Clean & Reliable Energy

Connected & Equitable Mobility

ALL-IN CLARK COUNTY
BOLD ACTION FOR A SUSTAINABLE FUTURE

Diverse & Circular Economy

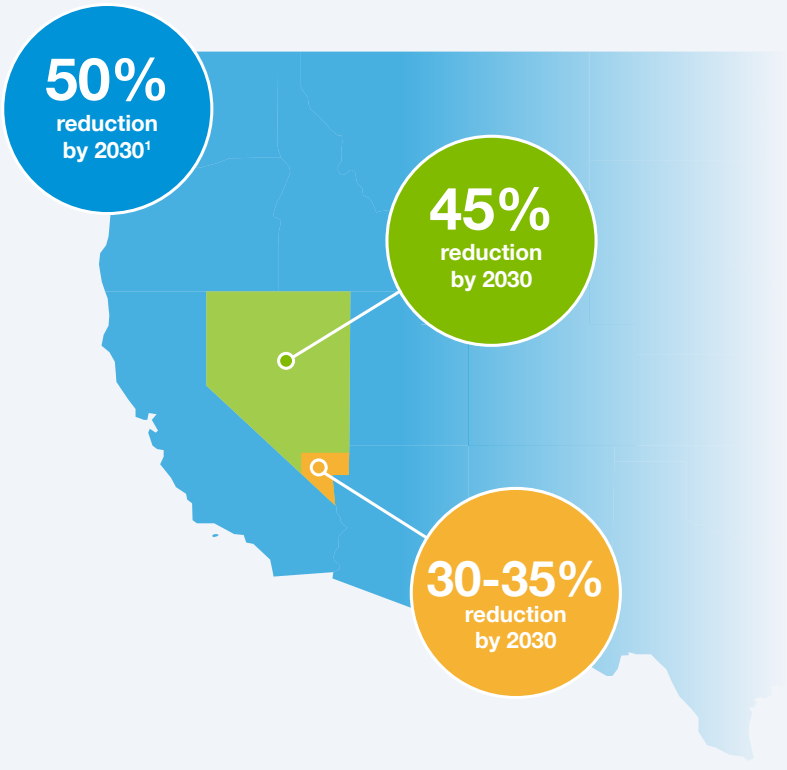
Smart Buildings & Development

Greenhouse Gas Pathways Analysis: Introduction

The **greenhouse gas (GHG) Pathways Analysis** evaluates potential greenhouse gas reduction strategies and develops a portfolio of options most likely to reduce Clark County's emissions to near zero by 2050. A 30-35% reduction by 2030 requires immediate and significant effort. Focusing resources on a portfolio of high-impact strategies, those that can produce the largest and fastest emissions reductions, will speed progress and simplify implementation.

This analysis summarizes potential contributions of each of these high-impact strategies to the overall targets and the pace, scale of activity, and investment needed to achieve those contributions.

The Pathways Analysis is a tool for decision-makers. A Pathway is a modeled scenario based on current data and expected future conditions, but it is not a prediction. The Analysis does not specify the policies or actions Clark County and its partners must implement nor does it provide specific implementation details. It does illustrate the type of innovation, collaboration, and coordination that will be necessary to reduce emissions. Reduction potentials of all strategies will continually evolve due to shifts in technology, state and federal policy, and actions of partner jurisdictions, as well as to efforts by businesses to reduce GHGs from operations, supply chains, and customers.



Aligning Ambition

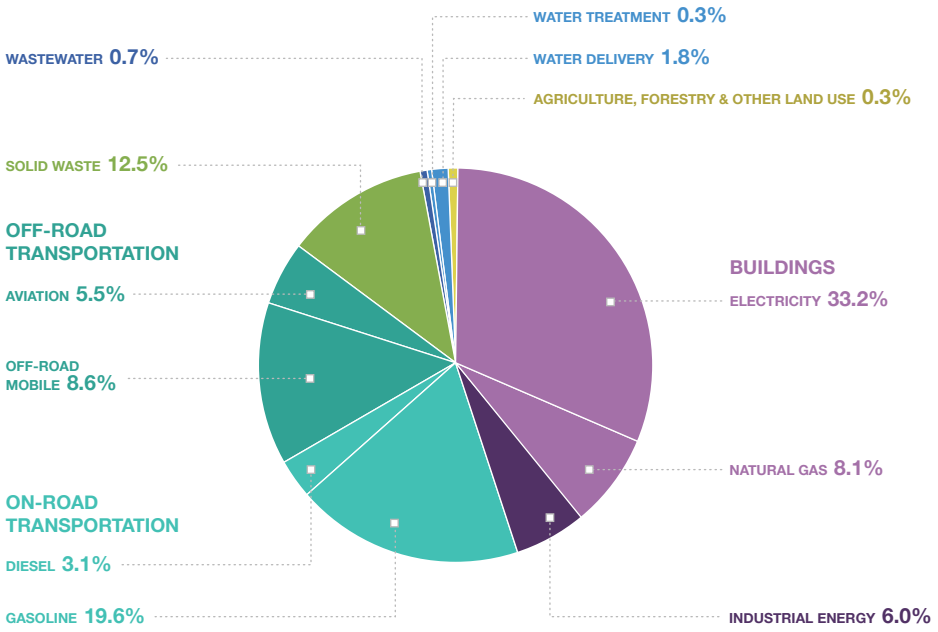
The NV Climate Initiative and the US Government have both set ambitious near-term goals on a path to zero emissions by 2050. The Nevada Department of Environmental Protection (NDEP) estimates that Nevada will fall short of its targets in the absence of additional action by State and local government.[2]

