10,000 new jobs, and $2 billion in startup funding to the state.

Also looking to the future, Freeman discussed the critical intersection of climate resilience and economic competitiveness, highlighting the NSF CO-WY Climate Resilience Engine's work in addressing regional climate challenges. Freeman gave an overview of Innosphere, which works with startups, maintains specialized facilities, and assists with venture capital funding. The CO-WY Climate Resilience Engine is one of ten engines across the nation and partners with universities and academic institutions, corporations, federal labs, economic development corporations, and local governments. A main focus of the engine revolves around community resiliency in the face of natural disasters and the mitigation of community impacts—rising insurance rates, higher recovery costs, growing food insecurity, and increased displacement mortality. He detailed the economic benefits of investing in preparedness, noting that every dollar spent saves

$13 in damages and recovery. To make communities in Colorado more resilient, Freeman noted the engine's innovation objectives of advanced sensing and data fusion, and data analytics and decision support. Freeman explained that these strategies, which can improve community resiliency, improve national security and will help bolster the state in the future.

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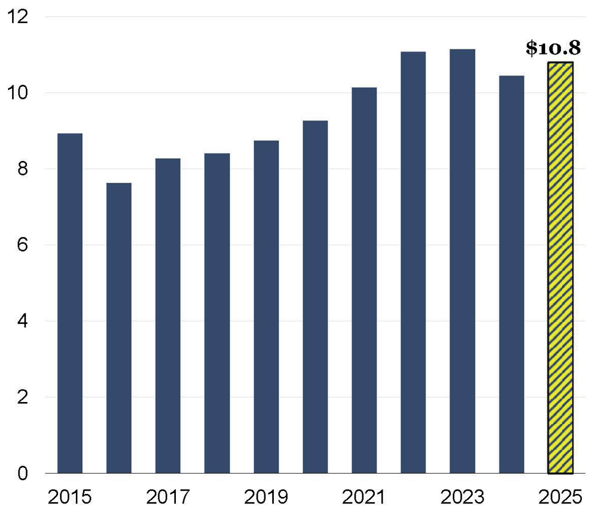
Colorado Rank Among Other States

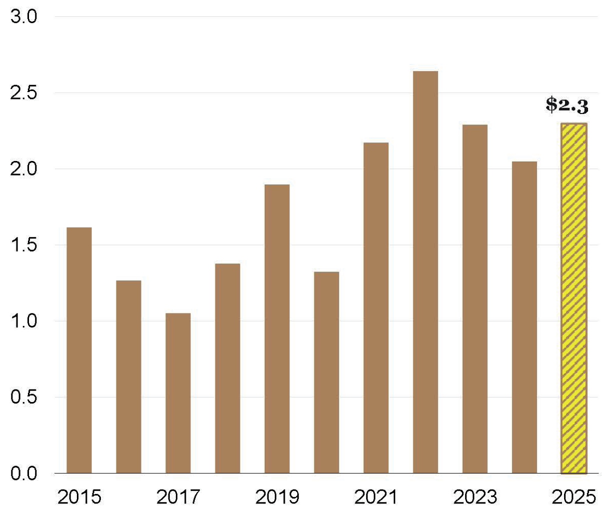
Metric	1-Year Change/ Current Level		1-Year Rank
Real GDP Growth	1-Year Change	1.7%	38
Employment Growth	1-Year Change	1.8%	12
Population Growth	1-Year Change	0.6%	17
Personal Income Growth	1-Year Change	4.8%	33
PCPI Growth	1-Year Change	4.2%	35
PCPI	Current Level	$83,635	8
Average Hourly Wage % Growth	1-Year Change	0.0%	14
Average Annual Pay % Growth	1-Year Change	7.4%	20
Average Annual Pay	Current Level	$75,819	7
Unemployment Rate	Current Level	4.3%	35
Labor Force % Growth	1-Year Change	1.2%	6
LFPR	Current Level	67.9%	4
FHFA Home Price Index Growth	1-Quarter Change	0.3%	44
FHFA Home Price Index Growth	1-Year Change	2.5%	47
Job Openings Rate	Current Level	8.8%	1
Worker Shortage Ratio	Current Level	2.2	3

