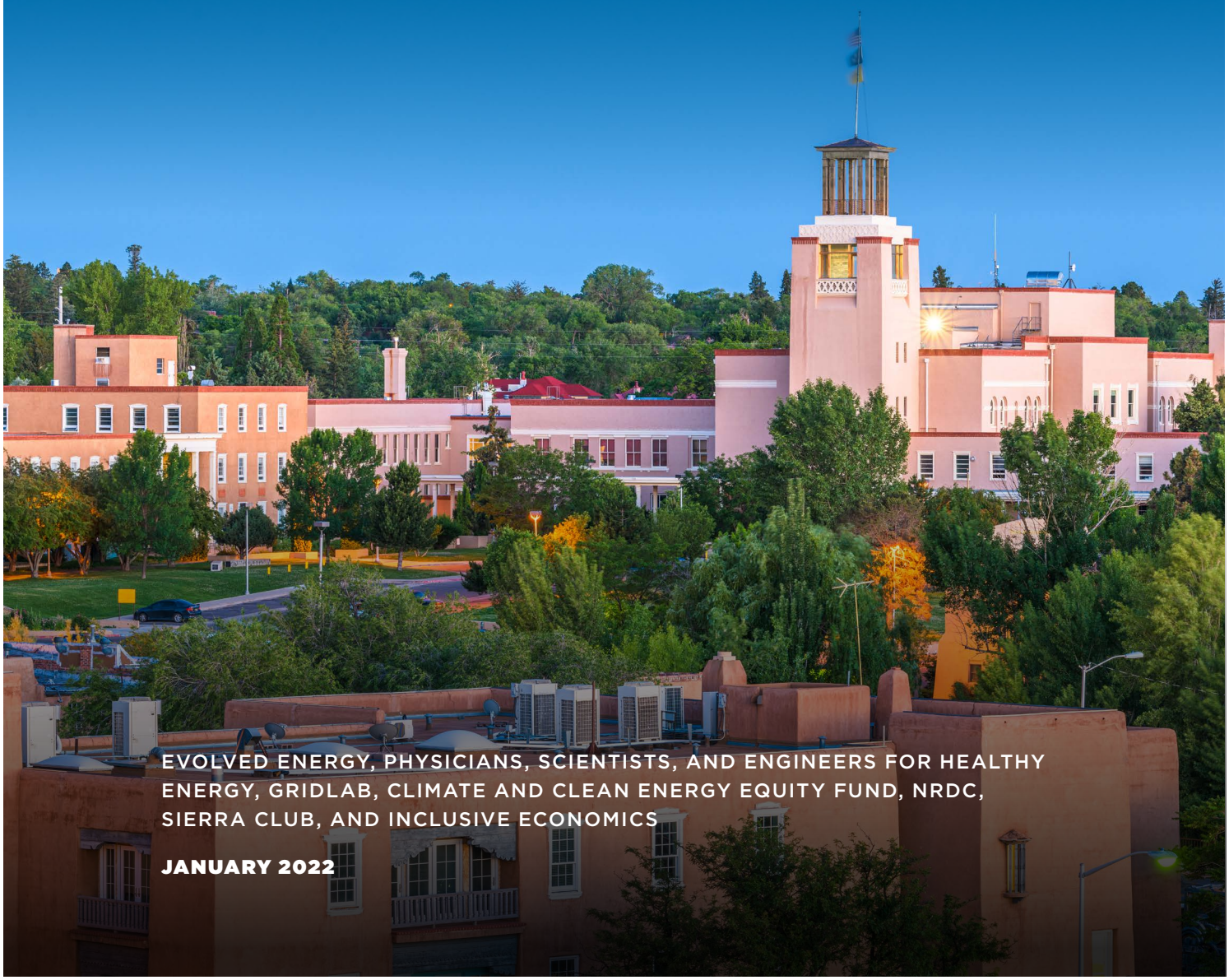
CLIMATE ACTION IN NEW MEXICO

PATHWAYS TO DECARBONIZING BUILDINGS



EVOLVED ENERGY, PHYSICIANS, SCIENTISTS, AND ENGINEERS FOR HEALTHY ENERGY, GRIDLAB, CLIMATE AND CLEAN ENERGY EQUITY FUND, NRDC, SIERRA CLUB, AND INCLUSIVE ECONOMICS