Clark County joined the County Climate Coalition in 2019 and committed to upholding the Paris Agreement. The Coalition's targets align with the original U.S. targets submitted in 2015, a 28% reduction from 2005 by 2025.

Clark County should aim to cut emissions by 30-35% from its 2019 baseline by 2030 to match the pace of reduction that the NV Climate Initiative aims to achieve statewide.

Clark County's Greenhouse Gases (2019)

- **Electricity used in buildings** was responsible for the largest share of GHGs in 2019 (33.2%). These emissions are decreasing as renewable energy replaces fossil fuel generation at a grid level.
- **Natural gas use in buildings** – encompassing hundreds of thousands of homes and businesses – adds up to 8.1% of total emissions.
- **Industrial** and other large-demand facilities use a substantial amount of natural gas and present opportunities to achieve significant reductions working with only a small number of companies.



- **On-road transportation**, from passenger vehicles and truck transport, was the second largest source in 2019 and will quickly become #1 as electricity emissions fall. Electric vehicles have the potential to significantly decrease transportation emissions. This transition can also be made easier with strategic investments in transit and community planning that can reduce driving.
- **Off-road transportation** is a significant emissions source, however, aviation[3,4] and off-road equipment industries[5] are developing net-zero initiatives that will scale up in future decades. Harry Reid Airport is already leading by electrifying ground support equipment.
- **Landfilled solid waste** is currently a substantial source of greenhouse gas emissions which could be captured and converted into a cleaner energy source.

Complete GHG Inventory

SOURCE	$MTCO_2e$	% OF TOTAL
Buildings	**12,164,255**	**41.5%**
Electricity	9,727,978	33.2%
Natural Gas	2,384,012	8.1%
Fugitive Natural Gas	30,851	0.1%
Propane	19,567	0.1%
Heating Fuels	1,710	0.0%
Wood	136	0.0%
Industrial Energy	**1,768,645**	**6.0%**
On-Road Transportation	**6,734,219**	**23.0%**
Gasoline	5,747,487	19.6%
Diesel	904,285	3.1%
Electric	8,705	0.0%
CNG	6,483	0.0%
Transit CNG	51,029	0.2%
Transit Biodiesel	16,230	0.1%

SOURCE	$MTCO_2e$	% OF TOTAL
Off-Road Transportation	**4,145,745**	**14.1%**
Off-Road Mobile	2,511,500	8.6%
Aviation	1,608,713	5.5%
Waterborne Navigation	17,589	0.1%
Railways	7,944	0.0%
Solid Waste	**3,675,785**	**12.5%**
Landfilled Waste	3,643,275	12.4%
Composted Waste	32,510	0.1%
Wastewater	**195,127**	**0.7%**
Process and Fugitive	195,127	0.7%
Water Treatment & Delivery	**523,621**	**1.8%**
Water Treatment	81,855	0.3%
Water Delivery	441,767	1.5%
Agriculture, Forestry, & Other Land Use	**92,398**	**0.3%**
Grand Total	**29,299,795**	**100%**

High Impact Strategies

Modeling the emissions reductions of high-impact strategies requires an understanding of current technologies, policies, and programs as well as some assumptions about the future, such as the speed in with which new technologies are adopted or changes to state energy policy. Detailed analyses are provided for four of these strategies as Fact Sheets.

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Removal of organic and recyclable material from the waste stream will create **11%** of 2030 reductions and **7%** of 2050 reductions.

Fact Sheet
Waste to Energy

Connected & Equitable Mobility

Electric and other zero emissions vehicles will create **16%** of 2030 reductions and **23%** of 2050 reductions with additional contributions from improved transit.

Reductions from offroad and aviation industries will contribute **2%** of 2030 reductions and **7%** of 2050 reductions.

Fact Sheet
Electric Vehicles

Smart Buildings & Development

Energy conservation in buildings will reduce energy use – reducing fossil fuels burned in buildings as well as easing the load on the energy grid. Going beyond the basic efficiency measures, quickly, will be crucial to reaching near-term targets. Efficiency contributes **34%** of 2030 reductions but only **8%** of 2050 reductions as other strategies catch up.

