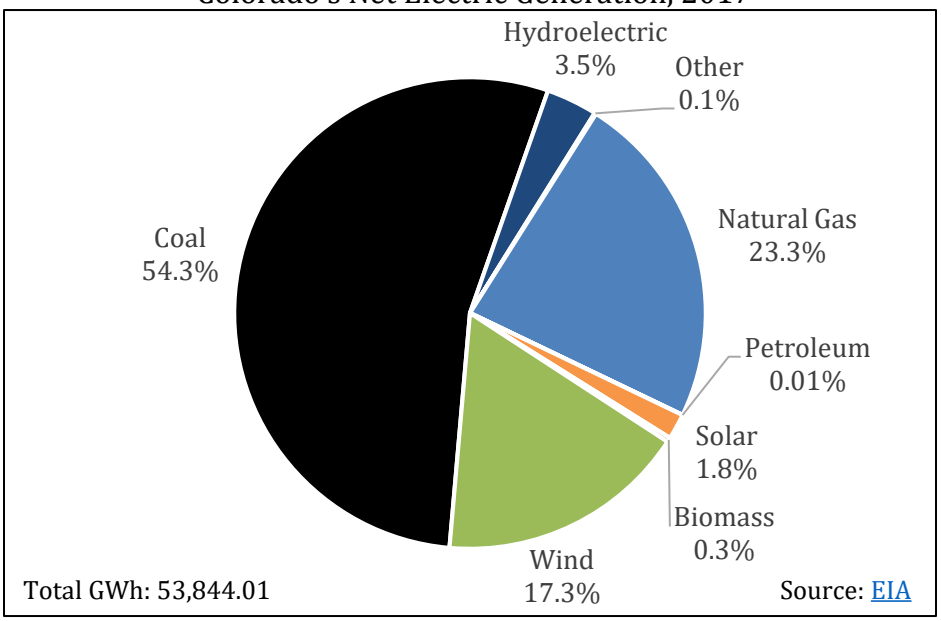
State Brief: Colorado

BACKGROUND

Colorado's net electric generation relies heavily on coal and natural gas. In 2017, annual production of coal increased for the first time in six years, due to increased demand from foreign countries. Overall, Colorado's energy generation from coal has declined in the last decade (67% in 2007 versus 54% in 2017). The state is the fifth-largest natural gas producer in the country and is home to 11 of the nation's 100 biggest natural gas fields.

Colorado's Net Electric Generation, 2017



A 2019 report by the National Association of State Energy Officials and the Energy Future Initiative found that Colorado has 91,905 traditional energy workers (3.4% of total state employment) and an additional 34,342 workers employed in energy efficiency.

Renewable energy production has doubled since 2010 to 25% of the state's net electricity generation in 2017. Colorado was also ranked 10th for solar and 8th for wind electricity generation in 2017. The Centennial State boasts a strong wind industry, employing 7,320 citizens. In April 2019, Xcel Energy obtained approval to construct a 500 megawatt (MW) wind farm as part of the company's effort to achieve fully carbon neutral generation by 2050. The solar industry within the state is also prominent, providing 7,819 jobs. Currently, Colorado is ranked 7th nationwide for renewable energy jobs and the renewable energy industry employs almost 58,000 Coloradans.

In early 2013, an informal collaboration of electricity service providers formed the Mountain West Transmission Group (MWTG). The intention behind MWTG was to develop methods to adapt to the changing electric industry through procuring membership in an existing regional transmission organization (RTO), the Southwest Power Pool (SPP). After losing both Xcel Energy (Colorado's largest utility) and Black Hills Energy as members in 2018, Western Area Power Administration (WAPA) decided to defer any further activity regarding MWTG and to pursue opportunities elsewhere.

The Colorado Public Utilities Commission (PUC) regulates the state's investor-owned utilities (IOUs). All three members of PUC are appointed by the governor. The former director of the Colorado Energy Office, Jeff Ackermann (D) is the Chairman. Democratic Governor Jared Polis took office in January 2019. At the Colorado General Assembly, a Democratic majority controls the House, while a slim Republican majority controls the Senate. In 2019, the state enacted Senate Bill 236, which includes a requirement to investigate performance-based incentives. The bill also requires Xcel Energy to submit a plan for approval by the PUC for reducing greenhouse gas emissions 80% by 2030 and includes the provisions allowing electric utilities to finance closures of fossil fuel-fired power plants. In June 2019, Xcel filed a Clean Energy Plan Portfolio proposing to close two coal plants and replace them with solar, wind, storage, and natural gas assets.