JANUARY 2022

Authors

Jacqueline Ennis
Noah Long
Arjun Krishnaswami

Project Team

Jill Horing
Ben Haley
Betony Jones
Elena Krieger
Gabe Kwok
Taylor McNair
Amelia Myers
Ric O'Connell
Parin Shah
Hannah Yi

INTRODUCTION

Buildings and the energy they use are a significant source of emissions in New Mexico. To stave off the worst effects of the climate crisis, the state must eliminate these emissions and can do so while improving quality of life for New Mexicans. Decarbonizing the state's buildings sector can be achieved through three major strategies. First, energy uses across residential, public, and commercial buildings — including water heating, space heating, cooling and cooking — must be fully electrified over the next three decades. Second, energy waste from buildings should be minimized through investing in highly efficient, energy-saving building improvements. Third, transitioning to smart appliances that can shift loads will reduce peak electricity demands and aid the integration of renewables onto the grid powering our buildings. Climate-aligned development strategies will also be instrumental to decarbonizing other sectors. For example, New Mexico's transportation emissions can be reduced by planning high-density housing near public transit hubs and embedding buildings with electric vehicle charging-ready infrastructure[1]. Building decarbonization policies should target both new and existing buildings. These policies should also be designed to mitigate high energy burdens, expand access to retrofits and appliance upgrades, and improve housing affordability for New Mexico's low- and moderate-income residents.

METHODOLOGY

This brief is based on modeling of New Mexico's energy system conducted by Evolved Energy Research using the **EnergyPATHWAYS** tool and the **Regional Investment and Operations (RIO)** platform[2]. These models use input assumptions about policy decisions, fuel price forecasts, technology costs, and technology performance to output a least-cost representation of the energy system under a set of carbon-emissions constraints. This analysis compares four scenarios: a **Reference** case, which is not required to meet carbon emission reductions beyond business as usual, and three **Decarbonization** pathways which achieve the state's goals of net-zero greenhouse gas (GHG) emissions by 2050 and 50 percent emissions reductions by 2030 relative to 2005[3,4].

1 Read more about decarbonizing New Mexico's vehicles in the Transportation sector brief.

2 Haley, B., Jones, R., Kwok, G., Hargreaves, J., Farbes, J., & Williams, J. H. (2019). (rep.). *350 PPM Pathways for the United States.* Evolved Energy Research. Retrieved 2021, from https://docs.wixstatic.com/ugd/294abc_95dfdf602afe4e11a184ee65ba565e60.pdf.

3 A similar analysis was done for decarbonization pathways in Colorado: Krishnaswami, A., Gonzalez, A., Gerhart, M., (September, 2020). *Committing To Climate Action Equitable Pathways For Meeting Colorado's Climate Goals.* Retrieved October 2021, from https://gridlab.org/wp-content/uploads/2020/10/GridLab_Colo-Clean-Energy-Economy.pdf.

4 The Governor had previously signed an Executive Order in 2019 that set a target of 45 percent emissions reductions by 2030 relative to 2005, though this was modeled at 50 percent. The state's net-zero goal was announced by Governor Lujan Grisham in 2021 and is expected to be codified in the January 2022 legislative session.

POLICY RECOMMENDATIONS

1. **Invest in a Climate Earthshot to support building improvements, including through rebates, direct payments, and an expanded sustainable building tax credit.**

   The state can invest its record budget surplus in helping New Mexicans upgrade to cleaner, safer, and healthier buildings. Given the high upfront costs of building improvements, financial support programs should prioritize low-income households and affordable housing improvement opportunities, including through the proposed Community Energy Efficiency Development (CEED) Block Grants. For low income residents, who are least able to afford the initial capital costs of retrofits, financial support should be made accessible in the form of direct payment assistance or no-interest financing. Rebates and an expanded sustainable tax credit can incentivize landlords to pursue building improvements on behalf of residents. The state should also expand the existing sustainable buildings tax credit, and allocate capital outlay funding to state and municipal building efficiency and electrification improvements.