Sources: Bureau of Economic Analysis, Bureau of Labor Statistics, US Census Bureau, Federal Housing Finance Agency All Transactions Index, BRD Calculations

Gross Farm Revenue, Millions



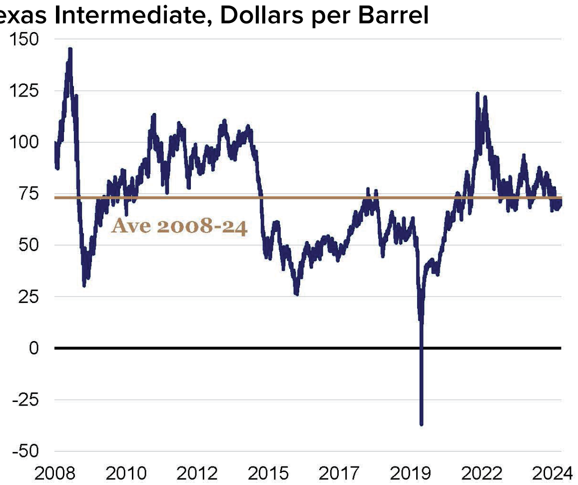
Net Farm Income, Millions



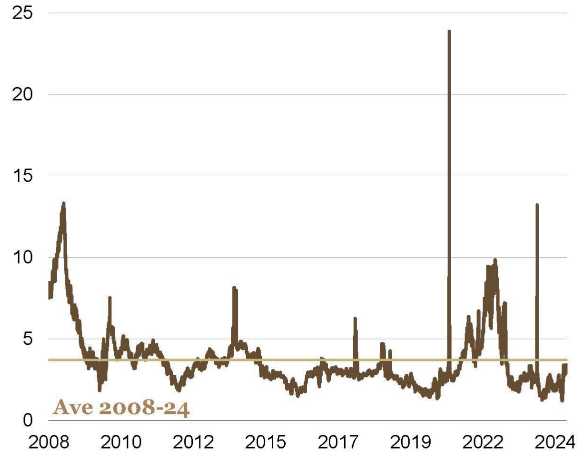
Source: Colorado Business Economic Outlook Committee

Oil and Gas Prices

West Texas Intermediate, Dollars per Barrel



Henry Hub Natural Gas, Dollars per Million Btu



Sources: EIA, Cushing, OKWTI Spot Price FOB

HEADING INTO A NEW REAL ESTATE CYCLE: INSIGHTS FROM THE 2024 REAL ESTATE PANEL

The commercial real estate market is emerging from a prolonged economic downturn, marked by improving transaction volumes, resilient demand, and new opportunities as institutional and private capital re-enter the market.

At the 60th annual Colorado Business Economic Outlook Forum in December 2024, a panel of distinguished real estate leaders explored the industry's persistent challenges and highlighted signs of stabilization and long-term growth as the economy transitions into a new real estate cycle. Moderated by Julie Gibson, Executive Director of the Michael A. Klump Center for Real Estate, the panel featured in-depth discussions on trends and expectations across key commercial sectors, including capital, office, retail, and residential markets. Panelists included Leon McBroom, Senior Managing Director and Denver Office Co-Head at JLL Capital Markets, Americas; Carl Koelbel, President and CEO of Koelbel & Company; Courtney Schneider, Director at Hines; Jon Weisiger, Senior Vice President at CBRE; and David Zucker, Principal and CEO of Zocalo.

