NEVADA'S 2020 *STATE CLIMATE STRATEGY* BUILDS A FOUNDATION FOR FUTURE CLIMATE ACTION

"Home means Nevada," and climate change has hit home.

By acting on climate, the state can move toward addressing Nevadans' concerns and build a better future with cleaner air, better health, an equitable society, economic stability, renewable energy, and a cleaner environment for everyone.

Check out our website: www.climateaction.nv.gov

CLIMATE ACTION

Nevada is committed to reducing GHG emissions, which contribute directly to climate change. With the passage of SB 254 in 2019, Nevada adopted aggressive GHG emissions-reduction targets: 28% by 2025, 45% by 2030, and net-zero (near-zero) by 2050.

Under Gov. Sisolak's executive order on climate change, state agencies were directed to develop Nevada's first-ever *State Climate Strategy*. The 2020 *State Climate Strategy* informs policymaking on how Nevada will achieve the ambitious targets established by SB 254 and provides an integrated framework for evaluating climate policies that make sense for Nevada.

The *State Climate Strategy* was developed using the best available science, combined with robust input from thousands of Nevadans.

The overarching goals of the 2020 *State Climate Strategy* are to:

1. Provide a framework for reducing Nevada's greenhouse gas (GHG) emissions across all economic sectors,
2. Lay the groundwork for climate adaptation and resilience, and
3. Establish a structure for continued, ongoing climate action across the state.

CLIMATE JUSTICE

Across the United States and in Nevada, low-income communities, people of color, and Indigenous populations have disproportionately borne the burden of climate change impacts. As temperatures continue to rise and climate-related challenges expand and intensify, particular attention must be paid to these vulnerable populations. Through climate action, there is the opportunity to reconcile the social justice challenges Nevadans face.

NEVADA'S CLIMATE LEGACY

Under the leadership of Gov. Sisolak, Nevada is accelerating efforts to achieve a clean, sustainable, and climate-resilient future for all Nevadans. The *State Climate Strategy* is just the beginning of Nevada's long-term commitment to combating climate change.

NEVADA'S 2020 *STATE CLIMATE STRATEGY* SNAPSHOT

THE PATH TOWARD NET-ZERO GHG EMISSIONS

The 2020 *State Climate Strategy* provides an integrated framework for evaluating climate mitigation policies. The policies contemplated were drawn from the Nevada Division of Environmental Protection's 2019 GHG inventory, which includes a catalog of policy options that could further reduce statewide GHG emissions, as required by SB 254.

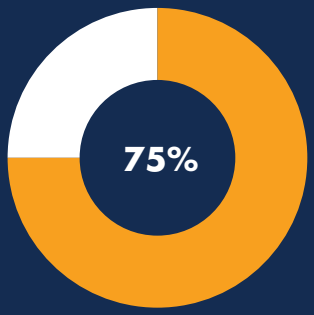
Transportation | Electricity | Industry | Residential & Commercial | Land Use & Land Change

Monitoring, Modeling, and Managing GHG Emissions

To support a comprehensive and consistent evaluation of GHG emissions-reduction benefits from policies across the state, the State of Nevada's capability to inventory GHG emissions would need to expand.

NAVIGATING THE COMPLEXITIES OF CLIMATE CHANGE

Harmonization of local, regional, state, and oftentimes federal policies is necessary in order to realize significant GHG reductions. Identifying and addressing interconnected issues will help avoid conflicting policies, optimize investments, bolster the resilience of infrastructure and communities across the state, and ensure that Nevada achieves net-zero GHG emissions.



Over 75% of climate survey respondents in Nevada indicated they are "very concerned" about climate change, and ranked drought, wildfire, and air quality as their top three concerns.

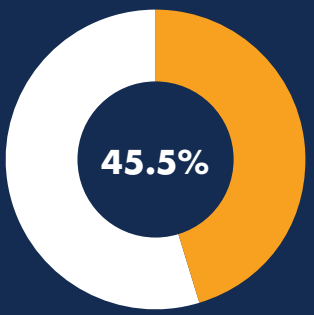
> "For the sake of our future, and our children's future, we must take bold action to stem the negative impacts of climate change while moving quickly to capture the economic benefits of creating sustainable communities throughout Nevada."
>
> – Governor Sisolak

NEVADA'S CLIMATE GOVERNANCE

State governments across the United States committed to climate action have adopted different governance approaches to address climate change within their organizational structures. The following guiding principles should be considered in a design appropriate for Nevada: intergovernmental and interagency coordination, stakeholder and community engagement, executive leadership and staff, adaptive governance, science-based climate assessment, and dedicated resources.

INVESTING IN A CLIMATE-FRIENDLY FUTURE

By meeting the state's emission reduction targets, Nevada would prevent between $172 and $786 million in economic damages by 2030 and up to $4 billion by 2050. Climate action and economic development activities in Nevada are intrinsically linked and can be strategically integrated to achieve their respective goals. As the state emerges from the pandemic, climate-conscious economic development efforts and investments can spur the expansion of renewable energy, reduce emissions, build climate resilience, and expand the use of sustainable resources, all while creating valuable new jobs and skilled workforces.



Prior to the COVID-19 driven economic downturn, Nevada outpaced the nation in clean energy job growth between 2016-2019; 45.5% increase in clean energy jobs, according to the U.S. Climate Alliance.

EXECUTIVE SUMMARY

The 2020 *State Climate Strategy* builds a foundation for future climate action under the State of Nevada Climate Initiative.

The overarching goals of the 2020 Climate Strategy are to:

1. Provide a framework for reducing Nevada's greenhouse gas (GHG) emissions across all economic sectors
2. Lay the groundwork for climate adaptation and resilience, and
3. Establish a structure for continued, ongoing climate action across the state.

CLIMATE CHANGE HAS COME HOME TO NEVADA

"Home Means Nevada," and climate change has hit home. Already, droughts have grown more severe, the snowpack is disappearing, and water supplies are at risk. As temperatures continue to rise, heat waves are expected to increase in frequency and duration, posing significant risks to the health of urban communities—particularly vulnerable populations and outdoor workers. Air quality is already a concern across the state, and increasing risks of wildfire and drought, combined with more heat, could create additional health problems related to air pollution.

Swift action must be taken to proactively bolster climate adaptation and resilience planning and to reduce GHG emissions. By acting on climate, the state can move toward addressing Nevadans' concerns and build a better future with cleaner air, better health, an equitable society, economic stability, renewable energy, and a cleaner environment for everyone.

Climate Justice

Across the United States and in Nevada, low-income communities, people of color, and Indigenous populations have disproportionately borne the burden of climate change impacts. As temperatures continue to rise and climate-related challenges expand and intensify, particular attention must be paid to these vulnerable populations. Through climate action, there is the opportunity to reconcile the social justice challenges Nevadans face.

CLIMATE ACTION

With the vision of ensuring a vibrant, climate-resilient future for Nevada, Governor Sisolak launched the State of Nevada Climate Initiative (NCI) in the summer of 2020. As the home of Nevada-wide climate action, the NCI is committed to reducing Nevada's GHG emissions and dedicated to achieving resilient communities that are prepared to successfully adapt to a changing environment and climate.

Under Gov. Sisolak's executive order on climate change, state agencies were directed to develop Nevada's first-ever *State Climate Strategy* establishing a framework to advance Nevada-wide climate action for a healthy, sustainable, resilient future. The *State Climate Strategy* was developed using the best available science, combined with robust input from thousands of Nevadans through a series of listening sessions on a full range of climate topics, a climate survey, consultation with subject-matter experts, stakeholder convenings, webinars, and more.

2020 STATE CLIMATE STRATEGY SNAPSHOT

THE PATH TO REACH NET-ZERO GHG EMISSIONS BY 2050

> **New mitigation-focused policies, programs, investments, and regulations are needed to put the state on the path toward realizing net-zero GHG emissions by 2050.**

Nevada is committed to reducing GHG emissions, which contribute directly to climate

change. With the passage of SB 254 in 2019, Nevada adopted aggressive GHG emissions-reduction targets: 28% by 2025, 45% by 2030, and net-zero (near-zero) by 2050. These targets are in line with neighboring states in the region and are an important step toward managing climate change. Nevada has a jump start on meeting these targets by embracing its abundant renewable resources to generate clean electricity under the state's renewable portfolio standard (RPS). However, there is still much work to do across all sectors of Nevada's economy.

Nevada's GHG emissions inventory mirrors trends occurring across the western United States, where transportation-sector emissions (35%) now exceed those from the energy sector (32%), historically the largest source of GHG emissions. Industrial, residential, and commercial emissions are growing rapidly, while those associated with other sectors remain relative consistent. To reduce and ultimately eliminate GHG emissions, Nevada will need to take bold and decisive action.

Under current policies and based on the best available science, Nevada is currently on a path to reduce economy-wide GHG emissions 24% by 2025 (4% short of the 28% goal) and 26% by 2030 (19% short of the 45% goal), thus missing the emissions-reduction goals. Consequently, new mitigation-focused policies, programs, investments, and regulations are needed to put the state on the path toward realizing net-zero GHG emissions by 2050.

The 2020 *State Climate Strategy* informs policymaking on how Nevada will achieve the ambitious targets established by SB 254 and provides an integrated framework for evaluating climate policies that make sense for Nevada. Given the complexities of climate change, it is imperative that policies to reduce GHG emissions be approached systematically so there is a clear understanding of the benefits and tradeoffs. This will optimize each given policy's effectiveness and maximize the benefits for all Nevadans.

Climate Mitigation Policy Evaluation Framework

The 2020 *State Climate Strategy* is a living document. This framework will continue to be applied and the NCI working groups will continue their evaluation of new and existing policies, and will provide additional reports in the future that may include periodic reassessment as new information emerges. This approach provides a mechanism to track progress while providing a roadmap for where investments may be needed to ensure the adoption of robust and sound policies. The four metrics comprising the framework are focused on GHG emissions, climate justice, fiscal issues, and pathways to implementation.

Metric 1: GHG Emissions-Reduction Potential: What emissions reductions can be achieved, and on what timeline, by implementing the policy?

Metric 2: Climate Justice Considerations: Have communities of color, low-income households, and tribal partners (i.e., Indigenous communities) been directly engaged and consulted about the challenges and opportunities associated with the policy? Will the policy avoid any negative impacts to vulnerable communities, provide the opportunity for a net benefit, and/or reconcile broader social justice issues?

Metric 3: Budgetary & Economic Implications: What are the resources needed for implementation and administration of the policy? What is the long-term return on the investment?

Metric 4: Implementation Feasibility: What are the legal barriers to implementation of the policy?

The policies and programs evaluated are organized by emissions sector.

Transportation

- Adopt low- and zero-emissions vehicle standards
- Implement clean truck program
- Adopt low-carbon fuel standards
- Implement state car allowance rebate system (“Cash for Clunkers”)
- Close emissions inspection loopholes for classic cars license plates

Electricity

- Transition from fossil-fueled electricity generation to clean energy sources

Industry

- Replace, capture, and recycle ozone-depleting substance substitutes

Residential & Commercial

- Adopt appliance and equipment efficiency standards
- Implement a statewide benchmarking program
- Require residential energy labeling and energy audits
- Adopt energy codes for net-zero buildings
- Expand the property-assessed clean energy (PACE) program

- Require GHG reduction plans and prioritize decarbonization in utility integrated resource plans (IRPs)
- Prioritize energy efficiency and demand response programs
- Expand energy savings performance contracting (ESPC)
- Transition from residential and commercial use of gas

Land Use & Land Change

- Expand urban forestry programs

MONITORING, MODELING, AND MANAGING GHG EMISSIONS

To support a comprehensive and consistent evaluation of GHG emissions-reduction benefits from policies across the state, the State of Nevada's capability to inventory GHG emissions would need to expand. To optimize resources invested, a consistent framework is needed for estimating a policy's potential GHG emissions reductions and for monitoring the efficacy once a policy is adopted.

NAVIGATING THE COMPLEXITIES OF CLIMATE CHANGE

Harmonization of local, regional, state, and oftentimes federal policies is necessary in order to realize significant GHG reductions. Consequently, climate mitigation policies must be considered in a broad context that engages multiple sectors and various levels of governance. Identifying and addressing interconnected issues will help avoid conflicting policies, optimize investments, bolster the resilience of infrastructure and communities across the state, and ensure that Nevada achieves net-zero GHG emissions.

- Transportation Transformation
- Transmission Planning & Grid Modernization
- Urban Planning
- Green Buildings
- Land Use and Natural & Working Lands

NEVADA'S CLIMATE GOVERNANCE

State governments across the United States committed to climate action have adopted different governance approaches to address climate change within their organizational structures. While there are multiple climate governance options that could be implemented, the following guiding principles—based on positive experiences from other states—should be considered in a design appropriate for Nevada.

- Intergovernmental & Interagency Coordination
- Stakeholder & Community Engagement
- Executive Leadership & Staff
- Adaptive Governance
- Science-Based Climate Assessment
- Dedicated Resources

Leading by Example

The State of Nevada has myriad opportunities to lead by example on climate action. The executive branch has the capability to adopt policies that will reduce GHG emissions—an important step given the extent of state-owned assets.

The Nevada Department of Transportation developed a roadmap to achieve net-zero emissions that can be adapted by other agencies and departments. They outline a process for developing and adopting internal policies and a strategic plan to reduce their GHG emissions across operations, construction, and planning. Taking action will require resources, but there will be a return on these investments in the form of savings on energy, water, and fuel.

INVESTING IN A CLIMATE-FRIENDLY FUTURE

Climate action is not a revenue-neutral proposition. However, by meeting the state's emission reduction targets, Nevada would prevent between $172 and $786 million of economic damages by 2030 and up to $4 billion by 2050. Investing in climate mitigation policies and strategies will also save untold lives, improve the health of Nevada's communities, and create a stronger workforce.

Climate action and economic development activities in Nevada are intrinsically linked and can be strategically integrated to achieve their respective goals. The ongoing COVID-19 pandemic has highlighted both the linkage between environmental quality and public health threats to Nevada's communities, and the precariousness of the current economic situation. As Nevada emerges from the pandemic, the co-development of an economic recovery framework and strategy will prepare the state and its businesses for climate impacts at multiple scales by growing and sustaining the sharing of climate science, information, and resources.

The ongoing COVID-19 pandemic has highlighted both the linkage between environmental quality and public health threats to Nevada's communities, and the precariousness of the current economic situation. As Nevada emerges from the pandemic, the co-development of an economic recovery framework and strategy will prepare the state and its businesses for climate impacts at multiple scales by growing and sustaining the sharing of climate science, information, and resources.

Climate-conscious economic development efforts and investments can spur the expansion of renewable energy, reduce emissions, build climate resilience, and expand the use of sustainable resources, all while creating valuable new jobs and skilled workforces.

Developing policies aimed at reducing GHG emissions in concert with framing workforce training and retraining programs that are aligned with Nevada System of Higher Education (NSHE) goals can create new jobs and bolster the state's economic diversification strategy and recovery. Nevada's research and innovation enterprise can also be leveraged by expanding engagement with private industry, by building partnerships with new and emerging clean and green innovators in renewable energy, air/water quality technology sectors, supply chains, and business incubation.

NEVADA'S CLIMATE LEGACY

Under the leadership of Gov. Sisolak, Nevada is accelerating efforts to achieve a clean, sustainable, and climate-resilient future for all Nevadans. The *State Climate Strategy* is just the beginning of Nevada's long-term commitment to combating climate change. The *State Climate Strategy* outlines a framework designed to evaluate the alignment of climate-conscious policies, feasibility, and readiness levels necessary for Nevada to achieve its GHG emissions-reduction goals and advance climate-forward solutions for the Silver State.

INTRODUCTION

Combating climate change requires a collaborative effort amongst all citizens of this state. As the next generation takes the reigns of leadership across Nevada and beyond, Nevada will be in a stronger position for taking proactive action on climate change. Laying the foundation for continued climate action, developing smart policies, and using the best science to identify future risks will ensure the safety and wellbeing of Nevadans and protect the state's natural resources, while reducing greenhouse gas (GHG) emissions.

> **"Let me be clear: I will not spend a single second debating the reality of climate change. It is real, and it is irresponsible to ignore the science that proves it—and the lives it has already upended, especially across the West. As governor, I am committed to making Nevada a clean energy leader—not only to combat the effects of climate change for future generations, but also for the abundance of green-collar jobs we can create right now."**
>
> – Governor Steve Sisolak

ESTABLISHING A LEGACY OF CLIMATE ACTION

On March 12, 2019, Governor Steve Sisolak announced that Nevada would join the United States Climate Alliance (USCA), a bipartisan coalition of 25 state governors committed to realizing the goals of the Paris Agreement, including reducing GHG emissions in order to keep global temperature rise well below 2°C (3.6°F) (Box 1). Throughout 2019, the legislature passed multiple climate-forward bills including SB 358 a statewide renewable portfolio standard (RPS) of 50% by 2030. The adoption of SB 254 followed, requiring the Nevada Division of Environmental Protection (NDEP) to develop an annual GHG emissions inventory for all major sectors of Nevada's economy, including electricity generation, transportation, and other key sectors. This legislation also set aggressive, economy-wide

GHG emissions-reduction targets for the state: 28% by 2025, 45% by 2030, and net-zero by 2050 (vs. a 2005 GHG emissions baseline). The 2019 GHG emissions inventory shows that Nevada will fall 4% short of the 2025 goal and 19% short of the 2030 goal if no additional action is taken by the state.

> **"Climate change knows no borders. By joining the U.S. Climate Alliance, we are taking bold and coordinated steps to ensure a healthier future for our children and grandchildren. With these ambitious goals and commitments to reduce our carbon footprint, I am determined to make Nevada part of the solution."**
>
> – Governor Steve Sisolak

In November 2019, Gov. Sisolak issued his executive order on climate change (EO 2019-22) directing State of Nevada agencies to identify and evaluate policies and regulatory strategies to achieve economy-wide GHG emissions-reduction targets established by SB 254. The Department of Conservation and Natural Resources (NDCNR) and the Governor's Office of Energy were tasked to coordinate statewide, interagency effort to deliver Nevada's first *State Climate Strategy*.

With the vision of ensuring a vibrant, climate-resilient future for Nevada, Gov. Sisolak launched the State of Nevada Climate Initiative (NCI) in the summer of 2020. The NCI is committed to reducing Nevada's economy-wide GHG emissions and dedicated to achieving resilient communities that are prepared to successfully adapt to changing environmental and climatic conditions. The 2020 *State Climate Strategy* builds a foundation for future climate action under the NCI in anticipation of the need to take climate action on multiple fronts, and serve as a roadmap for policymakers at all levels of government in Nevada for achieving the state's collective climate goals.

Box 1. U.S. Climate Alliance

In March of 2019, the State of Nevada joined the U.S. Climate Alliance, a bipartisan coalition of 25 governors committed to reducing GHG emissions consistent with the goals of the Paris Agreement. Each state commits to reducing their emissions in line with the U.S. target under Paris, and all have enacted new climate policy measures since joining the Alliance. The Alliance is led by state governments and is focused on state-to-state cooperation to accelerate the deployment of climate solutions needed to help each achieve their climate goals.

The U.S. Climate Alliance has three core principles:

1. **States are continuing to lead on climate change:** Alliance states recognize that climate change presents a serious threat to the environment and our residents, communities, and economy.
2. **State-level climate action is benefiting our economies and strengthening our communities:** Alliance members are growing our clean energy economies and creating new jobs, while reducing air pollution, improving public health, and building more-resilient communities.
3. **States are showing the nation and the world that ambitious climate action is achievable:** Alliance members are committed to supporting the international Paris Agreement, and are pursuing aggressive climate action to make progress toward its goals.

By joining the Alliance, governors commit to:

- Implement policies that advance the goals of the Paris Agreement, aiming to reduce GHG emissions by at least 26–28% below 2005 levels by 2025
- Track and report progress to the global community in appropriate settings, including when the world convenes to take stock of the Paris Agreement, and
- Accelerate new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal level.

The U.S. Climate Alliance now represents 55% of the U.S. population and 60% of U.S. gross domestic product (GDP). The climate and clean energy policies of these states have created over 2.1 million clean energy jobs, equivalent to 60% of all clean energy jobs in the United States.

The State of Nevada remains committed to collaborating with fellow U.S. Climate Alliance states to foster a healthy, resilient, climate-friendly future for all.

THE 2020 CLIMATE STRATEGY

The overarching goals of the 2020 *State Climate Strategy* are to 1) provide a framework for reducing Nevada's GHG emissions across all economic sectors, 2) lay the groundwork for climate adaptation and resilience, and 3) establish a structure for continued, ongoing climate action across the state.

The 2020 *State Climate Strategy* informs policymaking on how Nevada will achieve the ambitious targets established by SB 254 and provides an integrated framework for evaluating climate policies that make sense for Nevada.

> **Given the complexities of climate change, it is imperative that policies to reduce GHG emissions be approached systematically so there is a clear understanding of the benefits and tradeoffs.**

This will optimize effectiveness of each given policy and therefore maximize the benefits for all Nevadans. By taking a smart, strategic approach to addressing climate change in Nevada, the state can fully capture the economic benefits of clean technologies and lead our peers in neighboring Western states.

The 2020 *State Climate Strategy* is a living document. Each section of the report is designed to stand alone such that content can be added or updated without compromising the integrity or relevance of another part of the document (Table 1). The NCI team led the development of the strategy, overseeing multiple interagency working groups. These working groups were coordinated around the strategy's climate themes and led the development of the content and related stakeholder engagement activities (Table 2).

Table 1. 2020 State Climate Strategy Section Descriptions

2020 Climate Strategy Section	Description
Climate Change in Nevada	Information here provides the motivation for climate action in Nevada. The section lays out science-based information about how climate change is impacting our communities and natural resources, alongside what we might expect in the future.

2020 Climate Strategy Section	Description
Climate Mitigation: Reducing Greenhouse Gas Emissions in Nevada Climate Mitigation Policies Climate Mitigation: Complex Challenges for Nevada	These sections are the centerpiece of the 2020 strategy, as it provides a framework for evaluating policies, programs, and regulations that could reduce Nevada's GHG emissions. The strategy also lays out the complexities of climate change and the broad scope of issues that should be considered together in order to develop a robust set of harmonized policies around both climate mitigation and climate resilience.
Climate Mitigation: Lead by Example	Nevada's state agencies can develop, adopt, and implement internal emissions-reduction policies using the roadmap outlined here. This section also contains a catalog of the different State capital projects that could include energy efficiency investments.
Monitoring, Modeling, and Managing Greenhouse Gases	This section outlines the data and modeling requirements necessary to support the alignment of GHG emissions tracking with policy investments.
The Economics of Climate Action	There are several components to this section. The cost of inaction is outlined along with opportunities to develop resources to support climate programs and policies. There is an accounting of opportunities for federal funding to support state climate action, as well as basic information about different types of carbon markets, and specific examples of models adopted elsewhere.
Nevada's Climate Opportunity: Economic Recovery & Revitalization	This part of the strategy highlights the economic opportunities of climate action, including information about the potential to expand the climate-friendly job market and attract green business and industry.
Climate Governance	This section outlines key characteristics important for establishing an effective governance structure to support the NCI, including effective processes to support ongoing climate action in the state.

Table 2. Climate Working Groups

Working Group	Agencies, Offices, & Departments Represented
Climate Change in Nevada	NSHE
Climate Survey	NSHE
Development, Green Building, & Appliance Efficiency	GOE, ADMIN, CORR, NHD
Energy & Power	GOE, PUCN
Transportation	NDOT, GOE, DMV
Land Use and Natural & Working Lands	NDCNR, NDF, NDA
Lead by Example	NDOT, GOE
Economic Recovery & Revitalization	NDOR, GOED
Greenhouse Gas Emissions	NDEP, NDOT, GOE
Legal Barriers to Decarbonization	NSHE, AG

The climate working groups led the development of content in the 2020 State Climate Strategy. These teams worked in consultation with other agencies as needed, even if they are not explicitly listed above. Members of the teams are listed here.

NSHE (Nevada System of Higher Education), GOE (Governor's Office of Energy), ADMIN (Department of Administration), CORR (Nevada Department of Corrections), Nevada Housing Division (NHD), PUCN (Public Utilities Commission of Nevada), NDOT (Nevada Department of Transportation), Department of Motor Vehicles (DMV), NDCNR (Nevada Department of Conservation and Natural Resources), NDF (Nevada Division of Forestry), NDA (Nevada Department of Agriculture), NDOR (Nevada Division of Outdoor Recreation), GOED (Governor's Office of Economic Development), NDEP (Nevada Division of Environmental Protection), AG (Office of the Attorney General)

STAKEHOLDER ENGAGEMENT

Stakeholder engagement to support the development of the 2020 *State Climate Strategy* was framed around the key message that this is just the beginning of what will be ongoing engagement. The threats and opportunities posed by climate change will evolve, and new risks will emerge as the climate continues to change, new technologies become available, and targeted policies are implemented. This requires ongoing discussion with all Nevadans to ensure that the NCI is responsive and addressing community concerns. The strategy is not the only step—it is among the first taken to support the broader mission of the NCI and establish Nevada as a leader in addressing all facets of climate changes in our state.

Although opportunities for engagement with Nevadans in the strategy's development were more limited than originally envisioned given COVID-19 restrictions, thousands of Nevadans were engaged between June and October 2020 by participating in the Climate Survey, sharing perspectives during listening sessions, attending webinars or convenings, and by submitting comments and materials directly to the NCI team. The GHG Emissions Working Group also convened stakeholders to review the status of previous and ongoing GHG inventory efforts across the state.

- **Climate Survey:** In collaboration with the UNLV Communications Department, a survey was administered and open to all Nevadans between August 24 and October 16, 2020. More than 1,500 responses were received from 13 of Nevada's 16 counties as well as Carson City.

COUNTY	TOTAL RESPONDENTS
None Selected	315
Carson City	87
Churchill	6
Clark	760
Douglas	37
Elko	13
Humboldt	1

COUNTY	TOTAL RESPONDENTS
Lander	2
Lincoln	3
Lyon	15
Mineral	1
Nye	17
Pershing	1
Storey	1
Washoe	309
TOTAL	1,568

- **Listening Sessions:** Virtual convenings focused on different climate topics were held between mid-September and mid-October 2020. Officials from relevant state agencies moderated each listening session. Framing questions were presented in order to refine the scope of input. There was significant interest in these convenings, such that the technical platform had to be expanded to accommodate the unexpected widespread demand. A Spanish language listening session was also convened after multiple requests from different members of the public. Recordings of these sessions are archived.

Topic	Date & Time	Registered Participants
Renewable Energy	9/14/20	253
Land Use & Land Change	9/15/20	172
Transportation Transformation	9/17/20	192
Air Quality	9/22/20	161

Topic	Date & Time	Registered Participants
Urban Planning	9/24/20	171
Economic Recovery	9/29/20	159
Green Buildings	10/1/20	163
Climate Justice	10/06/20	163
Spanish Language	10/13/20	16

- **2020 Climate Strategy Roadshow:** The NCI team contacted more than 70 industry groups, member organizations, chambers of commerce, economic development authorities, municipalities, and more to specifically discuss the 2020 *State Climate Strategy*. Of those contacted, the NCI team held more than 35 one-on-one meetings. Additionally, information about the 2020 *State Climate Strategy* was sent to all current members of the Senate and Assembly Growth and Infrastructure Committees as well as members of the Interim Committee on Energy. The NCI team met with a handful of legislators for one-on-one discussions. Finally, the NCI team was invited to present information about the 2020 *State Climate Strategy* by various groups and public bodies. Specifically, the NCI team gave more than a dozen presentations via webinars, formal member convenings, and public meetings.
- **Climate Emails:** Additional comments—as well as documents, research, and expert opinion to consider in the development of the content—were submitted via email.

CLIMATE CHANGE IN NEVADA

Nevada's climate is changing. This is now being observed across the diversity of its climates, from the cool high mountains of the eastern Sierra Nevada and the Spring Mountains, to the uplands of the Humboldt River and the blistering heat of the Mojave Desert in the south. In fact, Nevadans say, they are already noticing and impacted by these changes. Climate change has come home.

> **Climate change has come home.**

Just as the current climate varies from place to place in the state, future climate change will also vary in its particulars. Its impacts will manifest in different ways for different communities, economic sectors, and ecosystems. For example, flooding of the Humboldt River has different risks and impacts than flooding in Reno due to different population densities, economies, and infrastructure.

The table of climate impacts in Nevada (Table 1) provides an overview of historical trends and future projections for some major climate variables and how they may affect public health, water resources, the environment, hospitality, and agriculture. The remainder of this section describes in more detail what is known about these past and future changes in Nevada's climate and what they imply for the state.

> **The current release of carbon into the atmosphere is unprecedented and more rapid than at any time over the past 56 million years.**

Climate Change in a Geological Context: Are the Changes Today Like Those in the Past?

How does the observed rate of greenhouse gas (GHG) increases compare to the past? To provide some perspective on the current and future rates of climate change, a geological context is useful. Perhaps the best analog of a past rapid release of carbon to the atmosphere happened about 56 million years ago during the Paleocene-Eocene Thermal Maximum (PETM).

At that time, a large amount of carbon (2,500 to 4,500 Pg (1015) of carbon) stored in the ocean was released to the atmosphere over a duration of at least 4,000 years (Zeebe et al., 2016). This corresponds to a release rate of ~0.6 to 1.1 Pg of carbon per year. For comparison, currently about 10 Pg of carbon are being released each year associated with fossil-fuel combustion and related processes (Hayhoe et al., 2017). These data indicate that the current release of carbon into the atmosphere is unprecedented and more rapid than at any time over the past 56 million years. Further, the magnitude of human-driven climate drivers in the modern era may be the largest Earth's climate system has experienced over the past 420 million years (Foster et al., 2017). The current atmospheric concentration of CO_2—about 413 ppm (and rising)—is similar to what was last experienced during the Pliocene period about 3 million years ago when global sea levels were at least 30 feet higher and global temperatures were 3.6 to 6.3˚F higher than they are today (Hayhoe et al., 2017). Future warming is expected to lag behind the rising emissions as the climate system equilibrates. This increased warmth in the Earth's atmosphere will persist for many tens of millennia after carbon emissions have stopped (Clark et al., 2016; Lyons et al., 2019). This warming is 'locked in', and the climate system may take many thousands of years to return to temperature levels prior to the 20th century unless GHG emissions are rapidly curtailed.

The changes in climate are expected to interact with each other in ways that exacerbate the impacts. For example, warmer temperatures will result in more precipitation falling as rain rather than snow, leading to more-frequent and -intense extreme storms. Individually, these projected changes are likely to increase flooding, but together their impacts on flood risks are likely to be more than the sum of the two. What is known about past and future climate changes and how they will impact Nevada is outlined in more detail in the following sections.

