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# **A Vision and Framework for Colorado's Energy Future**

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# *About the Terry J. Stevinson Fellowship*

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The Terry J. Stevinson Fellowship is designed to spur thoughtful policy discussions and potential solutions regarding the many policy and economic challenges brought about by population growth in Colorado. The 2023 Fellowship builds on the first three years of research which covered the issues of transportation and growth in 2020, housing and growth in 2021, and water in 2022.

## About the Authors



### Tisha Schuller

Tisha Schuller founded Adamantine Energy to provide thought leadership to energy companies to translate sustainability and decarbonization aspiration into action. Tisha advises private clients from Fortune 100 energy companies to non-profit environmental organizations in matters including ESG and decarbonization strategies, managing disruption, energy policy, environmental justice, and stakeholder engagement. She also serves as the Strategic Advisor for Stanford University's Natural Gas Initiative. Previously, Tisha served as president and CEO of the Colorado Oil & Gas Association and as principal and vice president of Tetra Tech, a national environmental consulting and engineering firm. She has a B.S. from Stanford University.

Tisha serves on many academic and non-profit boards including those of the Breakthrough Institute, the Energy for Growth Hub, the Denver Museum of Nature & Science Institute for Science & Policy Strategic Council, the University of Wisconsin Madison Nelson Institute for Environmental Studies, and the Payne Institute for Public Policy at the Colorado School of Mines, and she is a member of the National Petroleum Council, an advisory board to the U.S. secretary of energy under the Obama, Trump, and Biden administrations. Tisha's book, *Accidentally Adamant* was published in 2018, *The Gamechanger's Playbook: How Oil & Gas Leaders Thrive in an Era of Continuous Disruption* was published in 2020, and her latest book, *Real Decarbonization: How Oil & Gas Companies Are Seizing the Low-Carbon Future*, was released in November of 2022. Tisha authors a weekly series entitled *Both of These Things Are True* and hosts the *Real Decarbonization* podcast.



## Doug Benevento

Doug Benevento is a partner at Holland & Hart. Doug brings a sophisticated understanding of environmental policy and compliance from his high-level leadership roles at federal and state agencies, including serving as the EPA Acting Deputy Administrator and the EPA Region 8 Administrator. He draws on this expertise and strong working relationships with regulators across the Mountain West and in Washington, DC to advocate for clients through both legal and legislative avenues. Doug guides companies to understand and respond to the regulatory impacts and ongoing developments of environmental justice matters. Doug also worked in Congress for close to 10 years on energy and environmental issues involving the Clean Air Act, CERCLA reform, cleanup and closure of Rocky Flats and other national and Colorado specific issues.

As the former Executive Director of the Colorado Department of Public Health and Environment, Doug has a public health background and ability to proactively identify and develop solutions. He is also currently serving as President of Douglas County, Colorado Board of Health.

His role as a senior executive at Xcel Energy, gives him valuable insight into the challenges of navigating complex regulatory regimes and myriad regulations. He counsels companies from diverse sectors in the development of permitting and compliance strategies and represents clients in enforcement actions and rulemaking proceedings before state and federal agencies.

## *About Common Sense Institute*

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**Common Sense Institute** is a non-partisan research organization dedicated to the protection and promotion of Colorado's economy. CSI is at the forefront of important discussions concerning the future of free enterprise and aims to have an impact on the issues that matter most to Coloradans. CSI's mission is to examine the fiscal impacts of policies, initiatives, and proposed laws so that Coloradans are educated and informed on issues impacting their lives. CSI employs rigorous research techniques and dynamic modeling to evaluate the potential impact of these measures on the economy and individual opportunity.

## *Teams & Fellows Statement*

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CSI is committed to independent, in-depth research that examines the impacts of policies, initiatives, and proposed laws so that Coloradans are educated and informed on issues impacting their lives. CSI's commitment to institutional independence is rooted in the individual independence of our researchers, economists, and fellows. At the core of CSI's mission is a belief in the power of the free enterprise system. Our work explores ideas that protect and promote jobs and the economy, and the CSI team and fellows take part in this pursuit with academic freedom. Our team's work is informed by data-driven research and evidence. The views and opinions of fellows do not reflect the institutional views of CSI. CSI operates independently of any political party and does not take positions.

## *Acknowledgements and Statement from the Fellows*

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## Key Points

The authors were tasked in this paper with describing an ideal end state of energy in Colorado. In an ideal end state, Colorado's energy would be affordable, reliable, and leave the smallest possible environmental footprint. To achieve this, energy would be appreciated as a central force that enables progress—rather than being viewed by legislators and policymakers as a necessary evil. Consumers would be empowered with choices that reflect their means, values, and circumstances. While we understand that both state and national energy objectives will continue to prioritize lowering the GHG footprint of energy, in an ideal state, decarbonization would be one among many balanced tradeoffs.

In this ideal state, Colorado leaders would make economic development a central consideration of energy policy. After all, this would position Colorado to sustainably reduce GHG emissions with public support, while attracting the businesses, workers, students, innovators, and partners required to undertake the massive task of evolving the energy system.

The energy system is extraordinarily complex and includes much more than electricity in homes and gasoline in cars. Energy is everywhere: it keeps the lights on, the room warm, and the vehicles running. More subtly, energy is the near-literal lifeblood of our economy, moving goods from factories across oceans to ports and over land by rail and road to neighborhood box stores. This global transportation network allows communities and businesses to thrive with unprecedented, affordable access to goods, people, and services. Energy also powers industrial processes, like steel smelting, and enables the entire global manufacturing sector to produce the materials and goods that we depend upon every day. Oil and gas serve as feedstocks required to produce chemicals, plastics, and fertilizer. Without energy refining and its products, we don't have computers, cell phones, Tupperware, clothing, or makeup. Without these processes and their outputs, we can't produce abundant, affordable food. This energy enables human flourishing.

A climate strategy alone does not make for a good energy strategy, and Colorado energy policy today is based primarily on reducing greenhouse gases (GHG). In 2019, the Colorado legislature passed HB19-1261 to promote emissions-reduction and establish statewide emissions targets. The goals established by 1261 were sweeping and have resulted in over 55 pieces of ensuing legislation and regulatory action that will soon impact numerous businesses and consumers in the state<sup>1</sup>. The Roadmap called for an economy-wide GHG reduction of 26% by 2025, 50% by 2030, and 96% by 2050 below 2005 levels. In 2023, the Colorado legislature heightened those goals by passing SB23-016, which calls for the elimination of all GHG emissions by 2050 and promotes a more aggressive schedule of reductions leading up to that point.



The Roadmap is a plan designed to outline both the steps Colorado has taken to address climate and those it should take in the future. It is the implementation document for the state's GHG goals and it touches upon every aspect of Colorado's economy. The Roadmap specifically intends to "inform how Colorado can make progress toward emissions targets in the Climate Action Plan (HB 1261),"<sup>ii</sup> for the purpose of which it establishes an emissions baseline and models GHG emissions under several different scenarios, including a reference case which only accounts for policy interventions prior to 2019 and one that reflects policy commitments made in 2019. Because modeling demonstrated that the state would not naturally meet the goals established in the Climate Action Plan, lawmakers adopted a series of policy interventions that would meet those goals. Colorado is currently in the process of updating the existing Roadmap to continue its decarbonization progress.

## The authors believe Colorado can do better and offer the following joint recommendations.

**Recommendation 1:** Create a real energy policy strategy. Colorado requires an energy strategy that factors in cost, reliability, economic development, innovation, environmental footprint, and greenhouse gas footprint. Colorado's current energy policy framework is a GHG reduction framework. This choice has consequences and should be reconsidered.

**Recommendation 2:** Build an energy strategy reflective of the complexity of Colorado's energy system. Policymakers should factor in the multiple dimensions of a complex energy system, including power generation, transmission, oil and gas production, refining, and transport, natural gas production, transport, and distribution, the mining, processing, and transport required for clean energy development, innovative energy solutions, and decarbonization solutions. Policymakers must think beyond electrification: Expanding the grid comes with its own Herculean challenges; electrification for various solutions should undergo robust analysis to consider alternatives and assess tradeoffs.