2. **Regularly update building and stretch codes to match the International Energy Conservation Code (IECC) model codes on a three year schedule, driving towards a zero-carbon building stock.**

   The cheapest and most effective way to achieve GHG emissions reductions from buildings is to build clean, efficient buildings from the start. Doing so avoids the costs of extending gas infrastructure and avoids the need for significant building improvements later on. Based on the modeling, an updated building code should be designed such that all new homes are all-electric no later than 2030. Reaching net-zero GHG emissions by 2050 will also require these buildings to be highly efficient and wired for electric vehicle (EV) charging (e.g., "EV ready").

3. **Develop commercial building performance and benchmarking standards.**

   Requiring large commercial buildings to disclose their annual energy use through benchmarking standards can help the state understand the sector's largest sources of emissions and identify the most efficient opportunities, or "lowest hanging fruit", for improvements. A rigorous emissions reporting and monitoring system improves the state's accounting of buildings' energy footprints and, in doing so, helps the state track its progress towards decarbonization targets. Setting targets for buildings' emissions through performance standards then ensures that the necessary emissions reductions are achieved in a timely manner. Tools such as energy audits can help building owners identify and resolve inefficiencies, meet performance targets, and attract commercial tenants through more affordable spaces. A performance standard for existing buildings should be grounded in the state's emissions budget (the modeling indicates that annual commercial building-related emissions in New Mexico should not exceed 1.4 MMT CO_2 by 2030).

4. **Advance utility investments in building electrification, weatherization, and flexible load programs**.

   In all decarbonization scenarios, nearly all building energy uses must transition from fossil fuels to clean electricity by mid-century. Utilities play an essential part in designing and implementing electrification programs that incentivize households and businesses to switch to high-efficiency, electric heating solutions or pursue cost-saving retrofits. Weatherization assistance programs can similarly provide support for energy efficiency audits and retrofits. Utility rate designs can incentivize load flexibility, e.g., through rewarding night-time vehicle charging. The state should require utilities (including investor-owned utilities, co-ops and municipal utilities) to align these customer-facing programs with state climate and equity goals. Programs should complete weatherization and efficiency audits before electrification, since these measures can reduce the overall energy footprint needing to be electrified. Building electrification programs should prioritize homes currently heated with propane—which are candidates for the most cost-effective replacements, especially for rural residents with high energy cost burdens—and homes that are under-heated—where families cannot afford sufficient heating through the winter. These are households that are often least able to afford the upfront costs of electrification, and are left at most risk of bearing the rising costs of a gas system in transition. These programs must include affordable financing mechanisms for low- and moderate-income residents, including on-bill financing, percentage-of-income payment plans, and low-income rates[5].

5. **Co-invest in affordable and transit-friendly zero-carbon housing.**

   Residential building decarbonization policies must be coupled with efforts to improve housing equity and mobility access. These efforts include provisions to preserve and expand affordable housing, especially near public transit hubs and public charging infrastructure. Resulting housing development and transit plans should be rooted in good-faith community outreach to ensure that they serve community needs. The transition to clean electricity should work to alleviate, not exacerbate, household energy burdens or resident displacement. At minimum, building decarbonization policies must be designed such that their benefits accrue for renters, mobile home residents, and residents of multifamily units.

6. **Launch a planning process at the New Mexico Public Regulation Commission (PRC) that implements an equitable and responsible reduction of the gas distribution system over time.**

   In most cases, electric and highly efficient appliances powered by clean electricity can yield lower lifetime costs and lower emissions than gas-powered appliances. Gas utility regulation must change and adapt as

5 For example, the California Public Utilities Commissions offers 30-35% discounts on electricity bills through CARE rates for households that make below a certain income threshold.

healthier and more cost-effective alternatives are becoming available to consumers. The PRC should launch a gas planning process that considers these changes, including eliminating line extensions, scrutinizing further investments in the gas system relative to alternative solutions, and implementing a strategy for the long-term pruning of the gas system as more customers transition. This process must put equity at its forefront: as customers exit the system or throughput declines, costs will increase for remaining customers. This can be ameliorated by targeted electrification incentives, accelerated depreciation, and utility cost control. This planning process should also consider workforce development programs that lay the groundwork for a just transition for the gas delivery system workforce.