Table 1. Climate Impacts in Nevada

	Heat & Heat Waves	Drought	Loss of Snow	Floods	Wildfire Risk
CLIMATE SCIENCE					
Historical Trends	Increasing temp; Rates of increase are higher in urban areas than rural areas	Increasing evaporative demand; More drought that not in last 10 years	Decrease between 20-60% from 1955-2016	No historical trends; Most recent flooding events are 2017 and 2006	Between 1984-2017, 4 of the 5 years with the largest area burned have occurred since 2005.
Projected Trend & Confidence	Increase in average temp; Increase in frequency and severity of heat waves ***HIGH Confidence***	Increase in frequency and intensity ***Confident***	By the end of this century, projections indicate a potential 30-50% reduction in April snowpacks,; Earlier snow melt ***HIGH Confidence***	More frequent flooding; ***Confident***	Increase of invasive species, increasing fire spread; Increase drying of fuels; Increase precipitation variability affecting fuel production ***HIGH Confidence***
IMPACTS					
Public Health	Increased risk of mortality and morbidity; Increase in preterm births	Potential for mental health impacts; Increased dust due to drying and lowered water levels in desert terminal lakes	Greater change of flooding and associated safety risks	Greater risks to public safety, private property, and infrastructure	Wildfire smoke decrease air quality; Increase in respiratory illness; Increases in hospitalizations and emergency room visits
Water Resources	Degradation of water quality; Increased water loss due to higher evaporative demand	Increase in demand and decrease in supply, limiting water availability for all sectors	Loss of a natural reservoir, reduced water storage; More growing days increasing water demand	Decrease in water quality; May limit the ability to capture rainwater for water supply (i.e., too much, too fast)	Potential erosion leading to changes in biogeochemical cycling and water quality
Environment	Species' ranges will shift; Some local extinctions; Negative impacts on wildlife health including higher mortality	Drought impacts to plant health and growth; Potential for plant mortality	Less and earlier-in-the-year availability of surface water and ground water limiting the bioavailablity of water	Increased sheet and river bank erosion affecting Riparian habitats	More cheatgrass, loss of native sagebrush further increasing wildfire risk; Loss of forested areas will impact erosion and sedimentation into watersheds; Negatively impacts wildlife species
Recreation & Hospitality	Decrease in time available to be safely outside; Deterrent to attracting visitors	Partial loss of recreational opportunities due to limited snow pack; Dust to negatively impact tourism	Partial loss of recreational opportunities due to decline of snow pack	Flooding impacts in downtown areas of Reno and Las Vegas; Road closures due to flood and landslide risk following wildfire	Increased fire risk and smoke may lead to loss of tourism and recreation during fire season
Ag and Ranching	Health impacts of being outdoors during heat waves; Heat impacts to livestock health and milk production; Longer growing seasons and new crop varieties; Impacts to plant health and crop production; Delayed or reduced production from adapting to shifting seasons and crop performance	Potential decrease on crop yield and production; Decreased forage quantity, range condition; Water hauling needs; Reduction in use of federal land; Increased need of feeding hay; Reduction in land available for production	Earlier and longer duration of irrigation needs due to decrease in run-off later in the season; Reduced irrigation capacity due to lack of water availability; Reduction in rangeland production	Increase erosion and soil loss; Potential crop loss/damage; Damage to water holding and confinement structures; Microbial contamination of crops	Direct livestock losses; Potential impact on forage production due to wildfire-induced changes in vegetation cover including noxious weeds; Crop and forage loss; Federal land permits closed or temporally closed due to fire; Loss of infrastructure

GHG Emissions Scenarios Over Different Time Horizons **Time Horizons**

The future climate—particularly the long-term future climate of the globe or of Nevada—is not written yet. There are significant uncertainties, in part dependent on what society chooses to do to reduce the causes of climate change. We can bracket these uncertainties about the future by focusing on two different GHG emissions scenarios and two different time horizons.

GHG Emissions Scenarios

High GHG Emissions Scenario:

In this scenario, global GHG emissions continue to grow at more or less the recent historical pace throughout the century, so that GHG concentration continues its recent growth rates unabated. In the scientific literature, this is referred to as RCP 8.5. That same label is used here.

Reduced GHG Emissions Scenario:

Under this scenario, global GHG emissions begin to be reduced from their current rate of growth by midcentury and return to late-20th century rates by about 2075. This yields GHG concentrations that level off in the last half of this century. In the scientific literature, this is referred to as RCP 4.5.

Near Term: Planning time horizons for many of today's decisions are often focused on the next several decades. For this reason, we will discuss changes and impacts projected for a near-term period, 2030–2059. For this report, we will use a high-emissions scenario (RCP 8.5) to illustrate near-term changes and impacts because this is the current emissions trend. Projections using low- vs. high-end emissions scenarios do not significantly diverge until the latter part of the century.

Long Term: Climate change will continue for centuries. The differences between GHG emissions scenarios (and their impacts) grow over time. Depending on society's emissions-related choices today, climate projections past 2060 diverge significantly. To illustrate the benefits of GHG mitigation, impacts are shown under both GHG scenarios at the end of the century, 2070–2099.

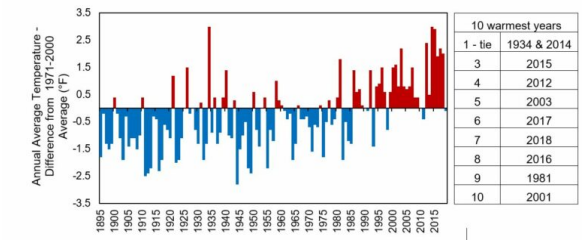
Both time periods cover 30 years, because it is a long-enough sample of data to allow the climate changes due to GHG emissions to be separated from natural weather variations that will continue from year to year, and sometimes decade to decade, even as the average character of the climate changes.

The data used here to develop these climate projections originates from some of the most-sophisticated global climate models currently available. The data has been downscaled using the localized constructed analogue (LOCA) method. For more information, please see http://loca.ucsd.edu/ and the references in the bibliography.

TEMPERATURE INCREASE, URBAN HEAT ISLAND, AND HEAT WAVES

Increased temperatures and the associated heat waves are particularly important to public health. In Nevada, average temperatures have been increasing and 8 of the 10 warmest years since 1895 have occurred since 2000 (Figure 1). Although temperatures throughout the state are increasing, the rate of warming is not the same everywhere. Urban areas, for example, are getting hotter faster relative to rural areas.

Figure 1. Nevada's annual average temperature has increased about 2°F since the early 20th century. Data from NOAA Climate at a Glance.



10 warmest years	
1 - tie	1934 & 2014
3	2015
4	2012
5	2003
6	2017
7	2018
8	2016
9	1981
10	2001

EXPAND

The amount of warming that Nevada will face in the future depends on whether GHG emissions are allowed to continue growing or whether they are reduced rapidly over the coming decades.

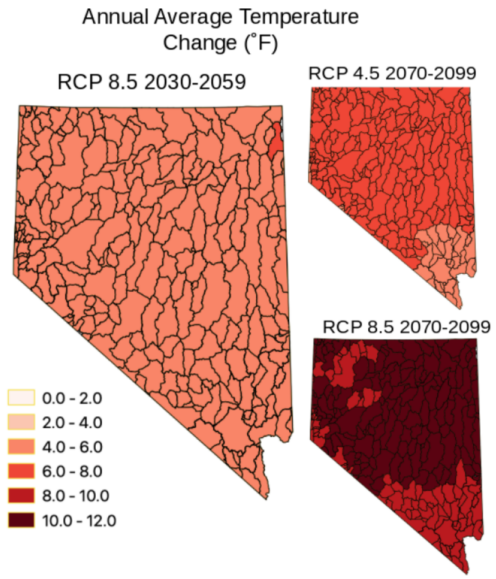
The amount of warming that Nevada will face in the future depends on whether GHG emissions are allowed to continue growing or whether they are reduced rapidly over the coming decades. Warming projections of 4–6°F throughout Nevada are expected in the near term. In the long term under a low-emissions scenario, warming is projected to reach 6–8˚F in all except the Clark County region (which is expected to see slightly less warming) and 10–12°F in

Figure 2. Temperatures 4 to 6ºF warmer are projected by midcentury across the State, increasing to 6 to more than 10ºF warmer by the end of this century, depending on which emissions scenario is followed in coming decades. This figure shows projected near-term changes in annual average temperature relative to historical average temperature for 256 hydrographic basins in Nevada, based on the averages of 2030–2059 and 1970–2000 simulations by 10 different global climate models responding to a high global GHG emissions scenario (RCP 8.5) (left). Average

most of central and northern Nevada under a high-emissions scenario (Figure 2). Simply, a certain degree of short-term warming is essentially locked in if GHG emissions continue, but a high-emissions scenario could result in about 50% more warming than a low-emissions scenario.

Nighttime temperatures—particularly important for human health—are projected to warm most, particularly in August and September, across much of the state. Daytime temperatures are projected to warm mostly in summer and fall. Increased temperatures affect multiple sectors, including increasing public health risks, in part by exacerbating poor air quality, stressing water resources by increasing water demand for irrigation and native vegetation, and creating a flashier streamflow regime by contributing to snow loss and leading to longer growing seasons (discussed below).

temperature projections for the long term (2070–2099) relative to the historical 1970–2000 average is shown on the right for a lower-emissions scenario, RCP 4.5 (top), and a high-emissions scenario, RCP 8.5 (bottom). Daily projections are downscaled and then aggregated within hydrographic basin boundaries.



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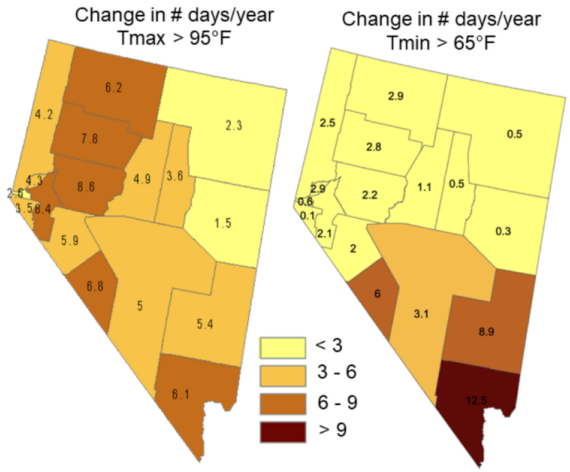
Projections of increasing average temperatures are punctuated by more-frequent and more-severe heat.

These projections of increasing average temperatures are punctuated by more-frequent and more-severe heat. The term heat wave generally refers to weather spells much hotter than normal, sufficient to be unpleasant or even unsafe. Extremely high temperatures pose a danger to human life and physical and mental health (Bandala et al., 2019; Zuo et al., 2015), to transportation and power infrastructure (Chapman et al., 2013), and to ecosystems. Extreme heat increases fire risk for some vegetation types (Zuo et al., 2015) and can also negatively impact wildlife (Albright et al., 2017). Extreme heat also impacts air quality, as higher temperatures are associated with increased ozone levels (Wise & Comrie, 2005).

What level of heat extreme is “problematic” depends on the impact in question (e.g., human health, infrastructure performance, or ecosystem health) and varies from place to place. There are different ways of defining heat waves that may take into account day and/or nighttime temperatures, humidity, and/or duration of the hot spell (Smith et al., 2013; AMS glossary 2020). For simplicity here, we use heat wave metrics that simply count the number of days per year where daytime temperatures exceed 95°F and nighttime temperatures remain above 65°F.

The number of very warm summer (June–August) days when daytime temperatures exceeded 95°F has increased across the state, with the largest increases in southern and northwestern Nevada (Figure 3), consistent with published analyses documenting increasing heat-wave frequency and/or severity across the Southwest (Allen & Sheridan, 2016; Gershunov et al., 2009) using a variety of heat-wave metrics. Increases in very warm nighttime temperatures (> 65°F) were larger in the southern portions of Nevada (Figure 3).

Figure 3. Most counties have experienced increases in the number of days each year when daytime high temperature exceeds 95°F (left) and when nighttime low temperature remains above 65°F (right). Southern Nevada experienced much larger changes in the number of warm nights than northern Nevada did. Changes between the periods 2001–2019 and 1981–2000 are shown. Maps use daily PRISM data, summarized in SC-ACIS. County boundaries are from the U.S. Census Bureau.



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As Nevada’s climate continues warming generally (Figure 2), the severity and number of extreme heat days and nights are also projected to increase markedly (Garfin et al., 2018; Jones et al., 2015; Mora et al., 2017). In the near term, much of Nevada is expected to experience 30 or more days per year when the daytime high exceeds 95°F, with the largest increases in west-central Nevada (Figure 4). Very warm nights are also expected to increase in frequency, with southern Nevada in particular experiencing 25 or more days each year

when the nighttime temperature remains above 65°F (Figure 4). In the long term, projected increases in heat extremes are significantly different depending on the trajectory of future GHG emissions. Much of the state (Figure 5) is projected to experience 30 or more days of extreme heat days as defined above per year under the higher-emissions scenario compared to the reduced-emissions scenario.

Figure 4. As in Fig. 2, but for near-term changes in the annual number of days when the daytime high temperature will exceed 95°F (left side) and when nighttime low temperatures will not drop below 65°F (right side). Figures use the higher-emissions scenario, RCP 8.5. By midcentury, an extra four weeks of hot days are projected for many parts of the State, and an extra two to three weeks (especially in the south) of hot nights are projected.

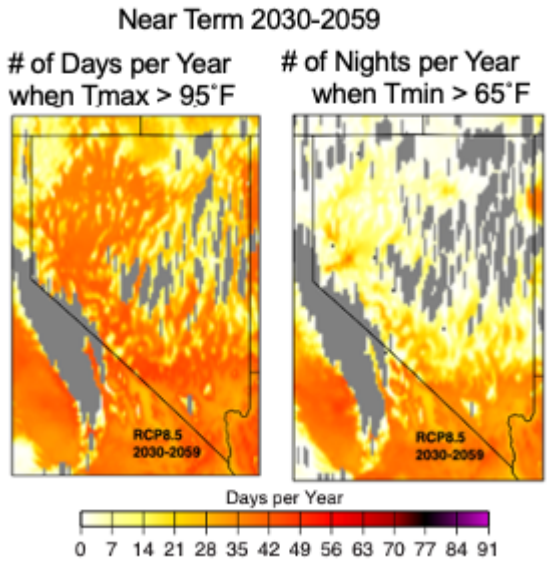

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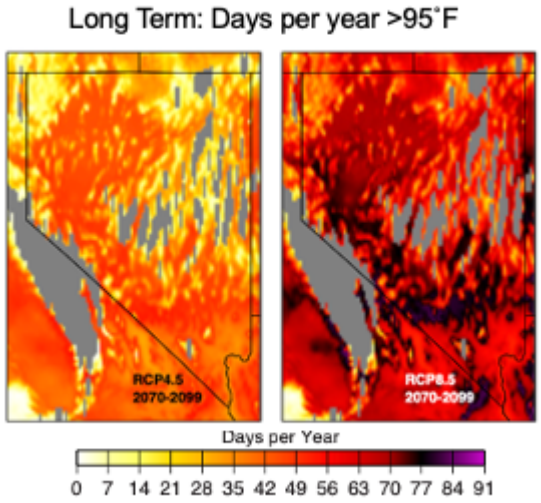
Figure 5. As in Fig. 2, but for long-term changes in the number of days per year when daytime high temperature will exceed 95˚F. By end of century, six extra weeks of hot days are projected in most of the State under the reduced GHG emissions scenario, RCP 4.5 (left) and a scorching 10 to 12 more weeks of hot days under high GHG emissions scenario, RCP 8.5 (right)



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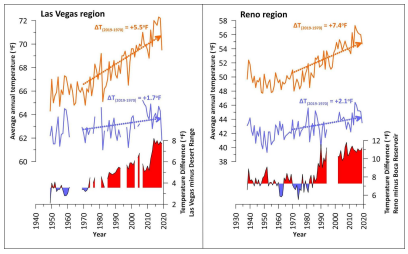
In addition to the warming documented statewide, Reno and Las Vegas have both experienced greater warming of annual temperature by 5°F and 4°F, respectively, than nearby rural areas (Figure 6). In particular, nighttime temperatures (the minimum daily temperatures) are

Figure 6. Trends in average annual temperature at the Las Vegas McCarran International Airport and the Desert National Wildlife Refuge (left), and Reno International Airport and Boca Reservoir, CA (right). Data from SC-ACIS. Bottom colored plot shows the temperature difference between the airport stations and the rural stations, with red coloring above the average temperature

increasing much more rapidly in the urban centers, the result of paving, buildings, and other land-use changes, called the urban heat island (UHI) effect (Box 1). Both Reno (Hatchett et al., 2016) and Las Vegas (Kamal et al., 2015; Miller, 2011) are known to have UHIs, which add to the broader-scale warming trends (Kamal et al., 2015). This urban heating can be expected to continue, leading to greater warming in cities beyond what is seen in regional climate projections.

difference for the 1950 through 1979 period. The trend lines are for the 1970–2019 periods. Gaps in the data are for years in which 36 or more daily observations were missing.



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Box 1. Urban Heat Islands

Urban heat Islands occur in developed areas that retain heat, leading to higher temperatures relative to more-rural, non-developed surrounding areas. Heat is released from vehicles, power plants, and other machine and equipment, along with the stored solar energy in buildings and other infrastructure. Together this causes the increased temperatures. This is in part illustrated by the photo below, where the black lizard is recording a higher temperature due to absorbing more solar energy. Urban heat islands often show a stronger nighttime temperature trend compared to rural areas because heat in urban areas does not dissipate due to the infrastructure.

Photograph shows the effect of albedo on temperature. A thermometer in the white lizard reads 95.7°F and the black lizard sculpture reads 142.5°F. Photo from Springs Preserve, Las Vegas (Lachniet).

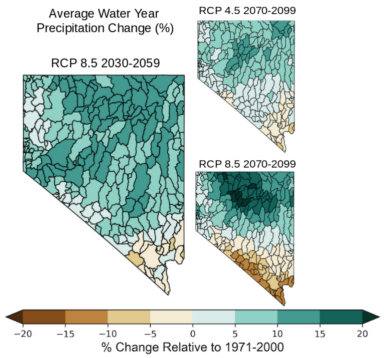
PRECIPITATION AND DROUGHT

Nevada is the driest state in the nation in terms of annual average precipitation (combined rain and snowfall). Las Vegas and Reno rely on water supplies that come primarily from mountains outside of Nevada (Box 2). The Rocky Mountains account for approximately 90% of the water supply to the Las Vegas Valley via the Colorado River, and the Sierra Nevada provides most of the water to Reno and surrounding areas. Elsewhere, local precipitation is critical for Nevada's natural ecosystems, as mountains block clouds and cause local precipitation, which in turn recharges valley aquifers and springs to maintain healthy rangelands, forests, and riparian zones. Such local precipitation also provides snowpack and water supplies to smaller rural communities.

Nevada is the driest state in the nation. Nevada's precipitation has historically been among the most variable from year to year in the United States.

Nevada's precipitation has historically been among the most variable from year to year in the United States (Dettinger et al., 2016; Dettinger et al., 2011). In large part because of this high variability, no trends have been detected; any trends are indistinguishable from the large range of year-to-year differences. Projected changes in precipitation remain quite uncertain, as not all models agree on the direction of change —some models project a wetter outcome, others a drier future, and still others project almost no change. The difference between the models is in part a result of the highly variable nature of the precipitation in Nevada (Deser et al., 2012). Using the average projections (combining outputs from many different climate models) helps to minimize the impact natural variability has on the future

Figure 7. As in Fig. 2, but for near-term changes in water year (October–September) total precipitation (left side) and for long term changes (right side). Only seven global climate models are used here (vs. ten models for Fig. 2). Across much of the State (except in the far south), 5-15% more precipitation is projected, as the average of 10 global climate models, some of which project some drying and some of which project more precipitation.



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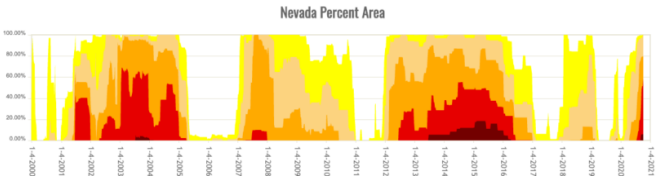
projections. The average projections lean towards a possible small increase in precipitation across all but the southern tip of Nevada in the near term (Figure 7). The largest seasonal increase is projected to be in winter, with an average 15–30% precipitation increase across Nevada. The Clark County region is projected to dry during all other seasons. Despite these uncertain projections of small increases in precipitation, droughts (discussed below), snow loss, and flooding (discussed in the next sections) are all fairly likely to increase in intensity and frequency because these increases are due directly or indirectly to warming, which is confidently projected.

Nevadans are no strangers to drought. While much of the region is generally arid or semi-arid, precipitation shortages combined with growing losses due to evaporation have already led to hydrologic (water supply) droughts being more common than not since the start of the 21st century (Figure 8).

Figure 8. U.S. Drought Monitor weekly time series showing how much of Nevada (in % area of the state) falls into each drought category over the past 20 years (January 1, 2000 through October 13, 2020): D0 (abnormally dry), D1 (moderate drought), D2 (severe drought), D3 extreme drought, or D4 (exceptional drought). Source: https://droughtmonitor.unl.edu/



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Source: https://droughtmonitor.unl.edu/

Droughts still become more likely in the future… stressing Nevada's water-limited ecosystems.

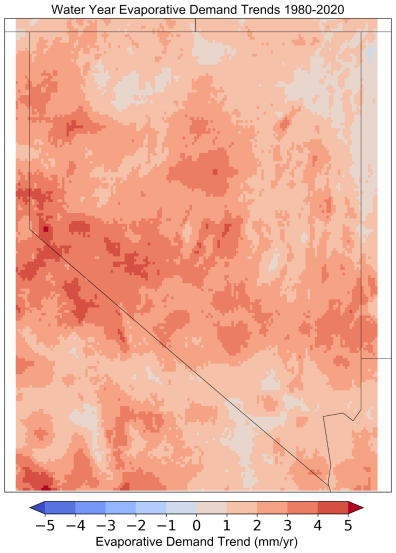
Projections of future droughts depend not only on changes in precipitation, but also on evaporative demand. Evaporative demand—the atmospheric thirst driven by temperature, wind, humidity, and solar radiation—plays an important role in droughts and can be particularly impactful in water-limited regions like Nevada (Hobbins et al., 2017). There is an imbalance between precipitation supply and evaporative demand across nearly all of Nevada (with the exception of high-elevation mountains) such that more water could be evaporated than actually falls as rain and snow. Therefore, it is critical to consider both precipitation and evaporative demand to understand drought in Nevada. When evaporative demand is higher than normal, soils dry out faster and vegetation (both live and dead) becomes drier, leading to increased fire risk, degraded ecosystems, and snow is lost more rapidly.

Over the past 40 years, evaporative demand has strongly increased in Nevada, with the fastest increases in the west-central part of the state (Figure 9). Climate projections indicate this trend will continue through the end of the 21st century (Figure 10). Despite projected (if uncertain) increases in precipitation across the region (Figure 8), droughts still become more likely in the future due to increased evaporative demand primarily as a result of increased temperature (Figure 2), stressing Nevada's water-limited ecosystems. One measure of drought that accounts for both precipitation and evaporative demand is the Standardized Precipitation Evapotranspiration Index (SPEI; Vicente-Serrano et al., 2010) which has been found to be a good indicator of low streamflows and reservoir levels in Nevada (McEvoy et al., 2012). SPEI projections indicate that what counts as a moderate drought (D1 on the U.S. Drought Monitor scale, or about two events per decade) under today's climate will become 3–4 times more common by mid-century for much of the state (Figure 11).

Figure 9. Observed trends in water year (October 1–September 30) total evaporative demand for the period 1980–2020. Evaporative demands have increased almost everywhere in the State, amounting to between 20 and 200 extra mm of demand over the 40-year period shown here. Source of trend computations: app.climateengine.org.

Figure 10. As in Fig. 7, but for near-term changes in average total evaporative demand (left side) and for long-term projections (right side) Evaporative demand is projected to increase everywhere in the State this century, and could increase by as much as 20% (of historical totals) in some places, by end of century.

Figure 11. As in Fig. 7, but for near term changes in water year standardized precipitation evapotranspiration index (SPEI) (left side) and for long term (right side). The SPEI represents normalized difference between precipitation and evaporative demand. Negative SPEI values (yellow, browns, and reds) indicate drought and positive SPEI values (blues) indicate wetness. U.S. Drought Monitor



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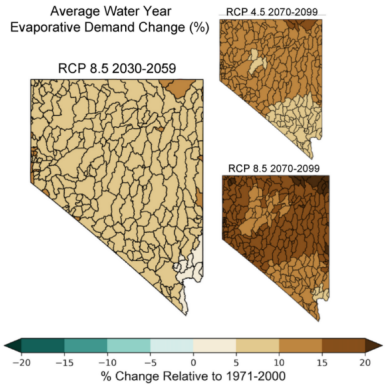

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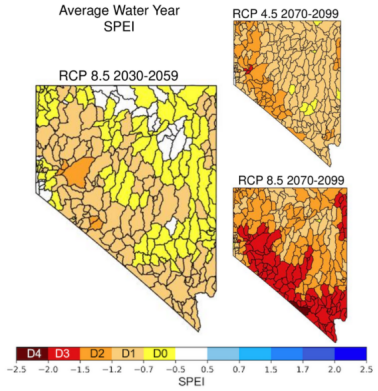
Source:
http://www.climatologylab.org/gridmet.html

classifications of abnormally dry (D0), moderate drought (D1), severe drought (D2), extreme drought (D3), and exceptional drought (D4) are labeled on the color scale. The SPEI index of combined precipitation-evaporation drought is projected to decline (get drier overall) across the State, until by end of century, broad areas are on average in a D3-level drought condition under the higher emissions scenario (RCP 8.5).



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Box 2. Projected Changes in Southern Nevada's Most Important Water Source: The Colorado River Basin

Since 2000, the Colorado River Basin has experienced an extended dry period in which the average annual water supply has been 18% lower than the historical average, contributing to depletion of water storage in the major reservoirs to less than half of capacity. This recent drought, along with the increasing recognition that rising temperatures impact the hydrology of the basin, has led to concerns about the long-term reliability of the basin's water supplies. Research findings described in Colorado River Basin Climate and Hydrology: State of the Science (Lukas et al., 2020) demonstrate that the concerns are warranted. There is very high confidence regarding both future warming in the basin and in the role of emissions in leading to greater warming. Human-caused warming is already impacting droughts in the Colorado

River Basin: an attribution study of the recent 2000–2018 drought indicates that it was made more severe by human-caused warming (Williams et al., 2020).

The future of precipitation in the basin is projected less confidently, so that it is not clear whether there will be more or less precipitation in the future overall. Studies have shown increasing variation from year to year, and on storm-to-storm scales, of basin precipitation. Consensus projections of overall shifts in hydroclimate driven by a warmer climate suggest a shift toward lower spring snowpacks, earlier melt and runoff, lower annual runoff volumes, and increasing water demand. Projected runoff changes are expected to lead to less streamflow overall (Udall & Overpeck, 2017), with the largest streamflow reductions projected for the Lower Basin downstream from Lees Ferry, Utah (i.e., the part of the basin from which Las Vegas extracts Nevada's allotment of Colorado River water). A long-term perspective from tree rings and other paleoclimate data suggests that the Colorado River Basin has experienced droughts lasting many decades to many centuries, even in the absence of human-caused climate change (Lachniet et al., 2020; Routson et al., 2019; Williams et al., 2020; Woodhouse et al., 2010). These studies suggest that long-term drying (aridification) in the Colorado River Basin is a threat to water supply in southern Nevada and elsewhere, and the magnitude of future aridity in the Southwest will depend on the future trajectory of GHG emissions (Williams et al., 2020) and links with climate changes happening elsewhere (Lachniet et al., 2020).

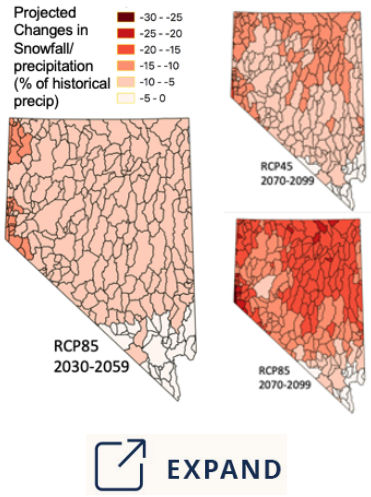
For more information, please visit https://wwa.colorado.edu/publications/reports/CRBreport/

SNOW LOSS & MELTWATER RUNOFF CHANGES

In Spanish, "Nevada" refers to "snow capped" and many of Nevada's mountains are indeed snow-covered during most winters. With more warming in the coming decades, though, more and more storms will drop rain rather than snow, even at high altitudes. In the near term, some 5–10% more of total precipitation is anticipated to fall as rain rather than snow, with basins around Tahoe and northwestern Nevada projected to experience 10–15% more rain rather than snow (Figure 12). By the end of the century,

Figure 12. As in Fig. 2, but for near-term changes in the fraction of annual precipitation falling as snow (left side) and for long-term changes (right side) The fraction of annual precipitation that falls as snow is projected to decline everywhere that snow falls historically.

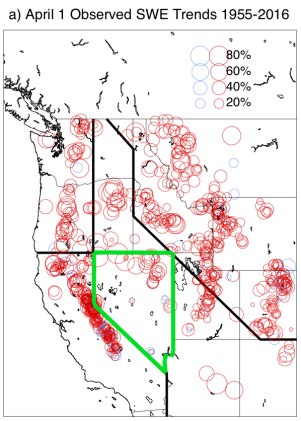
under the reduced-emissions scenario, Nevada could see approximately 10–15% more of its precipitation falling as rain rather than snow. Under the higher-emissions scenario, the proportion falling as rain could be 15–25% higher than today (Figure 12). The largest changes at the end of century are in northern and western regions of Nevada, while southern Nevada is not projected to receive much snow beyond mid-century.



In the near term, some 5–10% more of total precipitation is anticipated to fall as rain rather than snow.

With less precipitation falling as snow, and with snowpacks also more inclined to melt earlier due to the warming winters, the amount of water in April snowpacks—the time when snowmelt normally begins to swell the state's streams and rivers—is projected to decline 30–50% by the end of century in most basins in the state (Dettinger, 2020). Less water in April snowpacks, less precipitation falling as snow and earlier precipitation runoff are all trends already being witnessed across the northern parts of the state and the Western United States, and constitute consistent and confident findings in the scientific literature (Figure 13) (Fritze et al., 2011; Knowles et al., 2006; Mote et al., 2018, Stewart et al., 2005). This leaves the state's highlands and riparian areas drier by the

Figure 13. The April 1 snowpacks measured across the West (including in Nevada) has been declining for the past 60 years. This map shows measured trends in 1 April snow-water equivalent (SWE, the amount of liquid water that would result if all the snow on the ground was melted) at 699 snow courses in the Western U.S. during periods of record during 1955–2016; diameters of circles are proportional to percentage change during this 62-year period, with red for declining SWE and blue for increasing SWE (Mote et al. 2018).



time summer arrives (Harpold et al., 2014; Fritze et al., 2011).

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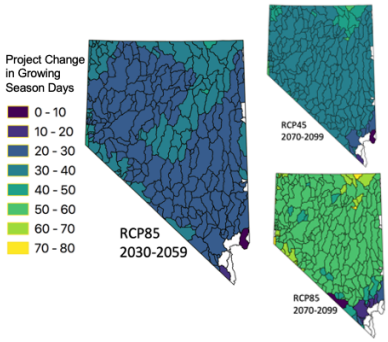
Less snow and earlier snowmelt runoff affect water management in Nevada, as snow serves as a natural reservoir. Furthermore, the loss of snow has implications for winter recreation, which would impact quality of life for many residents as well as winter tourism. A shorter snow season and/or a less-reliable winter snowpack imply a shorter ski season, which would impact tourism directly (i.e., at Nevada-based resorts) and indirectly, as some communities in Nevada may benefit from visitors to ski resorts located in neighboring California communities.

By the end of the century, the higher-emissions scenario projects approximately 3 additional weeks of growing season relative to the lower-emissions scenario. However, because of the longer growing seasons, plants will likely demand more water overall, and with more of the year's runoff occurring during the winter months, the growing season water demands and surface-water availability are expected to be increasingly out of sync, further challenging water management in Nevada.

The warming temperatures also are projected to lead to longer growing seasons for native plants and crops alike by an estimated 3–6 weeks in most basins in the near term (Figure 14). By the end of the century, the higher-emissions scenario projects approximately 3 additional weeks of growing season relative to the lower-emissions scenario (Figure 14, right). A longer growing season may provide some benefit to farmers in terms of season extension and crop diversity. However, because of the longer growing seasons, plants will likely demand more water overall, and with more of the year's runoff

Figure 14. As in figure 2, but for near-term changes in temperature-based growing season lengths (left side) and in long-term changes (right side). . Growing-season length is estimated here as the number of days between the last springtime occurrence of 6 days with temperatures below 50ºF and the first autumn occurrence of 6 days with temperatures below 50ºF. (https://www.extension.purdue.edu/extmedia/nch/nc 40.html)13 Across most of the State, excepting only the far south where cool temperatures do not limit growing season, growing seasons are projected to las 20 to 40 days longer by midcentury and as much as 50 to 80 days longer by end of century under the higher emissions scenario (RCP 8.5).

occurring during the winter months, the growing season water demands and surface-water availability are expected to be increasingly out of sync, further challenging water management in Nevada. Longer growing seasons may also propagate the expansion of invasive species and pests in many places.



