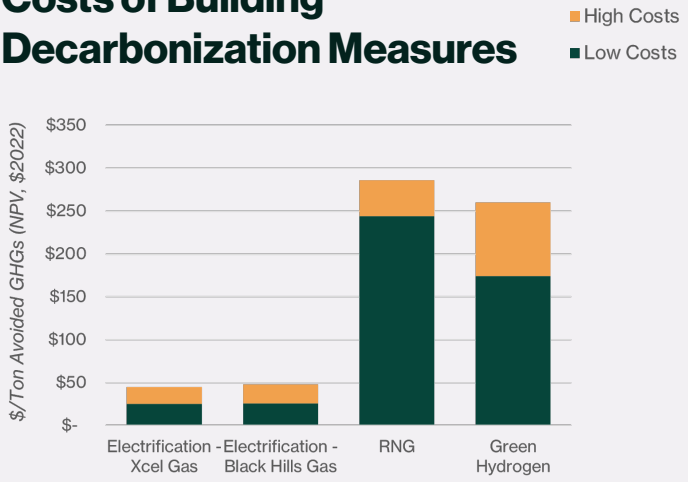
Costs of Building Decarbonization Pathways: Colorado

KEY FINDINGS

- Beneficial electrification is the cheapest decarbonization measure that utilities can deploy.
- If beneficial electrification also reduces methane leakage from the production and distribution of natural gas, the cost/ton of GHG reductions from BE is cut in half to approximately $25 per ton.
- Over the 2023–2040 modeling period, the cost per ton of emission reductions from green hydrogen and biomethane are more expensive, despite available federal tax credits for green hydrogen before 2033.

Costs of Building Decarbonization Measures



BACKGROUND

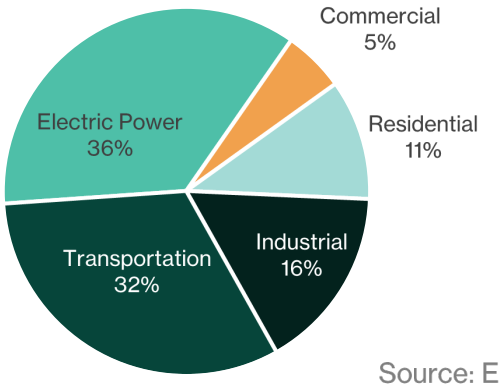
Colorado has adopted ambitious, science-based economy-wide goals to reduce climate pollution. Today, approximately 16% of Colorado's emissions stem from energy used in residential homes and commercial buildings; most of this comes from burning fossil methane gas for space and water heating. Starting in 2023, gas utilities must develop clean heat plans to achieve a 4% reduction by 2025 and a 22% reduction by 2030, below 2015 levels. To meet these goals, gas utilities can deploy energy efficiency, incentivize customers to replace gas appliances with efficient electric appliances (beneficial electrification), and replace fossil gas with green hydrogen or renewable natural gas, among other measures.

Achieving these decarbonization goals at the lowest cost can maximize consumer benefits. The Building Decarbonization Analysis tool, developed by Synapse Energy Economics, can help decision-makers identify and promote the most cost-effective suite of resources for gas utilities to tap.

SCENARIO ANALYSIS

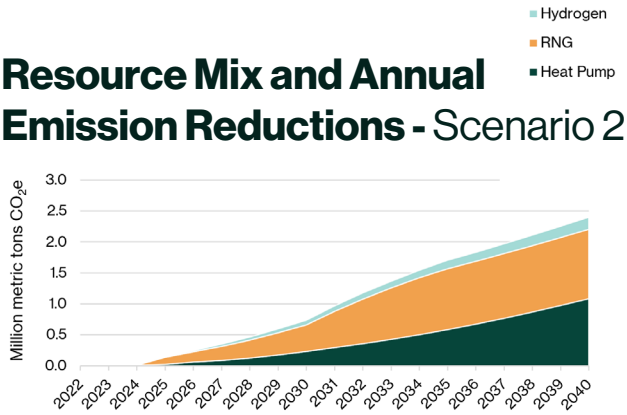
The Building Decarbonization Analysis tool can be used to evaluate portfolios of resources. In the example on the next page, we compared two scenarios. Scenario 1 prioritizes whole-home, cold-climate heat pumps and heat pump water heaters, assumes a 100% sales share for heat pumps in 2040, and models high costs/low availability for green hydrogen and RNG. Scenario 2 assumes low costs/high availability of RNG and hydrogen, and moderate adoption of beneficial electrification. Specifically, under Scenario 2, heat pumps for space- and water-heating have a 50% sales share in 2040, and of the heat pumps deployed, half are hybrid systems that retain a gas furnace for back-up. In each year, the average annual cost of emission reductions is higher for Scenario 2.

