SB 21-072

Legislative Council Staff

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Revised Greenhouse Gas Emissions Report

(*replaces greenhouse gas report dated March 15, 2021*)

Drafting Number:	LLS 21-0499	**Date:**	April 26, 2021
Prime Sponsors:	Sen. Hansen; Coram Rep. Valdez A.; Catlin	**Analyst:**	Christina Van Winkle | 303-866-6289 Christina.VanWinkle@state.co.us
BILL TOPIC:	**PUC MODERNIZE ELECTRIC TRANSMISSION INFRASTRUCTURE**		
Sectors Impacted:	☒ Electric Power ☐ Transportation ☐ Industrial Processes ☐ Waste Management ☐ Agriculture	☐ Natural Gas and Oil Systems ☐ Residential / Commercial / Industrial Fuel Use ☐ Coal Mining and Abandoned Mines ☐ Land Use / Land Use Change / Forestry ☐ Other	
Net Change:	☐ Increase	☒ Decrease	☒ Indeterminate ☐ Minimal
Report Status:	This report reflects the reengrossed bill.		

Emissions Impact Summary[1]

This bill is expected to reduce greenhouse gas (GHG) emissions by expanding transmission capacity and increasing market access for clean energy resources.[2] The new Colorado Electric Transmission Authority, created by this bill, is expected to provide additional financing, tools, and planning for building transmission capacity and infrastructure, which is needed to bring clean energy resources online. Also, requiring transmission utilities to join organized wholesale markets will expand market access and allow for the more efficient integration of clean energy resources into the power system.

As a result, the bill will facilitate and potentially accelerate the state's ongoing transition to clean energy by alleviating constraints in transmission and market access. This will lead to greater GHG emissions reductions than are currently projected for the electric power sector under current law. Since emissions reductions are largely dependent on future actions by the Public Utilities Commission (PUC) and the authority, the exact GHG emissions reductions cannot be quantified.

[1] Pursuant to Section 2-2-322.2, C.R.S., this greenhouse gas emissions report uses available data to assess whether a legislative measure is likely to directly cause a net increase or decrease in greenhouse gas pollution within the ten-year period following its enactment, The report will identify new sources of greenhouse gas emissions, any increase or decrease in emissions from existing sources, and any impact on sequestration of emissions. The report is authorized but not required to quantify the magnitude of the impact on the emissions, to the extent that unbiased estimates are feasible given the available data.

[2] Clean energy resources, as defined in 40-2-125.5(2)(a), C.R.S., include electricity-generating technologies that generate or store electricity without emitting carbon dioxide into the atmosphere, and include eligible energy resources as defined in Colorado's Renewable Energy Standards. Clean energy and clean electricity are terms used throughout this report to refer to these eligible energy resources.

Key Provisions Impacting Emissions

Key provisions in this bill that impact GHG emissions include:

- requiring transmission utilities to join an organized wholesale market (OWM) by 2030, unless waived by the Colorado Public Utilities Commission (PUC);
- directing the PUC to expedite the review of applications to build new transmission facilities; and
- creating the Colorado Electric Transmission Authority (authority).

The new authority is authorized to declare eminent domain, negotiate transmission corridors, and issue revenue bonds to finance, plan, acquire, maintain, and operate eligible electric transmission and interconnected energy storage facilities.

Background

Colorado has recently passed legislation establishing greenhouse gas emission reduction targets and clean energy goals.[3] The electric power sector has an important role to play in meeting these goals by transitioning away from fossil fuel-fired electric generation to clean energy resources, which will require investments in transmission and energy storage infrastructure. Information on these commitments as well as Colorado's current electric power system and emissions is provided below.

Colorado Climate Action Plan. Colorado's Climate Action Plan to Reduce Pollution, passed by the General Assembly in 2019 through House Bill 19-1261, established the following statutorily-mandated GHG emission reduction goals, as measured relative to 2005 levels:

- 26 percent by 2025;
- 50 percent by 2030; and
- 90 percent by 2050.

These economy-wide emission reduction goals must be largely met by reductions in emissions from the electric power, transportation, oil and gas, and building sectors, which account for over 80 percent of statewide GHG emissions. In parallel with the transition to clean electricity, Colorado is pursuing efforts to electrify the transportation and building energy sectors to benefit from the increased availability of clean electricity. Electrification of these sectors, along with population growth, is projected to double current annual electricity consumption, from 60 to 120 terawatt hours, by 2050.[4] New generation resources will need to be developed to meet this demand.