Capital Market

The capital market plays a vital role in economic growth, connecting investors seeking returns with entities needing capital. McBroom highlighted trends shaping real estate as the market transitions from a 24-month industry recession. Transaction volumes are recovering, up 4% year-over-year after a 52% decline from 2022 to 2023. However, treasury market volatility challenges transaction predictability. Despite this, many groups are pricing through uncertainty, signaling an improving capital market.

McBroom emphasized the impact of monetary and fiscal policy, especially during an election year, on market sentiment. Inflation risks and recession concerns continue to create volatility. Construction pipelines have dropped 75–80% but show signs of stabilizing, fostering a more favorable development outlook. Capital supply remains crucial, with record-high dry powder levels reflecting institutional under-allocation to real estate, currently at 10% of portfolios but expected to rise. Cap rates have compressed by 25 basis points over 120 days, and private capital remains largely untapped, presenting lucrative opportunities as institutional investors re-enter the market.

Pricing trends reveal discounts to replacement costs not seen since the 2008 financial crisis. Asset values are correcting, making it more economical to buy than build. Over 25 years, commercial real estate has consistently delivered positive five-year returns, a trend expected to continue despite diminished recent returns. Additionally, the lender ecosystem is more balanced, with unique lenders playing vital roles. Refinancing activity is increasing, driven by forced payoffs of maturing loans and new engagements. The maturity wall is expected to diminish by 2029. As cost compression and capital flows improve, the market is positioned for stability, provided treasury volatility stabilizes.

Office

Koelbel expressed optimism for the commercial office market recovery, focusing on tenant demand and capital supply. Uncertainty around hybrid and remote work in 2023 limited large leases, but most tenants have now settled on post-pandemic work models. Medium-sized tenants (20,000–40,000 sq. ft.) are re-entering the market, suburban offices are gaining appeal, and amenities are crucial for attracting employees. On the supply side, opportunistic high-net-worth buyers are returning, while institutional investors remain cautious. Banks, the market's key sellers, are compressing bid-ask spreads by offloading undercapitalized assets. Koelbel anticipates pre-COVID leasing volumes by 2025, with suburban office demand growing, rents normalizing, and institutional capital gradually re-entering as interest rates stabilize values.

Industrial

Schneider highlighted trends in the industrial real estate market. Tenants are delaying leasing decisions due to cost concerns and fluctuating interest rates, slowing leasing activity, and prolonging vacancies. Developers face high interest costs, unmet financial metrics, and loan extensions, leading to cautious rent growth

strategies. However, this deliberate pace is expected to result in a more stable and strategically aligned market in the future.

Schneider highlighted the continued expansion of e-commerce as a major driver for industrial real estate demand, with third-party logistics (3PL) companies leading both demand and signed leases, up 66% since 2020. Demand is shifting inland due to the affordability of central U.S. markets, and over 50% of future demand is expected to come from smaller industrial spaces (under 250,000 square feet), which currently have high vacancy rates. While new development has fallen significantly—down 63% since its peak before 2022—the tightening supply, growing need for Class A first-generation space, and e-commerce-driven demand should reduce vacancy rates as leasing activity recovers. Investors, however, remain cautious, favoring acquisitions below replacement cost over new development until construction costs decline and rent growth stabilizes. Location has become more critical, with successful developments focusing on premium markets and neighborhoods to ensure long-term resilience and demand.

Retail

Jon Weisiger discussed retail market trends, emphasizing U.S. consumer resilience. Cyber Monday spending totaled more than $13 billion, with Cyber Week above $41 billion, exceeding expectations. Holiday shopping shows generational differences (among in-store and online mixes). Retail real estate has historically low availability (4.7% vacancy nationally and in Denver) and rising asking rents. Limited new supply over the last decade, coupled with high construction costs, creates barriers despite demand. Net absorption has declined, but quality space remains scarce. Colorado's population growth supports retail demand, though net migration concerns add complexity. Restaurants thrive, but apparel and home-related sales are flat. Denver ranks in the top 15 for retail absorption but trails larger Southern and Eastern markets.