POLICY STRENGTHS AND OPPORTUNITIES[1]

The National Renewable Energy Laboratory (NREL) developed the notion of "policy stacking,"[2] an important framework for policymakers to consider. The basic idea behind policy stacking is that there is an interdependency and sequencing of state policy that, when done effectively, can yield greater market certainty, private sector investment, and likelihood of achieving stated public policy objectives.

In theory, but not always in practice, clean energy policies can be categorized into one of three tiers of the policy stack. Tier 1, market preparation policies, remove technical, legal, regulatory, and infrastructure-related barriers to clean energy technology adoption. Tier 2, market creation policies, create a market and/or signal state support for clean energy technologies. Tier 3, market expansion policies, create incentives and other programs in order to expand an existing clean energy market by encouraging or facilitating technology uptake by additional market participants.

For example, before financial incentives for combined heat and power (CHP) will be successful, two key considerations for deployment are having clear interconnection standards and favorable stand-by rates for customers who opt to add CHP. In this example, states should adopt policies to address interconnection and stand-by rates before adopting financial incentive programs.

GRID MODERNIZATION

The transition to a digital economy requires affordable, sustainable, and reliable electricity and presents challenges and opportunities to the grid. Emerging physical and cyber security threats, along with increased demand for faster outage response times, require, at minimum, real-time incident tracking and response capabilities. Increased grid penetration of renewable energy coupled with the adoption of advanced metering, energy storage, microgrids, electric vehicles, and other technologies to modernize our electric system will provide economic benefits, increase security, and ensure more reliable, resilient, and clean electricity. These innovations will require substantial planning and investment in grid technologies.

Grid modernization will require a suite of state and federal policy changes to support advancements in grid technologies, grid management, and utility regulation. Grid modernization strategies, while recognizing regional and inter-state diversity and avoiding one-size-fits-all plans, should take a holistic view of the electric system.

According to the latest GridWise Alliance Grid Modernization Index Colorado jumped from 18th to 11th position for overall grid modernization efforts. In June 2017, the PUC approved Xcel Energy's $612 million grid modernization investment proposal, in which the utility will equip homes and business with advanced metering infrastructure (AMI) and rolling out a voltage optimization system between 2019 and 2024. This metering infrastructure will allow customers to track their energy usage and should lead to greater efficiency. Improvements in efficiency will, however, affect Xcel's profits and, as part of its proposal, Xcel suggested, and the PUC granted, a pilot revenue decoupling program to recover costs if total electricity consumption drops over time.

There are supportive policies that Colorado's policymakers could adopt to enhance in-state modernization efforts.

1. Update the grid modernization strategy through a stakeholder process that incorporates the viewpoints of utility customers, utilities regulators, utilities, and other stakeholders. Colorado took steps toward a transition to a modern grid following the enactment of SB 10-180. This bill created the Colorado Smart Grid Task Force, which produced "Deploying Smart Grid in Colorado," a 2011 report with recommendations for legislators and the PUC. Grid modernization strategies, while recognizing regional and inter-state diversity and avoiding one-size-fits-all plans, should also take a holistic view of the electric system.

2. Require that utilities' integrated resource plans (IRPs) include strategies to enhance cybersecurity, integrate distributed energy resources (including electric vehicles and energy storage), increase smart meter deployment and demand response and/or demand-side management (DSM) programs, and measure and

[1] For more information on policy opportunities, please visit the SPOT for Clean Energy. For more information on specific policy actions related to these opportunities, please review the *Clean Energy Policy Guide for State Legislatures*.

[2] V.A. Krasko and E. Doris, *National Renewable Energy Laboratory*, 2012. Strategic Sequencing for State Distributed PV Policies: A Quantitative Analysis of Policy Impacts and Interactions. http://www.nrel.gov/docs/fy13osti/56428.pdf.

report on the results of grid modernization efforts. The Colorado Smart Grid Task Force's report, mentioned above, addressed most of these topics.