ANALYSIS

Updated policies are necessary to achieve net-zero emissions buildings in New Mexico. Under the Reference case, emissions from commercial buildings are set to rise 10 percent over the next three decades. Emissions from residential buildings initially decline, but absent new policy updates, they begin to increase after 2040. All decarbonization scenarios indicate that emissions from commercial and residential buildings must decline by 20 and 30 percent, respectively, by 2030 to stay on track with New Mexico's climate goals.

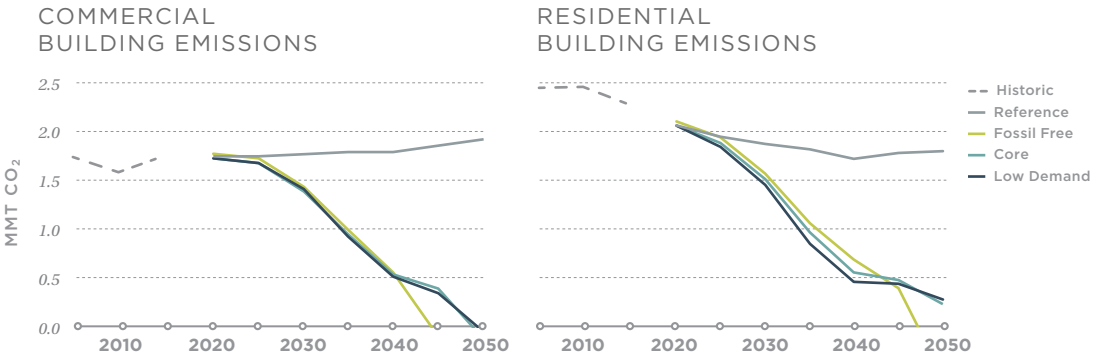


FIGURE 1. *Historic and projected carbon emissions from New Mexico's building stock.*

Eliminate fossil fuel use in buildings through electrification. The first major strategy for decarbonizing New Mexico's buildings sector is electrification of fuel-powered energy uses. Fossil gas, wood[6], and refined fuels supply over half of the energy consumption of the state's building stock. The majority of these energy needs are for cooking, space heating, and water heating. Without

6 Where fireplaces and wood stoves are retained as cultural traditions, switching to higher efficiency, low-emission wood pellet stoves, or augmenting them with efficient electric heat pumps, can provide indoor air quality benefits as well as low cost heating.

further policy interventions, this dependence remains unchanged into 2050 under the Reference scenario (Figure 2). Under all decarbonization scenarios, however, nearly all of these applications must be powered by clean electricity to meet New Mexico's climate goals. Given the efficiency of electrification relative to fuel combustion — and compounded by building efficiency measures — the building stock of the Core scenario uses 31 percent less energy overall than that of the Reference scenario (Figure 2, 2050). Electrification proves the most cost-effective pathway relative to fueling appliances with hydrogen or renewable natural gas, which themselves carry significant climate, economic and health risks[7,8]. The Low Demand scenario, which maximizes energy efficiency retrofits and other demand management measures to achieve the lowest cost pathway for New Mexicans, is another 8 percent less energy-intensive relative to the Core scenario by 2050. Reducing overall building energy consumption means lower pollution rates, lower household energy bills, and smaller clean energy infrastructure requirements for meeting additional load associated with electrification.