Fact Sheet
Deep Energy Efficiency

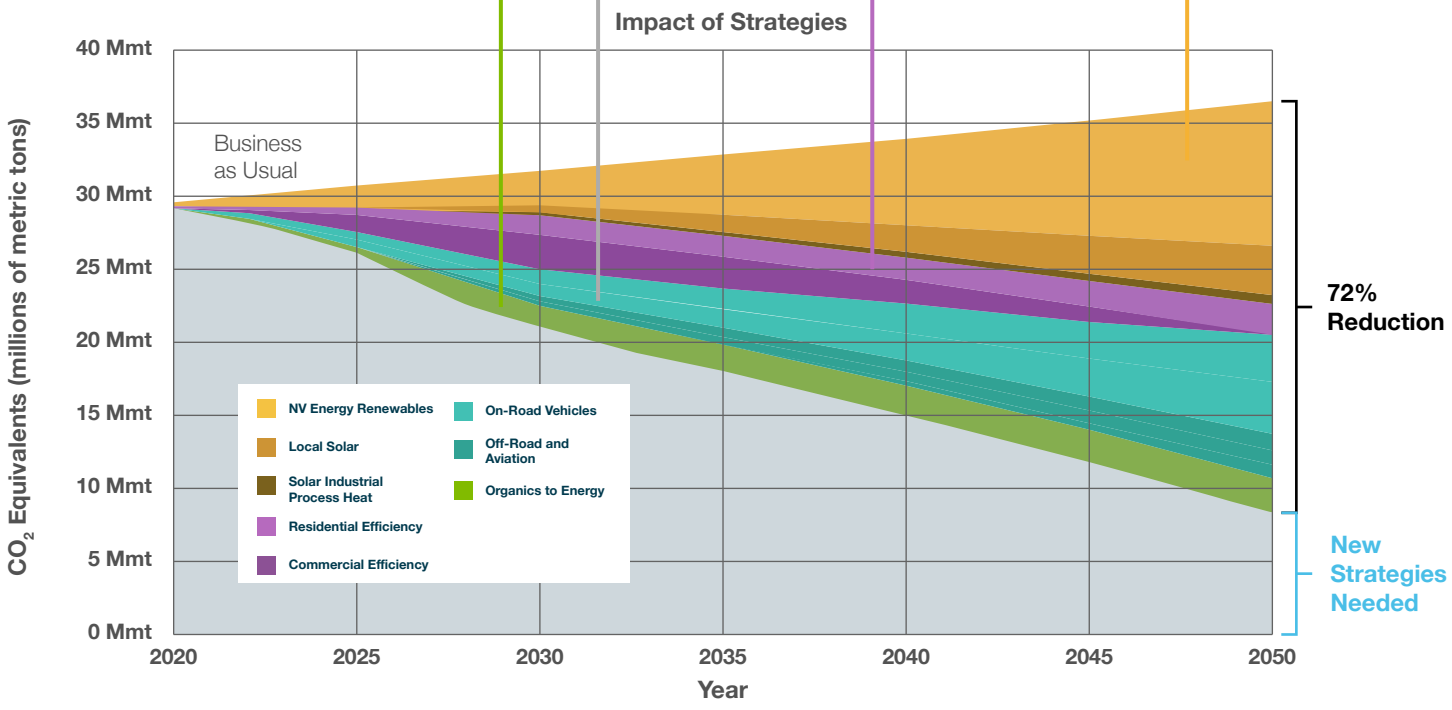
Clean & Reliable Energy

Reaching 100% renewable electricity supply has the highest impact of any strategy. Maximizing local solar could supply up to **5%** of reductions in 2030 and **12%** by 2050.

By 2050, solar industrial process heating could conservatively reduce existing emissions by **2%** and could also allow for the growth of new carbon-free industries to develop.

Fact Sheet
Rooftop Solar Energy

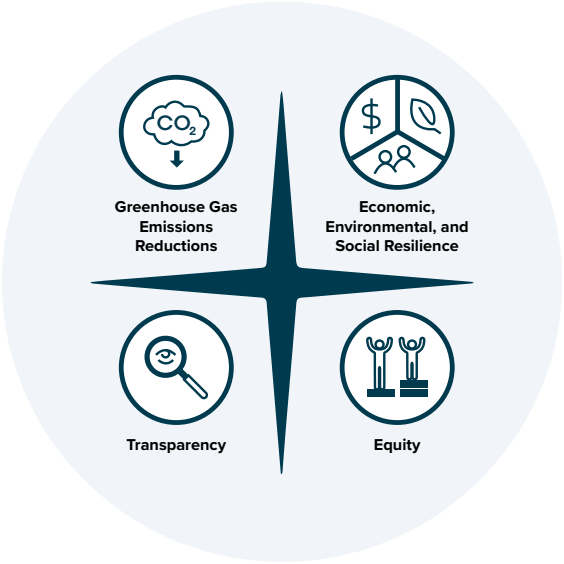
Emissions Reductions of High-Impact Strategies



The pathway explored here creates a **72%** reduction from 2019 by 2050, using well-developed technologies and policies. The remaining 28% of emissions in 2050 will likely include heavy-duty vehicles, large industry, aviation and off-road equipment, sectors where emissions solutions are not yet feasible. Future iterations of All-In Clark County will take on these challenging sectors as new strategies become available.