3. The technologies associated with grid modernization generate a wealth of information about the grid itself and about customer behavior. Policymakers could develop legislation or rules that, at minimum, do the following: clarify who owns the energy data associated with consumer energy usage; protect customer privacy; and promote access to the highest resolution of data possible. The Xcel Energy advanced metering infrastructure deployment is affiliated with the Green Button.

ENERGY STORAGE

Energy storage offers a unique opportunity to dynamically manage supply and demand while maximizing the value of grid resources. By deploying storage in strategic locations, utilities can more effectively manage their energy portfolios. First, storage provides management of intermittent demand – helping to flatten peak demand requirements for the utility. Second, the responsiveness of energy storage can allow the utility to implement voltage regulation and other ancillary services, which are useful for improving system efficiency. Third, storage can dispatch power to better integrate intermittent resources like renewable energy.

The flexibility of battery storage, combined with advanced metering infrastructure, allows customers to control, for instance, how and when they use energy from the grid or from solar panels installed on their home or business. In most cases, this can provide greater cost savings than standalone solar systems. Combined with time-varying rates or real-time pricing programs, state policy can further support customer choice and open a new market for energy services. Prices that better reflect the time-varying and location-dependent costs of producing and delivering electricity can lead to a number of economic and environmental gains.

Two major trends have enabled increased deployment of energy storage: declining costs and technological advances. State policy can help maximize these benefits through a combination of establishing a framework for easy integration of energy storage into the grid and establishing a marketplace that monetizes the benefits of energy storage for cost-effective investment.

In March 2018, Colorado became one of the first states to grant customers the right to store energy. SB 18-009 grants electricity users the ability to store energy without discrimination in rates or excessive barriers to connecting to the grid. It also requires the PUC to adopt rules allowing the installation, interconnection, and use of energy storage systems by utility customers.

In June 2018, HB 18-1270 was enacted. This bill directs the PUC to adopt rules establishing mechanisms for the procurement of energy storage systems by electric IOUs, based on an analysis of costs and benefits as well as factors such as grid reliability and a reduction in the need for additional peak generating capacity. The information supplied by the utilities must include appropriate data and must specify interconnection points to enable independent evaluation.

For Colorado, now a leader in energy storage policy, there are policy opportunities for supporting the energy storage market.

1. Consider creating a mandatory energy storage procurement target or requirement for energy storage with a documented process for periodic review of progress towards that goal. Procurement targets can limit the amount of utility owned storage; require that a certain amount of storage be targeted to low-income customers; and create carve-outs for storage at the transmission, distribution, and customer levels. Procurement targets can jump-start market creation, spur fast learning, and guide the development of a regulatory framework.

2. Finance and incentivize energy storage for customers and utilities. Incentives could enable customers to use storage to manage their electric load and store locally produced renewable energy. Incentives in the form of rebates, grants, and tax credits can provide a bridge to scalable deployment for storage. Incentives can be designed to decline as storage values become more readily monetized and/or as the cost of storage decreases. Policymakers could allow utilities that provide incentives to customers to recover the costs of installing smart meters. This would enable dynamic and time-varying energy management from multiple distributed battery systems. This should signal to customers the value of leveraging storage while better aligning customer costs with system costs. Financing energy storage installations for commercial customers could help reduce their

demand charges. Policymakers might want to start first with a policy that provides grants to pilot projects. Policy might also target solar system owners. Financial incentives should be designed to ensure that the state will meet other goals including emissions and peak demand reductions, and equitable access to clean energy.

3. Clear data access policies that allow third parties to provide energy management services based on signals from the utility can greatly increase the value of efforts to monetize the value stream offered by energy storage. (See discussion above, under Grid Modernization.)

MAINSTREAMING RENEWABLES

As the renewable energy industry has matured, technology has improved, and global production of generating equipment has increased, renewable energy is increasingly seen as the least cost and lowest risk form of energy (excluding energy efficiency). A 2019 Bloomberg New Energy Finance report predicts that renewable resources will generate at least 60% of total global electricity and 43% of U.S. electricity by 2050. With increased deployment, utilities are learning more about how to integrate renewables effectively, investors are becoming more comfortable with the technologies, and building code officials are recognizing common standards and best practices. For these reasons, it is in the interest of policymakers to ensure that their states are well positioned to benefit from the transition to clean energy resources.

To reduce barriers to customer and utility participation in the renewable energy market, policymakers in Colorado might consider several options.