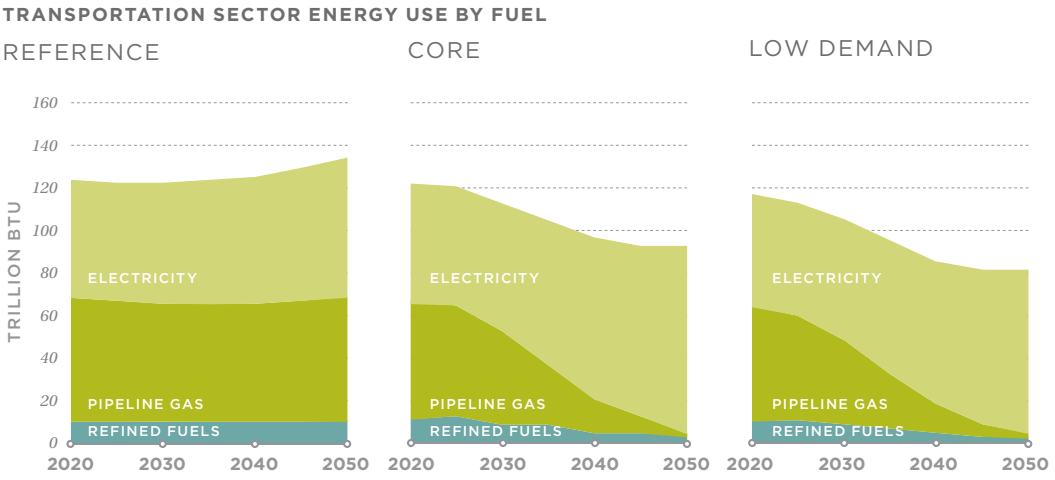


FIGURE 2. *Fuel use mix in buildings. Refined fuels include propane and fuel oil.*

Electrifying a building requires replacing its fuel-powered appliances with efficient electric models. The Core scenario depends on the widespread adoption of electric induction stoves and electric air source heat pumps for space and water heating. For example, sales of electric heat pumps grow to nearly 70 percent by 2030 compared to the Reference case, where they maintain a modest one-fifth of market share over the next three decades (Figure 3). These adoption curves assume the purchase of a new appliance replaces an older one at the end of its useful life; however, if adoption does not ramp up quickly enough or emissions targets are not met in other sectors, swapping for electric alternatives would need to happen during the lifetime of newer appliances.

7 Fakhry, R., & Borgeson, M. (2021, September 8). Hydrogen in buildings: The poster child of tech-crastination. NRDC Expert Blog. Retrieved December 15, 2021, from https://www.nrdc.org/experts/rachel-fakhry/hydrogen-buildings-poster-child-tech-crastination.

8 Borgeson, M. (2020, June 15). A Pipe Dream or Climate Solution?. NRDC Expert Blog. Retrieved December 15, 2021, from https://www.nrdc.org/resources/pipe-dream-or-climate-solution.

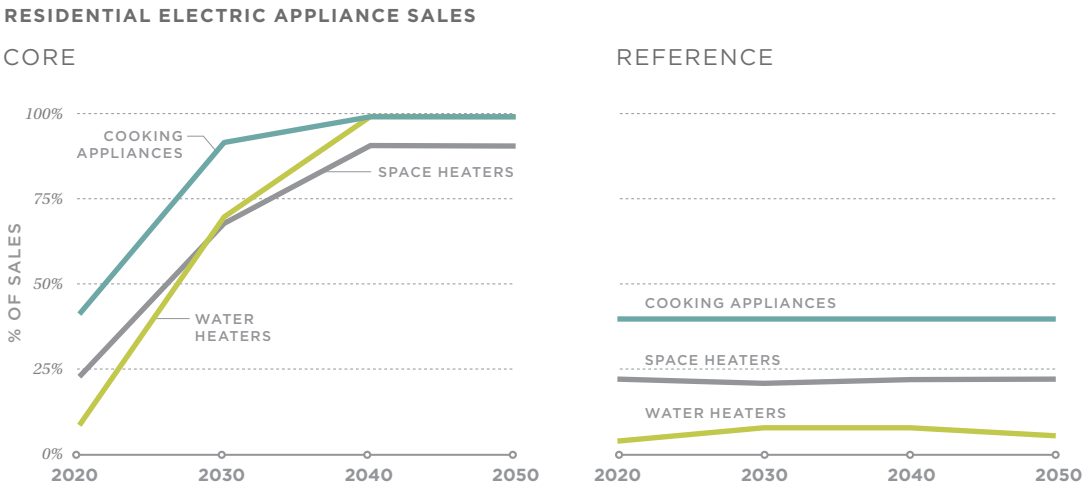


FIGURE 3. *Electric model sales as a percent of all residential appliance sales under the Reference and Core cases. Electric cooking appliances include electric models of stovetops and ovens.*