Multifamily

David Zucker addressed challenges in multifamily housing. Short-term interest rates may fall, but the 10-year Treasury bill is expected to rise 75 basis points, pressuring property values as cap rates rise. Investors are seeking rare opportunities for 10% revenue growth, while developers face tighter income pyramids, needing higher yields on cost (7% today vs. 5.5% three years ago). This shift focuses efforts on affluent areas to meet financial targets. Operational challenges include steep increases in property taxes, insurance costs, and staffing expenses (up 30% post-pandemic). Tariffs could exacerbate these issues. Denver risks oversupply due to slower population growth and high new supply (over 10%). Affordability remains critical, with 50% of residents spending over a third of income on housing. Rising utility costs, taxes, and interest rates strain affordability, threatening market stability despite record national absorption of 200,000 units.

Data and sentiment reflect trends seen in December 2024 prior to the publication of this issue.

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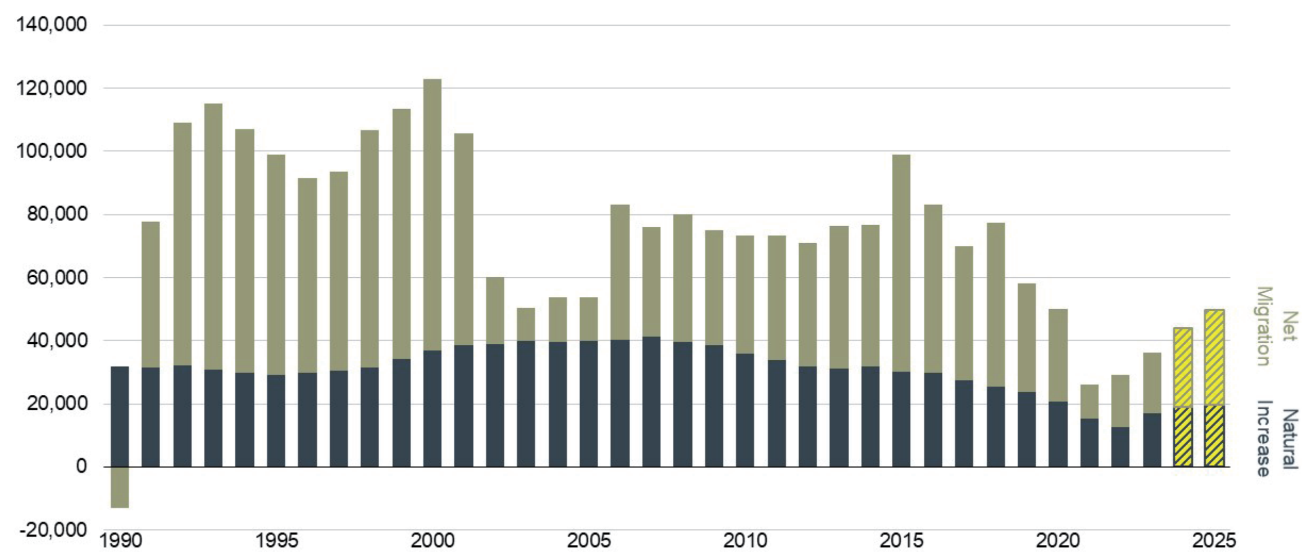
Colorado Change in Population



Sources: Colorado Demography Office, U.S. Census Bureau, and the Business Research Division

THE PAST, PRESENT, AND FUTURE OF HEALTH CARE IN COLORADO

The Health care industry is suffering from a tightening labor market, increasing equipment costs, and under- and un-compensated patients. At the 60th Colorado Business Economic Outlook Forum in December 2024, Dr. Donna Lynne, CEO of Denver Health, discussed industry challenges, the health care industry's history in Colorado, health care in the U.S. compared to peer countries, the difficulties in providing health care to all Americans, and the economic impact of health care.