Customer-Oriented Policies

1. Interconnection, net metering, and streamlined permitting – In general, customers want a clear, streamlined, affordable, and predictable system for connecting renewable energy systems to the grid. Colorado adopted standards for net metering and interconnection in 2005 and updated the rules in 2008 and 2009. These standards apply to utilities with 40,000 or more customers, municipal utilities with 5,000 customers or more, and all cooperative utilities. The state's net metering policy, while a gold standard in the U.S., could be improved by severing the policy's tie to the state's RPS. Colorado's policymakers might also consider establishing either statewide standards for streamlined permitting processes, or resources to support local governments that voluntarily implement a streamlined program, as Brighton has done. State incentives, such as tax credits, financial incentives, or loans, can be tied to systems that are established within a designated streamlined permitting jurisdiction.

2. Shared Renewables – Due to building and property attributes and ownership issues, many customers are unable to install renewable energy technologies where they live or work. Allowing shared, or community, renewable energy projects addresses these barriers. These projects have multiple owners or subscribers who pay for a portion of the project or the generation provided by the system. Colorado currently allows virtual net metering for solar customers of IOUs only. Virtual net metering allows a customer to receive credits from a shared system as if the generation were on site. Virtual net metering is different from a power purchase agreement (PPA), which pays the customer for the proportion of power they produce. Because it is treated as a credit on the customer's bill, the customer can avoid the tax implications of a PPA payment - which can adversely affect the economics of the system (and may come as a surprise to the participant). To expand program participation, the state might consider expanding the virtual net metering policy. Enacted in 2019, HB 19-1003 removes restrictions on Community Solar Gardens (CSG) and increases the maximum size of a CSG from two MW to 10 MW.

   Low credit ratings often deter participation in renewable energy markets; this can affect low- and moderate-income (LMI) households' adoption of renewable energy solutions. Supportive policies for shared renewables can be designed to encourage participation by LMI households; this can increase adoption of renewable technologies and reduce energy costs. Colorado is emerging as a national leader in bringing the benefits of renewable energy to LMI households.[3] The state has pursued low-income solar energy programs since 2015 and

[3] Colorado enacted House Bill 1342 in 2010, authorizing community solar gardens, requiring that community solar developers include at least five percent LMI subscribers at each of their arrays. This approach was difficult for Xcel Energy to meet and was revised in 2016 as part of a settlement agreement, expanding the low-income carve-out to an aggregate requirement. Colorado has also experimented with grant-funded, dedicated LMI community solar arrays. One planned community solar

is on track to have 20 MW installed by 2019. Colorado's Low-Income Community Solar Demonstration Program could be expanded even further to drive additional participation. Low-income participation can be encouraged either through a percentage mandate for the overall annual contracted capacity, like Colorado's five percent requirement, or by offering a higher rate of payment for the portion of shared solar capacity attributed to low-income customers. States that have a shared renewable program may want to coordinate this program with implementation of the federal Weatherization Assistance Program (WAP) to provide recipients of assistance with participation in a shared renewable system. Colorado's Energy Office is the managing agency for Colorado's WAP and has a proven record of successful implementation. The state's WAP is the first in the nation to be granted permission by the Department of Energy to use rooftop solar as an approved measure to reduce households' energy burdens.

There are several additional policy options that Colorado might consider to promote renewable energy uptake by LMI consumers. Generally, successful state policies should be tailored to these customers, be cost-effective and financially sustainable, have measurable performance indicators, and be flexible enough to allow later changes in design.

3. Corporate Procurement – Many Fortune 100 and 500 companies have established either climate goals or commitments to purchase renewable energy. Over the last five years, over 16 gigawatts (GW) of renewable contracts have been announced by corporate entities. This is leading policymakers to provide additional avenues for businesses to procure renewable energy. In Colorado, Xcel Energy launched Renewable Connect, a green tariff program that offers corporate buyers a fixed price contract for 100% solar power on a month-to-month basis, or for five or 10 years. The state has no significant corporate offsite procurement deals to date, but with Xcel's program, that might change soon. Colorado's policy allows companies to purchase renewable energy credits (RECs), provides for a statewide shared renewable energy policy, and allows for the lease and ownership of onsite renewable energy projects. The products available in Colorado meet all six of the Corporate Renewable Energy Buyers' Principles. One area for improvement for Colorado is to allow businesses to keep the RECs that they accrue from these projects. This is a key incentive for a business to participate. In addition, it is prudent to integrate corporate renewable purchase commitments into the IRPs that utilities submit to regulators to plan for resource needs over multiple decades. By integrating these renewable purchase commitments into utilities' plans, regulators can avoid over-building resources and stranding generation assets.