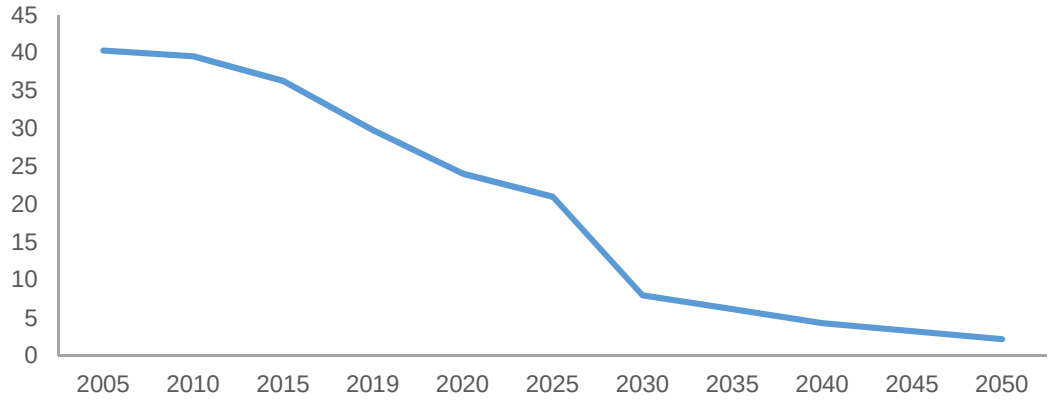
[3] House Bill 19-1261 established greenhouse gas emissions reduction targets and Senate Bill 19-236 established clean energy goals.

[4] In order to achieve the emissions reduction targets established in the Climate Action Plan, state agencies developed a Greenhouse Gas Pollution Reduction Roadmap, which identifies key actions needed to achieve the 2030 and 2050 targets. More information can be found at: https://energyoffice.colorado.gov/climate-energy/ghg-pollution-reduction-roadmap.

Clean Energy and Resource Plans. Under Senate Bill 19-236, qualifying retail utilities are required to submit clean energy plans to reduce carbon dioxide emissions associated with electricity sales by 80 percent from 2005 levels by 2030, and to seek to achieve 100 percent clean energy generation by 2050. Although by law, only Xcel Energy is required to submit a Clean Energy Plan, other electric utilities may voluntarily submit plans. Five other electric utilities, including Black Hills Electric, Colorado Springs Utilities, Platte River Power Authority, Holy Cross Energy, and Tri-State Generation and Transmission, accounting for 99 percent of the state's fossil-fired generation, have committed to resource plans that meet or exceed an 80 percent GHG reduction by 2030, largely through commitments to retire coal-fired power plants.

These closures are estimated to result in GHG emission reductions of 32.3 million metric tons of greenhouse gases in 2030, compared to 2005 emissions (see Figure 1). These emissions reductions account for 50 percent of the total emissions reductions needed to achieve the statewide 2030 GHG emissions reduction target. Emissions from the electric power sector are projected to decline a further 6 million metric tons between 2030 and 2050, reaching 2.2 million metric tons of GHG emissions annually by 2050. These projections are based on an illustrative scenario of Colorado's two largest utilities, Xcel Energy and Tri-State Generation and Transmission, meeting energy needs with zero-carbon electricity by 2050, with smaller utilities reducing emissions 80 percent below 2005 levels.[5]

Figure 1
Electric Power Sector GHG Emissions and Projections
Million Metric Tons of Carbon Dioxide Equivalent



Source: Colorado Department of Public Health and Environment; based on 2021 GHG Inventory.

Balancing areas and coordination. The U.S. transmission system is largely divided into three grids, or interconnections. Colorado is part of the western interconnection, which consists of 38 balancing authorities. Balancing authorities are responsible for balancing electricity supply and demand within their geographic boundary, or balancing area (see Figure 5 in the Appendix A for a map of balancing areas in the western interconnect). Balancing authorities achieve a 'balanced' grid by dispatching power in their area to meet demand while minimizing operating costs and maintaining reliability.

[5] Based on modeling results as reported in the Colorado GHG Pollution Reduction Roadmap.