U.S. Relative to other countries in health care

The United States is unique in health care compared to peer countries. The United States is the only advanced nation without universal healthcare, leaving approximately 26 million Americans--about 8% of the population--uninsured. Additionally, we spend about 17% of GDP on health care, nearly $12,000 per citizen, whereas most other countries spend less than 10% of GDP. Germany in the next closest county in spending at a little over 7,000 per resident. Despite this, Dr. Lynne argued that the U.S. does not boast better outcomes. Americans' life expectancy is 77 years, compared to an average of 80 years in other wealthy countries. We also have the highest rate of avoidable deaths from causes such as diabetes, hypertension and certain cancers.

Looking more specifically at Colorado, we spend less, at about $10,000 per resident. Colorado is one of the healthiest states with the lowest obesity rate, at 24.2%, and the second-lowest rate of diabetes, at 7.6 diagnoses per 100,000. Dr. Lynne believes this is likely due to how active Coloradans are, with only 16.7% of residents not exercising outside of their regular jobs. Despite this, Colorado's obesity rate is the same now as the most obese state in 1996.

History of health care in Colorado

In its infancy, Denver Health treated patients compromised by the rugged life of a Rocky Mountain pioneer. Then, as Denver's population grew so did its heath care challenges: typhoid, cholera, and yellow fever. Fast forward to the 1940's and Denver had the highest rate of typhoid, whooping cough, scarlet fever, and smallpox in the county.

In the 20th century, President Lyndon B. Johnson expanded coverage to more Americans by signing the Medicare Act in 1965. This particularly benefited retired Americans who did not have employer-provided insurance. Johnson asserted drastic impacts on the war on poverty. Additionally, he created community-based solutions to health care to help the poorest neighborhoods. This led to Denver opening the first community-based center in the country.

Health care today and into the future

In the modern era, Dr. Lynne noted that we have achieved great feats like eradicating smallpox and treating an HIV epidemic. Molecular biology has allowed the industry to use DNA to predict people's health issues.

Recently, public health care has taken another step with President Obama enacting the Affordable Care Act in 2010. This raised the threshold to receive Medicare insurance from 100% of the poverty line to 138% of the poverty line and added some benefits for people over 138%. This helped reduce the number of uninsured Americans from 50 million to 26 million. It also removed annual and lifetime maximums, so people no longer must move jobs to reset their health care limits. Medicare and Medicaid eligibility increased sharply due to the Covid pandemic, but many individuals—nearly 600,000 Coloradans—are now losing public benefits with Medicaid redetermination.

This has had major effects on the business side of Colorados hospitals. Over 70% of Colorado hospitals are running on unsustainably thin margins. Increasingly, Colorado hospitals are expanding their support for patients receiving uncompensated or undercompensated care. Dr. Lynne claims this will be exacerbated by two factors. First, Colorado's aging population will increase demand for health care, further straining the sector. Second, people receiving employer-provided health care has dropped below 50% from its peak of over 60%; many of these people are shifting to public programs. Also, government assistance has not changed from $30 million in 1996 despite a 550% increase in expenses and 300% increase in patients. On the costs side, the labor remains tight due to Covid-induced burnout and retirements. Additionally, as medical technology gets more advanced it also gets more expensive. Denver voters passed a 0.34% sales tax increase to help support Denver Health in November 2024.

From a larger economic perspective, health care tends to be the largest employer, with 11% of Coloradans working in health care, and hospitals contributing $18 billion to the economy. Health care creates jobs and is essential for a thriving economy as it keeps workers healthy. It will become even more essential as Colorado's population ages. Looking ahead to the next administration, Dr. Lynne anticipates Medicaid eligibility will suffer and there will be some defunding of research and Medicaid and Medicare programs. Increased funding for hospitals that treat a disproportionate share of Medicaid patients only received a one-year renewal, not the desired three-year renewal. Additionally, the provider fee, which increases federal funding for hospitals, is potentially at risk.