Utility-Oriented Policies

Some states have created programs that aim to reduce greenhouse gas (GHG) emissions and increase investments in clean energy resources. In 2004 Colorado passed the first voter-initiated Renewable Portfolio Standard (RPS) in the country, requiring utilities to obtain a certain percentage of their power from renewable energy sources.[4] In 2019, Governor Polis Signed the Climate Action Plan which sets goals to reduce 2025 greenhouse gas emissions by at least 26%, 2030 greenhouse gas emissions by at least 50%, and 2050 greenhouse gas emissions by at least 90% below statewide GHG emissions in 2005. Colorado's largest utility, Xcel Energy, also set exemplary targets. It plans to increase renewable energy sources to 55% of its energy portfolio by 2026. Xcel achieved its required 30% emissions reduction at the end of 2016 and now aims to further reduce its emissions to 80% below 2005 levels by 2030 and to achieve 100% carbon-free electricity by 2050.

The Sunset Public Utilities Commission Bill (Senate Bill 236) requires an IOU, when submitting a filing to the commission that includes a proposed retirement of an electric generating facility, to include in the filing a workforce transition plan that provides estimates of workforce transitions that will occur as a result of retiring the electric generating facility. The bill also includes provisions for the refinancing of aging coal plants to support the transition toward clean energy with a policy tool called securitization. Securitization restructures utilities' unpaid debt on non-competitive coal plants, allowing them to pay reduced interest rates with ratepayer-backed bonds to minimize the economic effects of closures for coal communities. A portion of bond proceeds goes toward funding jobs-focused

installation by Grand Valley Power will exclusively serve low-income customers, and eligible participants must be at 80 percent or less of the area's median income.

[4] Each qualifying retail utility is required to generate or cause to be generated electricity from eligible energy resources in the following proportions of its retail electricity sales for 2020 and each year thereafter: 30% for each IOU, 20% for each electric cooperative serving 100,000 meters or more, and 10% for each electric cooperative serving less than 100,000 meters and each municipal utility serving more than 40,000 meters.

transition assistance programs and renewable energy initiatives. This enables coal-owning utilities to retire coal plants ahead of schedule while also promoting a just energy transition.

Colorado might see a clean peak standard as the next step in a progression from its RPS. Clean Peak Standards aim to increase the share of clean energy resources used to meet peak demand and decrease energy bills over the long-term by reducing peak demand in the hours when energy costs are highest. These objectives can be met through different policy options including: planning and procurement requirements that focus on peak demand; a moratorium on the construction of new peaking units or a phase out of existing units; incentives – including carve-outs in states with RPSs – for clean energy resources delivered during peak times; and/or adopting a new clean peak standard that sets a target for clean energy deliveries during peak times.

ELECTRIFICATION OF THE TRANSPORTATION SECTOR

Bloomberg New Energy Finance estimates that 57% of all new passenger vehicle sales will be electric by 2040 and that price parity with conventional vehicles will be met for most segments in the mid-2020s. Designing infrastructure that will facilitate easy connection of EVs to the grid is a key part of building a modernized grid. The relationship between the increased adoption of EVs and the availability of EV charging stations is complicated. On the one hand, consumer range anxiety creates a barrier to increased adoption. On the other hand, while greater availability of charging stations would ease this anxiety, the relatively low numbers of vehicles on the road provides little incentive to install and make these stations available to the public. The good news is that both supportive policies for developing charging infrastructure and advancements in technology have eased range anxiety.

Colorado has a few financial incentives for citizens to purchase electric vehicles, such as a plug-in EV (PEV) tax credit. A partnership between the Colorado Energy Office (CEO) and the Regional Air Quality Council supports grant programs for EV charging stations. Refuel Colorado is an education and outreach program that helps fleet owners identify monetary savings and other advantages from converting to alternative fuels. Other incentives include an EV emissions inspection exemption, a low emission vehicle (LEV) sales tax exemption, and a high occupancy vehicle lane exemption (although the Colorado Department of Transportation reached its quota and all new applicants are on a waiting list). PEV owners are required to pay an annual fee of $50 to use public EV supply equipment (EVSE) in Colorado. Fees contribute to the Highway Users Tax Fund and the EV Grant Fund. Colorado adopted California's low-emission vehicle (LEV) standards and is in the process of adopting California's zero-emission vehicle (ZEV) standards.