Guiding Principles

Following each of these high-impact strategies down a pathway of significant emission reductions will require a portfolio of several targeted actions. Actions – steps like policies, programs, studies, or incentives – could be combined in different ways, or with different timelines, and still keep Clark County on its pathway to near zero emissions. While *All-In Clark County* is focused on drastically reducing GHG emissions, climate actions will have other impacts – both positive and negative – on communities. *All-In's* four guiding principles – emissions reductions, resilience, transparency, and equity – provide a framework for evaluating each action. Since each set of actions will vary in their ability to reduce greenhouse gas emissions, their cost, and their community benefits, guiding principles can be used to optimize the portfolio of actions selected for each pathway. Guiding principles can also be used when designing implementation of actions – avoiding deepening existing disparities and improving the resilience of impacted communities.



The opportunities and challenges identified in each fact sheet are paired with their appropriate guiding principle.

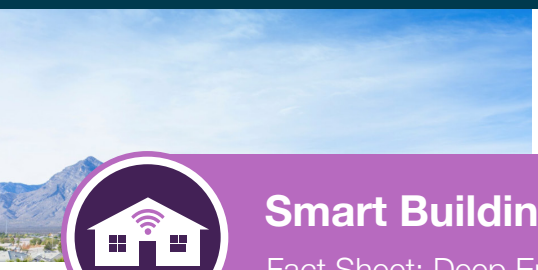
[1] The White House. "President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target." April 22, 2021. https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/

[2] Nevada Climate Initiative. "Nevada releases 2021 GHG Emissions Report Tracking Statewide Climate Action." January 10, 2022. https://climateaction.nv.gov/news/2021-greenhouse-gas-emissions-report-tracking-statewide-climate-action/

[3] Airlines for America. "Major U.S. Airlines Commit to Net-Zero Carbon Emissions by 2050." March 30, 2021. https://www.airlines.org/news/major-u-s-airlines-commit-to-net-zero-carbon-emissions-by-2050/

[4] International Air Transport Association. "Our Commitment to Fly Net Zero by 2050." October 4, 2021. https://www.iata.org/en/programs/environment/-flynetzero/

[5] Caterpillar Inc. "Strategic Alliance to Achieve Zero Emissions Mining." November 10, 2021. https://www.caterpillar.com/en/news/caterpillarNews/2021/newmont-zero-emissions-mining.html



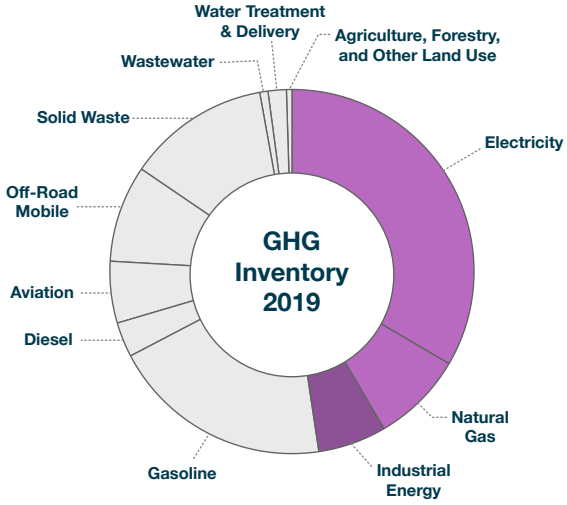
Smart Buildings & Development

Fact Sheet: Deep Energy Retrofits

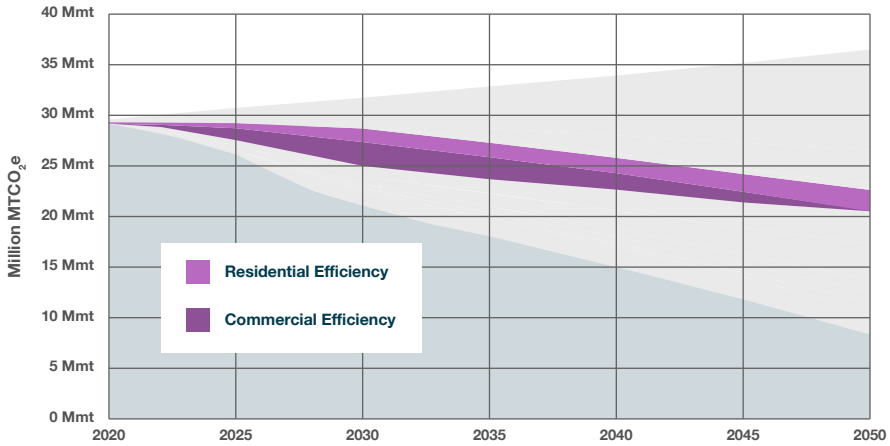
Achieving a completely renewable energy grid requires lowering demand to meet the supply. Electricity and natural gas use in building and industry currently contributes almost half **(47.3%)** of all emissions in the county. Immediate action on efficiency is necessary to succeed in this energy transition. The technology needed to meet emissions reduction goals in this area already exists; it is only a matter of creating the right conditions to deploy it.