**Recommendation 3:** Eliminate renewable-only targets and move toward a net-zero framework. It's time for policymakers to explicitly reassess Colorado's commitment to 100% renewable electricity generation by 2040. If Colorado policymakers want an effective decarbonization strategy, they should consider adopting a net-zero policy that maintains high reliability at low cost and is technologically sound. A net-zero policy would allow for the continued use of fossil fuels with appropriate offsets and or capture of GHGs. This strategy would also pave the way for a wide array of other potential technologies, such as nuclear power and hydrogen.

**Recommendation 4:** Embrace a five-factor policy efficacy framework. Constant legislation and rulemaking is impacting Colorado's competitiveness. Policymakers should put their energy and climate bills, regulations, and decisions through a five-factor common-sense framework test to ensure that their benefits will outweigh their costs, their unintended consequences are aired, and their tradeoffs are evaluated.

**Recommendation 5:** Consider using an energy competitiveness index. Policymakers should consider consulting an energy competitiveness index to help them understand Colorado's competitive position relative to other states—especially regional competitors.

## A Note From The Authors

As authors, we did not agree on everything. While working toward this vision, we had to acknowledge that our different perspectives and priorities mirror the complex environment faced by energy consumers, producers, and policymakers. Nevertheless, we were animated to collaborate by our shared faith in Colorado's ingenuity and ability to build a successful energy future. Readers will see that some sections are credited to individual authors to acknowledge where authors' opinions diverge significantly.

## A Vision for Colorado's Energy in 2030 and Beyond

### Tisha

In an ideal state, Colorado's energy is affordable, secure, and leaves the smallest possible environmental footprint. To achieve this, energy will be appreciated as a central force that enables progress—rather than a necessary evil. In this ideal case, consumers are empowered with choices that reflect their means, values, and circumstances. Both state and national energy objectives will continue to prioritize lowering the GHG footprint of energy, but decarbonization will be just one among many balanced tradeoffs.

To reach an ideal vision, we must acknowledge that today energy is deeply politicized, with values and perceptions around it often dominated by political identity. For some, energy is both the cause of and the solution to climate change. For others, it's closely tied to their livelihood, identity, or ability to make ends meet. Regrettably, energy has become a battleground for culture wars, wherein individuals are either praised or demonized for choices that were once non-controversial.

Polarization around energy is compounded by an oversimplified caricature of energy supply, demand, and decarbonization. Colorado's current energy policy is primarily concerned with GHG reductions—yet the current portfolio of solutions is limited and frequently disconnected from the state's own goals. In an ideal end state, energy decisions will include (1) more tools in the toolbox and (2) an assessment of the many tradeoffs inherent to energy policy decisions.

The energy future will require significant construction efforts due to growing demand, changing consumer expectations, technological developments, and regional drivers. Where decarbonizing infrastructure is required, the construction needs for new forms of generation, transmission, transport, and storage will be significant. The more construction is required, the more delicate are the tradeoffs that apply—cost,

*To reach an ideal vision, we must acknowledge that today energy is deeply politicized, with values and perceptions around it often dominated by political identity.*

new environmental footprint due to mining and land use, and policy implications need to be carefully considered and addressed. In the ideal energy future, each option will be weighed according to its myriad of tradeoffs and resulting implications.

In the ideal energy future, policymakers will endeavor to increase the availability of energy sources, types, and services (tools in the toolbox) to allow for skillful identification and management of tradeoffs. This will require strong state leaders, particularly in the general assembly and the Governor's administration, who acknowledge that a GHG-reduction framework alone does not make good energy policy. Colorado has an opportunity to be a leader and national role model: a blue state willing to navigate the real-world tradeoffs that an energy evolution requires.

In this ideal state, Colorado leaders will prioritize economic development as a central consideration of energy policy. This will position Colorado to sustainably reduce GHG emissions with public support while attracting the businesses, workers, students, innovators, and partners required to undertake the massive task of evolving the energy system.

Colorado will prioritize regulatory certainty for all forms of energy projects, projecting an "open-for-business" posture and beating other states at attracting energy investment and projects. This will convey to all Coloradans that they have an important stake and role in energy policy: from urban to rural, newcomers to multi-generational, startups to traditional industries. In an ideal future, Colorado is building an energy innovation ecosystem that increases coordination and invention between traditional and new energies and across sectors, emphasizing progress over politics.

Legislators will be supported by a non-partisan entity that can evaluate energy and climate legislation to consider effects on cost, reliability, economic development, and environmental footprint. In short, Colorado will focus on advancing its economic, environmental, and climate goals by taking politics out of it.

Finally, Coloradans won't imagine "old" and "new" energy worlds—they'll instead seamlessly evolve and efficiently repurpose today's infrastructure for tomorrow's needs. Energy infrastructure will evolve to incorporate technological advances and changing consumer preferences. Pipelines will carry decarbonizing liquids and gases; power plants will be retrofitted with new technology such as carbon capture or replaced with nuclear power generation; incumbent oil and gas companies will be advancing carbon sequestration and geothermal energy projects.

*In the ideal energy future, policymakers will endeavor to increase the availability of energy sources, types, and services to allow for skillful identification and management of tradeoffs.*

## Colorado's Energy Mix

In order to pursue a vision, it is important to understand where we've been and how energy has been impacted under the current GHG framework.

Colorado is a state where energy empowers everything. As a society, we have gotten so good at producing and distributing energy that it's largely invisible and taken completely for granted. Colorado's energy mix includes electricity, but energy plays other important roles. Transportation fuels provide the near-literal lifeblood of our economy, moving goods from where they are manufactured across oceans to ports, over rail lines and highways, to your neighborhood box store where you can find nearly anything your heart desires. This global transportation network allows communities and businesses to thrive with unprecedented, affordable access to goods, people, and services. This energy enables human flourishing.

Additionally, oil and gas serve as feedstock. They are required to produce chemicals, plastics, and fertilizer. Without oil and gas refining and their products, we don't have computers, cell phones, Tupperware, clothing, or makeup. Without these processes and their outputs, we can't produce abundant, affordable food. Energy also plays an important role as a power source and thermal heat for industrial processes, like steel production. Everything we wear, use, type on, and ride in had to be built somewhere. Manufacturing and industrial processes require a lot of energy and significant heat.

Energy in Colorado is so much more than light from your light switch and gas at the gas station.

Colorado's energy mix is changing on both the production and demand sides. This section provides some level-setting information on power generation, transportation fuels, and end-use applications.

## Power

Colorado's power sector is multi-faceted and always evolving. What began the decade as 80% coal-derived is today a healthy mix of coal, natural gas, and wind (**Figure 1**). The proportion of coal in the electricity generation mix has been steadily declining by around 2% annually since 2000 (from 80.2% in 2000 to 41.5% in 2021). Wind and solar power, conversely, have increased as a collective share of the state's energy mix by nearly 30%, 1.4% annually, since 2000. Combined-cycle natural gas' share has increased by 20% over the past 21 years while the share of simple-cycle natural gas has declined by 11% (largely driven by the superior efficiency of combined-cycle gas).<sup>iii</sup>

These changes within the state's energy mix appear to have impacted prices. According to the U.S. Energy Information Administration, Colorado's residential retail power price was 11.0 cents per kilowatt hour in 2010 whereas the mountain-state average was 10.4 cents. By 2022, Colorado's price had grown by 30% to 14.3 cents while the mountain-state average rose by only 23% to 12.8 cents. It's important to remember that there's no "free lunch" during an energy transition, and that shifting generation sources will impact consumers.