Overall, the health care industry nationally and in Colorado is suffering from increasingly thin margins from both cost and revenue issues. Additionally, there is an increasing risk of not being able to treat as many Americans due to profit margin issues, Medicare and Medicaid program cuts, and an aging population. This has implications for quality of life in the U.S. and carries economic consequences, as poorer health leads to reduced productivity among citizens.

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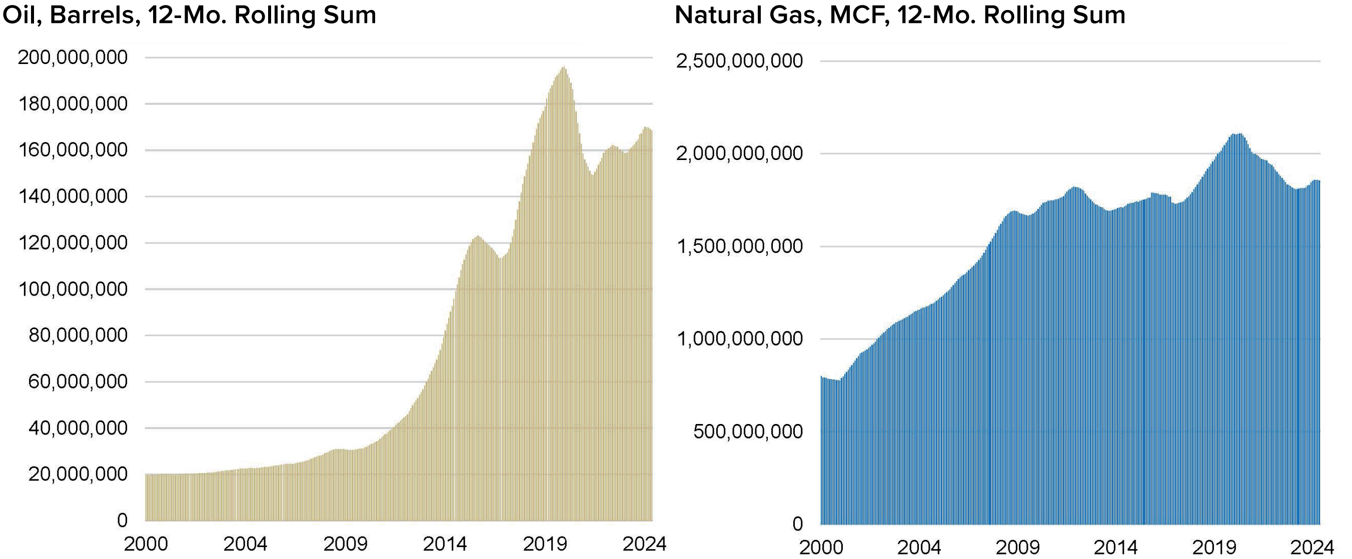
Colorado Oil and Gas Production