Load flexibility is an important tool for managing additional electricity load due to building electrification. The Core scenario assumes that 50 percent of residential appliances can shift load backwards or forwards by one or two hours[9] to take advantage of excess renewable generation or avoid peak demand periods. For example, air conditioners during a New Mexico summer day could be started an hour earlier in the day to use up excess solar generation. Load shifting can be achieved through utility rate designs—which can incentivize consumption during off-peak hours—and smart appliances (like smart thermostats, refrigerators, and laundry machines)—which can automatically load shift, reduce energy waste, and communicate with the grid. New Mexico should prioritize expanding access to smart appliances (and the broadband connections that enable them) such that their cost-saving benefits can accrue to rural residents and renters, who are traditionally underserved by these technologies.

9 Elasticity of load shifting time depends on the appliance.

Prioritize early electrification investments in homes burning wood or propane. The combustion of wood, propane, and gas creates air pollution with significant chronic health risks. Many rural communities, including half of the households in majority Native American areas of New Mexico, use wood as their primary heating fuel. This means that roughly 50,000 New Mexican households are exposed to higher levels of health-harming criteria air pollutants than those that burn conventional fuels for heating[10]. Prioritizing installing efficient electric heat pumps in homes and buildings that currently rely on wood and propane will improve health outcomes for rural and tribal communities while reducing energy cost burdens.

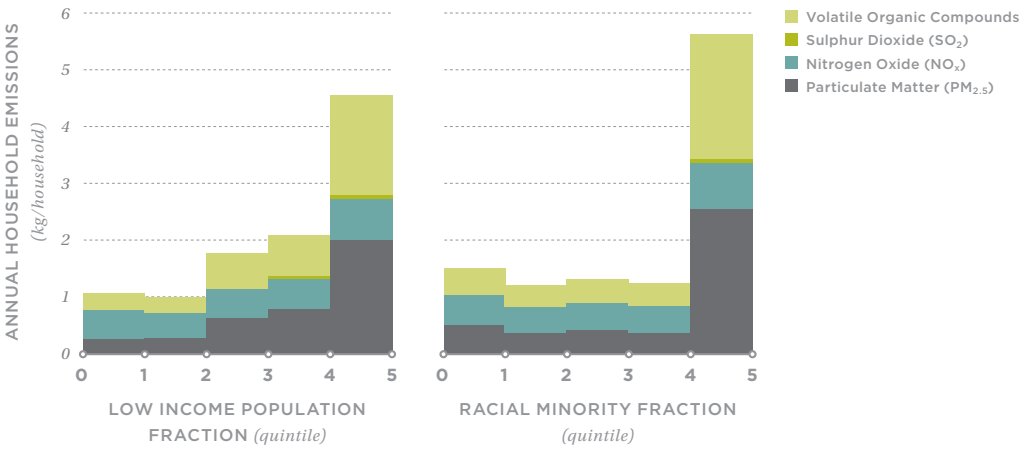


FIGURE 4. *Residential air pollution emissions by demographic, 2015. Average annual household air pollutant emissions are significantly higher in census tracts where higher fractions of the population are low-income and people of color. Census tracts are grouped into quintiles based on the fraction of racial minority and low-income populations in each census tract[11].*

Improve New Mexico's buildings through energy efficiency investments. For new construction, the cheapest pathway by far is to build clean from the start by creating standards for new buildings to reach net-zero through high-efficiency building materials and the installation of electric and efficient heating, cooling, and lighting systems. However, for New Mexico's growing stock of existing buildings, decarbonization will rely on energy efficiency retrofits, which cut the emissions of buildings by minimizing their energy waste while improving their comfort and weather resilience. Energy savings accumulate when appliances (such as air conditioners and dryers) are replaced with more efficient models, and when walls, roofs, windows, and insulation

10 Krieger, E., Lukanov, B., McPhail, A., Smith, A., Dillon, A., (August, 2021). Equity-Focused Climate Strategies for New Mexico. Physicians, Scientists, and Engineers for Healthy Energy. Retrieved December 2021, from https://www.psehealthyenergy.org/wp-content/uploads/2021/08/Equity-Focused-Climate-Strategies_New-Mexico_Report.pdf.