As part of the national Volkswagen Diesel Emissions Settlement, Colorado will receive $68.7 million from the environmental mitigation trust. The state plans to invest the money as follows: $10.3 million in zero emission vehicle equipment like EV charging stations; $18 million in transit buses; $18 million in trucks, shuttles, and school buses; $11.7 million as flexible funds that will be allocated to the areas above with the most demand; $5 million to support the Diesel Emissions Reduction Act, a program that reduces diesel emissions in construction, agriculture, mining and industrial areas, and $5.7 million in administrative costs.

There are several policy opportunities to further encourage and prepare for increased market penetration of EVs in the state, including:

1. EV and EVSE Financing and Financial Incentives – Providing financial incentives and innovative financing options can help spur greater market penetration of EVs. Sales, property, and income tax credits are some of the simplest methods for addressing high up-front costs of EVs and EVSE. While sales tax credits are typically applied at the time of purchase, property and income tax credits may do less to address upfront cost barriers as the credit is not applied at the time of purchase.[5] States have adopted other financial incentives including low-interest loans, grants, vouchers and rebates. A handful of states qualify EVSE under their property assessed clean energy (PACE) programs. A simple solution is to increase and expand existing tax credits to incentivize commercial, publicly available charging stations. Colorado offers a Plug-In Electric Vehicle (PEV) and Electric Vehicle Supply Equipment (EVSE) Grants. House Bill 19-1159 makes light-duty PEVs purchased, leased, or converted between January 1, 2017, and January 1, 2026, eligible for a tax credit.

[5] A study by the Congressional Budget Office suggests that tax credits are important tools for ensuring increased adoption of alternative-fueled vehicles.

2. Charging Infrastructure Plan – Locating charging infrastructure is different from locating conventional fueling stations. For the most part, EVs are cars used for commuting and local trips. Furthermore, while a driver of a conventional vehicle stops only briefly at a gas station for the specific purpose of filling up, a driver of an EV is generally looking to refuel when they are parked for a longer period of time, for example when going shopping, going to a restaurant, or going to work. Charging infrastructure plans should attempt to pair the appropriate level of charging with a reasonable amount of time a person will be at that location. Legislation could direct a state agency to develop an infrastructure plan through a stakeholder process.

   Colorado joined Arizona, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming in signing the Regional Electric Vehicle West (REV West) memorandum of understanding to create an Intermountain West EV Corridor. The goal is to develop best practices and voluntary minimum standards for stations, expand access to new EVs, and create consistent charging experiences.

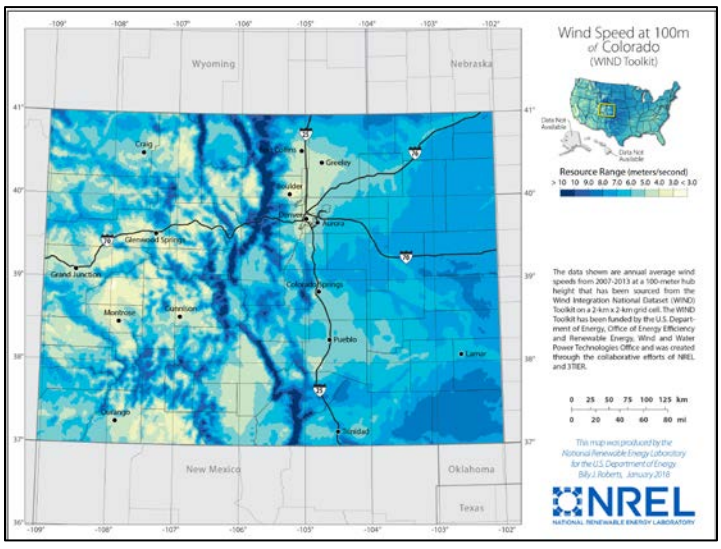
3. Parking Infrastructure Requirements – In tandem with the development of a statewide plan, legislation could set requirements for EV parking infrastructure. Some states have adopted permitting standards for parking lots, requiring, for instance, that for every 100 parking spaces, there must be at least one EV charging space. Legislation could also incentivize utilities to develop make-ready locations. These locations supply power to the point where a utility or third-party developer might install an EV charging station. Like Denver's building code, Colorado's statewide building code could also be updated to include requirements for EV charging infrastructure.