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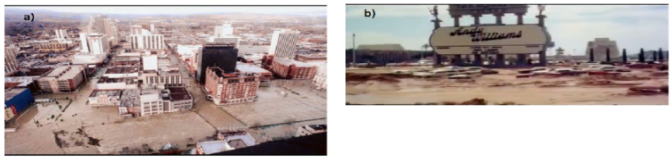
FLOODS

While Nevada is the driest state in the Union, the state has experienced many catastrophic floods. In northern Nevada, the worst floods typically are associated with warm, very wet storms that deposit copious amounts of rain over much larger areas than do more typical cold storms (Albano et al., 2016). The winters of 1997 and 2017 were particularly severe examples of these conditions and caused major flooding and flood damages in Reno and along both the Truckee and Carson Rivers (Figure 15). In southern Nevada, intense summer thunderstorms have unleashed flash floods that have crashed through neighborhoods and the resort corridor along the Las Vegas Strip with devastating effects (Figure 15).

Figure 15. Historical flooding in (a) downtown Reno, January 2, 1997 (photo credit: https://www.reddit.com/r/ImagesOfHistory/comment , and (b) across the Strip at Caesar's Palace in Las Vegas, July 3, 1975 (photo credit: http://water.nv.gov/home/pdfs/the%20flood%20of%2



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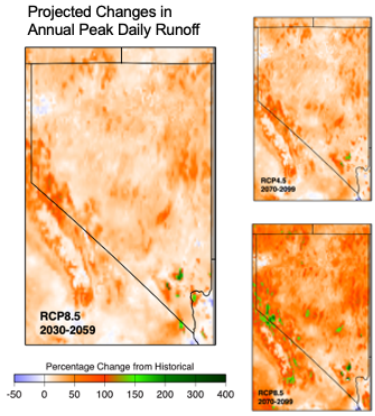
A warmer atmosphere can carry more water. When atmospheric conditions conspire to wring the water from storms, future storms are projected to become more severe more often. As a

result, the most-extreme storms are expected to become even more extreme.

The projected precipitation increases, with more coming as rain than as snow, and earlier runoff will result in shifts in the annual sequences and peaks of streamflow and aquifer recharge to earlier in the spring and winter in many of the state's basins. Because a warmer atmosphere can carry more water, when atmospheric conditions conspire to wring the water from storms, future storms are projected to become more severe more often (Gershunov et al., 2019; Kunkel et al., 2013). As a result, the most-extreme storms are expected to become even more extreme. This applies to both winter storms and summer monsoon rains. As a result of the projected changes, much of the projected increases in winter surface-water flows will come in the form of a much "flashier" flood flows regime for the state's streams and rivers with drier intervening periods. In the southern parts of the state, where snowmelt is less of an issue, more-intense monsoon thunderstorms in the future are expected to result in more-severe flooding risks.

Projected near-term and long-term changes in peak annual runoff rates (the maximum daily runoff rate occurring during the average year) are shown in Figure 16. Generally speaking, peak runoff rates are projected to increase more than 25–50% above historical peak rates across much of the state (especially in and around many mountain ranges) in the near term. In the long term, peak-runoff projections under a lower GHG emissions scenario (RCP 4.5) do not increase that much more compared to midcentury projections. Projections under the higher GHG emissions scenario (RCP 8.5) yield large additional increases (compared to midcentury) in peak runoff across nearly all of the state. A few locations, however, emerge as peak runoff "hot spots" that are projected to experience very large increases in the maximum runoff rates (e.g., around Las Vegas Valley, in various parts of the Walker River area extending up through the Carson River to

Figure 16. As in figure 2, but for near-term changes in annual-peak daily runoff rates (left side) and for the long term (right side).. With few exceptions, peak runoff rates are projected to increase by from about 25 to 50 or more percent of historical rates by midcentury, and by end of centiury, will have increased by more than 50% in much of the State under the higher emissions scenario. The green spots on each map are "hot spots" where peak runoff rates (and thus flood risks) are projected to increase substantially more (see discussion above).



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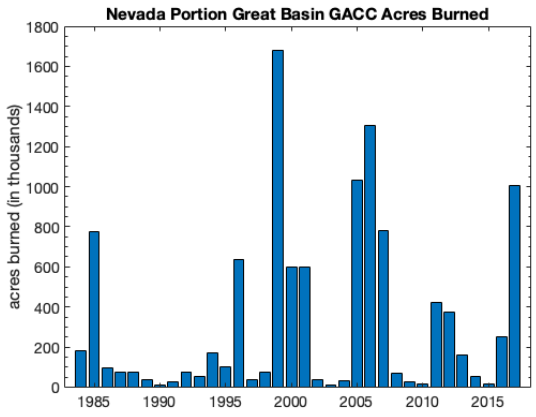
the Sierra Nevada catchments of the Truckee River) (Figure 16).

WILDFIRE RISK

During the period 1984–2017, 4 of the 5 years with the largest area burned have occurred since 2005.

Wildfire risk is influenced by land use, habitat, weather, and climate (Westerling et al., 2003) and regardless of risk, every wildfire needs some sort of ignition. Ignition is usually either human-caused (e.g., campfires, unextinguished cigarettes) or natural (e.g., lightning). Weather conditions prior to fires explain 27–43% of the variations in the area burned in the Great Basin (Pilliod et al., 2017), highlighting how climate can synergistically act with other factors to increase wildfire risk. When a wet winter is followed by a dry spring and summer, it is likely that more area will burn, suggesting that a seasonal drought is a larger factor that multi-year droughts in the Great Basin (Pilliod et al., 2017). During the period 1984–2017, 4 of the 5 years with the largest area burned have occurred since 2005 (Figure 17). Fire also creates a reinforcing feedback loop whereby cheatgrass more-commonly occurs and is more prevalent after fires, but it also increases fire risk (Bradley et al., 2018; Williamson et al., 2020). However, on the

Figure 17. Acres burned in 1,000s of acres for large fires for the Nevada portion of the Great Basin Geographic Area Coordination Center (GACC), the focal point for coordinating the mobilization of resources for wildland fire. Large fires are defined as those of 1,000 acres or more in extent. Data from the Monitoring Trends in Burn Severity: https://www.mtbs.gov/.



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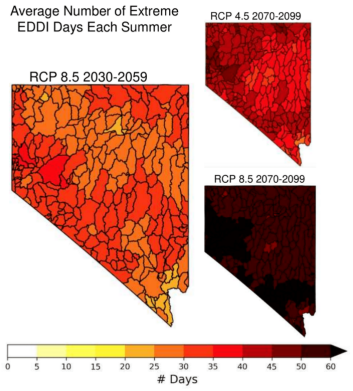
decadal timescale, if there is not a recurrence of fire, native sagebrush has been shown to return to areas once dominated by cheatgrass (Morris & Leger, 2016).

Spring and summer evaporative demand increases the wildfire risk by faster drying of vegetation. Evaporative demand in both seasons is projected to increase by 5–15% in the near term.

Changes in climate can affect the fire risk largely through variations in drying and warming. As mentioned above, winter precipitation is projected to increase throughout Nevada, which can increase wildfire risk through more vegetation and fuels growth (particularly grasses and small shrubs). Spring and summer evaporative demand increases the wildfire risk by faster drying of vegetation. Evaporative demand in both seasons is projected to increase by 5–15% in the near term (McEvoy et al., 2020). Moreover, the number of days with extreme evaporative demand each summer, which is largely indicative of increases in extreme temperatures, is projected to increase by 25–35 days (out of 92 possible days, or about 30% of the time) in the near term (Figure 18). By the end of the century the number of days with extreme evaporative demand is projected to increase by 10–20 days or more, depending on the GHG emissions scenario.

Figure 18. As in Fig. 7, but for near-term changes in the number of days with extreme (top 5% of all days) evaporative demand, indicative of fire weather conditions (left side) and for long-term changes (right side). The days are identified based on the 2-week Evaporative Demand Drought Index (EDDI). (More details in McEvoy et al., 2020 and Hobbins et al., 2016). Wildfire risks (as indicated by this measure) increase dramatically across the State.



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In addition to wildfire's direct risk to residential and commercial properties, infrastructure, and to business operations, wildfire can pose widespread risks to life and public health. Smoke from wildfires can travel hundreds of miles, impacting the health of Nevadans well beyond the immediate threat from the fire itself (Moeltner et al., 2013). Wildfire smoke is associated with respiratory issues and hospitalization, especially for the elderly and children under four (Delfino et al., 2009). Emergency room visits for those with asthma increase as a result of wildfire smoke as well (Kiser et al., 2020).

REDUCING CLIMATE CHANGE THREATS TO NEVADANS

The most-effective way to forestall or reduce the projected impacts of climate change is to help minimize climate changes themselves. Nevada is actively pursuing reductions in GHG emissions (mitigation) and is poised to also take on climate change preparedness and adaptation to build the resilience of its sectors and communities.

To this end, one aspect of this effort would be increasing technical capacity at the state level for climate-informed decision-making, including increased in-house climate expertise. These resources and expertise can be focused on working directly with state agencies and counties to support the development of climate resilience strategies designed to reduce the impacts of climate change on Nevada's economy, communities, and ecosystems.

A first step in this effort would be to build off this preliminary assessment into a comprehensive and regular assessment effort for Nevada that examines potential climate change impacts on the issues Nevadans most value and are concerned about. Such an assessment would allow resources to be more-effectively allocated in supporting the resilience of the ways of life and places most important to the people of Nevada.

Below we list examples of risks associated with different climate impacts, resilience-building efforts that have been adopted or are under consideration elsewhere, and insights that could be gleaned from research that would help characterize risks more usefully and identify additional opportunities to build community resilience. This list is not comprehensive, but rather illustrative of the scope and scale of considerations necessary to support climate resilience and adaptation planning. Future assessments could more-comprehensively assess potential risks and resilience-building efforts.

PUBLIC HEALTH RISK PROFILE

- Extreme heat killed more than 150 Nevadans in 2017 and 2018, and puts outdoor workers at risk.
- Extreme heat is likely to increase in already-warm locales and affect parts of the state that have not historically experienced regular, very warm temperatures.
- Decreased air quality via increased ozone levels associated with higher temperatures (Wise and Comrie 2005).
- Higher wildfire risk and the potential for increased wildfire risk to lives and property, along with health risks from smoke exposure to fires within and from outside Nevada.
- Increased frequency and/or severity of drought, along with mental health impacts, particularly in agricultural areas (OBrien et al., 2014; Vins et al., 2015).
- Air quality degradation from PM10 particles may become a public health hazard in areas near desert terminal lakes as lake levels decline and lake beds begin to dry.

EXAMPLES OF RESILIENCE-BUILDING ACTIONS

- In Nevada's cities, urban planners and public health officials can work together to help build resilience in the face of more-extreme urban heat and greater flooding potential by managing green spaces and increasing bright reflective surfaces in the built environment (Georgescu et al., 2014) to reduce the urban heat island effect and flooding risks.
- Enhanced situational awareness of events building off national, state, and county programs that already provide forecasting for these events and information about how people can limit their exposure (particularly for shorter-term heat and poor air quality events).
- Communication of insurance programs designed to mitigate the impact of drought on farms and ranches, which might offset some stress.
- Enhanced long-term, high-quality, spatially distributed monitoring of temperature and air quality with timely reporting to public health officials.

RESEARCH TO SUPPORT RISK ASSESSMENT & RESILIENCE-BUILDING

- Assess why Nevada cities have such large urban heat islands.
- Evaluate specific strategies or combinations of strategies that are most effective in mitigating urban heat islands in Nevada without creating negative side effects.

- Examine how the monsoon exacerbates or moderates public health impacts from extreme heat.
- Assess how dust from drought affects public health.

WATER RESOURCES RISK PROFILE

- Rising temperatures are likely to strain Nevada's water resources, even if precipitation increases or does not change.
- Nevada is already experiencing earlier snowmelt and longer growing seasons.
- Nevada is already experiencing more droughts from increases in evaporative demand.
- Snowpacks will decline as temperatures warm and a flashier surface-water flow regime is expected to develop in coming decades.
- Desert terminal lakes in Nevada will likely have lowered lake levels and increased salinity, endangering fisheries and culturally sensitive species, such as the Cui-ui in Pyramid Lake.

EXAMPLES OF RESILIENCE-BUILDING ACTIONS

- Fill weather and climate monitoring network gaps that have historically characterized Nevada to provide information critical to recognizing, measuring, and ultimately managing the changes that are projected to emerge this century.
- Maintain and, where feasible, enhance water-, land-, and flood-management practices and upgrade infrastructures to better accommodate future climate extremes and impacts.
- Begin to consider and test options for slowing stream discharges and increasing upland recharge with a flashier, more heavily runoff-dominated system. This would hold precipitation (water) in basins longer and slow passage from the uplands to the basin floors.
- Project and assess the likely impacts of climate change on water availability, water law and allocations, and perennial yields of basins throughout Nevada.

RESEARCH TO SUPPORT RISK ASSESSMENT & RESILIENCE-BUILDING

- Identify and track the specific stresses and impacts drought causes on different sectors, with attention to how these impacts will change in the future.

- Reevaluate flood risks in light of expected changes towards a flashier runoff regime in all parts of the state.
- Develop strategies and programs for slowing the passage of runoff from the uplands to the basin floors and for increasing deep percolation in groundwater recharge areas to counteract the projected trends towards earlier runoff and more flooding.
- Research directed towards improving projections of the future monsoon regime and storm intensities in southern Nevada.
- Reassess historical water-supply sources and qualities in the context of future climate changes in cooperation with management agencies.
- Conduct research into adaptation strategies that could alleviate the growing risks to recreation and tourism industries in Nevada.

RECREATION AND HOSPITALITY RISK PROFILE

- A shift from snow to rain and earlier snowmelt is expected to reduce the winter tourism season and potentially expand the summer outdoor recreation season.
- Increased wildfire risk and occurrence could lead to increasing public lands closures due to both fire risk and post-fire debris flow risk, affecting other forms of recreation and tourism.
- Increasing wildfire activity can also degrade air quality, which could discourage visitation.
- Increased heat in Reno, and particularly in Las Vegas, might impact tourism.
- Flooding can and has impacted tourism (for example, see the 1997 New Year's Flood in Reno).

RESEARCH TO SUPPORT RISK ASSESSMENT & RESILIENCE-BUILDING

- Assess the timing and predictability of the changing frequency of snowy winters in the near term.
- Determine the sub-seasonal to seasonal forecasts of winter snow needed for hospitality and outdoor recreation planning.
- Determine the type of heat waves that are most impactful on the hospitality industry.

AGRICULTURE AND RANCHING RISK PROFILE

- Increased drought intensity and/or frequency may limit crop and forage production.
- Longer growing seasons may benefit producers, particularly in cooler areas of the state.
- Large wildfires can cause economic harms for ranchers, due to livestock losses and damage to grazing lands.

EXAMPLES OF RESILIENCE-BUILDING ACTIONS

- Evaluate and connect existing tools and guidance (e.g., National Drought Mitigation Center, "Managing Drought Risk on the Ranch") for Nevada ranchers and farmers.
- Enhance and expand current efforts of researchers and producers working toward sustainable grazing management and crop production in water-scarce environments.
- Encourage rangeland resilience to prevent overgrazing, (e.g., grazing rotation).
- Improved drought monitoring to better inform application of existing drought policies and drought remedies.

RESEARCH TO SUPPORT RISK ASSESSMENT & RESILIENCE-BUILDING

- Determine barriers for implementation of forecast tools useful applicable to agriculture and ranching. (e.g., Grass-Cast grassland productivity forecast expansion).
- Assess what drought-tolerant crops can be grown successfully in Nevada and the market outlooks for those crops.
- Evaluate irrigation efficiency improvements.
- Understand plant uptake of water for Nevada-specific soils and the associated soil moisture relationships to crop vitality.

WHAT DO NEVADANS THINK ABOUT CLIMATE CHANGE?

Feedback from the stakeholder process was clear: Nevadans want a better future and they want action on climate.

> **"We must make radical moves to secure a future for our children and future generations."**
>
> *— Climate Survey Respondent*

> **"We are ALL human beings, and we ALL have something at stake in this challenge, something to lose."**
>
> *— Climate Survey Respondent*

> **"Nevada can continue to be a leader on climate action with actions as well as words."**
>
> *— Climate Survey Respondent*

Throughout the listening sessions, during small group meetings, through the survey, and at community-hosted events, Nevadans and community advocates were clear about what they want for the future: cleaner air, better health, an equitable society, economic stability, investment in renewable energy, and a clean environment.

Responses to the climate survey also show that Nevadans are worried about climate change: more than 75% of respondents indicated they are 'very concerned' about the issue (Figure 1). Drought, wildfire, air quality, and extreme heat are among the topics of greatest

concern (Figure 2). The results also show that Nevadans think the threat climate change poses to both the natural environment and local communities needs to be taken seriously (Figure 3).

More than 70% of survey respondents indicated Nevada needs to do more to combat climate change (Figure 4). Of those who indicated the state should *not* do more, open-ended responses indicate that some Nevadans thought state action alone was not enough and encouraged regional action, action from the federal government, and through international collaboration. For example, one Nevadan wrote: “The state should work with California, Arizona, Colorado, and New Mexico to develop a regional strategy for addressing the impacts of climate change.” Another commented: “Nevada is only a small part of the overall problem. We need a national sustained strategy.”

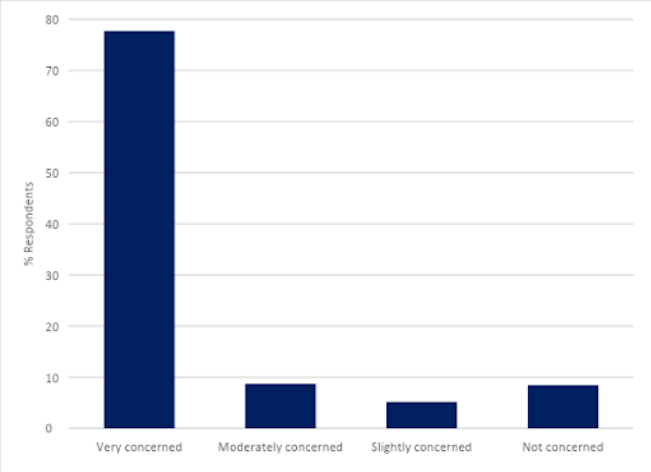

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Figure 1. Nevadans’ level of concern about climate change.

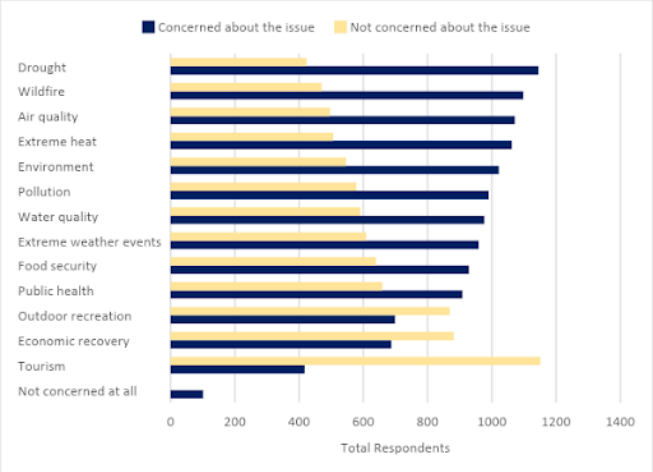

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Figure 2. How concerned are Nevadans about specific climate-related issues?

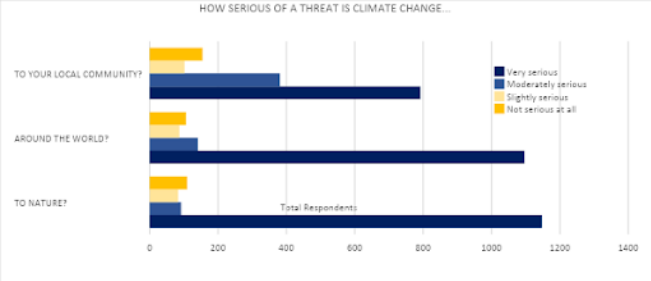

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Figure 3. How serious a threat do Nevadans perceive climate change to be?

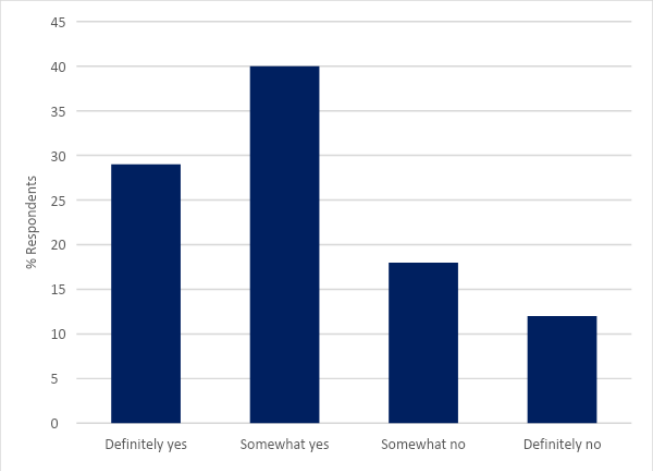


Figure 4. Do you think Nevada should do more to address climate change?

CLIMATE MITIGATION: REDUCING GREENHOUSE GAS EMISSIONS IN NEVADA

Greenhouse gases (GHGs) occur naturally in the environment and are an important factor in ensuring the planet's habitability. However, excessive GHG emissions from human activities are accumulating in the atmosphere, upsetting the natural balance, and rapidly driving up temperatures across the planet, the United States, and here in Nevada (NCA 2017; IPCC 2013). The shift in temperature has caused cascading impacts that pose risks to our state. Mitigating GHG emissions is imperative to ensure that we minimize the dangers of climate change for future generations.

To date, 189 countries have committed to reducing global emissions by 7.6% annually for the next 10 years in order to keep warming well below 2°C (3.6°F). China is currently responsible for the majority of global GHG emissions (>30%), but in September 2020 China committed to net-zero emissions by 2060. The United States ranks second in the world for emissions (~15%), but has the highest GHG emissions per capita of any country (UNEP 2019). Although statewide emissions represent 0.68% of the U.S. total with 0.9% of the U.S. population, the ambitious goals necessary to reduce the risks of climate change across the planet require action by everyone, everywhere.

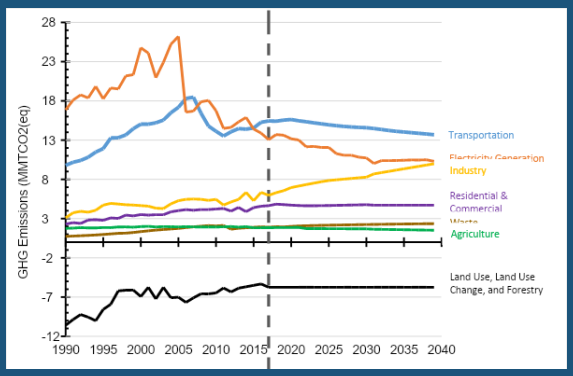
The U.S. federal government under the Trump administration has not adopted any emissions-reduction targets. However, Nevada is committed to reducing economy-wide GHG emissions along with the other States that are members of the US Climate Alliance. With the passage of SB 254, Nevada has adopted aggressive emissions-reduction targets: 28% below 2005 by 2025, 45% by 2030, and net-zero by 2050. According to the Nevada Division of Environmental Protection's (NDEP) 2019 GHG inventory (Box 1), under current policies and based on the best available science, Nevada is currently on a path to reduce economy-wide GHG emissions by 24% in 2025 (4% short of the 28% goal) and by 26% in 2030 (19% short of the 45% goal). Consequently, new mitigation-focused policies, programs, investments, and regulations are needed to meet these goals and put the state on the path toward realizing net-zero GHG emissions by 2050.

> **Under current policies and based on the best available science,**

Nevada is currently on a path to reduce economy-wide GHG emissions by 24% in 2025 (4% short of the 28% goal) and by 26% in 2030 (19% short of the 45% goal). Consequently, new mitigation-focused policies, programs, investments, and regulations are needed to meet these goals and put the state on the path toward realizing net-zero GHG emissions by 2050.

Box 1: Nevada's GHG Emissions

The portfolio of emissions across Nevada mirror the trends occurring across the United States, where transportation-sector emissions (35%) now exceed those from the energy sector. However, emissions of hydrofluorocarbons, a potent GHG used as a substitute for ozone-depleting substances, are rapidly growing. These industrial-sector emissions are associated with air conditioning and refrigeration. Under the current suite of policies in place, energy-sector emissions are projected to decline through 2030, while transportation-related emissions modestly decline, then flatten. Industrial emissions are expected to increase through the future, while those tied to the residential and commercial sectors stabilize. The carbon sequestration capacity of natural and working lands, represented in the land use and land change sectors, represents significant uncertainty for two reasons. First, there is little information about the amount of carbon stored in high desert landscape, as most research has focused on forests. Second, burning of forested ecosystems by wildfires releases large quantities of GHGs, which can dramatically



alter annual emissions depending on the extent of burning in a given season. – from the 2019 NDEP GHG inventory

How Will the Impacts of COVID-19 Affect GHGs?

The unprecedented global shutdown driven by the COVID-19 outbreak in early 2020 brought dramatic declines in many forms of transportation as people were confined to their homes. The dramatic decline in travel drove a ~17% reduction in daily global CO_2 emissions at the peak of global stay-at-home orders in April 2020 compared with the year prior. Total annual emissions for 2020 may decline by 4–7% relative to 2019 depending on the trajectory of the pandemic and related restrictions (Le Quere et al., 2020). However, the overall impact of these reductions on total atmospheric GHG concentrations and global temperatures will be imperceptible. The rate at which human activities are adding GHGs to the air far exceeds the natural processes that remove them. This has been occurring for at least the last century, at rapidly increasing rates. Even a full year of reduced emissions cannot significantly compensate for the large amount of GHGs already released into the atmosphere. Total concentrations of CO_2 are only expected to be 0.3 ppm below what they would have been had the world not had to stay home in the spring (Betts et al., 2020). To put this in perspective, from 2010 to 2020, the annual increase in concentrations averaged 2.4 ppm, or 24 ppm in total. The reduction in activity during spring 2020 will have a marginal impact on reducing global temperatures and demonstrates the scale of global action necessary to reduce GHG emissions.

CLIMATE MITIGATION POLICIES: DIGGING DEEPER INTO WHAT NEVADA CAN DO

The 2020 *State Climate Strategy* provides an integrated framework for evaluating climate policies. Given the complexities of climate change, it is imperative that policies to reduce GHG emissions be approached systematically so there is a clear understanding of the benefits and tradeoffs. This will optimize effectiveness of each given policy and therefore maximize the benefits for all Nevadans.

The policies contemplated in this strategy were drawn from the NDEP's 2019 GHG inventory, which includes a catalog of policy options that could further reduce statewide GHG emissions, as required by SB 254. This list was developed by identifying climate mitigation policies adopted by other states (e.g., Oregon, Colorado) and through consultation with experts at the U.S. Climate Alliance. Some of what is included in the GHG emissions inventory list is conceptual. However, there are very specific policies identified throughout the document. These targeted ideas were considered in further detail by interagency working groups.

> **The 2020 *State Climate Strategy* provides an integrated framework for evaluating climate policies.**

These teams applied a consistent, risk-based framework using four different metrics to evaluate what is and isn't known about the potential outcomes of adopting a specific policy in Nevada. The working groups completed this evaluation for 17 policies. Every attempt was made to analyze all of the specific policies, programs, and regulations outlined in the NDEP policy catalog. However, time, resources, and the realities of COVID-19 constrained the assessment's comprehensiveness. Fortunately, this strategy is a living document and the working groups will continue evaluating options under current policies identified in the strategy and periodically reassess them, as well as evaluate new and emerging policies.

For each policy, the working group assigned a color-coded designation for each metric that indicates the current level of knowledge about outcomes expected should the policy be adopted in Nevada. A yellow designation does not necessarily mean that a policy is inappropriate for Nevada. Rather; it indicates that the current level of information and analysis for a given metric is highly uncertain or incomplete. Conversely, a dark green designation does not indicate that a policy is appropriate for Nevada; it indicates the current level of information and analysis for a metric has a high level of confidence or certainty.

This metric-based approach to policy evaluation is unique and appropriate for Nevada. It establishes a framework with specific metrics designed to track progress and policy impact, while informing future public policy discussions and choices.

The four metrics and the color-coded assessment guidance are briefly described below.

Metric 1: **GHG Emissions-Reduction Potential:** What emissions reductions can be achieved, and on what timeline, by implementing the policy?

Insufficient or highly uncertain information resulting in significant uncertainty about the magnitude of the emissions reduction & timeline	Minimal and/or uncertain information resulting in uncertainty about the magnitude of the emissions reduction & timeline	Adequate and/or somewhat certain information resulting in uncertainty about the magnitude of the emissions reduction & timeline	Robust information with little uncertainty resulting in confidence about the magnitude of the emissions reduction & timeline

Metric 2: **Climate Justice Considerations:** Have communities of color, low-income households, and tribal partners (i.e., Indigenous communities) been directly engaged and consulted about the challenges and opportunities associated with the policy? Will the policy avoid any negative impacts to vulnerable communities, provide the opportunity for a net benefit, and/or reconcile broader social justice issues?

Insufficient information about challenges & opportunities Significant additional stakeholder consultation needed -OR- Significant negative impacts to vulnerable communities with no benefit	Minimal information about challenges & opportunities Additional stakeholder consultation needed -OR- Primarily negative impacts to vulnerable communities with little to no benefit	Adequate information about challenges & opportunities Minimal additional stakeholder consultation needed -OR- Primarily positive outcomes for vulnerable communities with minimal negative impacts	Robust information about challenges & opportunities Comprehensive stakeholder consultation -OR- Positive outcomes for vulnerable communities

Metric 3: **Budgetary & Economic Implications:** What resources are needed for the policy's implementation and administration? What is the long-term return on investment?

Insufficient or highly uncertain information available to assess	Minimal or uncertain information to inform estimates of the economic implications	Fair degree of confidence in estimates of economic implications with minimal uncertainty	Robust estimates and full picture of economic implications

Metric 4: **Implementation Feasibility:** What are the legal barriers to the policy's implementation?

Legal hurdles will be difficult to overcome (e.g. federal law, NV constitutional issues) and require significant time and process	Legal challenges exist, but are surmountable; may take a bit of time to navigate implementation	Minimal legal challenges	Authority exists and clear path forward

The policies evaluated using this framework are organized by the GHG emissions sectors identified by NDEP. Recognizing the complexities of these policies and how they may be interconnected, each policy is labeled with an icon that represents different relevant policy spheres (Table 1).

Table 1.

GHG Emissions Sector	Policy Spheres	Icon

GHG Emissions Sector	Policy Spheres	Icon
Transportation	Vehicle Emissions Reductions, Mass Transit	
Electricity	Power Generation, Transmission	
Industry	Ozone-depleting Substance Substitutes	
Residential & Commercial	Green Building Standards, Energy Efficiency	
Land Use & Land Change	Natural & Working Lands, Development & Land Use, Urban Planning	

NDEP POLICY CATALOG

The policies contemplated in the State Climate Strategy were drawn from the NDEP's 2019 GHG inventory, which includes a catalog of policy options that could further reduce statewide GHG emissions, as required by SB 254. The text of this component of Nevada's 2019 GHG Inventory is included here for reference along with links to relevant sections of the *State Climate Strategy*.

NDEP GREENHOUSE GAS INVENTORY 2019: POLICIES THAT COULD ACHIEVE REDUCTIONS IN PROJECTED GREENHOUSE GAS EMISSIONS BY SECTOR

As required by SB 254, this section identifies policies that could achieve reductions in projected greenhouse gas (GHG) emissions, organized by the GHG emissions sectors in this report. As noted in the introduction to this report, NDEP has included GHG emissions from the "waste" sector as an additional contributor to GHG emissions in Nevada necessary for monitoring and identifying policy proposals. NDEP coordinated with the Governor's Office of Energy, the Public Utilities Commission of Nevada (PUCN), the Nevada Department of Transportation, and the Nevada Department of Motor Vehicles in the identification of these policies. NDEP also reviewed policies included in climate change planning documents recently generated by the U.S. Climate Alliance, New Mexico, and Colorado, and other relevant sources.

This list is an initial identification of policies that could reduce Nevada's GHG emissions. It is not a list of recommendations. Individual policies listed herein need further evaluation to determine whether additional planning, legal review, economic impact and cost-benefit analyses, regulation, and/or legislation may be required prior to implementation. As required by Executive Order 2019-22, state agencies will be developing a specific set of policy and budget recommendations in a State Climate Strategy to be prepared by December 1, 2020. Policies are not listed in order of priority or feasibility.