In 2021, 37% of Colorado's electric power consumption derived from residential demand, 37% from commercial demand, 27% from industrial demand, and less than 1% from electric transportation demand

Figure 1: Colorado electric power industry generation by primary energy source, 2001 through 2022 (EIA)

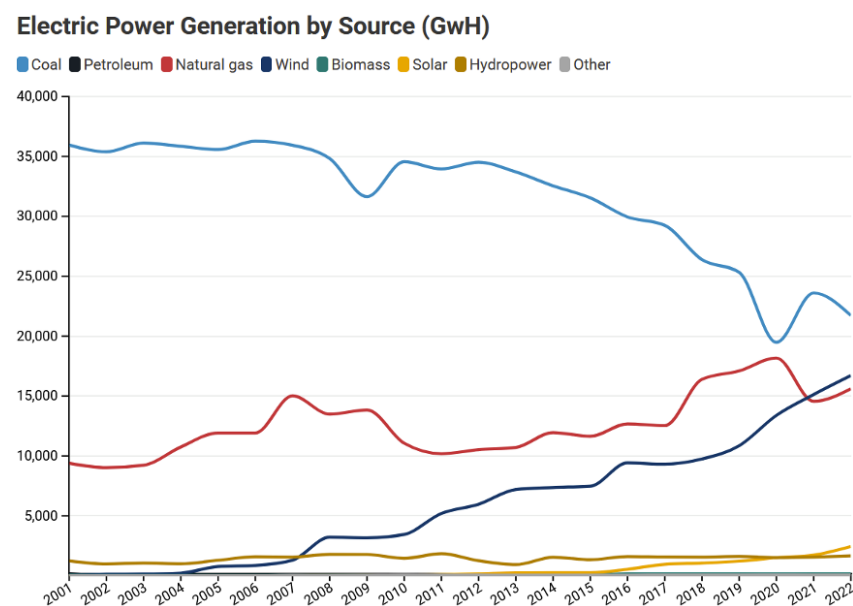
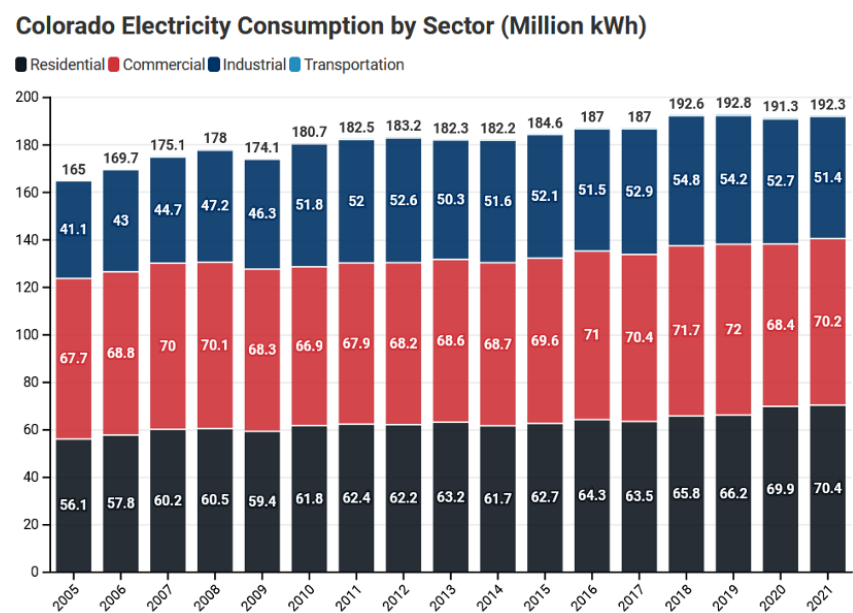


Figure 2: CO electricity consumption by end-use sector, 2015–2021 (CO GHG Roadmap)



**(Figure 2).** Since the early 2000s, commercial power demand has usually been the largest end-use demand segment of power consumption, followed closely by residential and industrial. Commercial power uses include ventilation, lighting, and refrigeration. On the residential side, common end-use activities with the highest energy loads include central air conditioning, water heating, lighting, and refrigeration. Industrial activities include manufacturing and electricity use by agriculture, mining, construction, and oil and gas.

Today, Colorado has no nuclear energy production, but this was not always the case. Fort Saint Vrain (FSV) was Colorado's first and only nuclear power plant. It was also America's only commercial High Temperature Gas Cooled reactor design at the time. FSV's building commenced in 1968, testing began in 1972, and electric power generation began in 1976. Though technically successful, the plant did not survive commercially.<sup>iv</sup> In 1989, all operations ceased and the excess nuclear fuel was shipped off site.

Some analyses indicate that Colorado may be a promising site for future nuclear generation. A recent report conducted by the Idaho National Laboratory for the US Department of Energy<sup>v</sup> identifies four coal-fired power plants in Colorado suitable for consideration for conversion to nuclear plants. The report focuses on the concept of a coal-to-nuclear (C2N) transition, whereby a nuclear reactor is installed at the site of a retired coal power plant. The study team examined various aspects of the C2N transition, including the feasibility of potential sites, the economic factors influencing the decision, and the impacts on local communities. By evaluating data on retired and operating coal power plant sites nationwide, the study found that approximately 80% of these sites possess the necessary characteristics to potentially accommodate advanced nuclear reactors.

The report identifies four potential sites in Colorado as "low risk" based on specific site parameters, including nearby population density, earthquake risk, geologic faults, protected land, slope, risk of landslide, as well as proximity to wetlands, open water, floodplains, and hazardous facilities. Colorado had the second-highest number of coal sites considered fit for nuclear conversion in the western region, behind Wyoming.

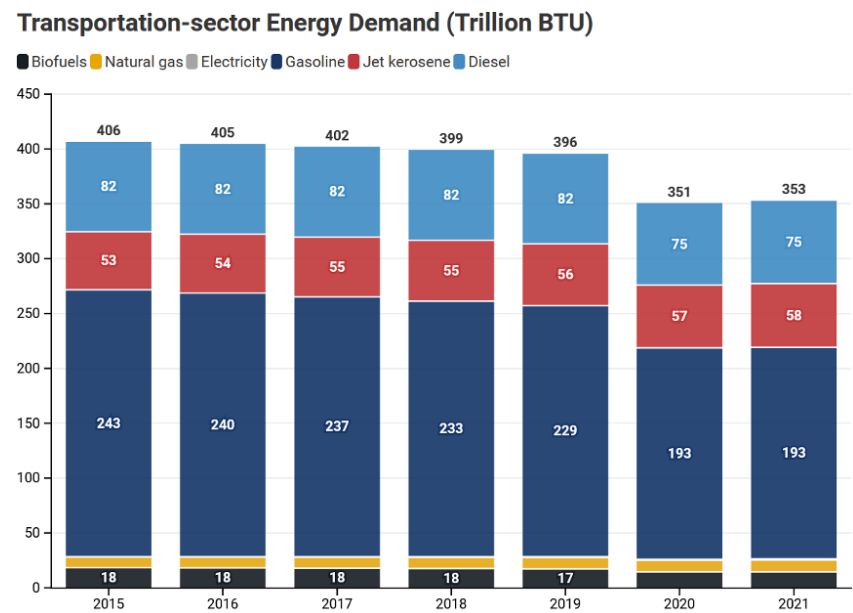
Colorado legislators have recently encouraged such evaluations. In 2023, the state passed HB23-1247, "Assess Advanced Energy Solutions in Rural Colorado," which asserts that advanced nuclear is "necessary to support the development of rural economies and to create jobs."<sup>vi</sup> The bill also calls for regional studies on "energy solutions," including nuclear, that will lay out economic forecasts, development timeframes, impacts, risks, appropriate incentives, steps that should be taken to advance feasibility, and how nuclear power can supplement intermittent resources in the electrical grid. Today there are no state-level policy restrictions on nuclear applications in Colorado.



## Transportation Fuels

Colorado's transportation sector—which includes personal and commercial vehicles, including planes—has been evolving slowly. Gasoline continues to dominate transportation fuel demand, although its prevalence has fallen in recent years. Today, gasoline accounts for approximately 55% of total transportation demand (Figure 3). The second-highest demand item, diesel, has long accounted for around 21% of total demand. The third-highest and fastest-rising demand segment is jet kerosene, which today registers around 16% of total demand.