Colorado's transmission grid is currently operated by two balancing authorities; Public Service Company of Colorado (PSCo, d.b.a. Xcel Energy), and Western Area Power Administration Colorado-Missouri Region (WACM). Balancing authorities may coordinate among each other to share resources across their service areas. A number of Colorado's electric utilities have recently announced plans to join energy imbalance markets. By participating in energy imbalance markets, electric utilities will have greater access to generating resources to meet the real-time fluctuations in demand, enhancing grid reliability and cost savings. Given the variable nature of wind and solar resources, this expanded market access could serve to moderate variability in renewable resource availability and electricity demand.[6]

Organized wholesale markets. Organized wholesale markets, which include regional transmission organizations and independent system operators, operate the transmission grid at a regional scale and ensure nondiscriminatory access to the power system. OWMs therefore act as a balancing authority in their regional territories, coordinating and managing the dispatch and transmission of electricity within their service areas. OWM's coordinate dispatch of generators through a competitive bidding process. About 60 percent of the U.S. electric power supply is managed by ten OWMs in the United States.[7] Colorado's transmission utilities, along with much of the western United States, does not currently participate in an OWM.

Emissions Assessment

This bill potentially reduces GHG emissions in two ways. First, the authority established in the bill will increase investments in transmission and energy storage infrastructure, which are needed to meet Colorado's clean energy goals. Second, requiring transmission utilities to join an OWM will increase coordination across an expanded geographic footprint, promoting more efficient integration of clean energy into the power system. The bill may also result in increased emissions from construction and related activities to transmission and clean energy development that partially offset the overall emissions savings. These impacts, as well as potential limitations of this analysis, are discussed below.

Increased transmission capacity. The need to expand transmission capacity to meet clean energy commitments is well-documented.[8] There is significant wind and solar potential in Colorado, including the eastern plains and San Luis Valley, where transmission infrastructure is currently unavailable (see transmission and resource maps in Appendix A). The timeline to develop clean energy resources has outpaced traditional fossil-fired resources, creating a need to accelerate upfront investments in transmission and storage ahead of development.[9] The authority established in this bill will result in additional investments in transmission infrastructure that will incentivize development of location-constrained clean energy resources. This will enable utilities to achieve their clean energy goals, facilitating and perhaps accelerating greenhouse gas emission reductions in the electric power sector.

[6] National Renewable Energy Laboratory. 2012. Energy Imbalance Market Fact Sheet. Available at: https://www.nrel.gov/docs/fy12osti/56236.pdf.
[7] To learn more about organized wholesale markets, see: https://www.eia.gov/todayinenergy/detail.php?id=790.
[8] See, for example: Transmission Planning for 100% Clean Electricity. 2021. Energy Systems Integration Group. Available at: https://www.esig.energy/transmission-planning-for-100-clean-electricity/.
[9] As demonstration of this need, Xcel Energy recently filed a plan with the PUC to invest $2 billion in a transmission corridor to "unlock location-constrained resources", and provide certainty to project developers during the competitive bidding process. .PUC Proceeding Number 21A-0096E, filed on March 2, 2021.

Increased market access. Wind and solar-generated power are variable resources, meaning that the amount of electricity generated depends on weather characteristics such as wind speed and cloud cover, which change continuously throughout the day. This variability, combined with continuous fluctuations in demand, can make it difficult for grid operators to efficiently integrate variable resources into the power system while maintaining grid reliability. Studies have shown that integrating high shares of variable resources will require changes to operating and coordination practices, particularly since increased use of variable resources can lead to greater overgeneration and curtailment.[10] Overgeneration may occur when grid operators under predict variable resources, leading to generators running at partial output. Curtailment may occur when variable resources exceed demand in a service area, forcing grid operators to restrict generation.

As Colorado's electric utilities continue to transition to wind and solar to meet their clean energy goals, enhancing coordination and market access over a wider geographic scale may enable the more efficient use of these variable resources. Consolidating operation under an OWM will expand the geographic footprint of available resources to meet demand, which may enable greater integration of clean electricity generation.[11] To the extent that this bill results in transmission utilities successfully joining an OWM, this expanded coordination and market access may support greenhouse gas emissions reductions associated with increased clean electricity generation.