11 Krieger, E., Lukanov, B., McPhail, A., Smith, A., Dillon, A., (August, 2021). Equity-Focused Climate Strategies for New Mexico. Physicians, Scientists, and Engineers for Healthy Energy. Retrieved December 2021, from https://www.psehealthyenergy.org/wp-content/uploads/2021/08/Equity-Focused-Climate-Strategies_New-Mexico_Report.pdf.

are improved to reduce the need for heating and cooling. Electrification is key to capturing these efficiency gains, as electric appliances can be powered by a rapidly decarbonizing grid. Gas appliances, on the other hand, depend on burning fuel and have limited opportunities for efficiency gains[12]. The efficiency of electric appliances must continue to improve to minimize the burden of building electrification on the electricity grid.

HIGH EFFICIENCY APPLIANCE SALES

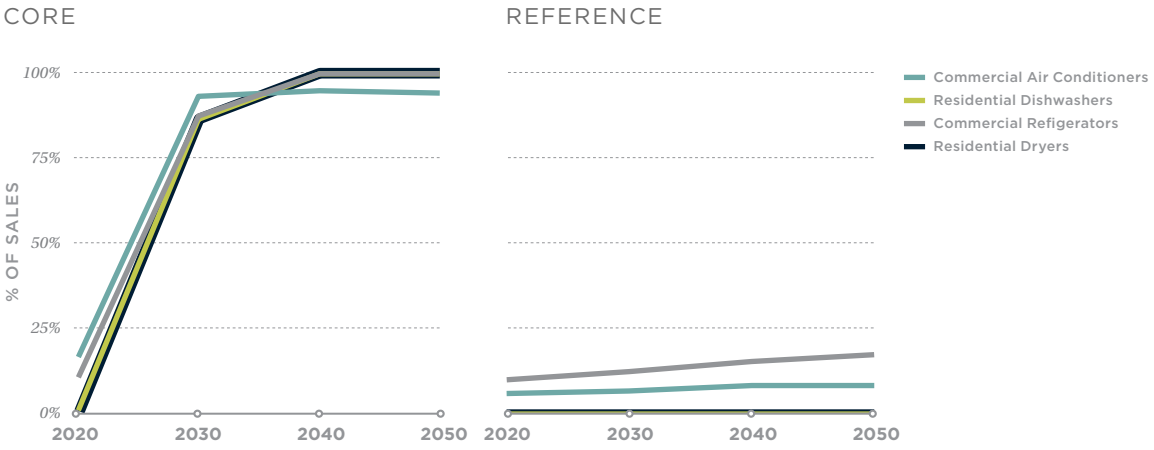


FIGURE 5. *High efficiency model sales as a percent of all appliance sales under the Reference and Core cases. Adoption of high efficiency models ramps up dramatically over the next decade to achieve New Mexico's emissions reduction targets.*

12 Pontecorvo, E., (October 1, 2021). Gas appliances are no longer eligible for Energy Star's top rating, Grist. Retrieved December 2021, from https://grist.org/energy/natural-gas-appliances-not-eligible-for-energy-star-top-rating/&sa=D&source=docs&ust=1639367414564000&usg=AOvVaw2eSn-8s6p9hU8U5Ttpnv1n.