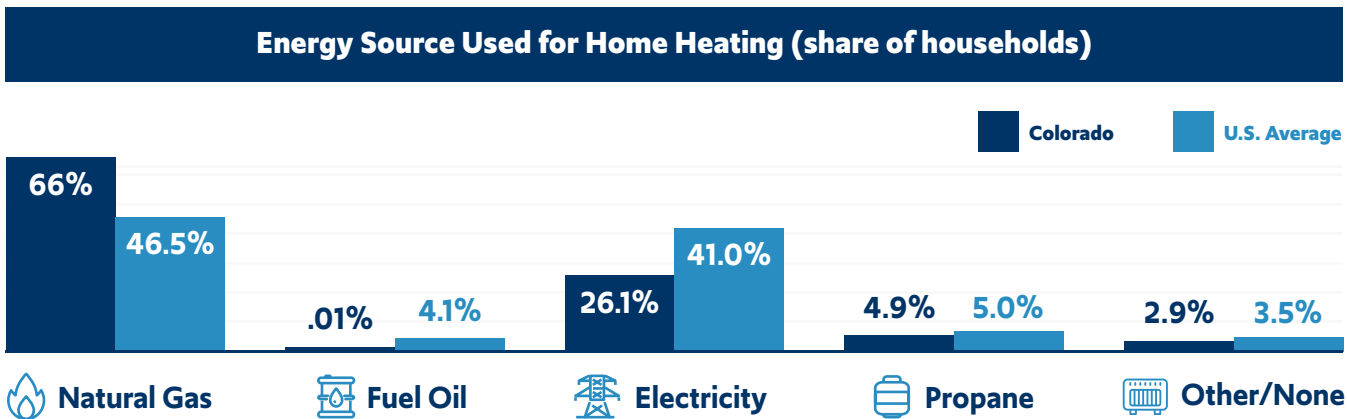
Figure 3: Changing Transportation Fuel Demand Mix (2015–2020), (CO GHG Roadmap data)



## Home Heating

Though it may be easy to conflate “energy” with electricity, energy used in Colorado comes from a variety of sources other than electricity. These fuels for other applications, including natural gas, fuel oil, and propane, play big roles in powering our state. Take home heating for example: 66% of households in Colorado are heated by natural gas—20% more than the national average. Only 25% of households are heated by electricity, which is 15% lower than the national average. Other fuels like propane heat around 5% of homes in the state (typically those in rural areas).<sup>vii</sup>

Figure 4: Energy Source Used for Home Heating (Shares of Households)



If Colorado pursues policy to electrify home heating, much of the load currently shouldered by natural gas and propane will be added to the electric grid. Because nearly 30% of Coloradans are energy stressed, challenged, or impoverished, how we heat homes in the state is a complex and nuanced challenge.<sup>viii</sup>



## Colorado Energy Competitiveness Index

Common Sense Institute has developed the Energy Competitiveness Index. The index is based on state-level, sector-specific data from the U.S. Energy Information Administration which CSI staff analyzed to produce an overall score for the Colorado economy.

The Energy Competitiveness Index is comprised of the following equally weighted variables that capture prices, reliability, capacity, and the energy mix:

- Nameplate capacity per 100,000 residents
- Average duration of power outages (with and without MED)
- Residential electricity prices
- Commercial electricity prices
- Industrial electricity prices
- Residential natural gas prices
- Commercial natural gas prices
- Industrial natural gas prices
- Share of electricity produced by clean energy

Figure 5: Selected Components of the CSI Energy Competitiveness Index

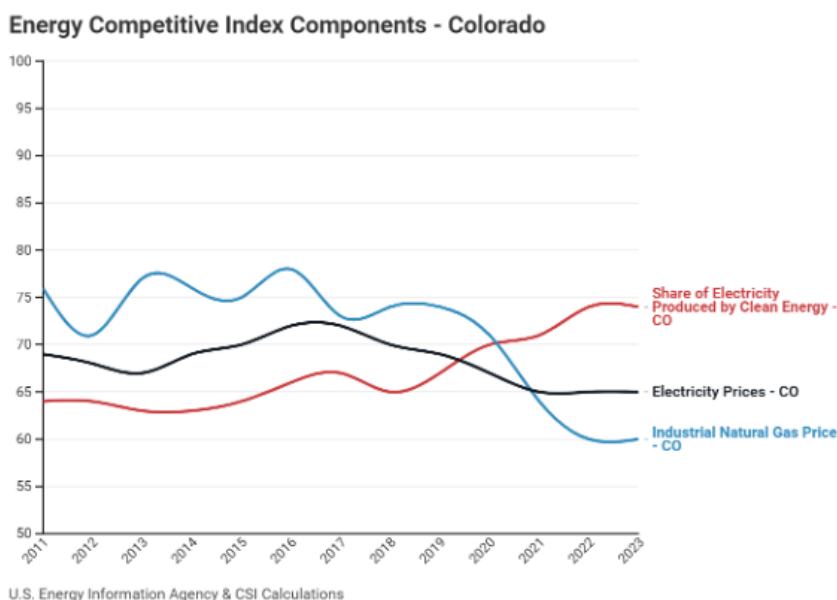
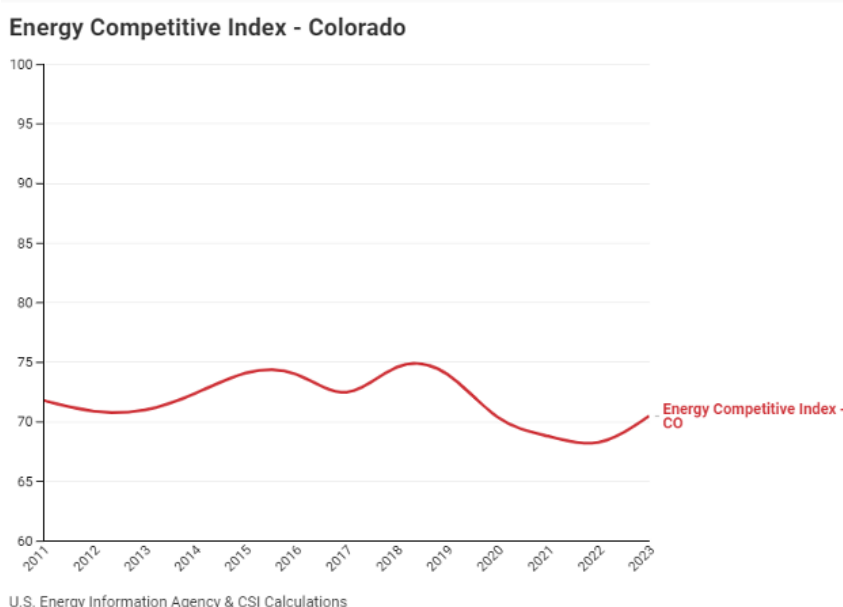


Figure 5 shows the evolution of three variables from 2011 through 2023 and Figure 6 shows the overall performance of the index over the same period. These figures show that according to CSI's analysis Colorado has become less competitive on both electricity and natural gas prices.

Since 2011, according to CSI's analysis (Figure 6), Colorado's energy competitiveness index has declined 1.8% overall from 2011 to 2023. This indicates that Colorado has become less competitive relative to other states.

Figure 6: CSI Energy Competitiveness Index



## Grounding Energy And Environmental Policy In Today's Reality

### Doug

Living in Colorado has become more expensive for multiple reasons not all related to decisions made by state policymakers. However, as the Competitiveness Index demonstrates, energy costs are rising in our state and reliability is slipping as state energy policy has been undergoing significant change.

State policymakers should understand why prices are going up and reliability appears to have diminished before implementing new policies that may exacerbate the problem.

Colorado currently prioritizes GHG reductions and not the cost impacts of policy interventions. Though reducing GHG emissions is a laudable goal, it's important to put Colorado's contribution to climate change into context. In 2021, Colorado ranked 22nd nationally in CO<sub>2</sub> emissions at around 85 million metric tons, according to the Energy Information Administration. This was only a small fraction of the national total and, from a global perspective, an insignificant amount.<sup>ix</sup> Colorado cannot impact climate change on its own, but it can impact jobs and energy costs in Colorado significantly.

Colorado policymakers are seeking, in a relatively short period of time, to eliminate or significantly curtail the use of fossil fuels by electrifying services that currently rely upon them. All appliances, cars, buildings, and other products, under total electrification, would rely upon utilities for power, increasing the demand on the grid and most likely significantly increasing costs.

### Greenhouse Gas Reduction Roadmap - Doug

Colorado is currently in the process of updating its energy policy agenda, the Greenhouse Gas Reduction Roadmap. As it moves forward on Roadmap 2.0, policymakers should reconsider their approach by applying more rigorous reliability and cost analyses to avoid damaging Colorado's economy. They should calibrate their targeted greenhouse gas reductions against the economic impacts that their proposals would cause. Reducing GHGs is important, but so is reliability and affordability. States like California, which has the second-highest utility prices in the country, exemplify the pitfalls of approaches that are unaccountable to their cost impacts.