Material, construction, and transportation. A portion of these potential emissions reductions will be offset by the emissions associated with constructing, transporting, and maintaining transmission and energy storage facilities as well as clean energy resources. In addition, sulfur hexafluoride (SF_6), a potent greenhouse gas, is used as an electrical insulator in high voltage equipment and may leak into the atmosphere as equipment ages and during maintenance and servicing. In part through the Environmental Protection Agency's SF_6 Emission Reduction Partnership for Electric Power Systems, operational improvements and equipment upgrades have reduced SF_6 emissions over time.[12]

Limitations. This analysis makes assumptions about the role that the authority and OWM participation will play in reducing greenhouse gas emissions through increased transmission infrastructure and market access. However, it is not known with certainty how these impacts will compare to the future investments in transmission infrastructure and increased coordination among existing balancing authorities that would occur under current law as Colorado works toward achieving its clean energy goals and greenhouse gas emission reduction targets. These limitations notwithstanding, the provisions of the bill are generally assumed to provide additional resources and coordination compared to what would occur under current law; thus, this report concludes that the bill is likely to accelerate progress toward meeting the state's clean energy and emissions reductions goals and result in a net decrease in GHG emissions.

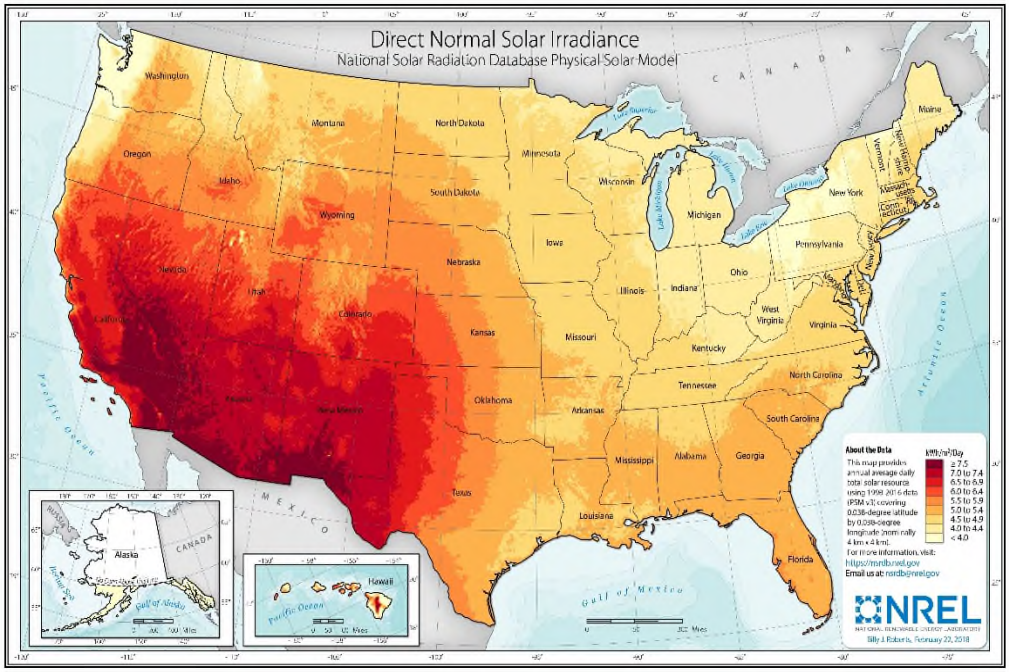
[10] National Renewable Energy Lab. 2017. Reducing Wind Curtailment through Transmission Expansion in a Wind Vision Future. Available at: https://www.nrel.gov/docs/fy17osti/67240.pdf.
[11] National Renewable Energy Laboratory. 2015. Greening the Grid: Balancing Area Coordination: Efficiently Integrating Renewable Energy into the Grid. Available at: https://www.nrel.gov/docs/fy15osti/63037.pdf.
[12] More information about the Partnership can be found at: https://www.epa.gov/f-gas-partnership-programs/electric-power-systems-partnership.

Data Sources and Agencies Contacted

Colorado Energy Office
Colorado Department of Public Health and Environment
Western Energy Coordinating Council
National Renewable Energy Laboratory