ECONOMY-WIDE POLICIES

In addition to the sector-specific policies listed below, comprehensive economy-wide programs—including market-based mechanisms—need further evaluation to determine what may be appropriate for Nevada's GHG emissions profile.

ESTABLISH A LEAD-BY-EXAMPLE PROGRAM FOR STATE AGENCIES

State agencies can demonstrate leadership in reducing GHG emissions within their activities and operations. The program would identify multiple pathways to meet GHG reduction goals and provide necessary assistance to all state agencies in achieving the goals of the Lead-by-Example (LBE) Program. The program would promote sustainability activities within state government such as green building practices, waste reduction, alternative fuels, recycling programs, and sustainable travel.

TRANSPORTATION

VEHICLE EMISSIONS STANDARDS

Adopt California emissions standards, established though a waiver application as allowable under Section 209(b) of the *Clean Air Act* (CAA), for certain new motor vehicles or new motor vehicle engines and certain model years (at least two years before commencement of such model year). These include:

- California's Low-Emissions Vehicle (LEV) standards that sets vehicle manufacturer GHG emissions standards for new passenger cars and light-trucks;
- California's Zero-Emissions Vehicle (ZEV) standard that creates a credit-based program for vehicle manufacturers that requires an increasing percentage of ZEVs; and
- California's Advanced Clean Truck Program, which is currently in development, would create a program reducing engine emissions and increasing electrification of medium- and heavy-duty vehicles.

REDUCTION OF VEHICLE MILES TRAVELED

- Promote the use of non-single-occupant vehicle trips, including, but not limited to, carpooling, transit, micro-transit bicycling, and walking.
- Expand regional transit services through increases in trip frequency, service areas, and improved reliability while also providing greater incentives to increase transit service use.
- Adopt a statewide transportation demand management program for large employers, requiring that employers actively participate in minimizing the vehicle trips created by their business.

- Provide incentives for the procurement of LEVs and ZEVs for rideshare and other for-hire transportation services.
- Adopt pricing strategies such as increasing fuel taxes to reduce single-occupant vehicle usage/driving of personal vehicles.
- Adopt parking pricing strategies such as lowering parking costs for carpools and vanpools to encourage the use of these services.
- Adopt a statewide parking policy that discourages single-occupant vehicle use and encourages the use of carpools, vanpools, and other modes of high-occupancy vehicle travel.
- Adopt land use policies that discourage more-impactful development/encourage less-impactful development, such as transportation impact fees based on projected increases/decreases in vehicle miles travelled (VMT) and incentivize mixed use, high density, and/or infill development.
- Evaluate a requirement for high-occupancy vehicle lanes, rather than general purpose lanes, for any proposed highway expansion.

EQUITABLE TRANSPORTATION FUNDING SOLUTION

- Adopt a solution to fund Nevada's transportation system in a manner that equitably addresses carbon reduction, transportation system asset management and operations, and provides safe and reliable alternatives to single-occupant vehicle travel.

EXEMPTION FROM EMISSIONS INSPECTION FOR CERTAIN MOTOR VEHICLES

- Adopt one or more of the changes to the special license plate program that were recommended by the Advisory Committee on the Control of Emissions from Motor Vehicles in 2016 in order to require motor vehicles that would not normally be considered classic vehicles, but nevertheless meet the statutory requirements necessary to obtain special license plates (Classic Vehicles, Classic Rods, or Old Timer), to be treated in a manner similar to other motor vehicles in Nevada. The recommendations included in the 2016 study were made in consideration of preserving the interests of owners of legitimate classic vehicles.

INCENTIVIZE THE STATEWIDE TRANSITION TO LOW- AND ZERO-EMISSIONS VEHICLES

- Adopt a program similar to the federal Car Allowance Rebate System, colloquially known as "cash for clunkers," that provides financial incentives to vehicle owners to

trade in older, less fuel-efficient vehicles and replace them with LEVs and ZEVs.

- Provide incentives for the replacement of public transit and school buses to ZEVs.
- Provide outreach and education on the benefits of ZEV ownership.
- Promote existing ZEV incentives and rebate programs.

PROCUREMENT

- Adopt a coordinated, interagency economy-of-scale procurement program for state, county, municipal fleets, and school districts that supports LEV and ZEV acquisitions and realizes a reduction in individual unit costs.

LOW-CARBON FUELS

- Adopt a low-carbon fuel standard for transportation fuels.

ELECTRICITY GENERATION

RENEWABLE PORTFOLIO STANDARD

- Adopt a renewable portfolio standard (RPS) of 100% by or before 2050.
- Provide incentives to customers that are willing to invest in additional renewable energy and/or energy storage resources to ensure that they receive electric service from 100% renewable energy resources.

PHASE OUT FOSSIL FUEL-FIRED ELECTRICITY GENERATING SOURCES ⇆

- Adopt a freeze on the approval or construction of any new fossil fuel-fired electricity generating sources.

INTEGRATED RESOURCE PLAN PROCEEDINGS

- Move away from using natural gas-fired electric generating units (EGUs) as placeholders in integrated resource plan (IRP) proceedings to ensure that IRPs consider GHG emissions goals. This will improve the accuracy of future projections of GHG emissions and can occur in the absence of new legislation.
- Explore accelerated retirement of remaining coal-fired EGUs operating in Nevada, including merchant and load-serving plants.
- Prioritize decarbonization in IRP proceedings as part of, or in addition to, the low-carbon base case.

DEMAND-SIDE MANAGEMENT PROGRAMS

- Prioritize demand-side management programs that have the effect of reducing electricity use during periods of time when renewable generating facilities cannot be relied upon (for example, when the sun is not shining).

DEMAND-RESPONSE PROGRAMS

- Prioritize demand-response programs that shift load to periods of time when renewable resources can be relied upon to serve the load.

ELECTRIC UTILITY ELECTRIC VEHICLE INFRASTRUCTURE PLANNING

- Provide incentives to promote electric vehicle infrastructure/rate structure for more ZEV deployment.

REGIONAL MARKETS

- Evaluate regional markets (that is, potential extended day-ahead markets or the California Independent System Operator's Western Energy Imbalance Market) as new tools to integrate more renewables into the grid and to realize more renewable efficiency gains.

GRID MODERNIZATION

- Provide for the analysis of and/or initiatives to support a modernized grid that will:
- Promote resilience and protection from future disruptive events, including natural disasters;
- Continue to rate Nevada high on the grid modernization index;
- Be optimized for a changing supply and demand profile with technologies that:
    - Provide the flexibility and optimization, without undue strain on the grid, to integrate increasing:
        1. Distributed energy resources,
        2. Renewable energy resources, and
        3. Electric vehicles;
- Be capable of serving as a platform to allow flexibility and the integration of non-wire solutions such as demand- and supply-side software and hardware resources; and
- Ensure the grid is optimized for additional opportunities to reduce GHG emissions.

INDUSTRY

FUEL SWITCHING

- Provide incentives for stationary combustion sources that fuel switch to less-carbon-intense fuels.

ENERGY EFFICIENCY

- Provide incentives for the implementation of energy-efficient technologies and practices; including more-efficient ways to light and heat industrial facilities or to run equipment.

REDUCE, CAPTURE, AND RECYCLE OZONE-DEPLETING SUBSTANCE SUBSTITUTES

- Evaluate replacement, capture, and recycling (or other measures) that reduce the usage of ozone-depleting substance (ODS) substitutes.

OIL AND NATURAL GAS PRODUCTION

- Adopt more-stringent controls on emissions from oil and natural gas exploration, production, transmission, and distribution systems beyond the current federal emissions limitation requirements.

INDUSTRIAL PROCESSES

- Adopt more-stringent controls to capture and prevent the release of industrial process emissions.

SUSTAINABILITY

- Promote the production of industrial products from materials that are recycled or renewable, rather than producing new products from raw materials.

RESIDENTIAL AND COMMERCIAL

ENERGY EFFICIENCY

- Provide incentives for the renovation of existing homes and businesses to reduce their energy demand/make their homes more energy efficient.

- Adopt a stretch code that improves energy efficiency in new construction by 20% above the currently adopted International Energy Conservation Code (IECC).
- Establish a program that assists state, county, and municipal government agencies with the adoption, implementation, and compliance with the most recently published IECC on a three-year cycle.
- Adopt a statewide benchmarking program utilizing the Energy Star program to track water and energy consumption within the built environment. The program would be established such that once the benchmarking is completed, within a year of the establishment of the program, the energy efficiency measures identified through an energy audit will be prioritized and implemented to reach a specific goal. The program would be open to public and private buildings and will provide a challenge and reward mechanism for the buildings that participate and achieve the GHG emissions-reduction goals set forth within the program.
- Perform and provide an energy audit to buyers during the purchase of a residence, similar to an appraisal or home inspection. The audit should be provided to the potential owner prior to the closing to allow for the negotiation of implementing the measures before the closing occurs. This will increase awareness of efficiency measures available to the buyer along with the cost/benefit of implementing the measures to allow further insight into total home ownership costs.
- Adopt disclosure documents for potential property purchasers or renters to include overall estimated cost of operating the home or business to include energy and transportation costs (similar to what is currently provided with new appliances).
- Establish and adopt appliance energy efficiency standards. Create a timeline for residential and commercial properties to update appliances, which includes switching lighting throughout the building or residence from less-efficient technologies to the most current technologies that provide a higher level of efficiency.
- Establish a comprehensive on-site energy efficiency program that can be utilized by residential, commercial, and public-sector buildings to increase energy efficiency. The program should include occupant engagement and provide techniques for the occupants to increase efficiencies throughout the space.
- Provide incentives to increase renewable-energy-sourced electrification of the built environment. Incentives would be provided for new construction as well as for existing buildings, both residential and commercial, to switch from fossil fuels to all electric.
- Further develop and adopt the commercial property-assessed clean energy (PACE) program statewide.
- Evaluate the effectiveness of adopting a statewide residential PACE program.

REDUCE OR ELIMINATE FOSSIL FUEL USE

- Provide incentives for the conversion of fossil-fuel-dependent appliances to renewable-energy-sourced electric alternatives (examples include stoves, water heaters, and furnaces).
- Evaluate a freeze or limitation on the installation of gas lines to newly constructed homes and businesses.

DISTRIBUTED ENERGY STORAGE

- Provide incentives for the purchase of distributed energy storage at homes and businesses.
- Battery packs at residential and commercial buildings could store renewable electricity and use it when fossil-fuel-fired electricity is the only option, effectively reducing emissions.

INFRASTRUCTURE IMPROVEMENTS IN HOMES AND BUSINESSES TO FACILITATE TRANSITION TO ZERO-EMISSIONS VEHICLES

- Provide incentives for installation of charging infrastructure in existing facilities.
- Provide incentives for inclusion of EV charging infrastructure in new residential, commercial, and industrial settings.
- Establish a planning process to develop robust ZEV infrastructure for all vehicle types across a broad set of stakeholders, including:
    - A ZEV infrastructure planning process developed and implemented by an electric utility or rural electric cooperative;
    - Opportunities to incentivize and increase the development of workplace charging infrastructure for electric vehicles at existing commercial and industrial facilities;
    - Opportunities to incentivize and increase the development of charging infrastructure for electric vehicles for all types of existing residences, including those in underserved and rural areas;
    - Opportunities to incentivize and increase electric vehicle readiness for the new built environment by facilitating the addition of charging infrastructure for electric vehicles in new residential, commercial, and industrial settings;
    - Opportunities to support the increased development of electric vehicle charging infrastructure at state, county, and local government buildings; and
    - Incentivize and encourage the purchase of ZEV's that will utilize this infrastructure.

- Promote awareness and utilization of existing ZEV incentive and rebate programs.

FUNDING OPPORTUNITIES

- Establish a revolving loan fund to be utilized by state and local government wherein the realized savings are collected back into the account and used to further energy-efficiency measures across the existing building stock.
- Provide enhanced incentives through the Nevada Clean Energy Fund for the implementation of renewable energy, energy storage systems, and energy-efficiency measures in residential and commercial structures.
- Establish a loan program with local credit unions to offer low-cost, long-term financing for energy efficiency and renewable energy improvements for residential properties.
- Collaborate with utility companies, local municipalities, and rural cooperatives to utilize on-bill financing for energy-efficiency improvements in both residential and commercial properties.

CONTRACTING

- Utilize energy saving performance contracting to identify opportunities for energy conservation measures and implement the measures that will have the largest effect on reducing GHGs. Performance contracting is well-suited for large commercial buildings as well as state-, county-, and city-owned or -leased buildings.

WORKFORCE DEVELOPMENT

- Establish a clean energy workforce development program to increase training and education around climate action policies and new energy efficiency technologies to ensure a next-generation Nevada workforce with the knowledge needed to reach the statewide GHG emissions-reduction goals.

WASTE

EXPAND EFFORTS TO CONVERT FUGITIVE METHANE (CH_4) EMISSIONS TO CO_2

- Provide incentives for flaring and landfill-gas-to-energy (LGFTE) practices in solid waste landfills and wastewater treatment plants.

- Landfill Methane Outreach Program (LMOP) data can be utilized to identify landfills where the potential for flaring or LFGTE exists.

PRIORITIZE BIOGAS RECOVERED FROM LANDFILLS AND WASTEWATER TREATMENT FACILITIES FOR TRANSPORTATION

- Promote the use of biogas recovered from landfills and wastewater treatment facilities for transportation needs, rather than for electricity generation, where renewable alternatives for electricity generation are already present or can be adopted.

SUSTAINABILITY PRACTICES TO REDUCE METHANE EMISSIONS

- Promote or adopt practices that reduce waste production.
- Promote or adopt practices that increase diversion of organic waste.
- Provide incentives for construction of anaerobic digesters for the diversion of food waste and flaring and LGFTE practices of captured methane emissions.

AGRICULTURE

AGRICULTURAL LAND MANAGEMENT ACTIVITIES

- Promote and provide incentives for the adoption of silvopasture practices.
- Promote manure and nitrogen fertilizer management practices that reduce GHG emissions.
- Promote practices to reduce emissions from enteric fermentation.

CARBON SEQUESTRATION

- Provide incentives to sequester carbon through land restoration and retirement, thereby removing highly erodible or environmentally sensitive land from agricultural production.
- Promote “no-till” and “low-till” farmland management practices to protect soil from erosion.
- Promote hedgerow, windbreaks, and shelterbelts best practices to protect soil from erosion.
- Explore opportunities and incentives to increase carbon sequestration on agricultural and range lands.

LAND USE, LAND USE CHANGE, AND FORESTRY

CARBON SEQUESTRATION

- Promote land management practices that increase carbon sequestration by natural lands that are typical and/or native to Nevada.
- Expand specific programs (an example being nursery programs) to restore and enhance habitats, including wetlands, with measurable carbon sequestration co-benefits through the Nevada Department of Wildlife and the Nevada Department of Conservation and Natural Resources' Division of Forestry and Division of Natural Heritage.
- Expand existing efforts to protect sagebrush habitat through the use of the Sage Grouse Protection Conservation Credit System to include carbon sequestration co-benefits.
- Promote enhanced forest biomass utilization with stringent emissions controls, such as restarting the biomass cogeneration plant located at the Northern Nevada Conservation Camp in Carson City.

URBAN FORESTRY

- Promote urban reforestation and management.
- Adopt requirements for increased tree coverage when constructing residences and commercial buildings to increase canopy coverage and reduce heat-island effects in urban areas. Strictly enforced requirements will help reduce the urban-heat island effect as a driver of record-setting temperature increases in Las Vegas and Reno.

DECREASE RISK OF CATASTROPHIC WILDFIRE EVENTS

- Promote land management practices that decrease the risk of catastrophic wildfire events. Such efforts must include comprehensive planning to create more resilient landscapes to prevent wildland fires, and during restoration efforts after fire events.

CLIMATE MITIGATION: LEAD BY EXAMPLE

To demonstrate leadership in greenhouse gas (GHG) mitigation, many states have adopted "lead-by-example" policies within the executive branch of government. The Nevada Department of Transportation (NDOT) has undertaken an effort to design a suite of internal policies that will minimize its operational GHG emissions. Building off its work developing the department's new climate policy, NDOT developed a framework process that other state entities may use and adapt in order to develop their own GHG mitigation strategies. The details below provide a roadmap for how Nevada's state agencies can lead by example.

THE NDOT GHG EMISSIONS-REDUCTION FRAMEWORK

NDOT developed and implemented a policy and strategic plan to reduce GHG emissions within its operations. The following sections describe the steps taken to develop NDOT's policy and strategic plan to reduce GHG emissions within its operations.

ADOPTING 'GHG EMISSIONS REDUCTION FROM THE TRANSPORTATION SECTOR' AS ONE OF NDOT'S ANNUAL PERFORMANCE MEASURES

In support of the statewide climate goals, NDOT proposed GHG emissions reduction as a new performance measure for NDOT's annual *Performance Management Report*. Although specific targets are not identified, NDOT is committed to reducing GHG emissions to the maximum extent both within the department as well as from the transportation system as a whole. The Nevada Transportation Board of Directors adopted this measure on April 13, 2020.

These actions prompted NDOT to develop and implement strategies to reduce GHG emissions within operations and to track statewide transportation GHG emissions

reductions on an annual basis.

OPPORTUNITY TO PARTICIPATE IN A GHG EMISSIONS-REDUCTION WORKSHOP

In May 2020, the NDOT senior leadership team and agency partners were invited to participate in a virtual workshop on the draft GHG reduction guidebook being developed for the National Cooperative Highway Research Program (NCHRP). NDOT was one of four state DOTs (i.e., Nevada, Colorado, Delaware, and Hawaii) invited to participate in NCHRP Project 25-56, *Methods for State DOTs to Reduce Greenhouse Gas Emissions from the Transportation Sector*. The workshop was led by the NCHRP project consultant team and had two objectives: 1) to assist NDOT in applying the guidebook and working towards state GHG emissions-reduction goals, and 2) for the project team to obtain feedback on the draft guidebook before it is finalized. Some 60 participants representing 14 different Nevada entities participated in four two-hour workshop sessions over three days (May 4, 6, and 14). NDOOT implanted various strategies and resources identified in the NCHRP guidebook, including the next steps outlined here.

> **NDOT developed a framework process that other state entities may use and adapt in order to develop their own GHG mitigation strategies. The details below provide a roadmap for how Nevada's state agencies can lead by example.**

COORDINATING COMMITTEE

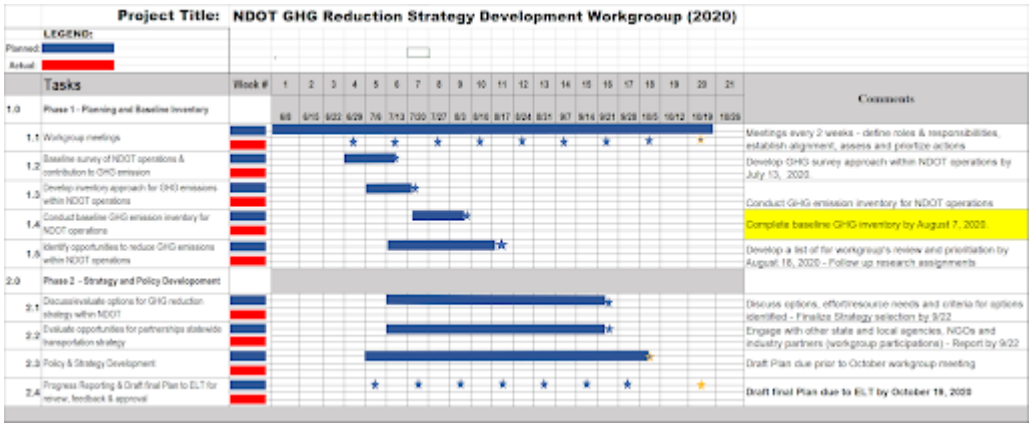
Building on the momentum from the May 2020 NCHRP workshop, a coordinating committee was formed by the NDOT executive leadership team to coordinate activities and facilitate the development of NDOT's GHG reduction policy and strategies. The six-member coordinating committee included representatives from NDOT's Environmental Division, Planning Division, and executive leadership team. The committee worked together to:

- Form an internal GHG Reduction Strategy Workgroup comprising leaders from programs and divisions primarily responsible for implementing GHG emissions-reduction goals,
- Identify steps in developing policy and strategies to reduce GHG emissions within NDOT operations, and

- Develop a timeline to complete NDOT policy and strategy development by mid-October 2020 (Table 1).

By June 2020, the coordinating committee developed a list of participants for the GHG Reduction Strategy Working Group.

Table 1. Timeline for Implementation of Policy and Strategy Development



EXPAND

GHG REDUCTION STRATEGY WORKING GROUP

The NDOT GHG Reduction Strategy Working Group comprised 25 members representing executive leaders, senior managers, and/or their representatives from:

- NDOT's executive leadership team (4)
- Planning: Multi-Modal, Performance Analysis, and Innovation Divisions (3)
- Project Delivery: Environmental, Project Management, Roadway Design, and Construction Divisions (7)
- Administration: Administrative Services, Equipment Management (2)
- Operations: Materials, Maintenance and Asset Management, and Traffic Operations Divisions (4)
- District Engineers and representative from all three Districts (4)
- Communications Division (1)

Beginning June 30, 2020, the working group met bi-weekly. The team was tasked with:

1. Reviewing recommendations from the NCHRP 25-56 Guidebook Draft 4.1 (April 2020) and conduct initial survey for NDOT functional units;
2. Conducting NDOT's baseline GHG emissions inventory;

3. Developing NDOT's GHG emissions-reduction policy;
4. Compiling a prioritized list of opportunities to reduce GHG emissions within NDOT operations; and
5. Developing a draft GHG emissions-reduction strategic plan by mid-October.

Carbon Benefits of Working from Home

Between March 18 and October 16, 2020, NDOT estimates a savings of 1,715 metric tons CO2(eq) in emissions as employees worked from home rather than commuting to their offices. This is approximately the total annual emissions of 230 U.S. households.

Consideration of work-from-home options, where appropriate and effective, has the potential to reduce GHG emissions and save departments expenses associated with energy, depending on the facilities and relative staffing levels.

Their estimate is based on the following assumptions:

- Number of NDOT staff on roster in FY 2020: 1,667 (HR data from August 2020)
- Estimated percentage of staff working from home since March 18, 2020: 50%
- Average daily commute miles for Nevada: 40.9 miles (car insurance data from 2016 Answer Financial Insurance Answer Center)
- Number of work days from March 18 – October 18, 2020: 149 days (accounting for 3 holidays)
- Additional avoided emissions were likely realized given decreased power demands at NDOT facilities with little or no occupancy.

OUTCOME

The following are products generated from the collaborative efforts of the working group:

1. Initial GHG benchmarking for NDOT functional units: completed by August 27, 2020.
2. NDOT's baseline GHG emissions inventory: completed by August 27, 2020.
3. NDOT's GHG emissions-reduction policy: completed by September 22, 2020.
4. NDOT near-term GHG emissions-reduction strategy table: compiled by September 24, 2020.

5. The draft GHG emissions-reduction strategic plan: completed by October 8, 2020.
   Note: The NDOT executive leadership team is currently reviewing the plan.

The draft GHG emissions-reduction strategic plan identifies activities where NDOT can implement GHG emissions-reducing measures and has direct control through its administration of programs or specific projects in three key areas: operations, construction, and planning. Table 2 lists select examples how NDOT will implement GHG emissions reductions within its operations. The full list of NDOT emissions-reduction measures can be found in the NDOT GHG emissions-reduction strategic plan.

Monitoring NDOT's GHG emissions reductions will require annual reporting to capture the previous fiscal year's activity unless otherwise specified. Beginning in 2023, and every three years thereafter, NDOT will determine which measures, if any, must be modified to reach the agency's GHG emissions-reduction goals.

Table 2. Examples of NDOT Operations GHG emissions-reduction measures.

Reduction Measure	Responsible NDOT Unit(s)	Associated Tasks
Procure more energy-efficient movable appliances and electronics.	Buildings & Grounds	Purchase appliances with an Energy Star rating of 75 or higher (top performer).
Procure more energy-efficient building HVAC, water heating, and lighting.	Buildings & Architecture	NDOT will purchase chlorofluorocarbon (CFC) updated compliant building cooling systems; purchase building heating systems, water heaters, and lighting to maximize energy cost savings.
Procure more energy-efficient or alternative fuel light-duty vehicle (AFV) fleets.	Equipment	AFVs capable of using E85 fuel are currently being purchased and used in Clark County; older vehicles are replaced with new cleaner-burning, lower-emissions versions.
Implement policies to support telecommuting or compressed workweeks.	Human Resources	NDOT will support wider use of part-time telecommute options.

Reduction Measure	Responsible NDOT Unit(s)	Associated Tasks
Install more energy-efficient roadway lighting.	Traffic Operations, Districts	NDOT uses updated specifications to install LED lighting fixtures on all projects and replaces legacy less-energy-efficient lighting fixtures within the limits of each project.
Reuse or recycle materials where feasible	Specifications, Construction, Districts	NDOT encourages recycling of metals and other materials in construction documents and as part of maintenance repair, replacement, and rehabilitation activities; NDOT will recycle other materials where feasible.
Plan maintenance activities to reduce unneeded delays or travel.	Maintenance	NDOT will continue to plan maintenance work around peak hours and special events as feasible to reduce delay or out-of-direction travel.
Provide real-time travel information to reduce congestion.	Traffic Operations	Real-time information to avoid congestion is available through the 511 Traveler Information System.
Alternative energy capture (e.g., solar, wind).	Traffic Operations, Districts	NDOT uses alternative renewable energy to power remote facilities where no electrical grid connection exists or when connecting to the power grid is too costly.
Consider the inclusion of non-single-occupant vehicle (SOV) vehicle trip projects (e.g., high-occupancy vehicle (HOV) lanes).	Design, Planning	NDOT has an HOV plan for the Las Vegas Valley; NDOT will evaluate HOV for any new travel lanes being considered on mainline freeways.

Reduction Measure	Responsible NDOT Unit(s)	Associated Tasks
Make GHG impacts a scored variable in the alternatives analysis.	Environmental	Scopes of work for environmental impact statements and environmental assessments will include GHG impacts as a criterion to determine which alternative is selected as a preferred alternative.

ADOPT LOW- AND ZERO-EMISSIONS VEHICLE STANDARDS

In June 2020, Governor Sisolak announced the Clean Cars Nevada initiative, with the goal of reducing greenhouse gas (GHG) emissions associated with personal transportation. Led by the Nevada Division of Environmental Protection (NDEP), the state is in the midst of a rulemaking process to evaluate the adoption of low- and zero-emissions standards for light-duty cars and trucks, beginning in model year 2025.

The low-emissions vehicle (LEV) standard would require car manufacturers to exclusively offer new vehicles for sale in Nevada that produce lower emissions of GHGs and other pollutants than those vehicles subject to federal emissions standards. The zero-emissions vehicle (ZEV) standard would set minimum credit targets for ZEV vehicles (including plug-in hybrid electric vehicles (PHEVs), battery electric vehicles, and hydrogen fuel cell vehicles) as a percentage of all new vehicles for sale in the Nevada market. The proposed rule only applies to passenger cars and light-duty trucks up to 8,500 lbs gross vehicle weight rating (GVWR) and medium-duty vehicles up to 14,000 lbs GVWR.

Similar LEV and/or ZEV regulations have been adopted in 14 states, all of which are based on regulations adopted in California. This is simply because the 1970 *Clean Air Act* allows California to seek a waiver to set stricter emissions standards than those set by the federal government, and provides the authority for other states to adopt California's standards. Note that the LEV for California and federal standards for vehicle model years 2021–2026 were set to be the same by the National Highway Traffic Safety Administration's (NHTSA) Corporate Average Fuel Economy (CAFE) rule. The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule part II amended the CAFE rule, creating a second set of less-stringent federal vehicle standards.

GHG emissions reductions from adoption of the LEV regulation will be directly correlated to the sales of new conventional vehicles starting with model year 2025, and to the level of car manufacturers' compliance—in particular through the sale of alternative fuel vehicles (AFVs). In contrast, the adoption of ZEVs and PHEVs across Nevada is far more complex than simply the adoption of ZEV regulations.

Issues including charging infrastructure, shifting energy demand profiles, end-of-life battery disposal, consumer interest, job creation, and other factors all must be considered.

GREENHOUSE GAS IMPLICATIONS

Increasing the relative proportion of new LEVs and ZEVs vs. the existing fleet and those powered by more-traditional fuels will reduce tailpipe GHG emissions. However, the extent to which LEV-ZEV regulations can reduce emissions on a timeline commensurate with the state's emissions-reduction targets will be driven primarily by market penetration and adoption rates. Simply, will Nevadans buy enough LEV-ZEV vehicles fast enough? And how will the economic impacts of the ongoing response to evolving COVID-19 conditions impact consumer purchasing?

According to the *Nevada Auto Outlook 2019*, total light-duty car and truck sales across Nevada declined by 4.7% through 2019, which is consistent with national trends. Light-duty truck sales continued to gain an increasing share of the total market, growing from 43.2% in 2012 to 67.8% in 2019. Sales of new hybrid and electric vehicles in Nevada represented 6.5% of the 2019 market share. Initially, total sales were up 25% for low- and zero-emissions vehicles through the beginning 2019, but dropped off rapidly later in the year.

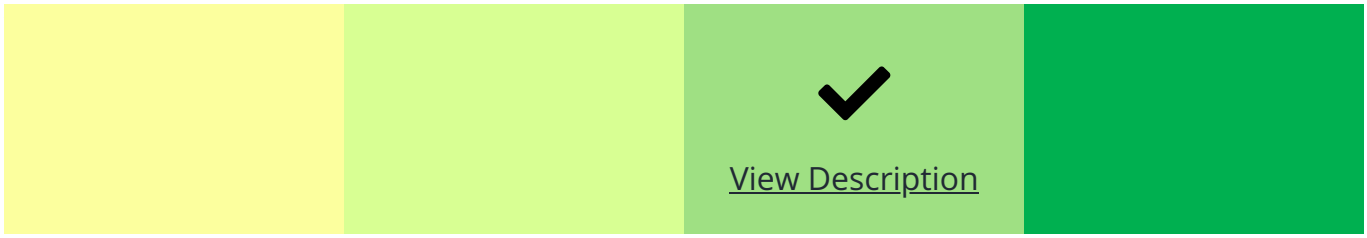
However, the onset of COVID-19 and the consequent economic slowdown drove new vehicle registrations in Nevada down by 12.7% between January and July compared to the same period in 2019 (*Nevada Auto Outlook Q2 2020*). Through the first half of 2020, the market share of electric, hybrid, and PHEV vehicles declined slightly (0.5% and less) relative to the same time last year. This contrasts with a 3.5% increase in relative purchases of light-duty trucks over the same time period.

How the market evolves in the coming years will be a complicated function of the COVID-19 pandemic's trajectory and the related economic, policy, and social response, as well as the affordability and desirability of the options available on the market. However, market availability of ZEVs in 2025 and beyond is expected to increase.

Multiple research entities are working to project the sweeping impacts of COVID-19 and the possible outcomes for different sectors of the economy—including the AFV, ZEV, and PHEV market. Estimates by the Rhodium Group suggest an increase in total sales of ZEVs and PHEVs in Nevada of 71–91% by 2025 compared with 2018. Their estimates for purchases by 2030 point to 4–5 times total Nevada ZEV and PHEV sales. While this gives a picture of the scope of possible outcomes, this is highly uncertain and there are multiple possibilities

(Rhodium Group, 2020). Indeed, it is clear that if tailpipe GHG emissions drop to zero, a majority of the transportation emissions in Nevada could be eliminated (NDEP, 2019).

Taken together, the impact of LEV-ZEV adoption on meeting the state's demands has the potential to significantly reduce the state's overall GHG emissions. However, the rate at



CLIMATE JUSTICE

During the listening sessions conducted in association with the State Climate Strategy, Nevadans expressed support for adoption of Clean Cars Nevada in that it would improve air quality. On the other hand, they expressed concerns about the up-front affordability of low- and zero-emissions vehicles currently available on the market. This is important given the basic need for car ownership more generally across low-income populations.