Pathway to 2050

By 2030, energy efficiency programs must increase to **6x** above current utility programs. By 2050, all **715,000 residential units and 406 million sq ft of commercial space** will need to undergo deep efficiency measures that address the building's shell, lighting, and heating and cooling systems. Deep energy retrofits at this scale will provide **35% of the 2030 reduction targets and a total contribution of 8% of reductions by 2050.**



Impact of Deep Energy Retrofits



Strategy Details

This pathway requires a rapid increase in building efficiency to reach a 30% reduction in GHGs in the near term (by 2030). The model considers current efficiency programs[1] reported activities and level of savings, as well as the expectation that heating systems will become gradually less fossil-fuel based in the coming decades.

This pathway analysis illustrates the scale of efficiency necessary but does not define the specific strategies to be used. Some efficiency strategies, like whole-home retrofits, can be scaled up rapidly using existing technologies or programs. Other strategies have more limited potential to scale and need a longer timeline. A combination of multiple strategies, each with different timelines and targeted end uses, can be optimized to deliver the required energy savings.

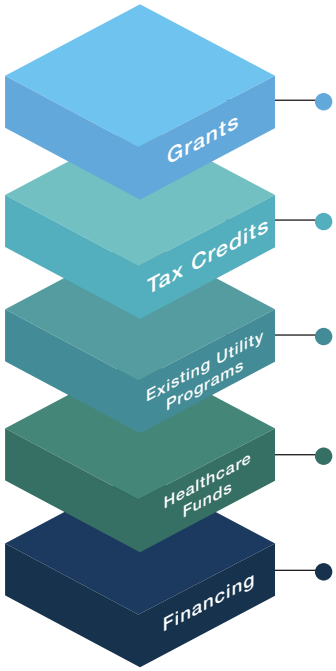
Dramatically reducing electricity use now, while the region's electricity is still substantially fossil fuel based, is necessary to meet near-term GHG reduction goals. However, the long-term goal of carbon neutrality by 2050 will require decreasing energy demand in every building until it is in balance with the available supply of clean energy. This goal demands going beyond reducing energy use at the margins - where most current efficiency programs operate - to instead structurally changing how energy is used in our homes and businesses.

Opportunities

- No technology barriers preventing us from getting to work immediately.
- Biggest GHG savings are near term while the grid is dirtier.
- Smart energy choices for new construction can avoid the need for high-cost retrofits in the future.
- Commercial heat pump adoption would accelerate transition away from water-consuming evaporative chillers.
- Improved efficiency can decrease both consumption and demand on the grid during extreme heat events.

Challenges

- Ratepayer programs alone have limited potential to reach scale, especially for heat pump retrofits.
- Maximum energy savings are only achievable with heat pump technology.
- New conventional heating and water heating systems build a backlog of high cost retrofit need.
- Upfront costs may be a barrier for those with limited access to capital, as well as in situations where the cost savings benefit someone other than the owner.
- Many building owners remain unaware of technologies and options.



Grants can refund retrofit program measures, services, and staff. Federal examples include the Low-Income Home Energy Assistance Program and the Weatherization Assistance Program.

A tax credit is a dollar-for-dollar reduction of income tax. Tax credits are available to incentivize single-family, multifamily, and commercial building retrofits.

Many **utility programs** do weatherization, energy efficiency, and on-bill financing. Successful programs include Efficiency Maine, Mass Saves, and Focus on Energy.

Healthcare programs, like Medicaid or Asthma Prevention Programs, can be leveraged for measures that improve health outcomes in homes.

Financing with consumer protections can fill the gap in funding. Consumer protections include barring utility shutoffs for participants and ensuring participants receive funding from other sources before financing is provided.

Example Efficiency Program Stacking Model

"Program Stacking" is an emerging strategy to create one-stop shops that can identify funding opportunities across a range of applicable programs and drive energy efficiency far beyond what is achievable through ratepayer supported programs.[1]

Funding Opportunities for Clark County *Bipartisan Infrastructure Bill*

- *Low Income Home Energy Assistance Program*; Home weatherization, energy-related repairs, **$500B.**
- *Energy Efficiency and Conservation Block Grant Program*; Building energy audits, conservation programs, retrofits, **$550M.**
- *Grants for Improvements at Public School Facilities*; Energy efficiency, renewable energy, **$500M.**

Key Collaborators

- County Residents
- HOAs
- Building Owners
- Developers
- Business and Industry
- Skilled Trades and Unions
- Policymakers
- Utilities

[1] RMI. Funding Our Future: Creating a One-Stop Shop for Whole Home Retrofits. April 2022.