In 2018, when then-candidate Jared Polis was running for Governor, among his top priorities was an aggressive transition to 100% renewable energy by 2040. In 2021, the Colorado legislature, at the urging of Governor Polis, passed HB19-1261 which established statewide goals for GHG reductions of 26% by

2025, 50% by 2030, and 96% by 2050, below the 2005 level. That legislation was supplanted in 2023 when the legislature passed SB23-016, which established new GHG reduction goals that added new reduction goals of 65% by 2035, 75% by 2040, 90% by 2045, and 100% by 2050.

The Governor's goal of 100% renewable energy is distinct from SB23-016's goal of reducing GHG emissions. It would require all utilities in Colorado to transition completely away from fossil fuels and rely exclusively on intermittent resources like wind and solar. There is no current technological basis for that goal; existing energy technology cannot support the reliable delivery of energy derived solely from renewables. While the goals of SB23-016 are slightly less ambitious, because GHG reductions can be achieved with the aid of nuclear power and carbon capture technology, Colorado has not demonstrated that it is prepared to deploy these kinds of technologies to meet its goals. The Governor's renewable energy goal and SB23-016's targets, however, are in harmony from the standpoint of significantly reducing GHG emissions. If a decarbonized economy is the goal, the first step is to eliminate fossil fuels and replace them with either renewables or other zero-GHG energy sources.

In order to implement HB19-1261 and the Governor's vision of a grid run on only renewable energy, the Colorado Energy Office released the Colorado Greenhouse Gas Pollution Reduction Roadmap in 2021. The Roadmap is a plan designed to enumerate the steps Colorado has taken to address climate and those it will take in the future. It is the implementation document of Colorado's energy policy and it touches upon every aspect of Colorado's economy. It was specifically designed to "inform how Colorado can make progress toward emissions targets in the Climate Action Plan (HB 1261)." For the sake of the Roadmap, the state developed an emissions baseline, modeled GHG emissions based upon different scenarios, and set policy commitments from 2019 forward. Because modeling demonstrated that the state would not meet the goals established in the Climate Action Plan, a series of policy interventions that would meet those goals was included in the Roadmap. These interventions included electrification of buildings and transportation, electrification of vehicles, and aggressive steps to curtail GHG emissions from the oil and gas industry.

## **Role of Electrification and the Roadmap - Doug**

Colorado policymakers, however, have not demonstrated how their policy goals can be implemented practically. The cornerstone necessary to achieve their objectives is electrification, which, according to the International Energy Agency, entails "replacing technologies or processes that use fossil fuels, like internal combustion engines and gas boilers, with electrically powered equivalents, such as electric vehicles or heat pumps." For Colorado to meet their decarbonization goals, the state will need to implement widespread electrification using non-emitting fuels consistent with the Governor's renewable energy goal. This will force utilities to shift their generation from fossil fuels, like coal, to clean sources and/or implement effective carbon-capture technology. The Governor's 100% renewable energy goal, however, would preclude the adoption of carbon capture, for which the state has established only a partial regulatory framework, and significantly restrict the use of hydrogen as a reliable fuel source.

Electrification will require investor-owned utilities (IOUs) to deploy new infrastructure to manage the additional load on their system. This will mean significant expansion of Colorado's electric infrastructure, which is already underway at the high expense of ratepayers. One IOU's transportation electrification plan, for example, proposes to spend between \$439 million and \$549 million, and that same utility is developing a \$1.7 billion transmission line to accommodate the expected growth of renewable energy. These costs compound others, such as the cost of retiring productive power plants and replacing them with new non-emitting generation—these costs, of course, will largely be passed on to customers.

Electrification also enables technologies like an electric vehicle ("EV") to be powered by electricity generated from renewable, or zero emission resources. As discussed further below, Colorado is planning to move Coloradans away from internal combustion engine vehicles and the use of natural gas for home heating and cooking, either voluntarily or through compulsion. Colorado has adopted certain California standards that will, among other things, require that 80% of all new vehicles sold in Colorado be zero-emission vehicles (ZEVs).

## **A Closer Examination of Electric Vehicle Requirements in Colorado - Doug**

The adoption of EV requirements illustrates assumptions in the Roadmap that may be impractical. Policymakers, for example, have set a goal of having 940,000 EVs on the road by 2030; in January 2023, however, there were only 72,480 EVs in Colorado. There is no evidence that EV sales will be anything near enough to close this gap over the next six years. Sales of EVs alone is not the only issue: many more charging stations need to be installed and actual renewable generation needs to be developed. The Roadmap did not include an independent analysis of ZEV sales necessary to reach its goal; it instead cited a 2019 Navigant study which assumes that, by 2030, 43% of all vehicles will be ZEVs. It is unclear whether Colorado is on track to reach that figure.

It is important to make a distinction between ZEV and EVs. There are hybrid EVs that can run on both gas and electricity, so an increase in sales of hybrids would not help Colorado reach their goals as much as sales of ZEVs.

Reaching the state's EV goal will require more than just a mandate; the sale of all vehicles is a function of a global marketplace, and, as the Colorado Automobile Dealers noted in recent testimony to the Air Quality Control Commission, "the grave risk [is that] global supply chain disruptions and manufacturing shortfalls [come] to fruition and manufacturers are unable to provide sufficient ZEVs to remain compliant." Buyers, too, may continue to prefer conventional vehicles.

## Limitations of the Roadmap Framework; Why A Future Vision is Needed - Doug

- The impact of increased strain on utilities is not addressed in the Roadmap, but the potential consequences of hasty electrification are grave. The state is rushing to implement policies that promote an energy source that does not appear technologically or infrastructurally ready to meet their demands. This is unsustainable and could cause reliability issues. Although Colorado has not faced actual power disruptions, like Texas or California, the North American Electric Reliability Council warned of energy supply shortages this past summer:

*“Increased, rapid deployment of wind, solar and batteries have made a positive impact.... However, generator retirements continue to increase the risks associated with extreme summer temperatures, which factors into potential supply shortages in the western two-thirds of North America if summer temperatures spike. The concern over energy supply shortages will likely only increase if more baseload power is replaced with intermittent power.”*

- The Roadmap also does not address nuclear energy and Roadmap 2.0 should. Nuclear power is an option for Colorado; though past attempts at nuclear generation were unsuccessful, time and experience may make another try more successful. There is no question that nuclear energy is safe and effective at providing power on demand and nor that it is the most reliable carbon-free resource available. Costs of construction and maintenance, however, are significant impediments to adoption. While small modular reactors (“SMR”) may be a possibility, the Department of Energy notes that, “[s]ignificant technology development and licensing risks remain in bringing advanced SMR designs to market and government support is required to achieve domestic deployment of SMRs by late 2020s or early 2030s.” There is government funding available for the development of nuclear power, but, as a DOE official commented at a public meeting, “[n]obody wants to build nuclear right now.” The state should place more focus upon promoting nuclear energy and incentivizing the siting of facilities in Colorado. The Colorado Public Utilities Commission should be tasked with building a docket on nuclear power generation, determining why developers and utilities are not pursuing it, and considering what incentives the state could develop.
- The Roadmap takes especial aim at the oil and gas industry and anticipates a significantly smaller industry in 2030 than exists today. An analysis of the Roadmap conducted for the state by the consulting firm Energy + Environmental Economics (E3) concluded that there would be a significant decline in oil and gas production in Colorado irrespective of any Roadmap policy changes. However, that analysis is open to question when compared to data from the Energy Information Administration. The E3 analysis found that the oil and gas industry in Colorado will peak around 2031 at an output of around 350 million barrels of oil and 2700 billion cubic feet of natural gas annually, before declining dramatically. This conclusion is at odds with what we know about proven oil and gas reserves in Colorado from the Energy Information Administration. Colorado has nearly 4% of the country’s proven petroleum reserves and its eighth-largest total natural gas reserve. The natural decline in production predicted by E3 does not seem likely given the state’s reserves. New policy and regulation are much more likely to cause that sort of decline.