At present, new ZEVs and PHEVs cost more than a new car or truck with a traditional combustion engine. The lowest-cost options for new low- and zero-emissions cars available in the United States start at ~$25,000, and SUVs start upwards of $30,000 (ICCT, 2019). In general, purchase prices are higher for ZEVs than for conventional vehicles. This could limit affordability.

However, similar to other emerging technologies, as demand increases prices should decline, thanks to competition and expanded consumer options. For ZEVs, some estimates suggest significantly more options in the $20,000 range will be on the market by 2030 (ICCT, 2019). Given the size of the market in California, the state's adoption of a 100% by 2035 clean car standard for sales of new passenger vehicles will likely drive up national demand for electric cars and trucks, and perhaps accelerate a decline in price. It will also likely expand the secondary market, which would provide more-affordable used options.

Low- and zero-emissions cars and trucks are less-expensive to own and operate over their lifetime relative to gas- and diesel-powered options. Recent research suggests that ZEVs and PHEVs save a consumer $200–$1,300 each year in fuel costs (Borlaug et al., 2020). With

relatively lower electricity charging costs and relatively higher fuel costs, savings in Nevada may be at the mid to upper end of these estimates.

Compared with other states, Nevada has fewer options to implement incentive or rebate programs that would offset these investments (see below). The federal Qualified Plug-In Electric-Drive Motor Vehicle Tax Credit is available for PHEV and ZEV purchases until manufacturers meet certain thresholds of vehicle sales. It provides a tax credit of $2,500–$7,500 for new purchases, with the amount determined by vehicle size and battery capacity.

Reducing tailpipe emissions can improve air quality and public health outcomes, particularly among vulnerable populations. Vehicle emissions contribute to air pollution by releasing fine particles into the air, as well as nitrogen oxides (NOx)and volatile organic compounds (VOCs), which are the necessary ingredients to produce ground-level ozone. Communities exposed to excessive ground-level ozone and airborne particulate matter have an increased incidence of heart- and lung-related disease, including asthma, and associated emergency department visitation. Low-income households and communities of color are disproportionately exposed to air pollution and experience a commensurate increase in adverse health outcomes.

Although the overall air quality across Nevada and most of the United States has improved over the past decade due to smog regulations (McClure & Jaffe, 2018), there are still periods where ground-level ozone and/or particulate matter exceed federal standards in the state. The U.S. Environmental Protection Agency (EPA) designated the Las Vegas Valley as in nonattainment for the 2015 ozone National Ambient Air Quality Standards (NAAQS). Moreover, climate-change-driven increases in temperature can increase the production of ground-level ozone (NCA, 2018).

Further, areas in nonattainment for ozone (or other pollutants) are subject to stricter regulations by the EPA. There is a cost associated to be in nonattainment and such costs are paid by businesses and the regulated industry. The costs increase with the level of nonattainment severity, and these expenses could be passed to consumers.

Adopting Clean Cars Nevada has the potential to improve air quality, and improve the health of minority and marginalized communities. However, the affordability of low- and zero-emissions vehicles is a concern for low-income households, although the expansion of

View Description

INTEGRATED ECONOMIC ASSESSMENT

The consideration and implementation of rulemaking around LEV-ZEV requires coordination across multiple state departments and divisions, particularly NDEP and the Nevada Department of Motor Vehicles (DMV), in consultation with the Nevada Department of Transportation (NDOT) and Governor's Office of Energy (GOE). Since Nevada is in the early stages of this process, it is unclear what the necessary personnel and related budgetary requirements will be to implement Clean Cars Nevada and administer the program in the long term.

Of the 14 states that have or are in the process of adopting LEV-ZEV, state investments (or in some cases, estimated costs) align with their unique executive branch organizational structures and related authorities.

Colorado, for example, estimates it will need one additional full-time equivalent (FTE) to monitor and track ZEV credits and debits for each auto manufacturer and aid in program enforcement. This estimate is based on discussions with other states on their costs of implementing ZEV standards. Colorado is also incenting ZEV purchases with a generous income tax credit for alternative fuel vehicles. Consequently, an increase in ZEV sales would diminish state income tax revenue. However, the loss in state tax revenue goes back to the consumer to potentially expend in other sectors of the state economy.

Similarly, Oregon estimates the need for two FTEs at a cost of $500,000 per year to implement. These positions would ensure that the rules are current, oversee manufacturer compliance and enforcement, and coordinate with the DMV.

Estimated resources required by other states to administer LEV-ZEV are shown in Table 1.

Table 1. Estimated State Resources to Implement California Clean Car Standards

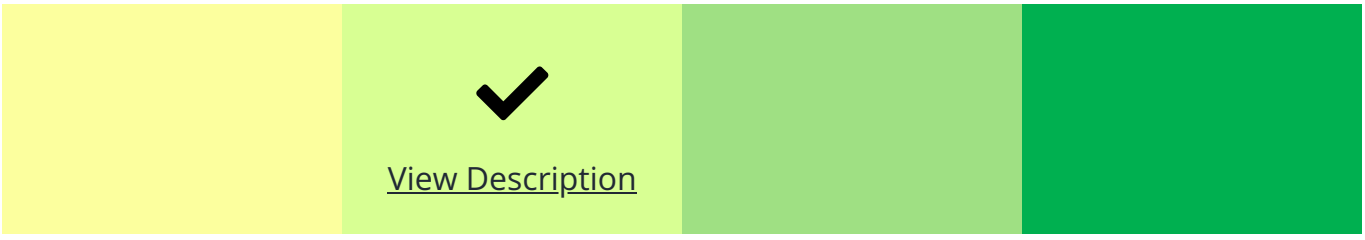
STATE	CA	WA	NY	MA	NJ	ME	CT	VT	RI
Full-Time Equivalent	~200	1.5	2–3	1	2	1	1	0.5–1	0.5

Other states that have adopted clean car standards have funded their programs in different ways. Some charge fees to fund their program, whereas others rely on general funds. For example, in Connecticut and Vermont, the DMV collects fees from vehicle owners at the time of registration.

- Connecticut registrants pay a “Federal Clean Air Act (CAA)” fee in addition to the regular registration fee each time they register or renew their car. A portion of this CAA fee ($4.25) is allocated to the Department of Environmental Protection and is used to pay for a variety of air quality programs, including the California vehicle emissions rules.
- Vermont has a similar program where the DMV assesses a “Clean Air” fee at the point of registration/renewal. Vermont’s fee (~$1 of the general registration fee) funds air quality programs, including the California vehicle emissions rules.
- In New York, all registered cars must get an annual safety inspection, and part of this vehicle inspection fee ($4) is used to fund the California vehicle emissions program and the mobile source section of the Department of Environmental Conservation.

Some state environmental agencies assess fees on the auto manufacturer rather than the individual registrant. New Jersey plans to charge large and intermediate-sized auto manufacturers $1 per vehicle sold in the state. The fee is imposed on potential users of the ZEV credit bank. California, however, tallies the cost of the on-road vehicle program and divides by the number of new vehicles sold in the state. Auto manufacturers are charged a proportion based on the number of vehicles sold in California. Other states do not charge a fee, and instead, rely on general fund money. Massachusetts and Maine use general funds to staff their California vehicle emissions rules program. Washington anticipates it will not collect fees, and instead, will use its general fund to staff its program. Rhode Island is not contemplating fees, but is still working out the logistics of its program.

Investment by the state will be necessary to administer a clean cars program in Nevada. However, there is a significant return on that investment specifically associated with reduced mortality and morbidity, including avoided health costs that map directly to improved air quality.



IMPLEMENTATION FEASIBILITY

The Nevada Revised Statutes (NRS) grant the authority required to adopt the LEV-ZEV regulations proposed under the Clean Cars Nevada initiative, although an amendment to the Nevada Administrative Code (NAC) would be required to implement the regulation. However, the waiver granted by the EPA to California under the *Clean Air Act* that underpins their LEV and ZEV regulations was revoked by the Trump administration in 2019, though the Biden administration is expected to reinstitute the waiver. The administration's authority to revoke these waivers is being challenged in court, and Attorney General Ford has signed Nevada to the multi-state lawsuit pending against the Trump administration. Similarly, Nevada is also party to a lawsuit asserting that the EPA violated the *Clean Air Act* by rolling back federal clean car standards that were set to begin in 2021. It is unclear how the announcement by California Governor Newsom committing California to eliminating the sale of new combustion-engine light-duty vehicles by 2035 may impact the waiver or the Nevada rulemaking process.

NRS 445B.100 establishes that it is public policy of the State of Nevada and the purpose of NRS 445B.100 to 445B.640, inclusive, to achieve and maintain levels of air quality which will protect human health and safety; prevent injury to plant and animal life; prevent damage to property; and preserve visibility and the scenic, aesthetic, and historic values of the state. The statute further states that it is the intent of NRS 445B.100 to 445B.640, inclusive, to require the use of reasonably available methods to prevent, reduce, or control air pollution throughout the State of Nevada. NRS 445B.760 establishes the authority of the State Environmental Commission (SEC) to adopt standards for emissions from mobile internal combustion engines found in motor vehicles after those standards have been approved by the DMV.

To fully enact LEV-ZEV regulation, the NAC Chapter 445B would need to be amended and would likely include a new subsection for the LEV and ZEV programs under the "Emissions from Engines" section. The subsection would likely need to include general provisions, definitions, severability, adoption of the California Code of Regulations by reference, LEV program provisions, ZEV program provisions, warranty and recall provisions, and civil penalties.

View Description

IMPLEMENT A CLEAN TRUCK PROGRAM

Nevada could evaluate implementation of a Clean Truck Program that includes requirements for low- or zero-emissions commercial truck sales in the state and/or operating requirements within the state. A Clean Truck Program could accelerate a large-scale transition of medium- and heavy-duty vehicles (MHDVs) within Class 2b to Class 8 from fossil fuels to zero-emissions technology (e.g., electric and hydrogen fuel cell).

The U.S. Environmental Protection Agency (EPA) estimates that MHDVs are the second-largest source of transportation-related greenhouse gas (GHG) emissions nationwide, noting that in 2018 light-duty vehicles represented 58% of CO_2 emissions from transportation fossil-fuel combustion and MHDVs represented 25%."

Like low-emissions vehicle (LEV) and zero-emissions vehicle (ZEV) standards, a Clean Truck Program would need to be based on regulations adopted in California. This is simply because the 1970 *Clean Air Act* allows California to seek a waiver to set stricter emissions standards than those set by the federal government and provides the authority for other states to adopt the California standards.

California adopted an Advanced Clean Truck (ACT) regulation on June 25, 2020. The regulation aims to accelerate California's transition to zero-emissions MHDVs (CARB, 2019; CARB, 2020). It has two parts:

- **Zero-emissions truck sales:** Manufacturers that certify certain truck chassis or complete vehicles with combustion engines would be required to sell zero-emissions trucks as an increasing percentage of their annual California sales from 2024 to 2035.
- **One-time large company and fleet reporting:** Large employers including retailers, manufacturers, brokers, and others would be required to report information about shipments and shuttle services. Fleet owners with 50 or more trucks would be required to report about their existing fleet operations. This information would help identify future strategies to ensure that fleets purchase available zero-emissions trucks and place them in service where suitable to meet their needs.

In addition to California, 14 other states have signed a memorandum of understanding (MOU) committing to collaborate on a multi-state action plan to support a sustainable zero-

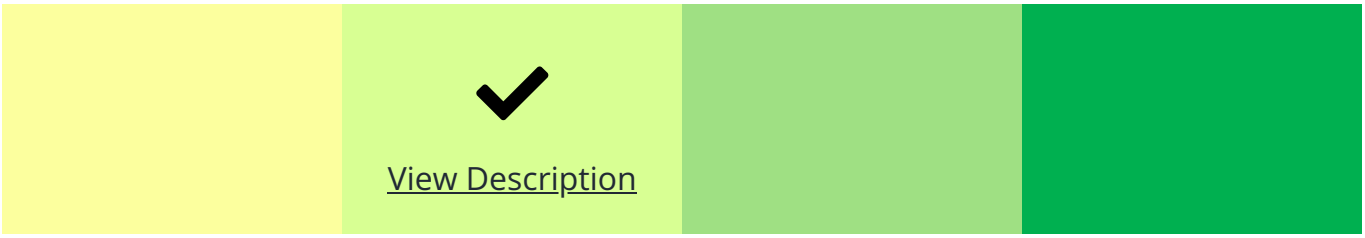
emissions MHDV market and widespread electrification of MHDVs. The MOU also includes agreement to reach 30% zero-emissions MDHV sales by 2030 and 100% by 2050, and to make progress toward electrification of state government and quasi-governmental agency MHDV fleets. The MOU contains several other elements, including consideration of the need for adoption of the California Advanced Clean Trucks Rule under Section 177 of the *Clean Air Act*.

With dedication of some additional personnel resources, Nevada could join these 15 states to participate in development of the action plan and associated efforts. An initial review of a Clean Truck Program and identification of issues for further evaluation is included below, and may be partially completed through Nevada's participation in the MHDV MOU and associated action plan with other states.

GREENHOUSE GAS IMPLICATIONS

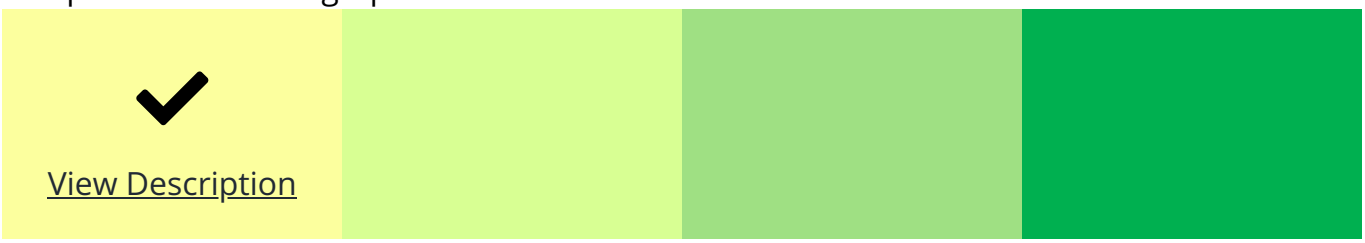
In order to adequately assess the potential GHG reduction, more information is needed, such as the market for MHDVs in Nevada as well as operating characteristics of the MHDV fleets in the state. MHDV charging infrastructure planning and investments would need to be evaluated in parallel with adoption of a Clean Truck Program to better predict GHG emissions-reduction impacts.

Operating characteristics of fleets, such as local delivery trucks that travel short distances within confined areas versus long-haul interstate trucking, would be necessary to understand both the opportunity as well as the effectiveness of this policy. Some of this information is available, but detailed analysis has not yet been done for Nevada. Approximately 70% of trucks operating within the state are coming from or going to California, so Nevada will likely benefit from regulations in California (Transearch Truck Data, 2018).



CLIMATE JUSTICE

As low-income and minority populations are often located in closer proximity to areas of high freight movement, such as freeways and industrial centers, this policy has the potential to have a beneficial impact to reduce the current disparity of emissions of criteria air pollutants (including fine particulate matter emissions from diesel MHDVs) among the population. As this policy may not affect freeway operations, the impact is uncertain without additional information on the areas with a high volume of short truck trips compared with demographic data.



View Description

INTEGRATED ECONOMIC ASSESSMENT

As this concept is still relatively new at the statewide level, costs and benefits are not yet well documented. For example, California is still undergoing rulemaking but has a detailed cost-benefit analysis of its ACT rule. The fiscal impact to state government is estimated to be -$1.4 million over the first three years of the regulation and -$3.8 billion over the regulatory lifetime. This large negative value mainly represents the decreased fuel tax revenue for the state government over the regulatory timeframe.

As Nevada is a smaller state, the overall economic impact would likely be much smaller, but would also have a large negative impact to the state highway fund and would pose substantial upfront costs to MHDV users and manufacturers. Analyses can be done on the anticipated revenue loss, once the scope of the policy (i.e., all trucks versus low mileage, versus only those sold in state) is determined. In addition, the Nevada State Legislative Committee on Energy has raised the issue of developing a more-sustainable funding source for transportation to be able to support climate and environmental initiatives while maintaining a healthy fund for transportation infrastructure. Consideration of this policy may need to be addressed as part of the larger transportation funding and climate incentives discussion.

Additionally, the upfront costs of zero-emissions MHDVs, infrastructure investment, and potential payback on fuel and maintenance savings need to be further assessed for Nevada fleet population characteristics.

IMPLEMENTATION FEASIBILITY

Preemption of state law by the federal *Clean Air Act*, and uncertainty surrounding waiver of federal preemption, are potentially the main legal hurdles for this policy. Potential additional hurdles include the need to amend or adopt new legislation and regulations.

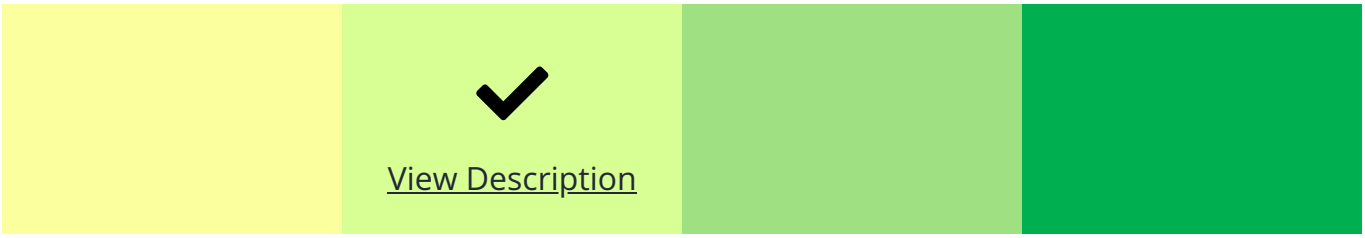
Section 209(a) of the federal *Clean Air Act* prohibits states from adopting limits on air pollutant emissions from cars and trucks. However, the *Clean Air Act* allows California to set more-stringent emissions standards (e.g., zero emissions from certain trucks) if the EPA grants a "waiver." Other states may adopt California's more-stringent emissions standards if California has a valid waiver.

The EPA granted California waivers for years until recently, when it withdrew California's 2013 waiver. California, joined by several states including Nevada, challenged the EPA's decision in federal court. The case is currently in the D.C. Circuit Court of Appeals, Case No. 19-1230 and consolidated cases. These challenges are not yet resolved, and it is unclear when they will be. It is expected that the Biden administration will reinstitute these waivers.

If California does not have a valid waiver from the EPA, then Nevada might not be permitted to adopt California's Advanced Clean Truck program.

In addition, adopting California's Advanced Clean Truck standards may require amendment of Nevada statutes. Under the *Clean Air Act* waiver process, a state must adopt standards identical to California's. Nevada's vehicle emissions statutes may contain definitions that differ from the definitions in California's Advanced Clean Truck program. In that case, the legislature might need to amend Nevada statutes. Additionally, the State Environmental Commission (SEC) would likely need to promulgate new regulations in order to adopt California's Advanced Clean Truck program.

In addition to these legal considerations, further evaluation of upfront costs, infrastructure investment, adaptation of zero-emissions MHDVs to user needs, and charging and fueling standards are needed.



ADOPT LOW-CARBON FUEL STANDARDS

Low-Carbon Fuel Standards (LCFS) are a way to establish a requirement for a reduction in the carbon intensity of fuels over a given time frame for a given sector of the market. For example, the state could require a 20% carbon reduction in transportation fuels by the year 2030. LCFS can be fuel- and technology-neutral and assess the lifecycle carbon emissions of fuels. In California, technical standards established include calculation of fuel greenhouse gas (GHG) intensity, compliance mechanisms, and a credit trading system. In addition, certain fuels are exempt, but have the option to opt in.

Adopting LCFS is somewhat similar to the renewable energy market in Nevada, where portfolio energy credits (PECs) can be used for compliance with the state's renewable portfolio standard (NRS 704.7821). The LCFS market could be run via a state agency, like PECs in Nevada, which are run through the Nevada Public Utilities Commission (PUCN), or it could be managed by a third party. Regionally, it would need to be decided if the program was bound only to Nevada or if we would join another state's program.

The details of a policy—including which fuels and markets are included, calculation of fees or credits, compliance strategy, and implementation strategy—would all need to be developed.

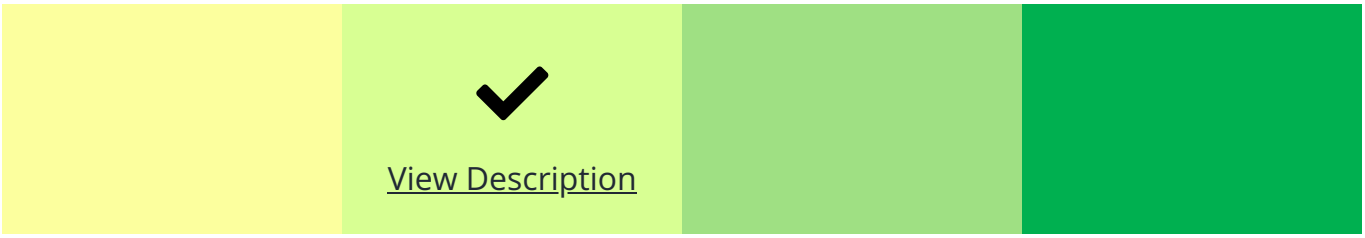
GREENHOUSE GAS IMPLICATIONS

Shifting to LCFS can reduce emissions, and there are multiple tools available to assess the impact of specific targets. The Oil Production and Greenhouse Gas Emissions Estimator (OPGEE) can calculate annual average carbon intensity (CI) for petroleum-derived transportation fuels. The CI for renewable fuels is calculated through a combination of direct emissions, using the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation model (GREET), and indirect emissions (through land-use change), using the general equilibrium model Global Trade Analysis Project (GTAP).

In the first eight years of its program (2011–2019), California saw a 6% decrease in carbon intensity. Between 2011 and 2015 the LCFS saved 16.8 Mt CO_2e, more than double the required standard. If this trend continues, the policy could be considered more successful

than anticipated. However, overcompliance in a market system with credits also creates a potential ability for the market to use credits rather than meeting new, tighter CI standards in the future (Energy Systems Catapult, 2018).

The CI reductions of California's transportation sector have come through increases in alternative fuel use, including biodiesel, renewable diesel, biogas, electricity, and hydrogen. California has a network of charging stations and alternative fueling stations that continues to expand, including a current emphasis on hydrogen. This type of robust network would be necessary to see the increase in alternative fuel use that California has experienced. More planning and analysis are needed to identify the Nevada investment strategy as well as the market for purchase and use of alternative fuel vehicles. However, LCFS has the potential to reduce GHG emissions in Nevada.



CLIMATE JUSTICE

This program could increase the prices of gasoline and diesel, creating a potential challenge for low-income communities. Increased diesel prices might also be passed on to consumers depending on how the commercial fleet is affected. However, fuel prices fluctuate due to a number of factors and the actual increase per gallon will likely be less than other market fluctuations, at least in the beginning of a program. However, this cost would gradually increase, enhancing the burden on those most unable to absorb the cost.

On the other hand, this policy would potentially reduce criteria pollutants in addition to carbon emissions, improving air quality. Depending on how the markets are set up and credits used, incentives could also be created for alternative transportation modes, to provide more access to disadvantaged communities to walking, biking, and transit infrastructure in addition to access to alternative fuel vehicles and fueling/charging infrastructure.

View Description

INTEGRATED ECONOMIC ASSESSMENT

Implementation costs would vary depending on program setup. The state would require staff dedicated to program oversight, and additional support if the state housed the program. Initial setup would need to include resources to support outside consultants to develop the program, criteria, management, and technical setup for credit calculations and market. If the state chooses to hire a third party to manage the program, then the cost of that contract, plus state staff to administer that contract, would also be needed. If the state administers it in-house, then likely 1–3 staff members would be appropriate.

Costs for the development of LCFS in Oregon may provide guidance of what costs would be in Nevada:

- 2009 HB 2186: Authorized the state's Environmental Quality Commission to develop LCFS, among other rules to reduce GHGs.
    - For rule development: 0.5 full-time equivalent (FTE) and $119,318 federal funds in the 2009–2011 biennium
    - For rule implementation: additional 0.5 FTE and $143,182 in the 2011–2013 biennium
- 2015 SB 324: Authorized Department of Environmental Quality (DEQ) to implement its Clean Fuels Program (CFP) in 2016.
    - Cost: Originally budgeted $778,141 General Funds for 2015–2017, but DEQ concluded it could implement the CFP with existing budget and reclassification of existing staff
- 2017 HB 2017: Various changes to LCFS and DEQ requirements.
    - For program management: 0.75 FTE and $185,596 General Fund in 2017–2019 and 1.0 FTE and $247,460 General Fund in 2019–2021
        - For associated services and supplies: $51,691 General Fund in 2017–2019 and $68,922 General Fund in 2019–2021
    - For fuel supply forecasting: 0.5 FTE and $178,539 in 2017–2019
        - For associated services and supplies: $80,000
        - For hiring a consultant: $150,000 in 2017–2019

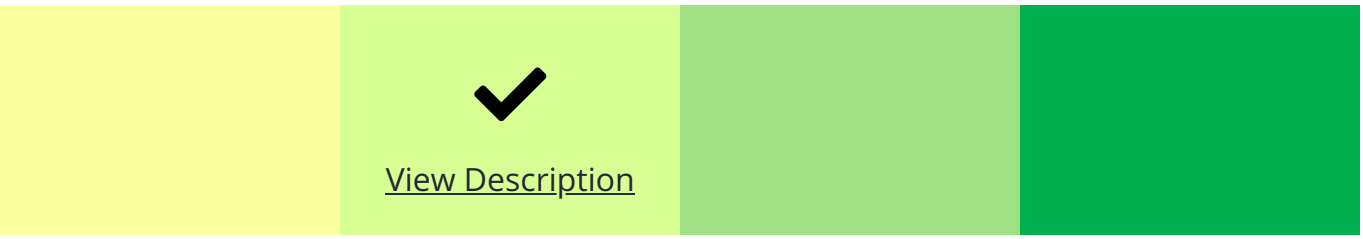
Another consideration of costs is the required investments from providers in the form on fueling and charging infrastructure. The cost/credit structure of the program would need to factor that in to ensure the combination of incentives and disincentives are appropriate to encourage investment in alternative fuels. In addition, this system only works with a strong consumer market for alternative fuel vehicles as well, which leads to other policy

View Description

IMPLEMENTATION FEASIBILITY

More analysis is needed, including the identification of the specific elements of LCFS in Nevada. The state may be able to adopt a standard used elsewhere, such as California or Oregon, to minimize the uncertainty. However, laws as well as the fuel delivery in Nevada have significant differences from those states.

Nevada's rural nature poses additional challenges for providing a robust network of charging and fueling stations. While work on "alternative fuel highways" is already under way and making progress, it is not clear that Nevada has the infrastructure nor the market demand to be successful with a complex system like this.



View Description

IMPLEMENT STATE CAR ALLOWANCE REBATE SYSTEM ("CASH FOR CLUNKERS")

The Nevada Division of Environmental Protection (NDEP) Greenhouse Gas (GHG) Inventory, Section 3.4 on Emissions Projections, 2017–2039, states:

> **"There is a high degree of uncertainty with transportation-sector projections. This is due in large part to the proposed federal rollback of passenger car and light truck vehicle fuel economy standards. In 2018, NHTSA and the EPA proposed the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule. This rule would freeze fuel economy standards for all passenger cars and light trucks for vehicle model years 2021 through 2026. This would have the effect of rolling back the already finalized Tier 3 passenger car and light truck fuel economy standards, which requires vehicle manufacturers to produce increasingly more efficient vehicles through model year 2025. Any reduction to the existing standards will result in an increase of GHG emissions."**

A state car allowance rebate system would ameliorate this situation through an incentive to replace higher-emitting, less-efficient vehicles with more-efficient, lower-emissions vehicles modeled after the 2009 federal "cash for clunkers" program.

While the original federal program was designed as a post-recession stimulus program to boost auto sales with fuel efficiency as a secondary objective, the program can also be used as a tool to reduce GHG emissions.

GREENHOUSE GAS IMPLICATIONS

Increasing or encouraging turnover of the vehicle fleet to lower-emitting, more-efficient vehicles would reduce GHG emissions. However, the amount of this reduction cannot be determined without better definitions on what vehicles would qualify for the program and how large the program is.

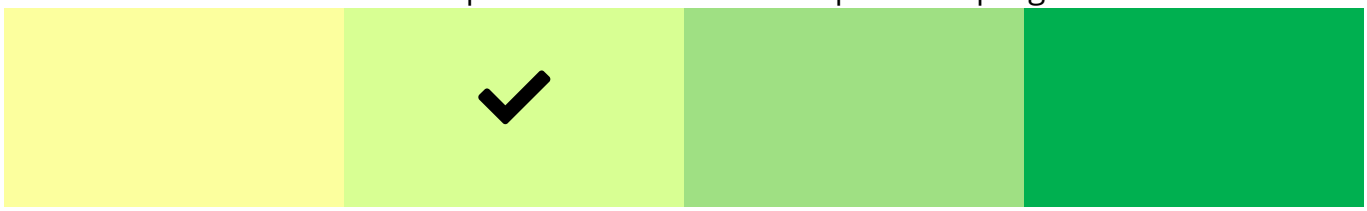
A University of Michigan study determined that the 2009 federal program had a one-time effect on GHG emissions of preventing 4.4 million metric tons of CO_2e, about 0.4% of U.S. annual light-duty vehicle emissions. Of these, 3.7 million metric tons are avoided during the period of the expected remaining life of the inefficient "clunkers" and 1.5 million metric tons were avoided as consumers purchase vehicles that are more efficient than their next replacement vehicle would otherwise have been. An estimated 0.8 million metric tons are *emitted* as a result of premature manufacturing and disposal of vehicles. These results are sensitive to the remaining lifetime of the clunkers and to the fuel economy of new vehicles that would have been purchased in the absence of the program, suggesting important considerations and significant uncertainty for policymakers deliberating on the use of accelerated vehicle retirement programs as a part of the GHG reduction policy.

In addition to limited GHG reduction from vehicle replacement, this policy would not reduce travel demand and vehicle miles traveled (VMTs). Vehicle manufacturing, disposal, and operations (roadway construction and materials) generate some amount of GHGs with or without additional tailpipe emissions.

The state could, however, tailor this program differently from the federal program, including stricter eligibility requirements to replace the most-polluting vehicles with low- or zero-emissions vehicles. The federal program was very popular and provided for a faster turnover of highly-polluting vehicles.

Further, although the magnitude of the impact is still likely to be fairly low compared with the GHG reduction targets, there are benefits to replacing older vehicles with newer models because of reductions in tailpipe emissions of other pollutants that contribute to poor air quality, including particulate matter. New vehicles are also required to meet higher safety standards.

Simply, this type of policy would likely reduce GHGs, but the magnitude and timing of emissions reductions would depend on the size and scope of the program.



View Description

CLIMATE JUSTICE

This program would not provide for the full cost of a new vehicle, so it might only benefit those who are either already considering a new vehicle purchase and/or have the financial resources to invest in a vehicle, albeit at a lower cost.

However, the policy might also allow someone who needs a newer vehicle, but has not collected the resources yet, to be able to do so sooner. Operating costs would be lower due to better fuel economy and/or electricity rates compared with gasoline costs. Repair and maintenance costs for the new vehicles may be lower for a new vehicle, however, often newer vehicles have more-complex systems that might be more difficult or costly to repair in the long term.

A “cash for clunker” model that provides for carefully selected low-emission or fuel-efficient vehicles with an accessible cost-to-benefit ratio for vulnerable populations could help address affordability concerns. In addition, consideration of a model that integrates other forms of low- and zero-emissions transportation, for example, bicycles, could be explored.

Removing older, polluting vehicles would reduce tailpipe emissions of other criteria pollutants, including particulate matter and carbon monoxide (CO), which would have localized benefits to improving air quality.

This policy has a number of unknowns that would need to be refined and require further discussion with vulnerable communities about how to address concerns.