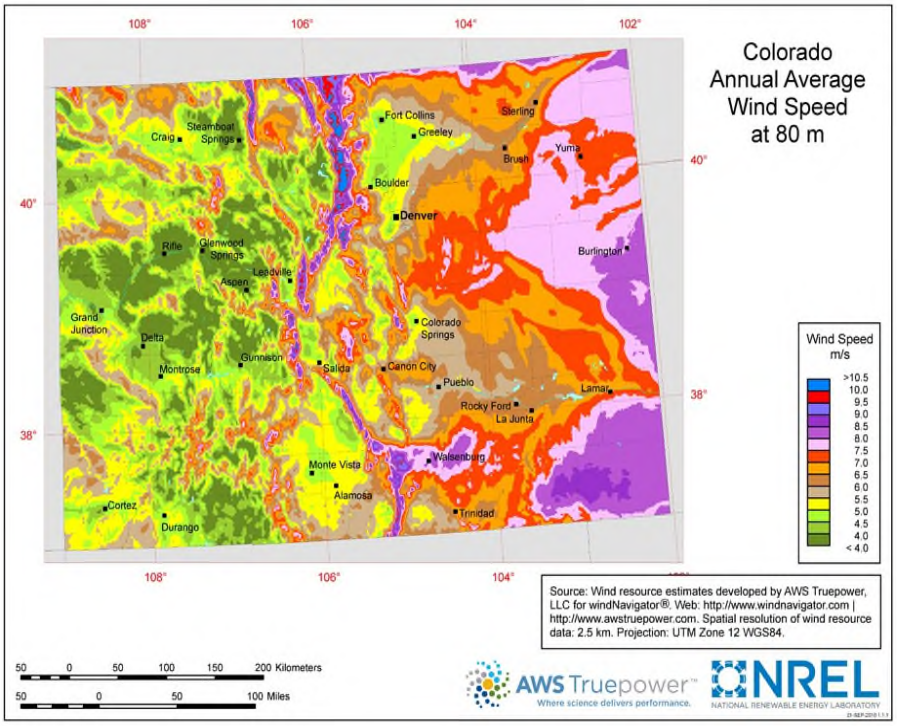
Appendix A

Figure 2
Solar Potential in the United States



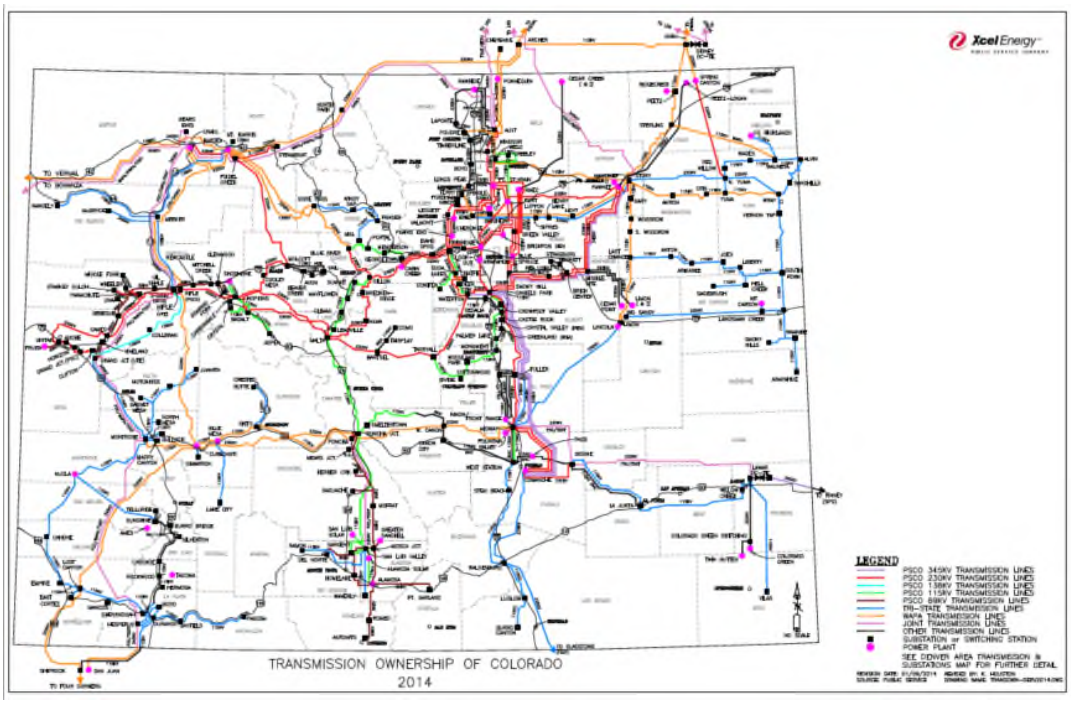
Source: National Renewable Energy Laboratory

Figure 3
Wind Resource Potential in Colorado



Source: National Renewable Energy Laboratory

Figure 4
Colorado Transmission Ownership Map



Source: Xcel Energy

Figure 5
Balancing Authorities in the Western Interconnect

Source: Western Electricity Coordinating Council, as illustrated in NRDC Issue Brief.