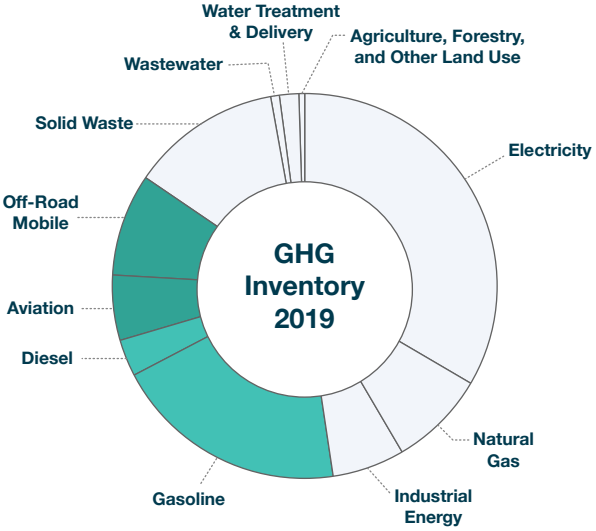
Connected & Equitable Mobility

Fact Sheet: Electric Vehicles

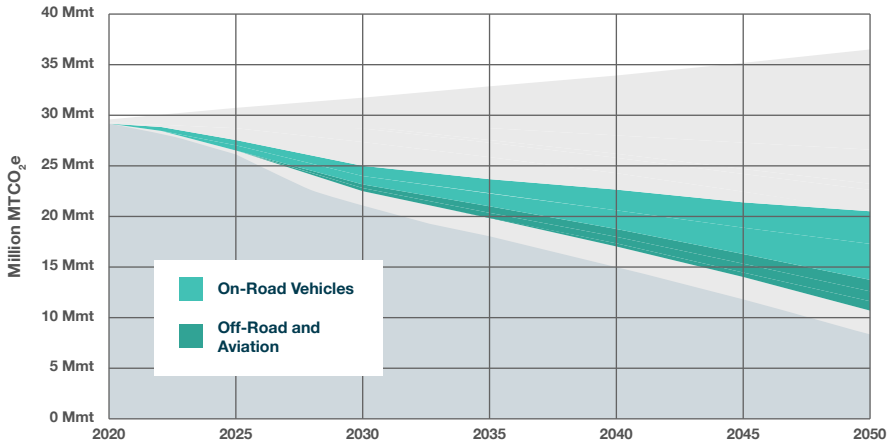
Clark County can dramatically reduce the use of gasoline and diesel. Fast-tracking the transition to electric vehicles (EVs) in concert with the transition to 100% renewable electricity will tackle its second-biggest source of emissions, On-Road Transportation **(22.7%)**.

Pathway to 2050

To fully transition passenger vehicles by 2050, **all new car sales must be zero emission vehicles between 2035 and 2040**. Electrified vehicles will **need more than 20,000 light-duty and 5,000 commercial truck chargers** in Clark County by 2030. Eliminating passenger vehicle GHGs and cutting commercial transport GHGs in half will **produce 16% of reductions** by 2030 and **23%** by 2050.



Impact of Electric Vehicles



Strategy Details

Converting passenger vehicles to EVs is cost effective and will contribute the vast majority of emissions reductions expected for the on-road transportation sector. Medium and heavy-duty vehicle technology is still advancing, and its charging infrastructure is physically larger and more costly. Aggressive efforts to rapidly transition all passenger vehicles to EV should begin immediately, to leave time for commercial vehicle technology to mature. Governor Sisolak recently joined the Multi-State Medium and Heavy-Duty Vehicle Initiative[1] which outlines anticipated timelines for technology deployment.

Opportunities

- Electric personal and light duty vehicles are readily available and offered by all US car manufactures.

Connected chargers for EVs enhance resilience of the electric grid by acting as batteries for balancing renewable power.

Electrifying heavy-duty trucks and equipment will provide significant improvements in air quality near construction and industrial sites.

- Clark County could lead the way on ground support and equipment electrification at Harry Reid Airport.
- EV planning efforts happening today can proactively address scaling up electric vehicle charging infrastructure to support tomorrow's heavy-duty electrified trucks and equipment.