View Description

INTEGRATED ECONOMIC ASSESSMENT

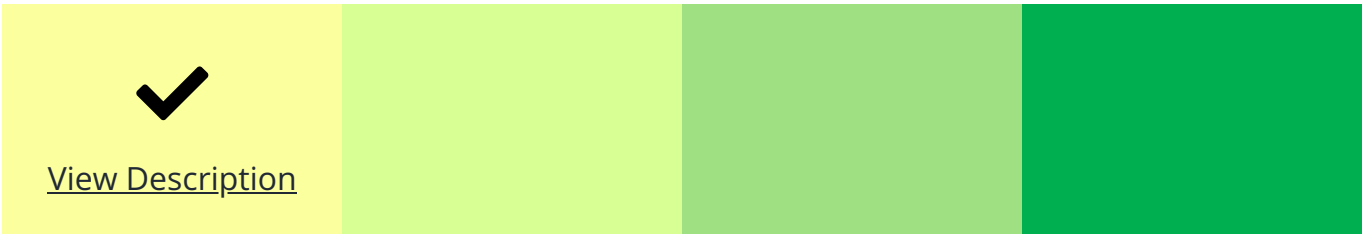
The initial amount of federal funds allocated for the original 2009 program was $1 billion, which was expended in a month. Congress then authorized an additional $2 billion to

support the program, given its popularity.

Assessing the economic impact of this policy depends on the subsidy per vehicle, anticipated number of vehicles for replacement consideration, and how complex the requirements would be. The administrative costs are unknown. The dealers would receive a direct subsidy when the new car is registered, and proof is provided of the old car being rendered unusable. Using an existing mechanism should minimize administrative startup costs and additional staff. However, additional resources would still be necessary to support the program.

The California Air Resources Board (CARB) initially provided funding for vehicle retirement and replacement incentives with the adoption of AB 118, Chapter 750, Statutes of 2007. AB 118 created the Enhanced Fleet Modernization Program (EFMP) through a $1 surcharge on motor vehicle registration, generating about $30 million every year. Two main features of EFMP include a scrap-only element administered statewide by the Bureau of Automotive Repair (BAR) and a program run by regional air districts to scrap and replace vehicles in air basins with the worst air quality. AB 630 Chapter 636, Statutes of 2017, codified the new EFMP Plus-Up pilot, and renamed it the Clean Cars 4 All Program. Clean Cars 4 All is a voluntary car scrap and replacement program that focuses on providing incentives through California Climate Investments (CCI) to lower-income California drivers to scrap their older, high-polluting car and replace it with a zero- or near-zero-emissions replacement. To specifically incentivize replacing internal combustion engine (ICE) vehicles with zero-emissions vehicles (ZEVs), the Clean Cars 4 All, Replace Your Ride, and Drive Clean San Joaquin programs award income-eligible households up to $9,500 in grants to apply toward ZEVs or public-transit vouchers.

All funding needs for the California programs were/are: $30–$35 million for 2019–2020. $35–$41 million for 2020–2021, and $38–$45 million for 2021–2022. California has greater than 10 times the population and registered vehicles asf Nevada, so the cost would be significantly less, but much more information is needed to estimate the actual cost of initiating and running a similar program.

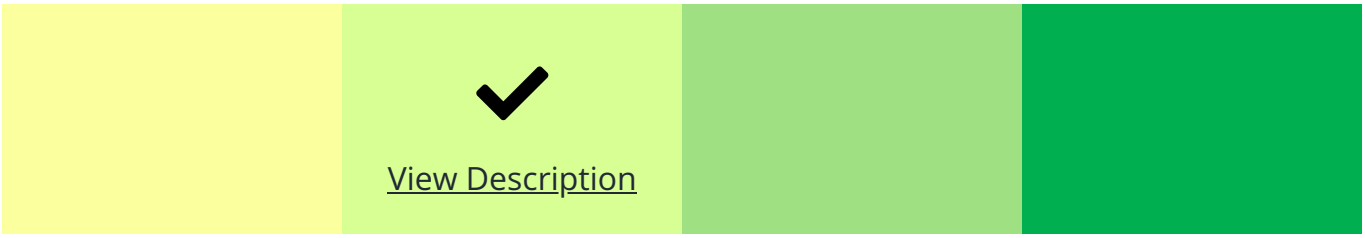


IMPLEMENTATION FEASIBILITY

Although Nevada statutes do not appear to provide explicit authority to adopt a “cash for clunkers” program, existing authority for the state to adopt this policy and provide legislation to implement it may exist. NRS 445B.100 establishes that it is public policy of the State of Nevada and the purpose of NRS 445B.100 to 445B.640, inclusive, to achieve and maintain levels of air quality that will protect human health and safety; prevent injury to plant and animal life; prevent damage to property; and preserve visibility and the scenic, aesthetic, and historic values of the state. The statute further states that it is the intent of NRS 445B.100 to 445B.640, inclusive, to require the use of reasonably available methods to prevent, reduce, or control air pollution throughout the State of Nevada…” The intent of a car allowance rebate system is to assist with achieving the purpose of NRS 445B.100. In addition, existing and retired federal and state legislation provide potential models, such as:

- **Federal Consumer Assistance to Recycle and Save:** H.R.1550 — 111th Congress (2009-2010) (This federal program ended within two months of starting due to funds being depleted.)
- **California’s Consumer Assistance Program**: Cal. Health & Safety Code §44100-44122.

The legislature might authorize this program and appropriate funds from an existing account, such as the Account for Management of Air Quality, NRS 445B.590; the Motor Vehicle Fund, NRS 482.180. This may require amendment of these statutes. Alternatively, the legislature might create a new account to fund this program.



CLOSE EMISSIONS-INSPECTION LOOPHOLES FOR CLASSIC CARS LICENSE PLATES

During the 2015 legislative session, Nevada's legislators passed AB 146, requiring the Advisory Committee on the Control of Emissions from Motor Vehicles to complete a study on the inspection and testing of motor vehicles and emissions-control systems in Nevada. This study included an overview and analysis of the legislative history of the Classic Vehicle program and its current status with respect to emissions testing. It further provided recommendations to address the loophole that allows owners of motor vehicles that would not normally be considered classic vehicles, but nevertheless meet the statutory requirements necessary to obtain special license plates (Classic Vehicles, Classic Rods, or Old Timer), to obtain these plates in order to be exempt from emissions-testing requirements normally applied to model year 1968 and newer vehicles.

NAC 445B.592 exempts model year vehicles that are 1968 or older from emissions testing requirements. Nevada's selection of 1968 as the threshold year for vehicle inspections was based on the requirements set forth by the U.S. Environmental Protection Agency (EPA) in 40 CFR 51.351(a), (g). The EPA's selection of 1968 as the threshold year was based on congressional passage of the *Motor Vehicle Air Pollution Control Act of 1965,* which amended the *Clean Air Act* (CAA) and established the first federal vehicle emissions standards beginning with 1968 model year vehicles.

There are, however, three categories of older vehicles, having model years of 1968 or *newer*, that can also be exempt from emissions testing. These vehicles are identified as:

1. Old Timer vehicles, which are any motor vehicles manufactured more than 40 years before the date of application for registration (NRS 482.381);
2. Classic Rods, which are any passenger cars or light-duty commercial vehicles with a manufacturer's rated carrying capacity of 1 ton or less that were manufactured at least 20 years before the application for registration (NRS 482.3814); and
3. Classic Vehicles, which are any passenger cars or light-duty commercial vehicles with a manufacturer's rated carrying capacity of 1 ton or less that were manufactured at least 25 years before the application for registration and contain only "original parts which were used to manufacture the vehicle or replacement parts that duplicate those original parts" (NRS 482.3816).

These three categories of vehicles are often collectively referred to as “classic vehicles,” even though only one of the three categories officially carries a “Classic Vehicle” designation. To avoid the ambiguity created by the collective use of the term and its statutory definition, these are referred to collectively as either “Classic and Old Timer” or “special license plate” vehicles.

The 1997 Nevada legislative session created a program that would allow an owner of a “restored” vehicle exemption from emissions-testing requirements. As the bill worked its way through committees, the Nevada Division of Environmental Protection (NDEP) expressed concerns about creating an emissions-exemption program that might produce a loophole for old, unmaintained vehicles utilized for general transportation, which were also gross emitters of pollutants. Subsequent changes made during the 2011 legislative session created such a loophole. In that year, AB 2 was passed that allowed vehicles that would otherwise be subject to the Inspections/Maintenance (I/M) program, but had obtained special license plates, to avoid the requirement that they pass an initial emissions test.

In 2015, Clark County issued 19,805 and Washoe County issued 6,758 special license plates for Classic Vehicles and Classic Rods. This represents significant growth occurred as a result of the legislative changes made during the 2011 legislative session. To a lesser extent, Old Timer vehicles also experienced a similar growth pattern.

Nevada could reduce the emissions impact of these vehicle types by:

- Providing a general definition for Classic Rods, Classic Vehicles, and Old Timer vehicles that is utilized by the Western states surrounding the Nevada Department of Motor Vehicles (DMV);
- Requiring owners applying for Classic Vehicle or Classic Rod special license plates to first pass an emissions test at the DMV prior to issuance; and
- Requiring owners of Classic Vehicles and Classic Rods to have their odometer readings annually certified at a Nevada Licensed Emission Station prior to obtaining a special license plate renewal sticker.

GREENHOUSE GAS IMPLICATIONS

Closing the classic cars loophole will reduce tailpipe greenhouse gas (GHG) emissions. However, the extent to which these regulation changes can reduce emissions on a timeline

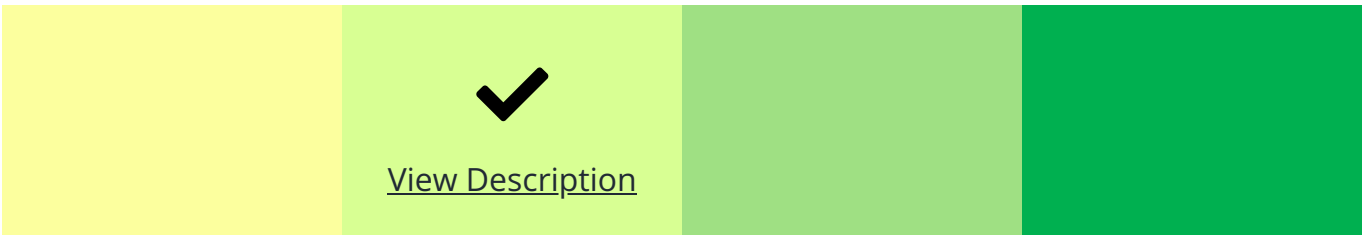
commensurate with the state's emissions-reduction targets will be driven primarily by rate of adoption as well as better data and analysis regarding the actual mileage driven by these vehicles rather than a self-certification that the car is driven less than 5,000 miles/year.

A majority of the states with inspection and maintenance programs have justified upward revisions of the 1968 threshold model year. One of the common justifications for such revisions is that on a per-capita basis, most states have far few older vehicles in regular operation, and that because of their low numbers the emissions impact is minimal. However, Nevada is the driest state in the country, so vehicles here do not rust as quickly as they do in other states. As a result, older vehicles tend to remain in operation longer and the 1968 exemption threshold in Nevada has remained unchanged.

Older vehicles emit significantly more emissions on a per-mile basis than newer vehicles. Not only do old vehicles fail emissions tests at a much higher rate than newer vehicles, but they fail those tests while being subject to far less stringent emissions standards (NDEP 2016). Compared with a 2015 model year vehicle, emissions from a 1990 model year vehicle (i.e., a vehicle that is 25 years older, and therefore, potentially classifiable as a "Classic Vehicle") are on average 9.1 and 18.3 times higher for the primary ozone precursor pollutants, VOC and NOx, respectively (ANL 2013). Additionally, the initial failure rates for light-duty gasoline vehicles are approximately 47 times higher for 1970 model year vehicles then they are for 2010 model year vehicles in Clark County, and 56 times higher in Washoe County (NV DMV 2014). The disparity is even greater for heavy-duty gasoline vehicles in both Clark and Washoe counties.

Taken together, the impact of adopting regulations to close emissions-inspection loopholes for classic cars license plates has the potential to reduce the state's overall GHG emissions.

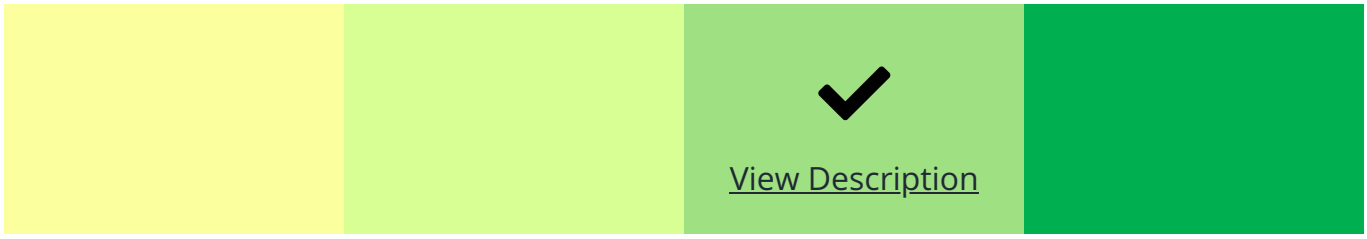
However, the rate at which emissions reductions can be achieved is highly uncertain. Additional analysis specific to GHG reductions is necessary to refine the emissions implications of this policy.



CLIMATE JUSTICE

A policy requirement to pass an emissions test prior to obtaining special license plates could have a negative financial impact for low-income households via vehicle repair costs and a positive health impact for vulnerable populations via air quality improvements.

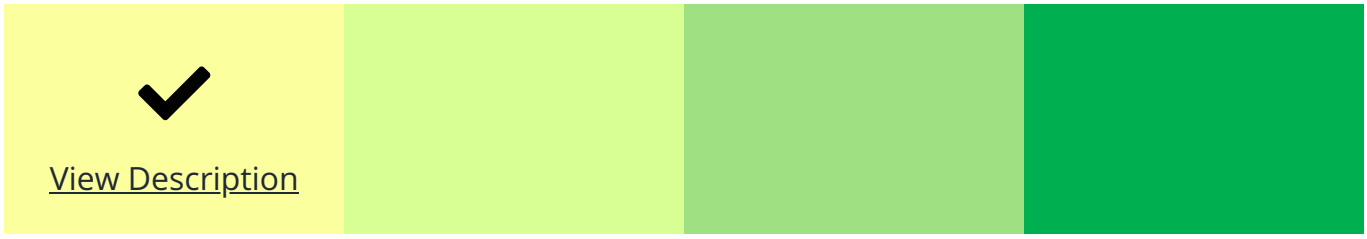
Other impacts are unknown, and should be explored through discussions with community members, but it is unlikely to disproportionately impact vulnerable communities.



View Description

INTEGRATED ECONOMIC ASSESSMENT

The consideration and implementation of regulations to close emissions-inspection loopholes for classic cars license plates requires coordination across multiple state departments and divisions, particularly NDEP and DMV, in consultation with the Nevada Department of Transportation (NDOT) and the Governor's Office of Energy (GOE). Since Nevada is in the early stages of this process, it is unclear what the necessary full-time equivalent (FTE) and related budgetary requirements will be to implement.



View Description

IMPLEMENTATION FEASIBILITY

Fully enacting regulations to remove emissions-inspection exemptions for classic cars license plates may require statutory and regulatory changes. These changes may include identifying new definitions for "classic vehicles" and requiring owners applying for Classic Vehicle or Classic Rod special license plates to first pass an emissions test at the DMV prior to issuance. Requiring owners of Classic Vehicles and Classic Rods to have their odometer readings annually certified at a Nevada Licensed Emission Station prior to obtaining a

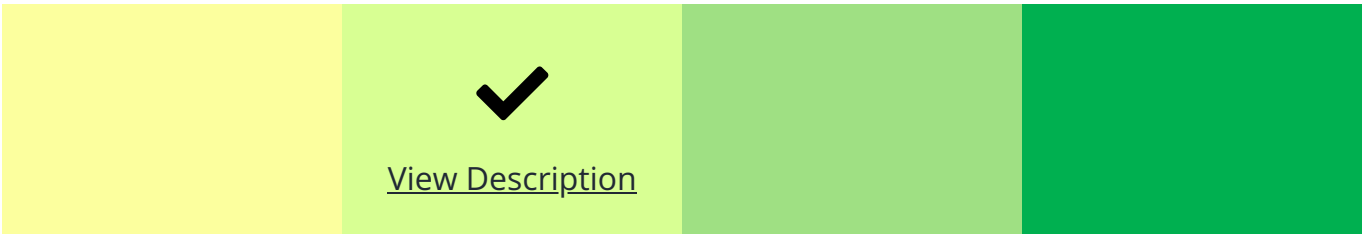
special license plate renewal sticker has also been identified as a legal hurdle. A working group discussion is necessary to identify any additional legal hurdles pertaining to this policy.

The State Environmental Commission (SEC) has the authority to prescribe by regulation standards for exhaust emissions so long as the regulations exempt certain vehicles ("Exempt Vehicles"). Exempt Vehicles include:

- Mopeds
- Vehicles with special license plates driven no more than 5,000 miles during the immediately preceding year:
    - Antique Vehicle/Old Timer
    - Street Rods
    - Classic Rods
    - Classic Vehicles

Nevada regulations follow the statute and exempt these vehicles from emissions inspection and testing.

To implement this policy, the legislature could amend NRS 445B.760(1) to change or eliminate the exemption for Old Timer, Classic Rods, and Classic Vehicles and make conforming changes to the corresponding sections cited in 445B.760(1)(b). Following the statutory change, the SEC could amend or repeal NAC 445B.574.



TRANSITION FROM FOSSIL-FUELED ELECTRICITY GENERATION TO CLEAN ENERGY SOURCES

In order to meet the 2050 greenhouse gas (GHG) emissions-reduction target of net-zero emissions established by SB 254, as well as realize SB 358's 2050 goal of producing energy from zero- emissions resources, the energy sector will ultimately have to transition away from coal and natural gas-fired power generation. Today, there are two coal-fired power plants and nine natural gas plants operating in the state. Key steps toward shifting entirely to non-fossil power sources include the systematic retirement of fossil-fueled power generation and replacing that capacity with clean energy sources.

In 2013, the Nevada Legislature passed SB 123 that required Nevada Power Company (NPC), NV Energy's Southern Nevada utility, to retire or eliminate at least 800 MW of coal-fired electric generation in Clark County under an Emission Reduction and Capacity Replacement (ERCR) Plan. More specifically, SB 123 required the utility to include a plan for the retirement or elimination of at least 300 MW of coal-fired generation capacity on or before December 31, 2014; an additional 250 MW by December 31, 2017; and an additional 250 MW by December 31, 2019. The last coal retirement was NPC's share of the Navajo Generating Station (Arizona) in 2019.

The ERCR plan also addressed replacement resources for the coal-plant retirements. NPC was required to issue requests for proposals (RFPs) for electric generating capacity from new renewable energy facilities. The utility was granted enhanced ratemaking treatment for all power plants constructed or acquired pursuant to an ERCR plan.

While all of the required retirements and eliminations of coal-fired generating capacity have occurred pursuant to SB 123, not all of the replacement capacity has been filled. As such, NPC is still authorized to construct or acquire an additional 35 MW of utility-owned electric generating capacity from new renewable energy facilities upon a determination that the utility has satisfactorily demonstrated a need for such capacity (Docket No. 14-05003, PUCN Order).

It is important to note that SB 123 did not apply to the coal plants operated by Sierra Pacific Power Company (SPPC), NV Energy's Northern Nevada utility. Two coal-fired power plants

are still in operation in the region: the North Valmy Generating Station and the TS Power Plant. SPPC, in conjunction with Idaho Power, owns the North Valmy Generating Station. Valmy Units 1 and 2 are slated for retirement at the end of 2021 and 2025, respectively (Docket No. 20-07023, Volume 3). Newmont Gold Mines owns the TS Power Plant.

Nevada Gold Mines recently announced that it has begun the conversion of the TS Power Plant to a dual-fuel facility, allowing it to also generate power from natural gas. Additionally, Nevada Gold Energy also filed with the Nevada Public Utilities Commission (PUCN) an application under the provisions of the *Utility Environmental Protection Act* for three permits to construct the TS Solar Project. This project is a 200 MW solar PV electric generating facility, a 120 kV on-site substation, a 120 kV generation-tie line, and an optional battery storage system. These solar facilities will be located adjacent to the TS Power Plant. The PUCN granted the application subject to several conditions on August 28, 2020 (Docket No. 20-06014, PUCN Order).

There are no applications pending with the PUCN for new fossil-fueled generation. More-aggressive policies to ensure a transition to 100% clean energy production, implicit in a net-zero GHG emissions target by 2050, will need to be considered moving forward. Already, NV Energy has filed a study regarding achieving full decarbonization in response to a request from the PUCN.

Nevada's experience with SB 123 and long-term commitment to a strong renewable portfolio standard (RPS) demonstrate the state is well on its way replacing remaining fossil generating capacity with clean energy resources. What is needed now is a long-term transition from the remaining fossil generation to clean energy, prioritizing retirement of old, inefficient gas plants located in population centers. With the 2050 100% RPS goal as the guide post, policy mechanisms such as a clean energy standard, securitization (allowing customer-backed bonds to pay off stranded asset costs), and alternative ratemaking should be considered.

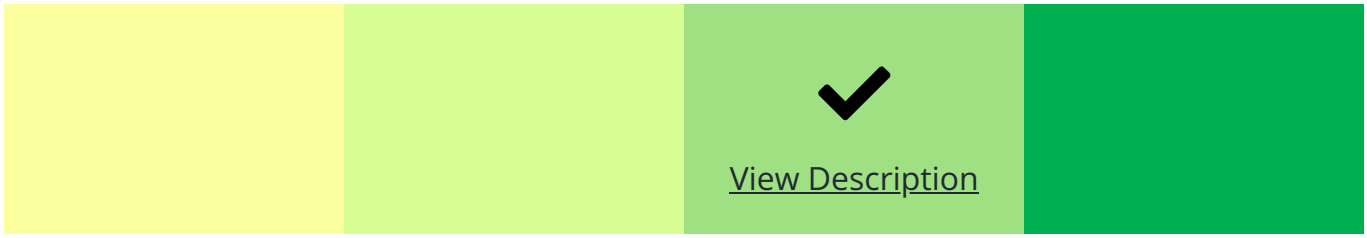
Transmission upgrades facilitating better market integration and expanded access to diverse resources will be needed for this transition and will promote reliability and cost containment for customers. As battery and other storage systems evolve and deployment expands, these technologies will assist with load following and ramping, services currently provided by the natural gas fleet.

GREENHOUSE GAS IMPLICATIONS

Under Nevada's current RPS, GHG emissions from Nevada's electricity generation sector would remain above 10 million metric tons CO_2e through 2039. However, the zero-emissions target in 2050 necessitates the transition from fossil-fueled power in Nevada.

The TS Power and North Valmy coal-fired electric generating units emitted approximately 1,073,958 and 1,645,434 metric tons of carbon dioxide in 2018, respectively. Together, that is equivalent to annual emissions from 580,000 passenger cars. Clearly, accelerating the retirement of remaining coal-fired electric generating units will reduce GHG emissions in Nevada. However, careful consideration of the timing and implementation of the phase out is critical to maintain the bulk transmission systems reliability.

Currently, the North Valmy and TS Power coal-fired electric generating units provide critical voltage support, on a seasonal basis, to NV Energy's transmission system in Northern Nevada. To maintain voltage support on the transmission system, these plants may need to be replaced with other electric generating resources. Once the replacement generation is known or the utility provides an alternative means to ensure reliable service, it will be easier to provide a more-accurate GHG emissions-reduction estimate.



CLIMATE JUSTICE

During the Renewable Energy listening session several Nevadans mentioned that low-income communities are being affected by the emissions from fossil-fueled generation and stated that renewable energy should replace those generating facilities.

Although natural gas-fired power plants emit fewer GHGs per unit of electricity relative to a coal-fired facility, there are still negative impacts to the health of nearby communities posed by natural gas. Like coal, burning natural gas releases particulates, as well as nitrogen oxides (NOx) and sulphur dioxide (SO_2), all of which can diminish air quality and compromise public health. Further, when considering the supply chain of natural gas, there

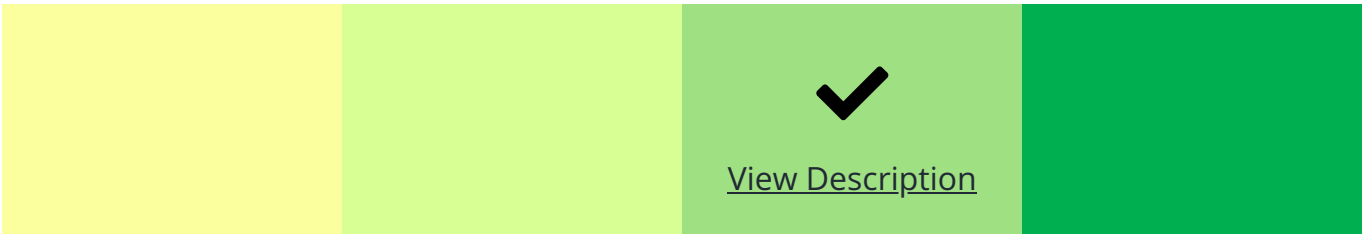
is evidence of negative health outcomes (e.g., Currie et al., 2017) associated with hydraulic fracturing—a process used to extract natural gas.

The pollutants associated with burning coal have a more-significant effect on the health of communities of color (Thind et al., 2019). Children living near coal-fired power plants suffer higher rates of adverse health outcomes (Amster & Levy, 2019). More generally, health impacts of climate change driven by GHG emissions disproportionately impact vulnerable populations (NCA, 2018). Vulnerable populations have the most to gain from eliminating fossil-fueled generation and reducing GHG emissions.

While NV Energyhas not conducted an economic analysis of the total cost that ratepayers may pay for phasing out all fossil-fueled generation, the company did conduct a study on the Effective Load Carrying Capability (ELCC) of Renewable and Storage Resources, which was filed in NV Energy's most recent fourth amendment to its integrated resource plan (IRP) (Docket No. 20-07023, Vol. 8, ECON-5). A separate analysis found that Nevada can move entirely off fossil fuels while keeping energy bills low (Evolved Energy, 2020).

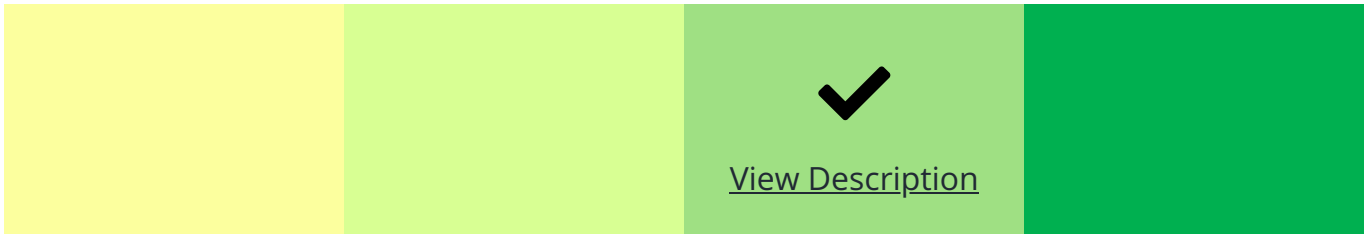
Accelerating the retirement of Valmy Units 1 (currently slated at 2021 in the IRP, but being depreciated at a 2023 retirement) and 2 (currently slated at 2025) could possibly result in a stranded asset that SPPC's ratepayers would pay for even though the asset was no longer in use. However, when considering the costs that would be required to upgrade the facility to meet federal Best Available Control Technology (BACT) requirements and extend the life of the asset, not to mention current coal plant operating costs, earlier retirement with replacement by clean resources may well be the less-expensive option. Ultimately however, the replacement costs are currently unknown given that the utility has not proposed any specific replacement capacity for these units.

Simply, the impact to customers' energy bills, and the implications for low-income households, is unclear, although the health benefits are indisputable. Given the long-term trajectory of clean energy resources becoming cheaper, the increasing expense of coal plant operation, and the potential price volatility of natural gas as a fuel source, a long-



INTEGRATED ECONOMIC ASSESSMENT

The PUCN is responsible for implementing any policies related to power plant retirements and modest resources may be required to support any additional administrative demands.



IMPLEMENTATION FEASIBILITY

Nevada regulations already allow for and contemplate carbon reduction. In addition to these regulations, NRS 704.746(5) requires that the PUCN give preference to measures and sources of supply that provide the greatest economic and environmental benefits to the state, among other requirements. NRS 704.746(5) also states that the PUCN must give preference to sources of supply that provide levels of service that are adequate and reliable. NRS 704.746(6) provides that the PUCN shall adopt regulations that determine the level of preference to be given to those measures and sources of supply. The Nevada Legislature has stated the goal of achieving by 2050 zero carbon emissions from electricity providers (NRS 704.7820(2)).

In addition to the PUCN's broad authority over integrated resource planning, the PUCN would also call attention to SB 300, which requires the PUCN to adopt regulations allowing an electric utility to apply for approval of an alternative ratemaking plan. Alternative ratemaking mechanisms represent a shift from the traditional cost-of-service ratemaking that the PUCN and most other state utility commissions have applied to electric utilities for decades. The electric utility industry is changing rapidly, and as a result, regulators across the country are evaluating whether changes in ratemaking are required to align regulatory mechanisms with those industry changes. SB 300 includes a menu of possible alternative ratemaking mechanisms, including, but not limited to, performance-based rates, subscription-based pricing, formula rates, decoupling, earnings sharing mechanisms, and multiyear rate plans.

View Description

REQUIRE GREENHOUSE GAS REDUCTION PLANS AND PRIORITIZE DECARBONIZATION IN UTILITY INTEGRATED RESOURCE PLANS

Passed in the 2019 legislative session, SB 358 set the goal for providers of electric service to use a net-zero carbon emissions resource portfolio to meet their customers' electricity needs by 2050. Requiring greenhouse gas (GHG) reduction plans and prioritizing decarbonization in utility integrated resource plans (IRPs) would further progress toward this goal.

Nevada requires electric utilities to file an IRP with the Nevada Public Utilities Commission (PUCN) on or before June 1 every three years. The IRP must set forth a three-year action plan to meet demand for electric service in an efficient, reliable, and sustainable manner over a 20-year planning period. Among other requirements, the PUCN must give preference to the measures and sources of supply that provide the greatest economic and environmental benefits to the state.

An electric utility's resource plan must include several different components, including a forecast of future load, a demand-side plan, a supply-side plan, a financial plan, an energy supply plan, and an action plan for next steps in the utility's resource procurement or demand-side resources.

Nevada's regulations already require environmental issues be addressed in a supply-side plan. Every option for supply must include an examination of the environmental impacts, taking into account the best available technologies and the environmental benefit of renewable resources. Options for lower carbon intensity must be assessed, and the plan must include at least one alternative plan of low carbon intensity (referred to as the low-carbon case). The alternative low-carbon plan must account for the generation or acquisition of an amount of renewable energy greater than required by the RPS, changes to the utility's existing fleet of resources for the generation of power, and the application of technology that would significantly reduce emissions of carbon. Also, the environmental costs to Nevada associated with operating and maintaining a supply plan must be quantified for air emissions, water and land use, and the social cost of carbon.

Currently, natural gas-fired generating units can be used as placeholders in the IRP in the electric utility's supply-side plan. These are only used to permit analysis of different supply-side options and maintain consistency between placeholders over multiple IRP cases so that assumptions about the future do not influence the selection of resources in a supply-side plan. To be clear, the utility is not seeking PUCN authority to construct the natural gas-fired generating units that serve as placeholders. Using natural gas-fired generating unit placeholders allows the production cost modeling software to complete its algorithm over the requisite 20-year analysis period.

However, eliminating the ability to use natural gas as placeholders and requiring the electric utility to use placeholders that more closely model Nevada's GHG emissions-reduction goals in its IRP would provide valuable information regarding grid reliability in order to effectively map a path toward net-zero emissions without compromising power delivery.