Colorado's Energy-Related Emissions, 2020

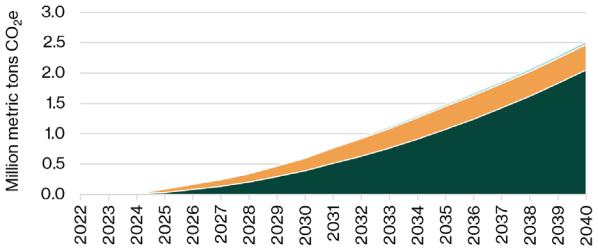


Source: EIA

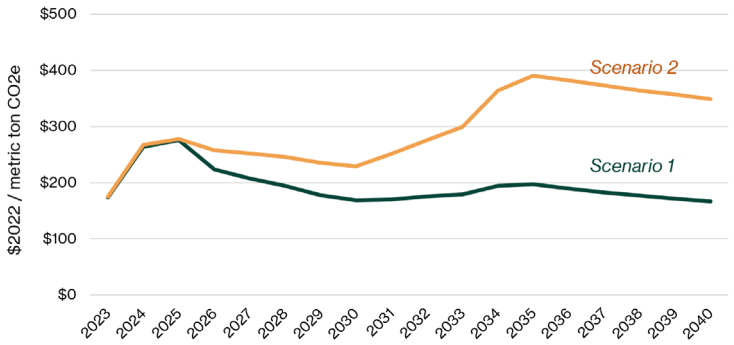
Resource Mix and Annual Emission Reductions - Scenario 2



Resource Mix and Annual Emission Reductions - Scenario 1



Average Annual Cost of Emission Reductions (Xcel Energy)



Beneficial Electrification Heat pumps and heat pump water heaters are efficient electric appliances that can displace conventional gas furnaces and water heaters. Newer, cold-climate heat pumps can meet home heating demands along Colorado's Front Range. Conventional heat pumps operate well down to approximately 10 - 20° F and can displace roughly 80 - 90% of a household's gas use for space heating. Heat pumps also provide cooling, which can improve home comfort and health, particularly in households that lack access to cooling today.

Green Hydrogen is produced using electrolysis; to be "green", the electrolyzer must be powered with renewable electricity. For existing gas distribution systems, hydrogen may be integrated up to at most 20 percent by volume; because hydrogen has a lower energy content than natural gas, that volume could reduce emissions by a maximum of 7 percent. Hydrogen is likely to be in high demand by other sectors, such as industry.

Biomethane, or so-called renewable natural gas (RNG), is produced through the anaerobic digestion or thermal gasification of organic waste, such as animal manure, municipal wastewater, and trash; energy crops; and non-biogenic waste such as construction debris. The potential for RNG use in buildings is limited by the availability of feedstocks and demand from other sectors such as the transportation, electric generation, and industrial sectors. The modeled costs for RNG increase over time, as more expensive sources of RNG are developed.

The Building Decarbonization Analysis tool, a full report, and the detailed methodology can be found at:
WesternResourceAdvocates.org/publications/building-decarbonization-strategies-and-tools

Building Decarbonization Strategies for the Southwest

Analysis of the costs and emissions reduction potential of space and water heating decarbonization

FOR MORE INFORMATION

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