- Recent regulatory decisions, such as approvals of Oil and Gas Development Plans (OGDPs) indicate a reason for a slowdown in production is a result of increasingly slow approvals by state regulators. Since 2021 the rate of approval of OGDPs has slowed dramatically: the average number of days before approval has risen from 157 to 259. The current regulatory environment suggests that policy and regulatory decisions will be significant reasons for any future declines of oil and gas development as well.
- If Colorado's policymakers intend to restrict oil and gas output, they should reconsider. Oil and gas are fungible resources—if they aren't available from one source, another source will make up the difference. Because it is unlikely that Colorado will eliminate the use of fossil fuels, it should produce what it needs in-state for the sake of the economy and the environment. We would employ Coloradans to develop a resource we need and under some of the most stringent environmental regulations in the country. Importing oil and gas from out of state sources is, in itself, carbon-intensive and contrary to state GHG reduction goals. California provides an example that we should not follow: it is the top producer of solar in the United States (32,000 MW of current capacity) but also uses more natural gas than any other state except Texas. Despite that, the Governor of California has decried the use of fossil fuels, noting in a 2023 address to the United Nations Climate Ambition Summit that "[t]his climate crisis is a fossil fuel crisis. This climate crisis persists. It's not complicated. It's not complicated. It's the burning of oil. It's the burning of gas. It's the burning of coal. And we need to call that out."<sup>x</sup> Colorado policymakers, when rewriting the Roadmap, must approach the issue of fossil fuels with more nuance; they should recognize that the state can't achieve its net-zero goals without fossil fuels.

## Net Zero Framework Holds Promise - Doug

A revised Roadmap should acknowledge this and promote the responsible development of fossil fuels in Colorado necessary to meet the goals established in legislation. Colorado cannot reach its GHG reduction goals without fossil fuels, and Colorado policymakers should ensure that the state should develop Colorado fossil fuels insofar as it can.

Along with committing to the continued use of fossil fuels, state policymakers also need to clearly lay out the cost of developing the infrastructure necessary to achieve zero emissions. Unless Colorado is still going to attempt a total shift to renewable energy, which is not achievable with current technology, state policymakers will have to oversee the development of infrastructure and the regulatory and policy framework necessary for carbon capture and sequestration and/or direct air capture of carbon. This will not be inexpensive, and the costs should be made clear to Coloradans so they understand what they are paying for in their utility bills.

The chart below demonstrates why fossil fuels are necessary in a net-zero world—when renewables go offline there is a significant ramp-down resulting in immediate demand for a fuel source like natural gas. Colorado cannot have its cake and eat it too; it cannot cease using fossil fuels while maintaining affordable and reliable power and it also cannot achieve net zero without the use of fossil fuels. The first graphic shows the demand for natural gas in California when solar power goes offline.

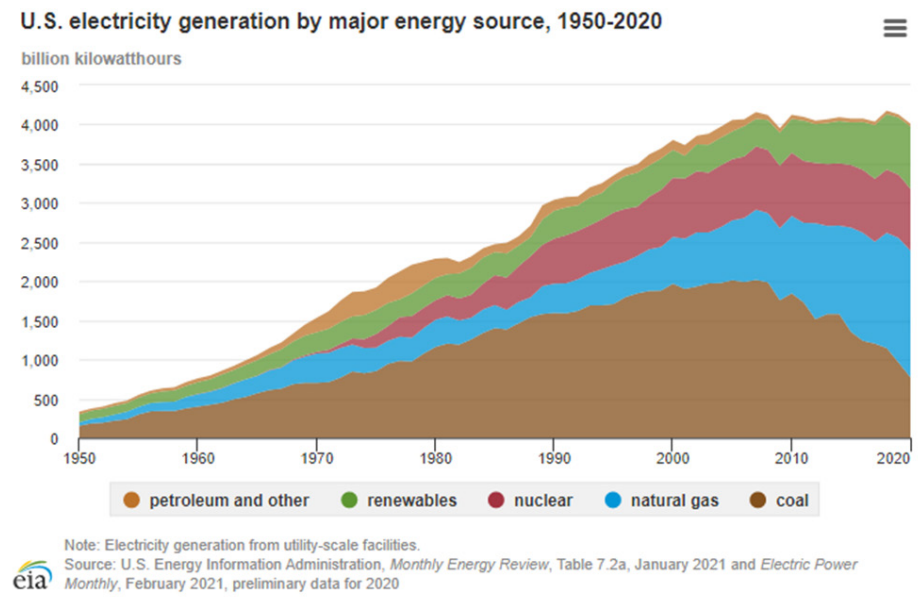
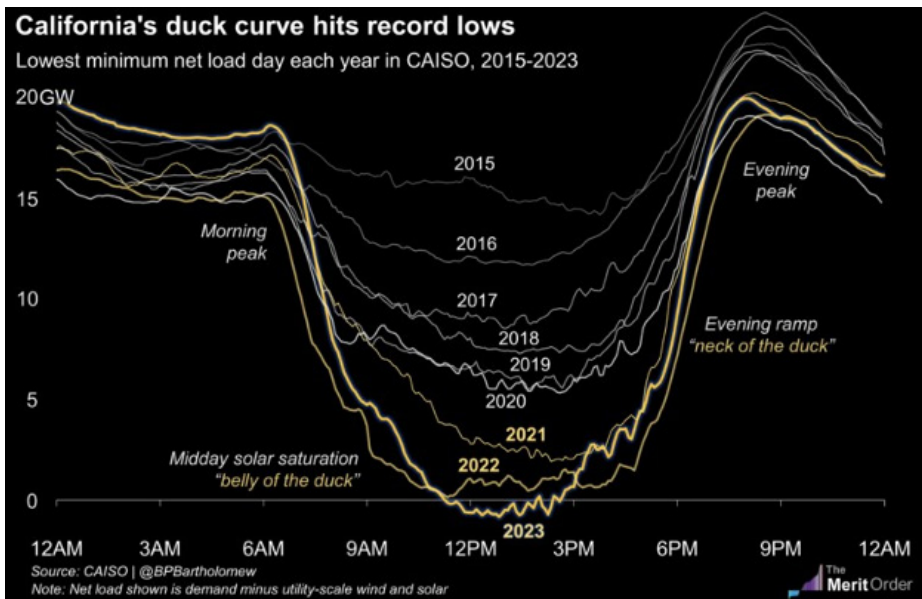
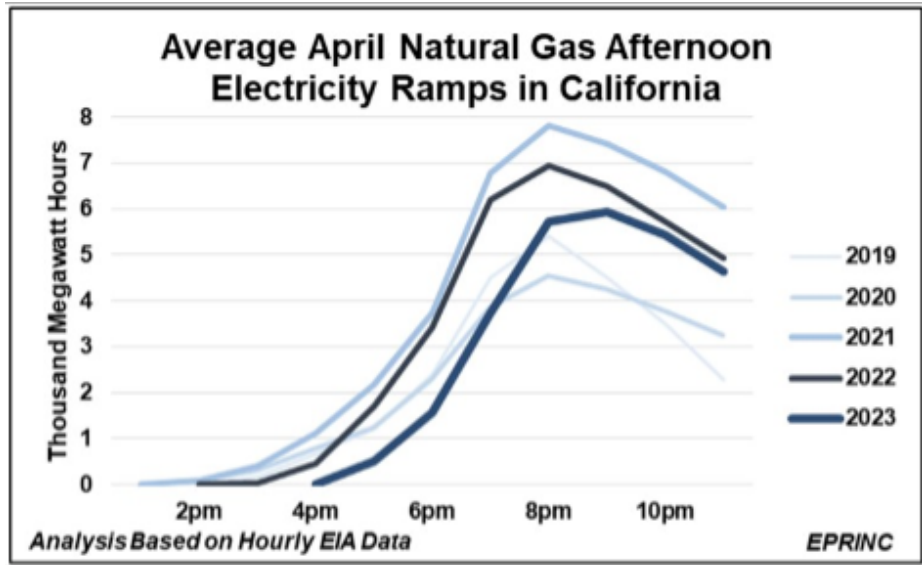
The second graph shows the load in California over the past few years.<sup>xi</sup> Demand is high early in the morning, falls below 0 in the afternoon, when solar is available, and then jumps up again in the afternoon when solar goes offline. California's grid needs a steady resource that produces power