Challenges

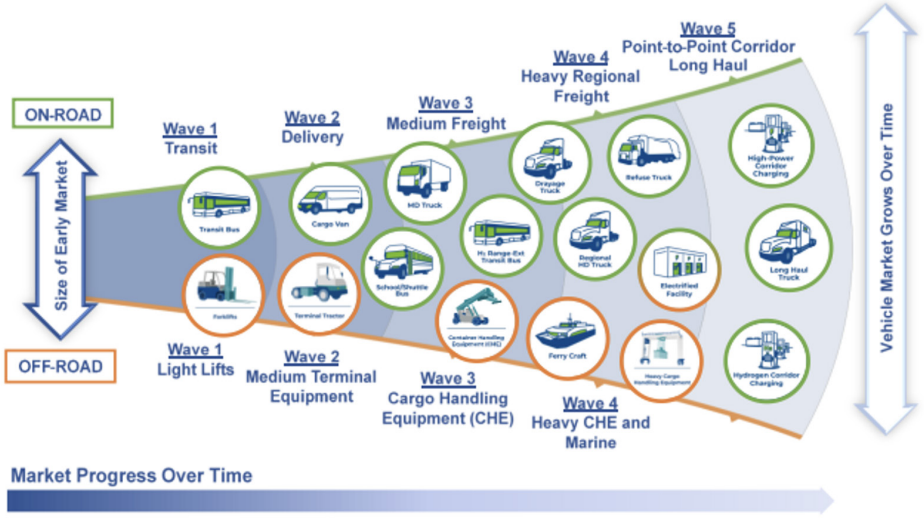
Need to address barriers to owning and charging EVs for low-income community members and renters.

EVs alone cannot address inequity in transportation; Clark County must balance personal vehicles with equitable, high-capacity transit.

- Electric vehicles will increase demand for clean electricity.
- Heavy-duty electrified trucks and equipment will likely not be readily available for several years.
- Charging infrastructure will need to precede demand to keep adoption rates high.

The Beachhead Model for Zero-Emissions Vehicle Commercialization

The variety of equipment that currently runs on fossil fuels is diverse and electric options will not be uniformly available for everything. Technology trends need to be monitored to anticipate the best timing to address each type.[2]



Funding Opportunities for Clark County *Bipartisan Infrastructure Bill*

- *Congestion Mitigation & Air Quality Improvement Program*; Projects that reduce congestion and reduce mobile source emissions, **$13B**
- *Transportation Infrastructure Finance and Innovation Act*; Electrification of buses, ferries, trains, and associated infrastructure, **$1.25B**
- *Advanced Transportation Technologies & Innovative Mobility Deployment*; Deploy, install, and operate advanced transportation technologies, **$900M**

Key Collaborators

- County Residents
- Business and Industry
- Policymakers
- Utilities
- Transportation Agencies

[1] https://gov.nv.gov/News/Press/2022/2022-03-31_ZeroEmission/
[2] CALSTART. The Beachead Model, Catalyzing Mass-Market Opportunities for Zero-Emissions Commercial Vehicles. October 2020. https://globaldrivetozero.org/public/The_Beachhead_Model.pdf

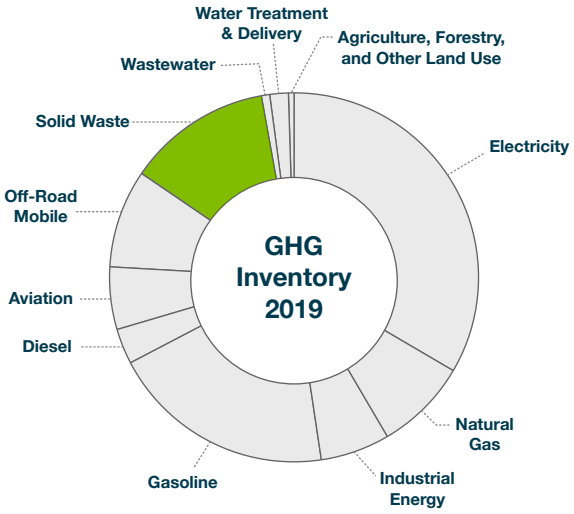
Diverse & Circular Economy

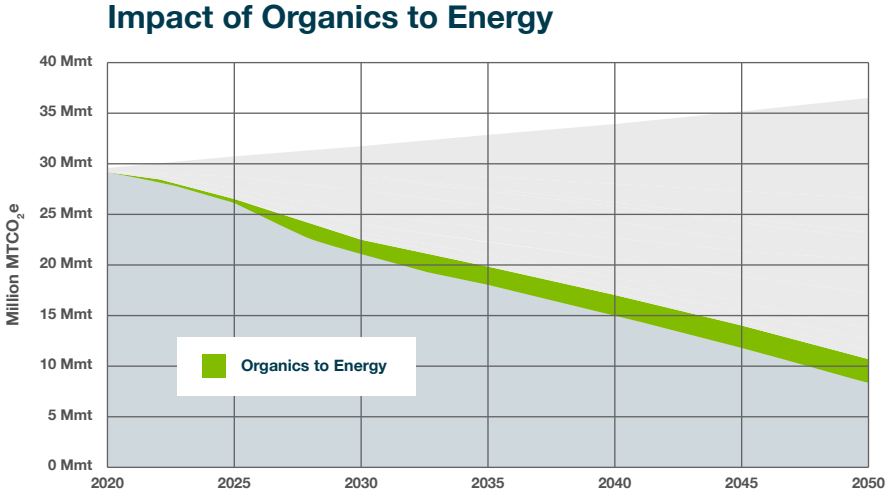
Fact Sheet: Organics to Energy

Diverting organic matter from landfills is the main strategy for reducing direct emissions from waste. This can be done by generating methane in a controlled environment, like an anerobic digester, where it can also be used as a cleaner energy source. This double-acting strategy creates a big win for the climate by focusing on the largest source of methane in the County and the source of **12.5%** of overall GHG emissions.