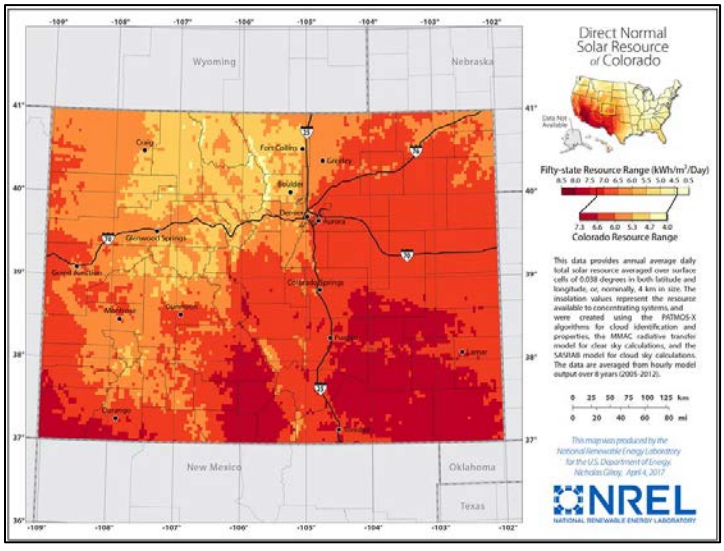
NEWS

- July 15, 2019: Colorado Puts Regulatory Microscope on Utility Distribution System Planning
- Aug 16, 2019: Colorado Adopts Zero-Emission Vehicle Standard in Push to Increase Adoption of Electric Cars
- Aug 12, 2019: Colorado's Most Powerful Climate Tool Isn't What You Think
- Aug 12, 2019: In Colorado, Electric Vehicle Ambitions Meet Extreme Peaks and Weather
- Aug 6, 2019: Pivot Energy Developing 25 MW of Community Solar in Colorado
- Aug 15, 2019: Colorado's National Renewable Energy Laboratory is Stepping into the Limelight
- July 26, 2019: High-Performance Flow Batteries Could Enable Grid-Level Green Energy Storage

COLORADO'S WIND AND SOLAR RESOURCES

WIND https://windexchange.energy.gov/states/co
SOLAR https://www.nrel.gov/gis/solar.html





OTHER RESOURCES

- Colorado Energy Office: https://www.colorado.gov/energyoffice
- The American Council for an Energy-Efficient Economy State and Local Policy Database, Colorado: https://database.aceee.org/state/colorado
- The Database of State Incentives for Renewables and Efficiency, Colorado: http://programs.dsireusa.org/system/program?fromSir=0&state=CO

- U.S. Energy Information Administration, Colorado: https://www.eia.gov/state/?sid=CO
- American Wind Energy Association (AWEA): https://www.awea.org/resources/fact-sheets/state-facts-sheets
- National Renewable Energy Laboratory Biomass Maps: https://www.nrel.gov/gis/biomass.html
- U.S. Department of Energy's Alternative Fuels Data Center, Colorado: https://www.afdc.energy.gov/states/co
- SPOT for Clean Energy, Colorado: https://spotforcleanenergy.org/state/colorado/
- The Rocky Mountain Institute: From Gas to Grid – Building Charging Infrastructure to Power Electric Vehicle Demand
- The GridWise Alliance: EVs - Driving Adoption, Capturing Benefits
- The Regulatory Assistance Project: Performance-Based Regulation

Our Resources

CNEE Homepage: http://cnee.colostate.edu/

The SPOT for Clean Energy: https://spotforcleanenergy.org/

The Advanced Energy Legislation (AEL) Tracker: https://www.aeltracker.org/

Clean Energy Policy Guide for State Legislatures: http://cnee.colostate.edu/cleanenergypolicyguide/

The Energy Policy Podcast: http://energypodcast.colostate.edu/

CNEE Contact Information

Tom Plant, Senior Policy Advisor
Tom.Plant@colostate.edu