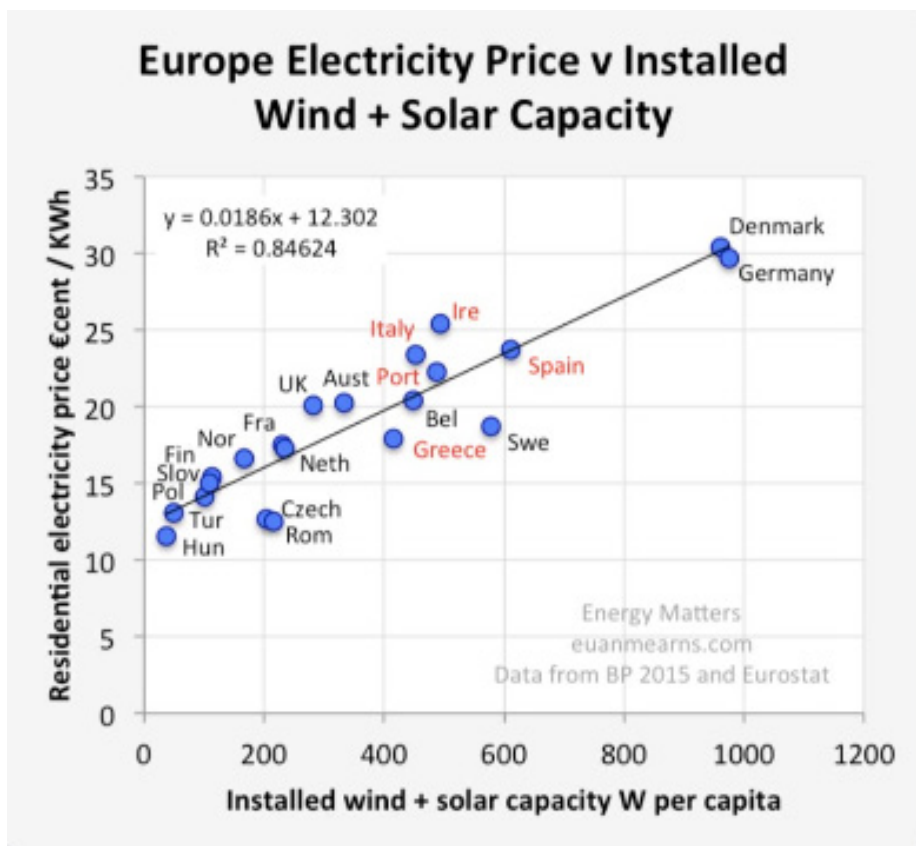
when solar generation is not available. The chart demonstrates that electric grids cannot operate on renewable generation alone; net-zero emissions may be achievable, but only with the aid of fossil fuels and carbon-capture technology.

This next graph demonstrates power generation in the United States.<sup>xii</sup> Though renewables' national share of total generation has grown, it is still too small to replace fossil fuels any time soon. Fossil fuels are not going away, and even if Colorado eliminates all fossil fuels from its portfolio, the rest of the country will not. The climate impact of Colorado's reductions will be minimal, but the economic impact of skyrocketing utility bills could be large. Policymakers should consider Colorado's cost of living and balance it against their climate goals to ensure that a negligible decrease of global GHG emissions does not unduly harm Coloradans.

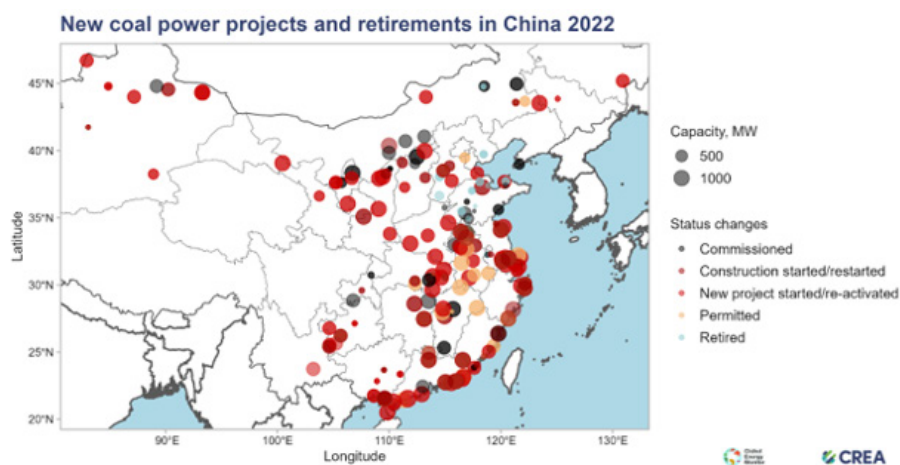
There are many factors that drive costs, but, as the next graphic demonstrates, there is a correlation between installed renewable capacity and price in Europe.<sup>xiii</sup> This graphic also demonstrates why Roadmap 2.0 should robustly analyze the cost of its recommended policies.



Climate change is a global issue; while local, state, and national steps can be taken to address it, Coloradans should not pay a steep price for what are very small contributions to global GHG emissions. The Centre for Research on Energy and Clean Air and the Global Energy Monitor notes that “[c]oal power plant permitting, construction starts, and new project announcements accelerated dramatically in China in 2022, with new permits reaching the highest level since 2015. The coal power capacity starting construction in China was six times as large as that in all of the rest of the world combined.” Colorado can thoughtfully move forward to address climate while recognizing that the steps it is taking are not going to offset what is happening around the world. Colorado alone cannot address climate change; what Colorado alone can do is make life here even less affordable, make household budgets even tighter, and make a state that is already very expensive outrageously expensive. The image right shows China’s 2022 coal projects.<sup>xiv</sup>



The Greenhouse Gas Roadmap 2.0 will, among other things, propose new policy interventions to reach the GHG reduction goals in SB23-016 and release updated modeling.<sup>xv</sup> The end of the report includes recommendations the state should consider when updating the Roadmap,





including more robust modeling of costs and reliability impacts. While the state has opposed doing this because, from their point of view, costs are assessed through the regulatory process, that is inaccurate. The aggregate costs of state policies are not considered; Coloradans do not know how much all of these policies together will cost them.

California has done an aggregate policy analysis of its version of the Roadmap and, to the state's credit, acknowledged the regressive nature of its policies in its economic impact analysis:

While the transition away from combustion of fossil fuels will improve air quality for all Californians (and even, more so in overly burdened communities), the economic impacts of the Scoping Plan Scenario are unlikely to be equal among Californians. Table 3-2 presents the change in income by household income group relative to the Reference Scenario in 2035 and 2045. While in 2035 there is a net decrease in personal income of \$600 million, total income for households that make less than \$100,000 per year is estimated to decline by \$4.1 billion dollars, and the total income for households that make more than \$100,000 per year will increase by \$3.5 billion under the Scoping Plan Scenario. In 2045, although there is no net change in personal income across all California households, results vary by income level. Total income for households that make less than \$100,000 per year are estimated to decline by \$5.3 billion dollars, while the total income for households that make more than \$100,000 per year will increase by \$5.3 billion under the Scoping Plan Scenario.<sup>xvi</sup>

Under California's Scoping Plan for Achieving Carbon Neutrality, residents with income less than \$50,000 will lose a total of \$2.9 billion by 2035 and \$3.9 billion by 2045. California's GHG reduction policies are regressive; the rich do better while others do worse. Colorado should conduct a similar analysis on cost distribution along with a reliability analysis. It should also take into account the equity impact of the state's plan—if there are negative impacts in Colorado, who will be the most impacted?

Finally, Colorado should look to its history. Colorado has historically been an innovator: for example, it adopted a 10% renewable standard in the early 2000s that many IOUs believed would result in billions of dollars in costs. The critics were wrong; it was modest proposal that worked. On the other hand, Colorado built a nuclear power plant in the 1970s which did result in hundreds of millions in losses, most of it for ratepayers. The state should consider its past and assess whether its current policies are more like its early adoption of renewables or its ill-fated attempt at nuclear.

## Joint Recommendations

The authors offer the following joint recommendations.

### RECOMMENDATION 1:

#### Create a real energy policy strategy.

##### **A climate strategy alone does not make a good energy strategy.**

Colorado requires an energy strategy that factors in cost, reliability, environmental considerations, economic development, innovation, and greenhouse gas footprint. Colorado's current energy policy framework is a GHG reduction framework. This choice has negative consequences and should be reconsidered.

### RECOMMENDATION 2:

#### Build an energy strategy reflective of the complexity of Colorado's energy system

##### **Policymakers should factor in the multiple dimensions of a complex energy system, including power generation, transmission, oil and natural gas production, refining, transport, and distribution, the mining, processing, and transport required for clean energy development, innovative energy solutions, and decarbonization solutions.**

Policymakers must think beyond electrification: expanding the grid comes with its own Herculean challenges. Electrification for various solutions should be robustly analyzed to weigh alternatives and assess tradeoffs.