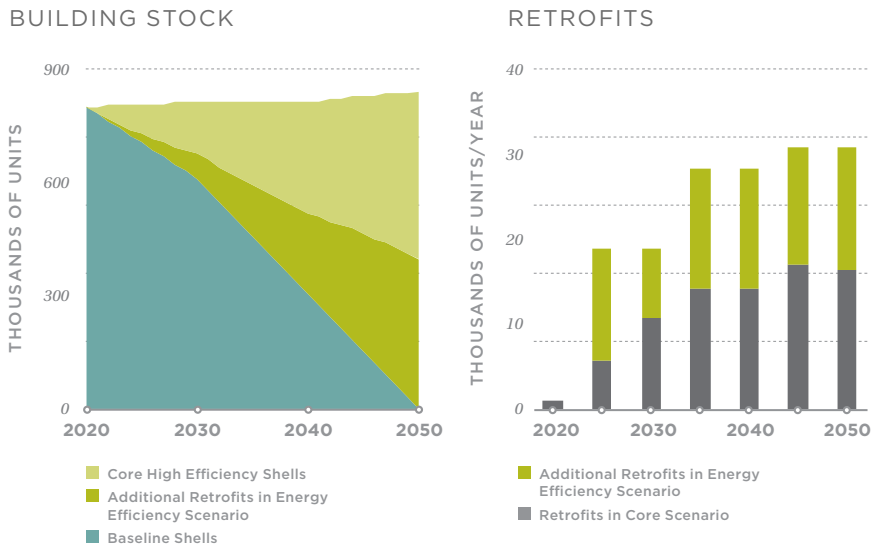


FIGURE 6. *Residential building retrofits under Core and Low Demand (high energy efficiency) scenarios.*

Revitalizing New Mexico's buildings through energy efficiency retrofits can cut energy bills, make homes safer and more comfortable, and reduce pollution. Retrofits should involve a package of upgrades including improving insulation and air sealing windows, doors, and air ducts. Under the Low Demand scenario, the state ramps up residential building retrofits to update 20,000 homes per year in the 2020s and 30,000 per year in the 2030s. By comparison, the leading federal retrofit program, the Weatherization Assistance Program, only funds 35,000 retrofits annually across the entire nation[13]. By capturing savings and reducing overall energy costs, the Low Demand scenario is the least cost pathway for decarbonizing the building sector in New Mexico. Furthermore, energy efficiency is a proven job creator—before the pandemic, the efficiency industry employed more than 6,000 people in New Mexico. Investments in retrofits should be targeted to ensure that the benefits of energy efficiency can be accessed by New Mexico's energy-burdened households.

Buildings present opportunities to decarbonize other sectors. Through these improvements, the buildings sector can also support the decarbonization of other sectors. New and existing buildings should be wired to allow for fast charging for an electric vehicle. Doing so can accelerate the market for passenger EVs by increasing access to chargers at New Mexicans' homes and offices. This is especially important for rental units, multifamily structures, and buildings in rural areas that are traditionally underserved by EV charging infrastructure due to barriers to capital, installation authority, and distance from public charging stations. Similarly, buildings can install rooftop solar panels or

13 Krishnaswami, A., Horing, J. Long, N., (February, 2021). Climate Action in New Mexico. Evolved Energy, Physicians, Scientists, And Engineers For Healthy Energy, Gridlab, Climate And Clean Energy Equity Fund, Natural Resources Defense Council, Sierra Club, Inclusive Economics. Retrieved December 2021, from https://gridlab.org/wp-content/uploads/2021/02/GridLab_NM-Overview.pdf.

solar water heaters, providing the building with a low-carbon and cost-saving distributed energy source and the opportunity to sell electricity back to the grid. Using available rooftop space for solar panels saves land while helping the state reach the solar capacity buildout that will be necessary for decarbonizing the power sector.

MODEL ASSUMPTIONS

Reference	No emissions reductions required; **does not meet net-zero goals**. Business as usual assumptions based on existing policy and market conditions.
Core	**Principal decarbonization scenario** upon which other scenarios are built. Meets 2030 and 2050 goals through ambitious but practical demand- and supply-side transformations to achieve the most cost-effective energy supply portfolio. Relies on rapid electricity decarbonization before 2030 and electrification of end-use applications and a limited deployment of low-carbon fuels by 2050.
	For buildings: Adoption of efficient appliances, electric appliances, and efficient building shells (walls, windows, and insulation) accelerates.
Low Demand	Built upon the Core scenario, but designed to assess the benefits of **reducing demand through increased energy efficiency measures** (including existing home retrofits, public transit infrastructure buildout, and reduced heavy-duty vehicle and aviation use).
	For buildings: Building energy demand drops further than in the Core scenario and all existing residential buildings are retrofitted by 2050.
Fossil Free	Built upon the Core scenario, but **designed to achieve zero fossil fuel production and use** across the United States by 2050. Given that this is a more limiting constraint than the state's net-zero target, this scenario is not an "apples-to-apples" comparison with the other scenarios but rather one to provide insight into the state relying solely on wind, solar, hydropower, and geothermal as resources to decarbonize the power sector.
	For buildings: Same as Core.