Eliminating natural gas-fired generating unit placeholders would be consistent with the PUCN's recent findings in NV Energy's most recent triennial IRP:

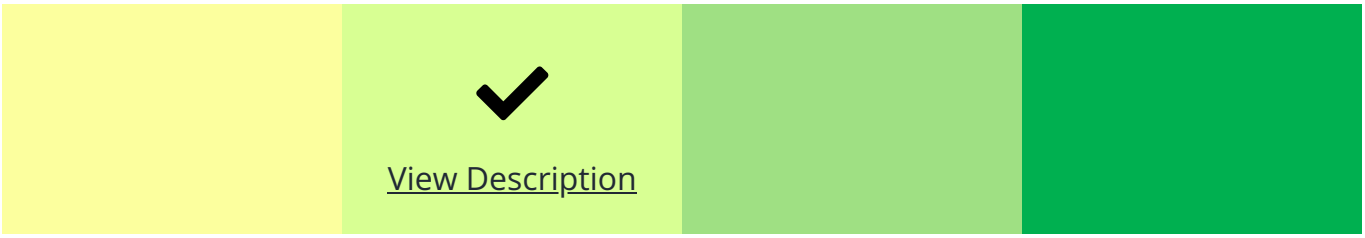
> **These [natural gas-fired unit] placeholders demonstrate an increase in gas generation and a decrease in renewable generation over the resource plan period. Although NV Energy is not seeking approval for any of these resources in this Docket and generally keeps placeholders identical among various Plans to provide a fair and more accurate comparison, the [PUCN] encourages NV Energy to select placeholders in future resource plan filings that more accurately reflect the general policy of the State toward more renewable generation and energy efficiency as well as NV Energy's own aspirational goals of supplying an ever-greater percentage of energy from renewable sources.**

GREENHOUSE GAS IMPLICATIONS

The PUCN is required to give preference to electricity supply portfolios that reduce customer exposure to the potential impacts of GHG emissions and it considers the social cost of carbon. For these reasons, prioritizing decarbonization in IRP proceedings could lead to GHG emissions reductions and benefit Nevada's communities.

However, without additional production cost modeling by the electric utility to determine the electric generation dispatch needed to meet forecasted electricity demands, the amount of GHG emissions reductions that are possible from decarbonization in Nevada is unknown. This uncertainty is a function of the utility's current production cost modeling software, PROMOD, which does not solve for lowest GHG emissions in determining the best resources for supply-side options. It also cannot model battery storage. PROMOD solves for a balance of supply and demand, particularly looking for the lowest-cost electric generation dispatch.

In order to understand the effects of broad-scale decarbonization, a different approach would be necessary. Recently, NV Energy filed a study for achieving full decarbonization with the PUCN.



CLIMATE JUSTICE

Since the natural gas-fired electric generating units are placeholders in the IRP used primarily for the purpose of modeling, it is not expected that these natural gas-fired electric generating units will be constructed and operated. Therefore, moving away from natural gas-fired units as placeholders does not impact low-income communities, communities of color, Indigenous peoples, and other vulnerable populations.

If fossil-fueled generating units are retired early as a result of achieving net-zero emissions, ratepayers could bear the stranded asset costs associated with their early, as well as the costs of the new replacement renewable energy resources. This could potentially burden low-income households.

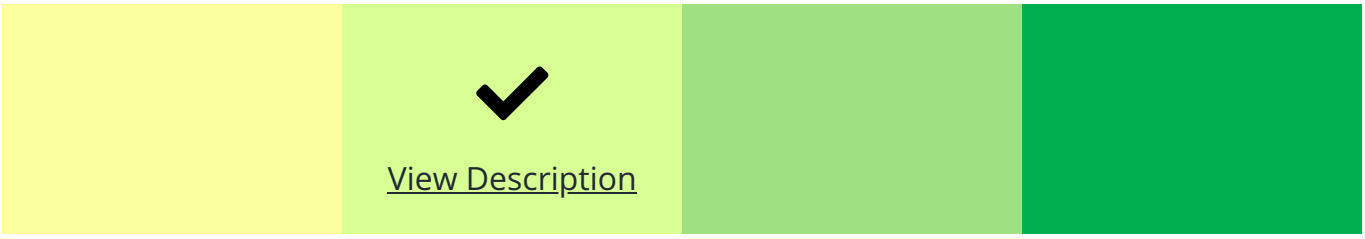
However, exploring net-zero emissions scenarios, prioritizing decarbonization in the IRP, and requiring plans for achieving net-zero emissions in the IRP will allow for a broader

understanding of how the power sector might evolve in the future in a more-transparent manner. This would allow additional time to identify any implications for rates in order to identify creative solutions. It would also ensure that accessibility of renewable energy for all Nevada's communities is considered.

As temperatures continue to rise, cooling degree days will also increase along with power demand (NCA, 2018). Consequently, ensuring that low-income communities have access to air conditioning, and that power is affordable, will reduce the exposure of vulnerable communities to extreme heat—particularly in Southern Nevada. NV Energy does have programs in place to support low-income households. However, several states are moving toward more-aggressive measures requiring utilities to address equity and social justice concerns across all aspects of operations and planning.

For example, in 2019 the State of Washington adopted the *Clean Energy Transformation Act*. Beyond establishing a 100% by 2045 RPS, the legislation also binds electric utilities to consider equity issues across all aspects of operations and planning as part of the IRP process. Oregon is taking similar steps. In response to legislation passed in 2017 directing the PUC to identify ways to navigate a changing electricity sector, the Oregon PUC issued a report indicating that the public's top priorities for the PUC are climate change and equity. The report provides a roadmap for the PUC to address these two issues, including specific recommendations to bolster issues of environmental justice and affordability. This was followed by (failed) legislation in 2019 and 2020, intended to put the roadmap in action by expanding the authority of the PUC.

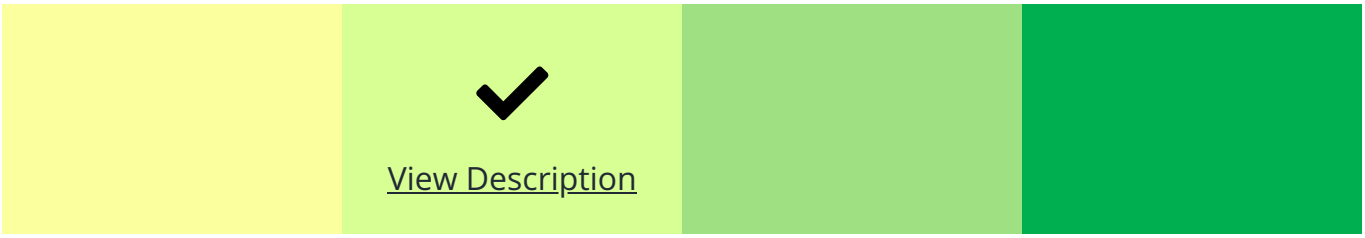
Nevada could consider requiring utilities to integrate more-comprehensive equity considerations in the IRP in order to address social justice issues and protect the same communities that are disproportionately impacted by climate change.



INTEGRATED ECONOMIC ASSESSMENT

Implementing and administering these options would necessitate additional resources based on similar policies adopted in other states.

In California, SB 350 required the state's PUC to "implement a process for integrated resource planning that will ensure that load-serving entities (LSEs) meet targets that allow the electricity sector to contribute to California's economy-wide greenhouse gas emissions-reduction goals." The state supports the administration with ongoing annual costs of $1.65 million for personnel services and $2.3 million in operating expenses for the PUC to fulfill



IMPLEMENTATION FEASIBILITY

As noted above, the Nevada Legislature passed SB 358 in 2019, setting "a goal of achieving by 2050 an amount of energy production from zero carbon dioxide emission sources that is equal to the total amount of electricity sold by providers of electric service" (NRS 704.7820).

Minimal legal challenges exist to prioritizing decarbonization in IRP proceedings as part of, or in addition to, the low-carbon base case.

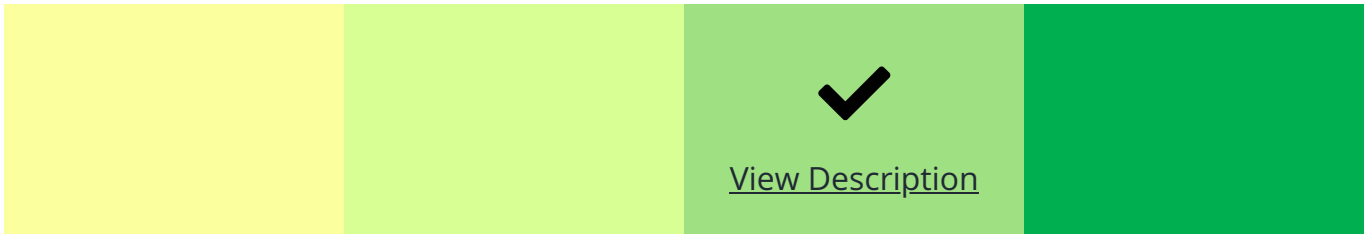
The PUCN has the authority to "prescribe the contents" of the IRP, including determining "the best combination of sources of supply to meet the demands or the best method to reduce them" (NRS 704.741(2)(a)(2)). NRS 704.746(5) requires that the PUCN give preference to measures and sources of supply that provide the greatest economic and environmental benefits to the state, among other requirements. NRS 704.746(6) says that the PUCN shall adopt regulations that determine the level of preference to be given to those measures and sources of supply, and may adopt regulations that prioritize decarbonization. In fact, it can be argued that the regulations already require some degree of prioritizing decarbonization of the utility's generating fleet. Specifically, NAC 704.9355(1)(e) states that options for lower carbon intensity must be examined. The IRP regulations also require a robust environmental review of both new and existing resources.

However, any decarbonization policy must be balanced with reliability concerns, as NRS 704.746(5) also states that the PUCN must give preference to sources of supply that

provide levels of service that are adequate and reliable. The PUCN must work with the electric utility to ensure that making decarbonization a priority in IRP proceedings does not cause any reliability concerns. Even though decarbonization and reliability concerns must be balanced, the legal challenges to a policy that prioritizes decarbonization in IRP proceedings are minimal.

Moving away from using natural gas-fired generating units as placeholders should be straightforward and will not require any changes to statute or regulation. Currently, there is nothing in statute or regulation regarding placeholders. A mandate to use placeholders other than for natural gas-fired generating units can be accomplished via regulation or on a case-by-case basis in a PUCN order. In fact, as noted above, the PUCN has already stated a preference for the utility to select placeholders in future resource plan filings that more accurately reflect the general policy of the state toward more renewable generation and energy efficiency.

To the extent that the PUCN believes a specific regulation governing the placeholders used in IRP is appropriate, NRS 704.746 provides the PUCN with a pathway for adoption of such regulations. As noted above, NRS 704.746(5) requires that the PUCN give preference to measures and sources of supply that provide the greatest economic and environmental benefits to the state, among other requirements. Furthermore, NRS 704.746(6) says that the PUCN shall adopt regulations that determine the level of preference to be given to those measures and sources of supply. The PUCN, in adopting regulations regarding the preference to be given to various sources of supply, may adopt regulations that mandate renewable placeholders, for example, as a means of evaluating the supply resources proposed by the utility.



PRIORITIZE DEMAND-SIDE MANAGEMENT PROGRAMS

Implementation of demand-side management (DSM) programs that prioritize load reductions when fossil-fuel assets are the marginal electricity generators, that prioritize load shifting when renewable resources are generating, and that establish a comprehensive on-site energy efficiency program that can be utilized across sectors to increase energy efficiency have the potential to reduce Nevada's greenhouse gas (GHG) emissions. While Nevada has multiple energy efficiency and demand response (DR) programs, it does not currently have DSM or DR programs that optimize management of electricity generated by renewables.

DSM programs consist of the planning, implementing, and monitoring activities of electric utilities that are designed to encourage customers to modify their level and pattern of electricity usage. DSM includes programs for energy efficiency and conservation, as well as programs that will produce benefits in peak demand and energy consumption. Energy efficiency encompasses the deployment of end-use appliances, such as higher-efficiency boilers and air conditioners, more-efficient lighting, and better-performing windows. Energy efficiency achieves the same or greater function to the customer (e.g., the refrigerator still keeps food cool), while reducing the energy required to achieve that result. DR programs reduce energy in response to either system reliability concerns or increased generation costs. DR generally must be measurable and controllable to be relied upon by the electric utility. DSM programs for both energy efficiency and conservation fall within the purview of the Nevada Public Utilities Commission (PUCN).

A recent study commissioned by NV Energy indicates the utility is aware that shifting load from evening peak hours to daylight hours when solar is generating electricity could improve the value of solar resources. In related testimony, the consultant indicated that "changes in load could improve the Effective Load Carrying Capability (ELCC) of solar resources, thereby reducing the amount of solar capacity that must be added to ensure reliability." He added that "[i]f the timing of high load events shifted from evening peak hours to daylight hours, either through building pre-cooling or other measures, then the ELCC for solar photovoltaics (PV) could increase." This indicates that the utility needs to take action to more-effectively integrate large quantities of solar into its generation portfolio.

Nevada electric utilities must file a demand-side plan, which includes proposals for energy efficiency and conservation and DR programs as part of their integrated resource plan (IRP) with the PUCN on or before June 1 every three years. The next IRP is due June 1, 2021. The IRP must set forth a three-year action plan to meet demand for electric service in an efficient, reliable, and sustainable manner over a 20-year planning period.

The PUCN also establishes each utility's goals for energy savings from energy-efficiency programs implemented each year. The goals set by the PUCN drive what is included in a demand-side plan, which must meet or exceed PUCN expectations. For the period January 1, 2022, through December 31, 2024, the amount of energy savings resulting from implementation of energy-efficiency programs by the electric utility must result in an average reduction of 1.1% of the forecasted weather normalized sales of the electric utility for that period. After January 1, 2025, the amount of energy savings is determined by the PUCN in an IRP order.

NV Energy Demand-Side Management Programs

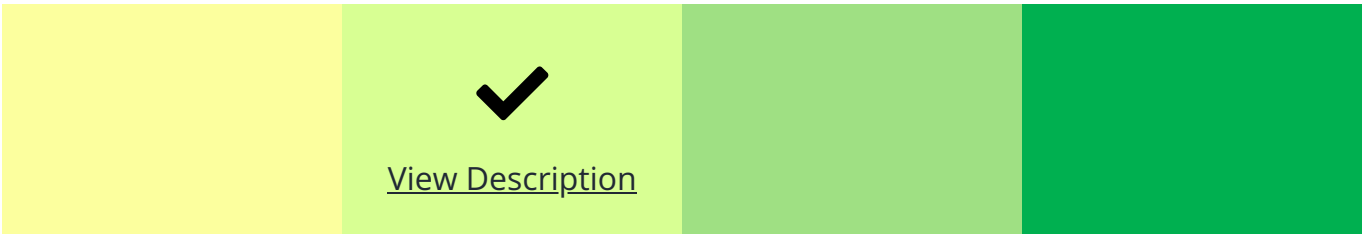
NV Energy has implemented multiple DSM programs, including rebates for energy-efficient lighting, pool pumps, appliances, air-conditioning repairs and replacements, on-site energy efficiency audits, and DR programs. NV Energy administers DR programs for its residential and commercial customers to manage demand and energy use during times of peak energy use or emergency conditions. NV Energy's residential DR program allows NV Energy to interact with its customers' air conditioners. NV Energy's commercial DR program allows NV Energy to interact with its commercial customers' air conditioner and end-use lighting loads.

GREENHOUSE GAS IMPLICATIONS

Expanding DSM and DR to shift loads will optimize the use of renewably-generated electricity. Coupled with robust energy-efficiency programs for residential, commercial, and industrial customers, this has the potential to reduce GHG emissions.

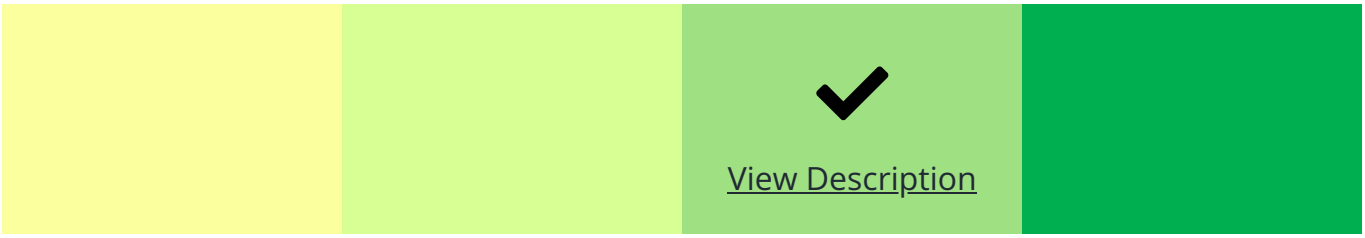
In fact, in 2019, NV Energy stated it had approximately 225 hundred kW and 327 million kWh of demand and energy savings, respectively, as a result of its DSM programs, for a total CO_2 emissions reduction of approximately 232 million lbs. For its DR programs, NV Energy reported it had approximately 176 hundred kW and 32 million kWh of demand and energy, respectively, equating to a total CO_2 emissions reduction of approximately 210 million lbs. Further, NV Energy indicated that residential energy audits resulted in a total CO_2 emissions reduction of approximately 6 million lbs.

Although reductions are expected, specific estimates of GHG emissions reductions cannot be accurately assessed until details are known about the utility design of such a program.



CLIMATE JUSTICE

Reducing the energy burden of low-income customers is a benefit of DSM programs. Until the utility designs DSM programs that factor in renewable generation patterns, it will be hard to predict economic impacts to ratepayers, including any potential burden on low-income households. However, Nevada law does require that at least 5% of the expenditures related to energy efficiency and conservation programs in the demand-side plan must be directed to energy efficiency and conservation programs for low-income customers of the electric utility.

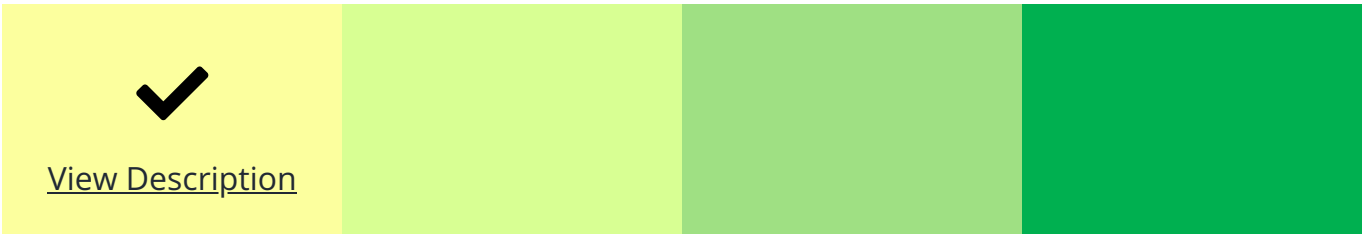


INTEGRATED ECONOMIC ASSESSMENT

The costs to the state are unknown with respect to administering DSM programs that prioritize load reductions when renewable resources are not generating, that prioritize load shifting when renewable resources are generating, and that establish a comprehensive on-site energy efficiency program that can be utilized across sectors to increase energy efficiency. However, it is likely that additional resources will be required.

However, it's worth noting that NV Energy was able to return money to customers as a result of energy savings in 2019. Nevada Power Company (NPC), NV Energy's Southern Nevada utility, expended $33.2 million in program costs in 2019 and reported achieved savings of 232,653,028 kWh (1.15% of weather-normalized retail sales). The Sierra Pacific Power Company (SPPC), NV Energy's Northern Nevada utility, expended $11 million in program costs and reported achieved savings of 94,562,194 kWh, (1.04% of weather-normalized retail sales). Because both NPC and SPPC over-earned in 2019, the utilities returned to customers $3.8 million and $1.1 million, respectively, of revenue collected under the Energy Efficiency Implementation Rate (EEIR).

The annual budgets for energy efficiency and conservation programs also are approved through the demand-side plan. The PUCN determines cost effectiveness of the programs in the plan and its regulations offer a bit of flexibility, meaning that the PUCN may approve a demand-side plan that consists of programs that are individually not cost effective, so long as the plan as a whole *is* cost effective.



View Description

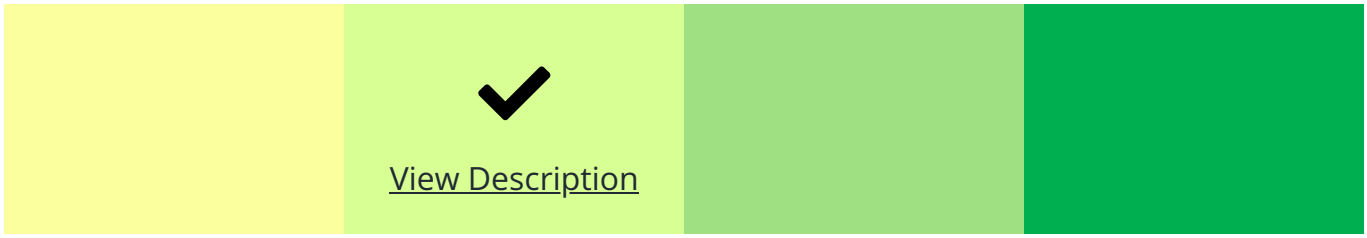
IMPLEMENTATION FEASIBILITY

The PUCN has authority to consider programs that prioritize load reductions when renewable resources are not generating, that prioritize load shifting when renewable resources are generating, and that establish a comprehensive, cross-sector, on-site energy efficiency program. There are no limitations in statute or regulation that would prohibit the electric utility from proposing such programs for PUCN approval in its next IRP. The utility, however, does face a few regulatory requirements that do not appear to be

insurmountable. For example, as noted above, the statute mandates that the plan be cost effective (NRS 704.7836). However, not every program is required to be cost effective, so long as the PUCN determines that the energy efficiency plan as a whole is cost effective. Also, the program must be technically feasible (NAC 704.934(2)(b),(c)). Energy efficiency and conservation programs, including DR, relied upon to reduce peak demand on a firm basis must include an assessment of the savings in the costs of transmission and distribution (NAC 704.934(5)(b)).

Beyond approval of cost recovery and lost revenue for demand-side programs in the Energy Efficiency Program Rate (EEPR) and EEIR rates, the PUCN may have another tool to incentivize programs that prioritize load reductions when renewable resources are not generating or that prioritize load shifting when renewable resources are generating. SB 300 requires the PUCN to adopt regulations allowing an electric utility to apply for approval of an alternative ratemaking plan. Alternative ratemaking mechanisms represent a shift from the traditional cost-of-service ratemaking that the PUCN and most other state utility commissions have applied to electric utilities for decades. The electric utility industry is changing rapidly, and as a result, regulators across the country are evaluating whether changes in ratemaking are required to align regulatory mechanisms with those industry changes. SB 300 includes a menu of possible alternative ratemaking mechanisms, including, but not limited to, performance-based rates, subscription-based pricing, formula rates, decoupling, earnings sharing mechanisms, and multiyear rate plans.

The PUCN opened Docket No. 19-06008 on June 6, 2019, in response to SB 300. In the docket, the Presiding Officer recently released Procedural Order No. 10, asking stakeholders to evaluate various alternative ratemaking mechanisms, including performance incentive mechanisms for peak load reduction, amongst other requests for comment. While it is not clear at this time if SB 300 will result in the adoption of an alternative ratemaking plan for the utility, the PUCN has a means to incentivize utility behavior beyond the traditional ratemaking tools currently set forth in statute and regulation.



REPLACE, CAPTURE, AND RECYCLE OZONE-DEPLETING SUBSTANCE SUBSTITUTES

Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) are compounds that are used as substitutes for ozone-depleting substances (ODS). The U.S. Climate Alliance's roadmap on reducing short-lived climate pollutants (e.g., ODS substitutes) has identified that HFCs—which are used in air conditioning units, refrigeration systems, foams, aerosols, and other applications—are thousands of times more potent than CO_2 and represent the fastest-growing source of greenhouse gas (GHG) emissions in the United States and globally. This is also true for Nevada.

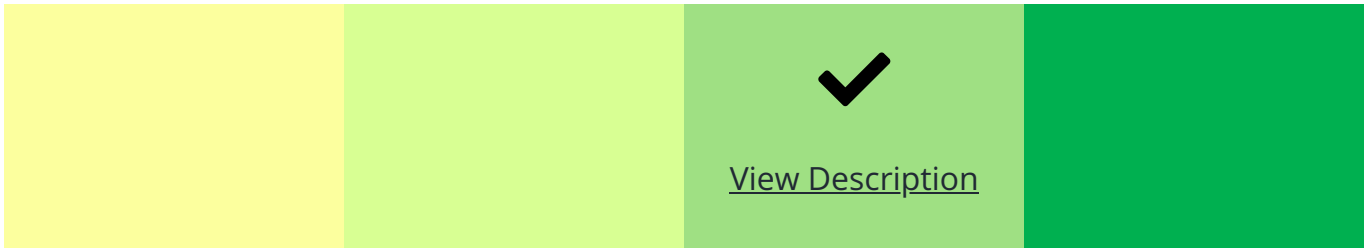
Replacing, capturing, and recycling ODS substitutes or other measures could reduce the usage of these compounds, thus ensuring healthy air while combating climate change. Coupled with efficiency opportunities in refrigeration and cooling, phasing down the use of HFCs and replacing them would deliver significant climate and energy efficiency benefits.

The U.S. Environmental Protection Agency (EPA) and various industries are working together to measure, manage, and reduce these emissions. An option for Nevada could be to increase reliance on healthier, less-harmful substitutes in partnership with the EPA.

GREENHOUSE GAS IMPLICATIONS

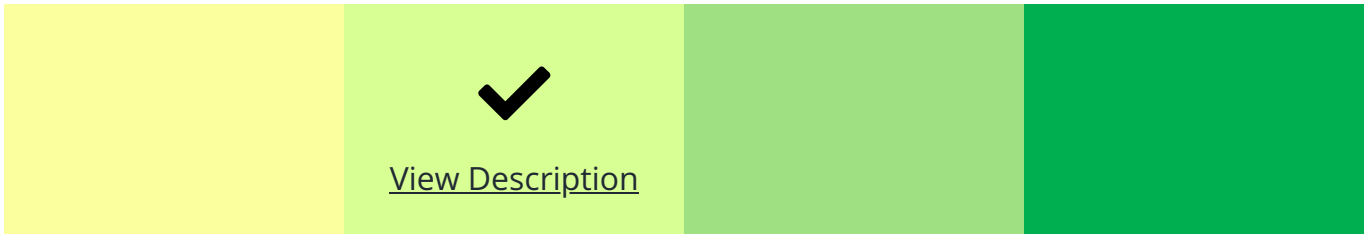
Although an important component of modeling future GHG emissions under different policy scenarios, data about ODS substitute management and use within Nevada is not currently collected by the state. Rather, estimates of these emissions are modeled based on population, which is an imprecise extrapolation. However, absent other changes, the growing population alone would likely increase GHG emissions from ODS substitutes.

Consequently, although it is clear that a reduction in GHG emissions would be achieved, and that this is an important target in order to achieve the state's goals, the trajectory and timeline is unknown. However, given the projected increase, failure to address the emissions of ODS substitutes will compromise the state's ability to meet GHG emissions-reduction targets and undermine other climate-mitigation policies.



CLIMATE JUSTICE

There are health benefits to reducing and ultimately eliminating ODS substitutes in homes and businesses. However, whether there is a broader suite of information that could help understand any impacts and benefits requires further research and coordination with Nevada's communities.



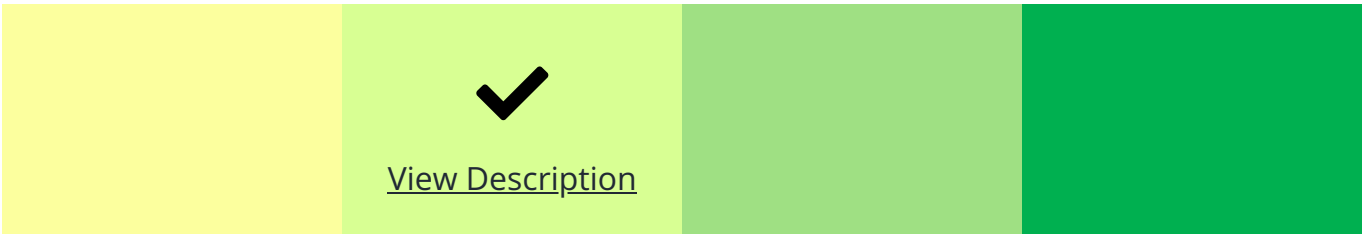
INTEGRATED ECONOMIC ASSESSMENT

In Oregon, California, and Colorado—states that have adopted policies surrounding the reduction and/or elimination of ODS substitutes—each state has identified that additional funding and staff are required to conduct rulemaking, implement and enforce the restrictions, and provide ongoing reporting.

During Oregon's 2020 session**,** HB 4024 B was introduced and passed prohibiting certain products that use or contain HFCs manufactured after a specific date from entering commerce into the state. In HB 4024, appropriations in the amount of $176,600 from the General Fund are allocated to the Department of Environmental Quality (DEQ) in order to conduct the rulemaking, implement and enforce restrictions, and provide ongoing reporting. In order to manage the rulemaking, establish use-restriction dates, and develop labeling and reporting requirements, DEQ will need one permanent full-time Operations & Policy Analyst 3 position (0.63 full-time equivalent (FTE)). Once the rules have been established, the position will be needed to manage and implement the ongoing reporting requirements.

In California, SB 1013 established the Fluorinated Gases Emission Reduction Incentive Program (FRIP) to phase out HFCs. The administrative costs associated with the ongoing development of engineering criteria and guidelines to assess and implement incentives for low-global-warming-potential (GWP) refrigerants, coordination of the program implementation, and evaluation of low-GWP refrigerants were estimated to be $355,000 in FY 2018–2019 and $353,000 in FY 2019–2020. The state's Public Utilities Commission (PUC) estimates costs of $516,000 to $1.2 million to consider and develop a strategy for energy-efficiency programs to incorporate low-GWP refrigerants in equipment. In the 2019–2020 budget (AB 74, *Budget Act of 2019*) the California Air Resource Board (CARB) received $1 million to reduce emissions from the use of fluorinated refrigerants as directed by SB 1013.

Colorado's proposed Regulation 22 Part B (HFC Rule) is based on a draft regulation that includes nearly all end-uses covered by the initial SNAP Rules. The Division anticipates the potential need for additional staff for enforcement of this rule. The state expects that the proposed regulation will cost $1.9 million per year.



IMPLEMENTATION FEASIBILITY

The State Environmental Commission (SEC) may need to adopt new regulations to require replacement, capture, and recycling, or other measures to reduce the use of ODS substitutes such as HFCs and PFCs. Colorado recently proposed a regulation to accomplish a similar purpose. Note that Oregon and California adopted new legislation, rather than a regulation, to prohibit or phase out HFCs or products that contain them.

Through NRS 445B.210(5), the SEC has authority to "establish such requirements for the control of emissions as may be necessary to prevent, abate, or control air pollution." The Commission may also "require elimination of devices or practices which cannot be reasonably allowed without generation of undue amounts of air contaminants" (NRS 445B.210(9)). In addition, the Commission "may cooperate with other governmental

agencies, including other states and the federal government" regarding air pollution (NRS 445B.210(4)).

ODS substitutes such as HFCs and PFCs are likely "air contaminants" when discharged into the atmosphere, as defined in NRS 445B.110. As such, the SEC can likely establish that ODS substitutes in the outdoor air constitute "air pollution," as defined in NRS 445B.115. They are present in the outdoor air in quantities and durations that, due to their high GWP, "may tend to . . . injure human health or welfare, animal or plant life or property; . . . interfere with scenic, esthetic and historic values of the State; and interfere with the enjoyment of life or property" (NRS 445B.115).

A brief preliminary federal preemption analysis indicates that federal law may not preempt Nevada laws that reduce the use of ODS substitutes, as long as Nevada's requirements are more stringent than federal requirements. However, more research is necessary to confirm this.

Section 116 of the *Clean Air Act*, 42 U.S.C. § 7416 ("Retention of State Authority") states, with exceptions not relevant here, that nothing in the *Clean Air Act* "shall preclude or deny the right of any State . . . to adopt or enforce (1) any standard or limitation respecting emissions of air pollutants or (2) any requirement respecting control or abatement of air pollution." Under Section 116, states may adopt emissions standards and limitations that are *more stringent* than standards or limitations in federally approved State Implementation Plans (SIPs). They may not, however, adopt standards or limitations that are less stringent (42 U.S.C. § 7416).

Section 116 applies to the *Clean Air Act's* requirements for protecting the stratospheric ozone layer (42 U.S.C. § 7671q). This seems to imply that states may adopt more-stringent requirements for ODS substitutes than under the federal *Clean Air Act*.