Sources: EIA, Cushing, OKWTI Spot Price FOB

EVOLUTION OF THE ENERGY MIX: NET ZERO - NUCLEAR

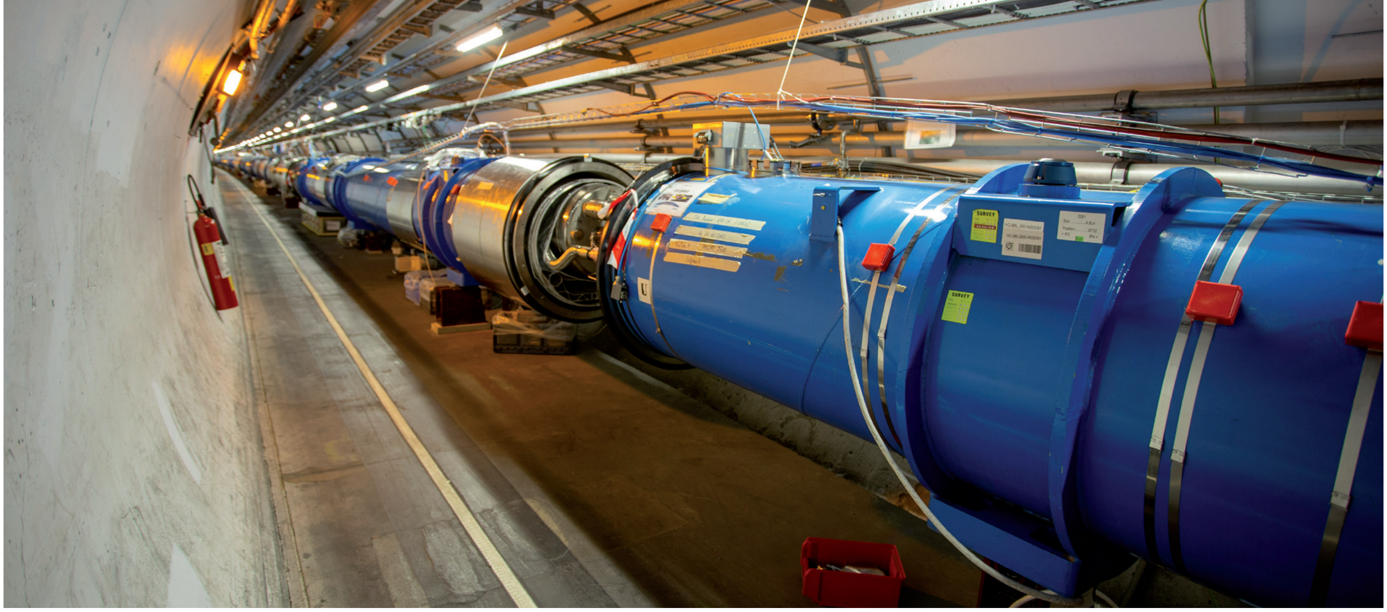
The global demand for energy is increasing, and it will only continue to grow moving forward. In context of this trend, finding an energy supply that meets this growing demand, while also considering sustainability, is pivotal. With energy sustainability goals urging a reduced consumption of fossil fuels, recent developments in nuclear fusion illuminate a path towards Net Zero emission goals with nuclear energy playing a key role in the evolving energy mix. This was the subject of discussion at one of the breakout sessions at the 2025 Colorado Business Economic Outlook Forum. Moderator John Tobin was accompanied by panelists Terry Palisch, Mark Jensen, and Gary Tobey to share insights on energy literacy, the future of nuclear energy, and noteworthy trends in the energy industry.

John Tobin is the former president of the Natural Resources Education program and is now directing his efforts towards promoting energy literacy. Tobin initiated the conversation by presenting a few general observations to illustrate his outlook on the energy industry. He noted that nuclear fusion is quickly gaining traction, and discussed how nuclear energy exhibits great potential in addressing important subjects concerning the supply and demand of energy, fossil fuel cutbacks, and reducing the environmental footprint.

Terry Palisch, CTO of CARBO Ceramics and President of the Society of Petroleum Engineers, focused on the economic impacts of energy access and touched briefly on the future of the energy industry. Palisch noted that humans inherently want to improve the technological efficiency of their energy, as having access to sustainable energy increases life expectancy, health, and economic prosperity. Globally, there is notable inequality in energy opportunity, particularly among less developed countries. As people emerge from poverty, energy demand will continue to grow, and this energy must be accessible, affordable, secure, reliable, and clean. Energy is required to solve this challenge, and Palisch believes that the U.S. is equipped with the resources to do the job.