Given the central role that energy plays in economic development, environmental footprint, and overall well-being, we recommend that Colorado broaden its energy policy framework to consider:

- The many tradeoffs inherent to good energy policy and planning (cost, reliability, redundancy, economic development and competitiveness, GHG emissions, other emissions, water use and quality, land use, and other environmental considerations.),
- All forms of energy to give policymakers more dials to turn and more tools in their toolbox,
- The unique considerations of communities including their histories, urban or rural natures, and development preferences, and
- Forms of carbon removal, utilization, and storage as important alternatives with which to weigh options and tradeoffs

**RECOMMENDATION 3:****Eliminate renewable-only targets and move toward a net-zero framework**

**It's time for policymakers to explicitly reassess Colorado's commitment to 100% renewable electricity generation by 2040.**

The goal is not achievable given the rapid infrastructure development that the state would need and the current state of technology. If Colorado policymakers want an effective decarbonization strategy, they should consider adopting a net-zero policy that preserves high reliability at low cost and is technologically sound. A net-zero policy that allows for the continued use of fossil fuels with appropriate offsets and carbon-capturing is complex but achievable. It would also open up a wide array of other potential energy sources, like nuclear power and hydrogen.

**RECOMMENDATION 4:****Embrace a five-factor policy efficacy framework**

**Constant legislation and rulemaking is impacting Colorado's competitiveness.**

Policymakers should put their energy and climate bills, regulations, and decisions through a five-factor common-sense framework test to ensure that their benefits outweigh their costs, their unintended consequences are aired, and their tradeoffs are evaluated:

1. Will this decision increase the cost of energy production, distribution, or use?
  - a. What advantages do the cost increases grant?
  - b. In what ways could the costs be mitigated?
2. Will this decision potentially undermine energy availability, create grid reliability problems (such as brown and black outs), or cause price spikes?
3. Will this decision enhance or inhibit Colorado's economic competitiveness, including its ability to attract new investment to the state, retain business activity in the state, and develop economically?
4. Does this decision better position Colorado for an uncertain energy future by encouraging innovation, promoting resource diversity, and expanding domestic energy availability?
5. Does this decision limit consumer choice for businesses and individuals?
 

If so, for what tradeoffs?

**RECOMMENDATION 5:****Use an energy competitiveness index**

**Policymakers should consider utilizing an energy competitiveness index to help them understand Colorado's competitive position relative to other states, including regional competitors.**

Ensuring Colorado's competitiveness could be a top priority. The CSI index provides a quantitative measure of the state's rank relative to its competition over time that considers specific factors like price of the electricity, the price of natural gas, and electrical grid reliability.

## Individual Recommendations

### Doug

#### RECOMMENDATION:

**Identify the costs and benefits to Coloradans of existing policies from the initial Greenhouse Gas Reduction Roadmap and other legislation**

**The state should analyze costs of the initial Roadmap and related policy adopted to achieve the goals of HB19-1261.**

It would detail the costs and benefits of existing policies and, alongside the analysis of Roadmap 2.0, would establish the total costs and benefits of past and current decarbonization efforts.

#### RECOMMENDATION:

**Identify the costs and benefits to Coloradans of the policy recommendations in Greenhouse Gas Roadmap 2.0**

**The policies in the GHG Reduction Roadmap 2.0 should be subject to analysis detailing their costs and benefits to Coloradans if they were to be fully implemented.**

The analysis should mirror the one done in California and include total costs and benefits to Coloradans according to income.

#### RECOMMENDATION:

**Conduct a reliability analysis of policies in the initial Roadmap and Roadmap 2.0**

**The initial Roadmap established policy goals of electrification, increased use of renewables, and decreased use of fossil fuels.**

The state does not appear to have analyzed the impact of past and future actions that will increase demand on the grid while decreasing energy supply. Roadmap 2.0 should assess the reliability impacts of past and future policy. This would allow the state to better understand future demand on the grid and what resources will be available to meet that demand.

**RECOMMENDATION:****Engage in permitting and regulatory reform**

**Colorado should review potential permitting and regulatory reforms to expedite the processes necessary to reach its energy policy goals.**

The state should expedite its application to run the Class VI underground injection control for carbon storage instead of the EPA. Colorado would run the program more efficiently; this would allow for quicker regulatory approval of carbon-capture projects. Colorado should also address other regulatory issues around carbon capture such as pore space ownership and liability allocation for stored carbon. More broadly, the state should expedite permitting for renewable projects and oil and gas projects, which will be necessary to support a net-zero goal. If the regulatory process does not provide certainty, Colorado will be a less attractive state for capital investment.

**RECOMMENDATION:****Avoid creating a hostile regulatory environment**

**In the past year, higher energy prices sparked the creation of a state joint committee to examine their causes which prompted legislation restricting IOU recovery for certain activities.**

Though the decisions of the joint committee and the legislative actions will have a negligible impact on state IOUs, such actions will sour investor perceptions of the regulatory environment in Colorado. If the perception persists that Colorado's regulatory environment is difficult, that will lead to an increase in the cost of capital for state IOUs will rise and lead to higher rates.

## Individual Recommendations

### Tisha

#### RECOMMENDATION:

#### Create a non-partisan entity

Create a non-partisan entity that can evaluate energy- and climate-related legislative proposals to consider effects on cost, reliability, economic development, and environmental footprint. Additional measures could include appointment mechanisms that result in ideological diversity and staggered terms across different gubernatorial administrations. In short, the state should take the politics out of energy policy and focus on mapping tradeoffs for legislators and regulators.

#### RECOMMENDATION:

#### Repurpose and reuse energy resources

Colorado's energy planning and policy framework should repurpose and reuse as much of today's energy resources as possible, including existing infrastructure, workforce, and educational resources. Part of the oversimplification of GHG-driven energy policy is a fallacy that there's "old energy" and "new energy." Considering the comprehensive tradeoffs of energy policy, it's clear that nothing could be more inefficient by every measure than not "reducing and recycling." This means building upon Colorado's energy history, knowledge, and infrastructure—evolving it rather than replacing it.

Policymakers can take stock of existing energy infrastructure around Colorado with an eye for what can continue to thrive in a decarbonizing and evolving energy system. Evaluating existing infrastructure, from refineries to power plants, means considering not only the life-cycle costs of replacing existing resources, but the unintended costs of having to import or increase travel distances of energy resources.

Once the illusion of "old" and "new" energy is dispelled, much existing infrastructure can accelerate decarbonization while reducing other tradeoffs such as increased environmental footprint and runaway costs. Pipelines can carry decarbonizing liquids and gases; power plants can be retrofitted with new technology, whether to capture emissions or accelerate adoption of nuclear; and, oil and gas wells and expertise can accelerate progress on carbon sequestration or geothermal.

By considering Colorado's long history, incumbent energy industries, and robust workforce, the state government can accelerate progress by partnering with companies, employees, and communities with decades of expertise, diverse and well-educated workforces, and proven track records of reinventing themselves again and again.

**RECOMMENDATION:****Include incumbent companies and legacy industries**

Long before environmental justice came to dominate national energy policy discussions, Colorado had established robust community-engagement practices that treated communities as valued partners and co-creators of energy projects. The current framework in Colorado is so dominated by polarized politics, that only limited voices are considered stakeholders. In practice, Colorado has an opportunity to be more genuinely inclusive. Colorado is considered a national leader in environmental justice—continuing to prioritize the interests of historically disadvantaged communities and overlooked stakeholders.

Discussions of environmental justice are often paired with calls for a “just transition.” A just transition is often referenced as a way to “help” coal and oil and gas communities and workers find an economic pathway in a changing energy future. It’s an unhelpful framework for numerous reasons, chief among them that no community of workers wants to be “justly transitioned” by someone else, no matter how well intentioned.

Nevertheless, the sentiment is admirable and bears exploring in a Colorado context. Colorado policymakers can participate in the truest form of a “just transition” by including incumbent companies and legacy industries in planning energy policy. Prioritizing oil and gas—adjacent new energy solutions, for example, particularly in historic basins, both accelerates energy evolution at scale and includes these communities and workers in the process.

## *Acknowledgements*

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