Pathway to 2050

To completely remove organic waste from disposal in a landfill will require development of a system capable of processing up to **860,000 tons of material per year**, as well as the logistics necessary to collect an additional separated waste stream. Turning waste to an energy resource contributes **11% of reductions modeled** for 2030 and **7%** for 2050.





Strategy Details

Landfill gas capture has long been a strategy to help mitigate the GHG impacts of burying organic waste. Shifting towards a circular mindset that separates organic and food material out of the waste stream before it goes to the landfill and maximizes methane recovery in an anaerobic digester turns a reactive strategy into a proactive one. This pathways analysis models the separation of food waste as the primary shift from business as usual. However there are other digester feedstocks that could also be optimized for methane recovery, such as outputs from wastewater treatment.

There are many competing uses for renewable biogas that could be generated from food waste and other feedstocks. This gas should be put to the “highest and best use” – the use that creates the deepest GHG reduction or, in an increasingly carbon-constrained economy, the use in applications that are most difficult to decarbonize in other ways.

Opportunities

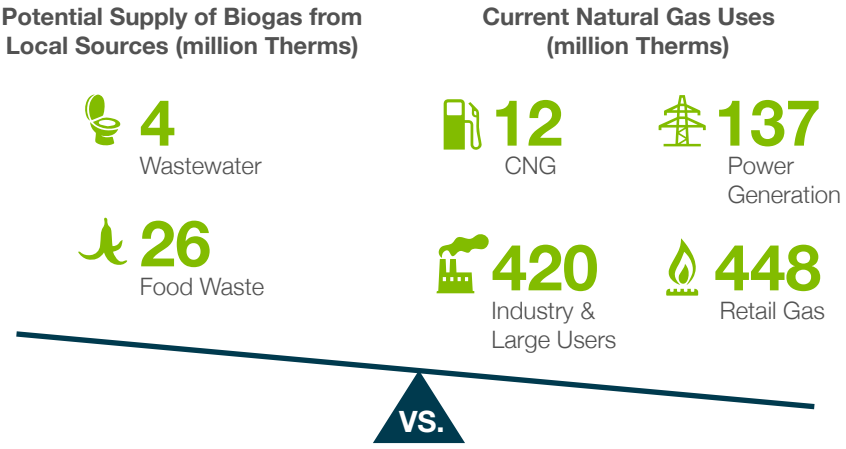
- Organics management reduces landfill GHGs while supporting clean energy.
- Existing infrastructure, logistics, and knowledge developed around the Apex landfill and generating station could provide a hub for scaling up biogas solutions. Biogas from Apex Landfill already generates enough electricity to power 11,000 homes.[1]
- Food waste recovery strategies in place in some resorts and at Allegiant Stadium provide a model for other businesses.
- Moving from landfill gas capture to direct separation and conversion of organic materials will maximize clean energy potential.
- Wastewater – another potential source of biogas - could supply approximately 1.5% of county-wide residential natural gas use if it could be captured at Clark County Reclamation District facilities.[2]

Challenges

- Collection logistics to capture all organics will require substantial coordination, especially across commercial generators of food waste.
- Competition for biogas supply will ramp up between electric generation, pipeline blending, aviation and on-road fuels. The best use of the resource is for those applications with the fewest alternatives to reduce demand.
- Biogas-to-hydrogen is another way to create value-added clean fuels, but local hydrogen production may be limited by water availability.

Potential Biogas Supplies Compared to Current Natural Gas Demand

There are substantial sources of biogas that can potentially be developed within Clark County, however they are small compared to demand. It will take cooperation and effort to balance demand with available supplies of renewable fuels.



Funding Opportunities for Clark County *Bipartisan Infrastructure Bill*

- *Battery and Critical Mineral Recycling*; Research, development, and demonstration projects to increase reuse and recycling of batteries, **$125M.**
- *Lithium-Ion Recycling Prize*; Recycling of lithium-ion batteries and a task force on battery producer requirements, **$10M.**
- *Solid Waste Infrastructure for Recycling Grants*; EPA, **$275M.**
- *Education and Outreach Grants*; EPA, **$75M.**

Key Collaborators

- County Residents
- Business and Industry
- Waste and Sanitation Providers
- Health District
- Policymakers
- Utilities

[1] Ophelia Young. KSNV News. "Trash to gas: Apex landfill now powering 11,000 homes. March 23rd, 2022. https://news3lv.com/news/local/trash-to-gas-apex-land-fill-now-powering-nevada-11000-homes

[2] Calculated using 140 MGD treatment volume and 1 cubic foot biogas per 100 gallons. NREL. Renewable Hydrogen Potential from Biogas in the United States. 2014. https://www.nrel.gov/docs/fy14osti/60283.pdf