Regarding energy trends in the U.S., energy consumption is flattening, energy expenditures per dollar of GDP is declining, and CO2 emissions are being reduced. This indicates that energy in the U.S. is abundant, affordable, and efficient. Nationally, there is a growing demand for electricity, particularly from data centers as artificial intelligence continues to expand. It is predicted that by 2030, around 8% of demand for commercial electricity will be from data centers. Palisch explained that meeting this demand requires energy sourcing that is dispatchable, affordable, constant, and sustainable. In 2023, U.S. electricity generation was predominantly from fossil fuels. To shift away from this fossil fuel consumption, Palisch pointed towards the promising development of technology in geothermal energy, hydrogen fuel, and nuclear fission/fusion as each of these energy sources have the potential to provide affordable, reliable, and sustainable energy.

Mark Jensen, a chemistry professor and the University Chair of Nuclear Science and Engineering at the Colorado School of Mines, provided a scientifically oriented perspective on the future of nuclear energy. While renewables accounted for only 12% of U.S. energy consumption in 2023, nuclear power makes up a large share of the total renewable contribution, and Jensen suggested three paths forward for nuclear power. Mentioned first was



expanding upon conventional fission plants which are already well established. Another intriguing prospect in fission comes from increasing the commercial viability small modular fission reactors (SMRs), which are essentially a scaled-down version of conventional fission. The third path is nuclear fusion. To briefly distinguish between fission and fusion, nuclear fission involves the energy derived from splitting atoms whereas nuclear fusion involves the energy resulting from joining atoms together. While fusion is in its introductory stages, it has significant long-term potential as an abundant, clean, and powerful energy source.

One of the most pertinent questions on nuclear fusion concerns the timeframe under which commercial fusion power could come available. While a definite answer cannot yet be given, Jensen suggested a range of 9 to 13 years between the generation of fusion energy and commercial electricity may be a reasonable expectation. Jensen also noted a few set dates regarding fusion, highlighting that several companies are planning ignition demonstrations between 2025 and 2027, a company called Helion plans to provide 50 MW of fusion-generated electricity to Microsoft by 2028, and prototype power reactors are expected to become operational in the 2030s. With the implementation of commercial fusion power comes hurdles which include the stability of materials, the scarcity of viable fuel, questions on the conversion of the fusion reaction to electricity, and the notably large amount of low-level radioactive waste that is produced.

Gary Tobey, a retired lawyer who formerly represented uranium exploration companies, examined the factors that could impact the nuclear energy industry moving forward. After having observed successful demonstrations of controlled nuclear fusion, focus has shifted towards commercialization, and Tobey explains that there is a widespread global effort to develop nuclear fusion as a source of electricity. This effort is incentivized by the continuously growing demand exhibited by artificial intelligence, crypto currency mining, and quantum computing, however building up the nuclear energy supply will remain a challenge.

Tobey's outlook on nuclear energy included the potential for the creative disruption of nuclear fusion to bring about conflict among existing energy producers and policy makers. It remains unclear how nuclear energy will replace entrenched energy sources, raising concerns on reliable transmission. Building off this, with substantial amounts of money invested in existing energy production methods, Tobey voiced concern for the turmoil that may be associated with stranded assets born out of the fusion's industry disruption. Looking towards regulatory bodies, the Nuclear Regulatory Commission established a positive ruling stating that fusion will be regulated in a less stringent fashion in comparison to fission plants. Tobey also addressed the notion that nuclear energy is unpopular among the public, and that changing this negative sentiment will be helpful in enabling nuclear to continue to advance.

As the panelists provided insights on the national energy outlook and the exciting prospects of nuclear fusion, Tobin interjected with summative thoughts. Regarding fusion energy commercialization, Tobin explained that fusion must go through policy, PR, and promotion. From the policy perspective, regulation will likely wait until more is known about fusion, and despite a tendency to overregulate, it is crucial that a cooperative environment is established between the government and the nuclear fusion industry. Tobin also emphasized the importance of PR and promotion around nuclear fusion as an enhanced public understanding of the great potential of nuclear energy can improve the progress of nuclear fusion while also making energy sustainability goals more attainable.

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