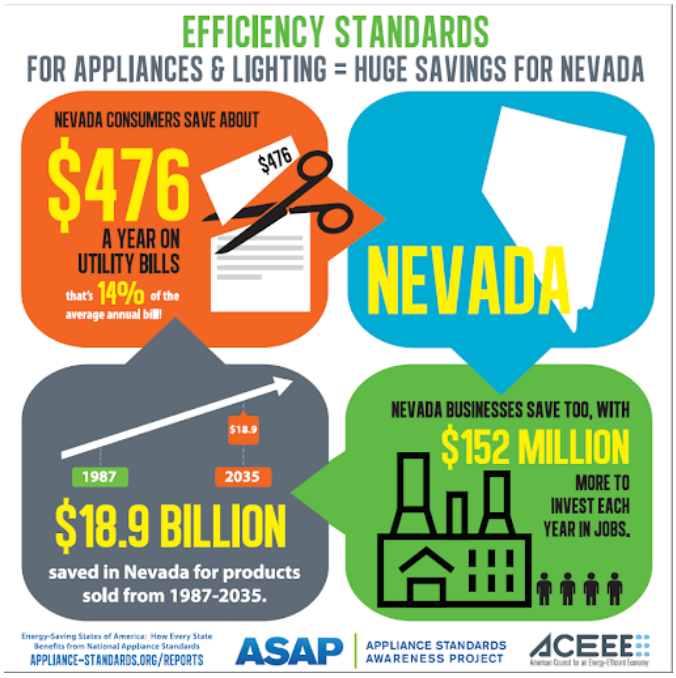
Title VI of the federal *Clean Air Act* covers protection of stratospheric ozone. 42 U.S.C. §§ 7671-7671q; see also 42 C.F.R. Subpart G. In particular, Section 612 ("Safe Alternatives Policy") governs safer alternatives for ODS. https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapVI-sec7671k.htm

A thorough analyses of the potential for federal preemption of state laws regarding ODS

ADOPT APPLIANCE & EQUIPMENT EFFICIENCY STANDARDS

Energy and water efficiency standards for appliances, lighting products, and equipment have been established in Nevada since the 1980s. Standards set at the federal level preempt states from adopting their own specific standards. However, not all appliances, lighting products, and equipment have federal standards, thus providing a way for states to adopt their own policies that achieve a higher level of efficiency.

In Nevada, minimum energy-efficiency standards for general service lamps (GSLs) were established through the passage of AB 54 during the 2019 legislative session. This legislation directed the Governor's Office of Energy (GOE) to establish a minimum efficiency standard of 45 lumens per watt for GSLs and required the agency to adopt this standard through regulations. This includes, but is not limited to, general service incandescent lamps, compact fluorescent lamps, general service LED lamps, general service organic LED lamp,; and reflector lamps. Adoption of appliance energy-efficiency standards plus adoption of the lighting standards will save Nevadans an average of $476 annually on their utility bills.



EXPAND

According to the 2013 *Better Appliances* report from the Appliance Standards Awareness Project (ASAP), between 1987 and 2010, real prices of refrigerators, clothes washers, and dishwashers decreased by 35%, 45%, and 30%, respectively, with an average decrease in energy use of more than 50%. And according to the U.S. Department of Energy (DOE), appliance and equipment standards have served as one of the nation's most-effective energy-efficiency policies since early enactment by California in 1974.

In 1975, the *Energy Policy and Conservation Act* (EPCA) established a federal program to implement test procedures, energy targets, and labeling for consumer products. EPCA was amended in 1979 directing the DOE to establish energy conservation standards for consumer products.

As shown on DOE's 2017 "Appliance Equipment Standards Fact Sheet," efficiency gains from the DOE's Standards Program has been remarkable, saving households an average of $321 per year on their energy bills.

Over the past decade specifically, appliance standards have become a topic of discussion nationally and recognized as a critical piece to combat climate change, reduce energy use, lower utility bills, and improve the overall comfort, health, safety and well-being of consumers' residences and businesses. Governors in at least 16 states, including Nevada, have acknowledged these benefits by adopting more-efficient standards that will assist in achieving emissions-reduction goals and lowering utility bills for all.

According to the *Pathways and Policies to Achieve Nevada's Climate Goals* report published by Evolved Energy, GridLab, the Natural Resources Defense Council (NRDC), and the Sierra Club, appliances must turn over so that about 45% of residential and 20–25% of commercial space and water heating is electric by 2030.

GREENHOUSE GAS IMPLICATIONS

Appliance standards set minimum energy- and/or water-efficiency levels for specific residential and commercial products. These minimum standards are set to reduce the emissions from appliances in order to effectively achieve lower levels of greenhouse gas (GHG) emissions over the life of the product.

The list of products to consider include: air compressors; air purifiers; commercial dishwashers, fryers, ovens, steam cookers, and hot-food holding cabinets; computers and computer monitors; electric vehicle supply equipment; faucets; high-CRI (color rendering index) fluorescent lamps; portable air conditioners and electric spas; residential ventilating fans; showerheads; toilets; uninterruptible power supplies; urinals; and water coolers. Increasing the efficiency of appliances in residences and commercial structures will lower GHG emissions, save consumers money, and contribute to the overall reduction goals as shown in Table 1.

During the process of implementing Nevada's lighting standards for GSLs, support from ASAP, the National Association of State Energy Officials (NASEO), the U.S. Climate Alliance (USCA), and the California Energy Commission (CEC) quantified GHG reduction impacts of the standard. ASAP provided an avenue for Nevada to have access to vetted data with conclusions, policies implemented, and analyses completed to provide the support for implementing efficiency standards across the state. NASEO, CEC, and the USCA hosted working groups focused on the topic and provided resources and support to the GOE in the development of these standards.

Table 1. Cost and GHG emissions savings associated with several appliances for Nevada.

Appliance product	Potential Annual Electricity (GWh) Savings in 2025	Potential Annual Electricity (GWh) Savings in 2035	Potential Annual Utility Bill Savings ($ million) in 2025	Potential Annual Utility Bill Savings ($ million) in 2035
Air Purifiers	22.5	57.9	2.5	6.9
Computers & Computer Monitors	43	68.7	3.8	6.3
Showerheads	8.2	23.4	6	19.1
Commercial Dishwashers	1.6	6	1.1	4.5

Source: ASAP

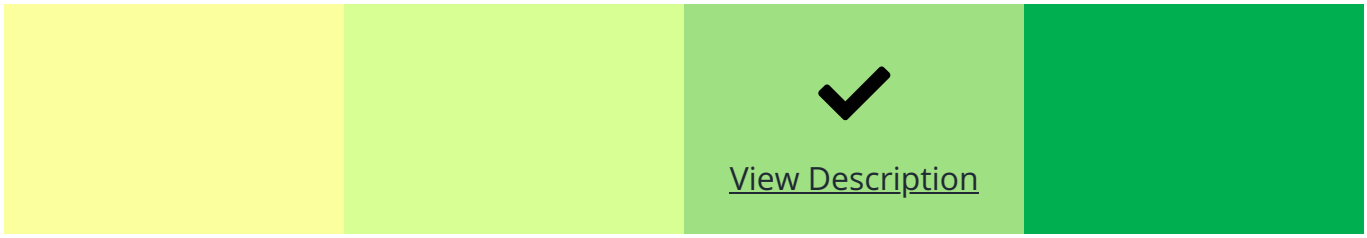
After analyzing the impact of appliance standards in other states, it is clear that adoption of state-specific standards in Nevada can achieve GHG emissions reductions. Federal regulations cover more than 55 products that are manufactured or imported for sale into the United States. This effectively preempts states from adopting stricter standards than what has already been established.

The DOE is required to review and update standards to keep up with technology as it advances. State standards apply specifically to products sold or installed in the state, allowing adoption of standards that are common sense for each state, as not all are alike in factors such as climate zone, economics, and landscape. Since not all products are covered at the federal level, the effectiveness and feasibility of implementing standards for those omitted was analyzed. Resources from ASAP, ACEEE, and the states of California, Oregon, and Colorado were consulted and reviewed. ASAP analyzed appliance standards nationwide, specific to each state, with growing positive impacts by as early as 2025 and 2035 if adopted in 2021. The results show that adoption of appliance standards in Nevada will assist in reaching the state's overall emissions-reduction goals as modeled in the ASAP Nevada-specific report.

Adoption of appliance standards is taking place in at least 16 states across the nation, including Nevada, Colorado, California, Oregon, and Washington. This is primarily due to the positive economic and societal benefits. This includes Nevada adopting minimum efficiency standards for GSLs under AB 54 and water-efficiency standards under AB 163.

Another reason is because the Trump administration, in its attempt to roll back efficiency standards, is failing to perform the duties required under the *Energy Independence and Security Act (EISA) of 2007*, failing to update standards for 28 products and attempting to roll back other policies that have been proven to benefit the most-vulnerable communities.

Nevada is one of many states pursuing higher-efficiency appliances in order to reach the ultimate reduction goal of zero or near-zero emissions by 2050.



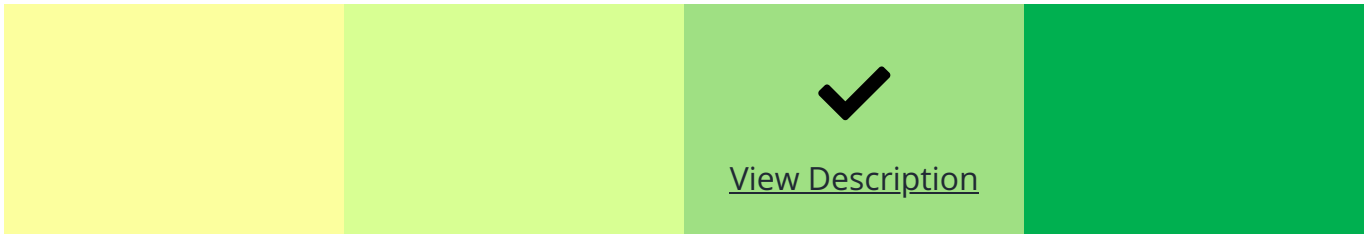
CLIMATE JUSTICE

During the Green Building listening session conducted in association with the development of the *State Climate Strategy*, Nevadans expressed support of improved efficiency in homes and businesses, particularly in vulnerable communities. Comments submitted by stakeholders highlight the naturally long lifespans of appliances, which shows the need to address carbon-reducing policies in the built environment today.

Appliance standards positively impact those in the low-income, Indigenous, and otherwise financially negatively-impacted communities by lowering utility bills. Such standards also ensure healthier environments and indoor air quality while promoting longer-lasting products that improve quality of life and having less of a financial burden on each citizen over time. More-efficient appliances can have a higher upfront cost, which is typically made back over time through savings via reduced energy costs to operate the appliance. Over time, these upfront appliance costs decline as technology matures and adoption scales.

Supporting these standards will lower consumers' utility bills an average of $476 per year, emit less harmful pollutants into the air that further exacerbate pre-existing lung and other health conditions, and provide long-term financial benefits as mentioned during the listening session.

The 2017 ASAP/ACEEE report *Energy-Savings States of America: How Every State Benefits from National Appliance Standards* estimates that existing consumers and businesses saved $80 billion on utility bills from existing standards in 2015. Savings will grow to nearly $150 billion by 2030. The economic value of existing standards can also be expressed on a cumulative basis, counting both costs and benefits. Accounting for products sold between 1987 and 2035 and for estimated product price increases, total net present value savings from national standards is $2.4 trillion for U.S. consumers and businesses.



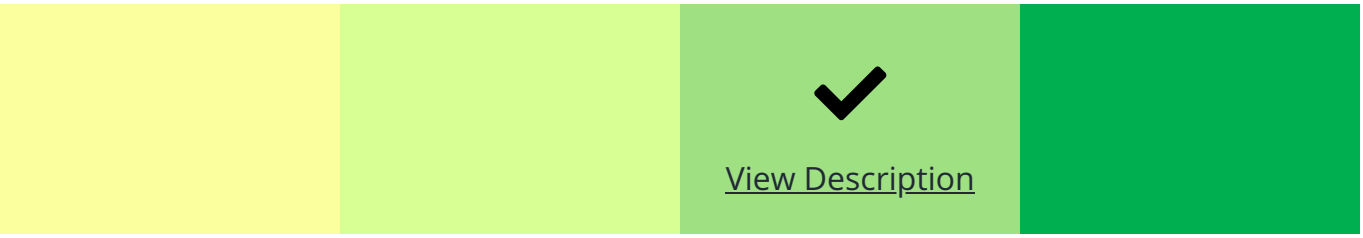
INTEGRATED ECONOMIC ASSESSMENT

The consideration and implementation of rulemaking around appliance efficiency standards requires coordination between the GOE and the Nevada Legislature, in

consultation with the Nevada Division of Environmental Protection (NDEP) and the Attorney General's (AG's) office. Currently, the GOE does not administer an appliance standard program and with the budgeted staff, additional resources would be necessary to implement and administer an appliance implementation and compliance program statewide. Appliance standards have been adopted in at least 16 states and the staffing and fiscal impacts to each can vary depending on the overall authority and enforcement provided to the department.

Investment by the state is necessary to adopt and implement appliance efficiency standards. Some states like Colorado have implemented these standards with existing staff. Colorado's Department of Public Health and Environment (DPHE) publishes the standards and the Attorney General is authorized to bring civil action against anyone violating the law, according to the fiscal note published during consideration of HB 19-1231. Both departments can handle the additional workload without expanding resources.

Additional research is needed to determine the full fiscal impact of appliance standards on Nevada's state and local government.



IMPLEMENTATION FEASIBILITY

Nevada Revised Statute (NRS) Chapter 701 grants GOE broad authority for adoption of energy policies in this state.

The GOE director has the authority to adopt any regulations that the director determines necessary to carry out the GOE's duties pursuant to NRS 701. Given this broad authority, GOE could likely adopt appliance energy-efficiency standards and create a timeline for properties to update their appliances from less-efficient to the most-current technologies that provide a higher level of efficiency. This approach appears to be in line with the statement in NRS 701.010 that "the State has a responsibility to encourage the utilization of a wide range of measures which reduce wasteful uses of energy sources."

Although State legal authority appears to exist for implementing such a policy, federal preemption under the *Energy Policy and Conservation Act* (EPCA) would likely present difficulties.

The EPCA expressly preempts states and municipalities from creating their own minimum energy- and water-efficiency standards for certain appliances and equipment. If a certain product is subject to a federal standard under EPCA, states may not prescribe a different efficiency standard for that same product. A minimum federal energy-efficiency standard would preclude not only state energy standards, but also water standards, and vice versa (Peter J. Ross, *Appliance & Equipment Efficiency Standards: A Roadmap For State & Local Action* 1-2 (2017); 42 U.S.C. § 6297(b)).

The U.S. Department of Energy (DOE) has primary responsibility for federal energy-efficiency standards (42 U.S.C. §§ 6202(1), 6295).

EPCA provides several exceptions from its preemption clause. First, states may implement procurement standards that are more stringent than corresponding federal energy conservation standards (42 U.S.C. § 6297(e)). Under this provision, Nevada could revise its procurement laws to require purchasing products that exceed federal energy-efficiency standards. To do so, the legislature may need to amend NRS 333.4611 (purchasing devices that use electricity, natural gas, propane, or oil). We did not have time to thoroughly examine Nevada's state purchasing laws.

Second, states may petition DOE for a waiver to develop their own energy-efficiency standards for certain products (42 U.S.C. § 6297(d)). In order to obtain a waiver, a state must show its regulations are needed "to meet unusual and compelling State or local energy or water interests," which are "substantially different in nature or magnitude than those prevailing in the United States generally" (42 U.S.C. § 6297(d)(1)(B) & (C)). In addition, the state regulations must be preferable to alternative approaches to energy savings, including reliance on reasonably predictable market-induced improvements in efficiency. Nevada's ability to secure a waiver under this provision is highly uncertain and may create litigation risk.

Third, states and municipalities may indirectly encourage the adoption of high-efficiency appliances through building codes for new construction (Ross, *supra*, at 21). EPCA does not preempt state or local building codes for new construction concerning the energy efficiency or energy use of a covered product as long as the codes meet certain statutory requirements (42 U.S.C. § 6297(f)(3)). Among other things, the codes may not "require that

the covered product have an energy efficiency exceeding the applicable [federal] energy conservation standard" without a waiver (42 U.S.C. § 6297(f)(3)(B)). The codes also must grant credits on the basis of how much each building option reduces energy use or cost, without favoring particular products or methods (Ross, *supra*, at 21 (citing 42 U.S.C. § 6297(f)(3)(C))).

This exception may allow Nevada to create a timeline for residential and commercial properties to update appliances from less-efficient technologies to the most-current technologies that provide a higher level of efficiency. It would be safest to require use of products that meet, but do not exceed, the federal minimum standards. *See* Air Conditioning, Heating & Refrigeration Inst. v. City of Albuquerque, 2008 WL 5586316, at *2 (D.N.M. 2008). EPCA preempted ordinance that prescribed standards for individual components of building that exceeded the federal minimum standards (Ross, *supra*, at 22). For Nevada legal authority to adopt building codes, see the policy on *Energy Codes for Net-Zero Buildings*.

There is, however, the possibility that a court may find that EPCA preempts a state or local building code. *See* Air Conditioning, Heating & Refrigeration Inst, 2008 WL 5586316, at *2; Ross, *supra*, at 21-22; Josh Zaharoff, *The Efficiency of Energy Efficiency: Improving Preemption of Local Energy Conservation Programs*, 37 N.Y.U. Rev. L. & Soc. Change 783, 811-18 (2013) (noting conflicting court decisions, both upholding and striking down, state and municipal building codes under EPCA's preemption provision).

Fourth, Nevada and California may adopt energy-efficiency standards for general service lamps in accordance with 42 U.S.C. § 6295(i)(6)(A)(vi). Nevada's new energy-efficiency standards for general service lamps, required by AB 54 (2019) and NRS 701.260, appear to fall within this exception.

In addition, states may pass energy-efficiency laws for new consumer appliances and industrial equipment that are not covered by federal law (Ross, *supra*, at 22). For example, despite 42% of U.S. homes having at least one desktop computer and 64% having at least one laptop computer, no national standards exist for computer products. The California Energy Commission adopted standards for computers and computer monitors in December 2016 (20 Cal. Code Reg. § 1605.3(v)).

New legislation is probably necessary to adopt energy-efficiency standards for appliances not covered by federal law. Nevada's practice has been to enact special purpose legislation

to authorize energy-efficiency regulations, such as NRS 701.220 (energy conservation in buildings) and NRS 701.260 (energy-efficiency standards for general service lamps).

In sum, even in light of the above stated preemption difficulties, Nevada may be able to implement parts of this policy using exceptions in the EPCA (e.g., state procurement standards, building codes, and energy-efficiency standards for products not covered by

View Description

IMPLEMENT A STATEWIDE BENCHMARKING PROGRAM

Energy benchmarking is a continuous process of analyzing the current performance of a building and comparing it to a standard baseline to determine where energy and water efficiency improvements are necessary. Benchmarking a large building stock could achieve considerable energy savings but would require time, effort, and capital. For example, State-owned properties cover over 29 million square feet of Nevada's built environment using more than 329 million kWh annually.

When considering a benchmarking program in Nevada, evaluating how effective it will be in reaching the goal of zero greenhouse gas (GHG) emissions by 2050 is crucial. Implementation of a statewide program to include public and privately-owned buildings could achieve a significant emissions reduction.

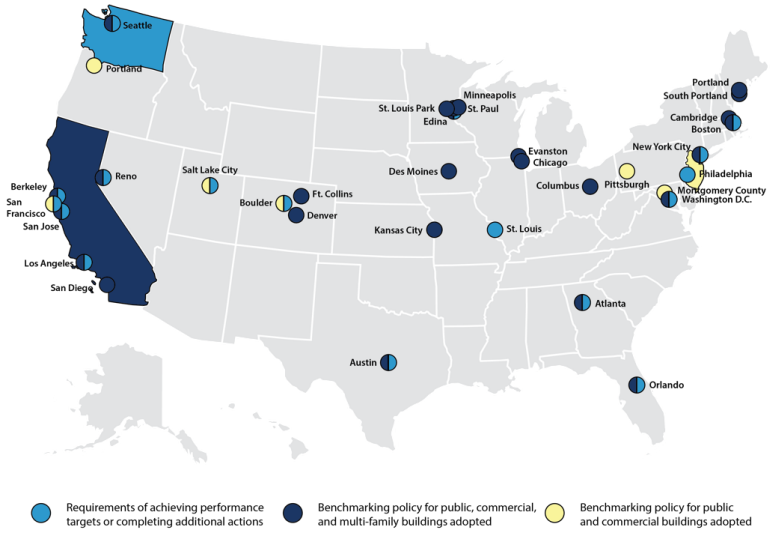
Data collection to identify the current status of a building or other structure with regards to energy and water consumption will inherently provide a baseline for improved standards, ultimately creating a path for buildings to achieve required GHG-reduction goals.

Utilizing a standard of measurement is necessary when considering benchmarking policies. Platforms such as the U.S. Environmental Protection Agency (EPA) ENERGY STAR portfolio manager provide a way to track water and energy consumption within the built environment and then compare that performance to similar buildings in similar climate zones.

GREENHOUSE GAS IMPACTS

Other cities, counties, and states that have adopted mandatory energy benchmarking policies are shown in Figure 1.

Figure 1. U.S. City, County and State Policies for Existing Buildings



EXPAND

Redrawn from Institute for Market Transformation

Chicago's benchmarking program has shown a 10% drop in energy use per square foot from 2015 to 2018. According to the city's 2018 benchmarking report, this equates to taking almost 400,000 cars off the road.

Reno passed the Energy and Water Efficiency Program, also known as the benchmarking ordinance, to encourage large commercial and multifamily buildings to participate in the community's goal of emissions reductions. Programs like this provide a way for building owners to measure current energy and water use and implement cost-effective efficiency measures that reduce GHG emissions.

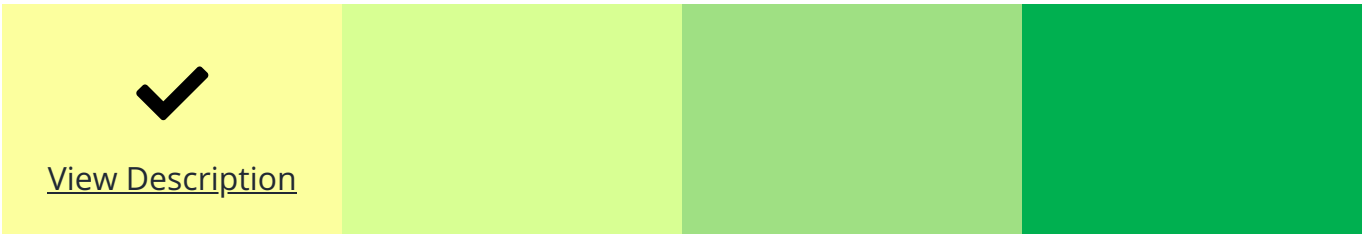
Significantly more information would be needed about individual buildings in order to truly establish precisely what type of emissions reduction could be achieved and on what time frame. Similarly, the diverse uses and business models behind Nevada's building stock (e.g., gaming, logistics, manufacturing, commercial, multifamily, leased vs. owned) makes this recommendation's success dependent on robust consultation with stakeholders. However, it is clear that this type of program would result in reduced GHG emissions.

View Description

CLIMATE JUSTICE

Research of similar programs suggests that an efficient way to implement a benchmarking program is to begin with State-owned buildings, buildings owned by political subdivisions, and commercial, institutional, and educational buildings over a certain square footage.

Improved understanding of benchmarking's impact in the multifamily development sector is required, as costs for compliance could be incurred by renters. However, these could be offset by savings in energy costs. More research and discussion are necessary to understand the tradeoffs.



INTEGRATED ECONOMIC ASSESSMENT

The consideration and implementation of a benchmarking program would require coordination among the Governor's Office of Energy (GOE), State Public Works Division (SPWD), Nevada Public Utilities Commission (PUCN), as well as other state agencies and local governments in consultation with the Nevada Division of Environmental Protection (NDEP).

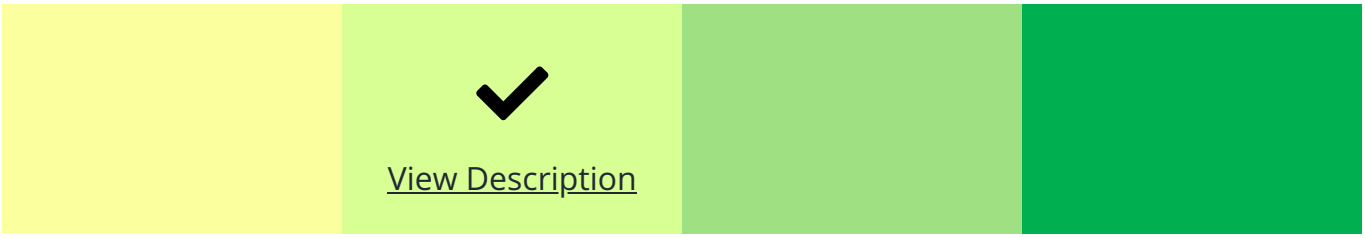
Benchmarking policies have been adopted in at least six states with varying degrees of specificity, but all require at least one full-time equivalent (FTE) staff member to manage the programs.

In Colorado, Governor Polis signed Executive Order D 2019 016 directing state agencies and departments to participate in local benchmarking ordinances providing data on State-owned buildings within those jurisdictions.

Oregon has a mandated State Energy Efficiency Design Program (SEED), which requires all State facilities constructed on or after a certain date exceed the energy conservation provisions of the Oregon State Building Code by at least 20%.

California has also established a benchmarking program that allows the California Public Utilities Commission (CPUC) to authorize electrical or gas corporations to provide incentives and assistance for measures to conform a building to California Energy Commission's (CEC) energy-efficiency standards for existing buildings.

It is unclear what the fiscal impacts are for states that implement benchmarking policies, as these can vary based on the policies adopted.



IMPLEMENTATION FEASIBILITY

Under NRS 331,070, SPWD's Buildings & Grounds Section manages and has jurisdiction over approximately 9 million square feet of the State's buildings. Other state agencies that own buildings include Department of Corrections, Department of Transportation, Nevada System of Higher Education, Department of Military, Department of Health & Human Services, the Legislature, Department of Public Safety, State Parks, Department of Wildlife, and Department of Agriculture.

The SPWD Code and Compliance Section's building official is the authority having jurisdiction over *all* buildings and structures on property of the state or held in trust for any division of state government (NRS 341.100 (9)). This authority extends to code adoption, including the adoption of energy codes (NRS 341.091).

A program for commercial and multifamily buildings might involve the GOE, the PUCN, the Treasury Department if considering a tax credit, and the Water Resources Division for water use. Each agency may have authority to deal with some part of the program.

A number of states and the City of Reno have adopted programs for "benchmarking" (or comparing) the energy and water use of buildings using the U.S. EPA's ENERGY STAR Portfolio Manager tool. These programs incorporate one or more of the following elements:

1. Applicable buildings must track and report their annual energy use using the ENERGY STAR Portfolio Manager tool.
2. Benchmarking data will be publicly disclosed for applicable buildings.
3. Utilities must provide applicable buildings with aggregated whole-building energy-use data in a format compatible with the ENERGY STAR Portfolio Manager tool.
4. Utilities must be able to provide this data and building owners must report annual energy usage.
5. State agencies must lease space in buildings that have earned ENERGY STAR certification, where possible.
6. Applicable buildings must reduce energy use (or, in some states, "energy use intensity") by a certain percentage (e.g., 20%) by a certain date (e.g., 2030).
7. Applicable building owners must seek to obtain ENERGY STAR certification for all eligible facilities.
8. Applicable commercial buildings must disclose energy performance metrics to a prospective buyer, lessee, or lender.
9. Applicable buildings must disclose their 1–100 ENERGY STAR score to a purchaser or prospective purchaser of the facility before the time of sale.
10. New construction buildings of more than 10,000 square feet must meet state energy code targets using the ENERGY STAR Target Finder tool or equivalent methodology (SPWD adopted codes in NAC 341.045, and 341.301 – 341.346, already exist and are applicable to all construction/buildings on state property).
11. Applicable buildings must comply with performance goals or follow compliance options.
12. An income tax credit is available to encourage private-sector design and construction of energy-efficient, sustainable buildings. To qualify, commercial applicants must demonstrate that the building is 60% more efficient than an average building of the same type using the ENERGY STAR Target Finder tool; residential applicants must demonstrate that ENERGY STAR Homes certification has been earned.

Other programs apply to commercial and multifamily buildings of a given size (e.g., larger than 25,000 or 50,000 square feet). Usually, the legislature passes a statute specifically drafted to establish the program. In some cases, states began with a program for state-owned, -leased, or -managed buildings and later adopted a program for commercial and multifamily buildings.

Some programs establish mandatory requirements (e.g., for state-owned buildings or buildings larger than 50,000 square feet); others are voluntary (e.g., New Mexico's income tax credit for efficient, sustainable buildings).

For buildings owned by the State of Nevada, an executive order could set goals for energy and water efficiency and direct state agencies to benchmark and track building energy and water use and make improvements to achieve efficiency goals. The GOE has authority to establish a program to track energy (but not water) use in buildings owned or occupied by the State (NRS 701.218). The GOE has already completed one such program (State Buildings: Monitoring Natural Gas and Electricity Use). Under existing regulations, capital improvement projects for state buildings larger than 20,000 square feet must meet ENERGY STAR standards for energy and water efficiency (NAC 341.346).

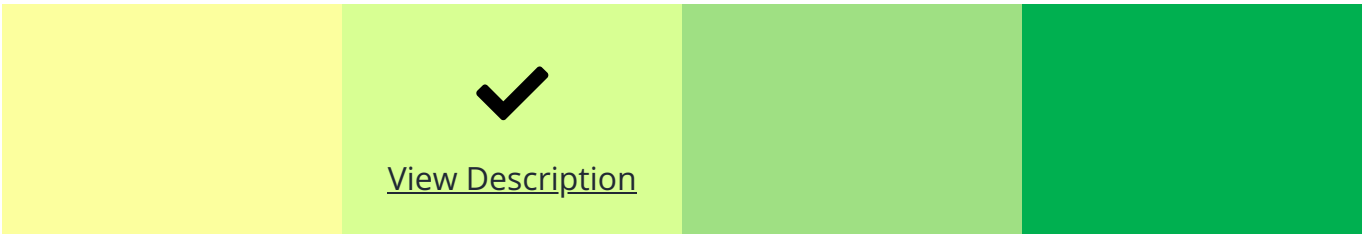
For commercial and multifamily buildings in Nevada, a benchmarking program might involve several state agencies, each of which may have authority for part of the program. For example:

- GOE: conservation of energy in buildings, promote incentives for energy conservation
- PUCN: require utilities to provide aggregated, whole-building energy use data or automated benchmarking data through ENERGY STAR Portfolio Manager
- Nevada Division of Water Resources and various water authorities (e.g., the Las Vegas Valley Water District, Truckee Meadows Water Authority): aggregated, whole-building water use data or automated benchmarking data through ENERGY STAR Portfolio Manager, water-use efficiency standards, incentives, rebates
- Department of Taxation: tax credits

For example, the GOE director has authority to:

- Adopt regulations for the conservation of energy in buildings (NRS 701.220(1));
- Adopt any regulations the director determines necessary to carry out the duties of the Office of Energy (NRS 701.170(4));
- Recommend to state agencies, local governments, and appropriate private persons and entities, standards for conservation of energy (NRS 701.200(1));
- Encourage the maximum utilization of existing sources of energy in the state (NRS 701.180(3));
- Prepare a comprehensive state energy plan that provides for promotion of, among other things:
    - Energy-use reduction, conservation, and efficiency (NRS 701.190(1));
    - Creation of incentives for energy-use reduction, conservation, and efficiency (NRS 701.190(2)(c)); and
    - Any other matter relevant to energy use, conservation, and efficiency.

This policy includes elements that may fall within the authority of several agencies. The most-efficient way to establish such a program may be through new, special purpose legislation (like that adopted in a number of states), rather through a patchwork of existing legal authority involving multiple agencies. EPA's *Benchmarking Programs and Policies Leveraging ENERGY STAR* lists a number of state programs (including New Mexico, Oklahoma, Texas, Utah, and the State of Washington) that could serve as models for Nevada legislation or executive orders. The Reno Energy and Water Efficiency Program (Reno Administrative Code Chapter 14.30) could also serve as a model.



REQUIRE RESIDENTIAL ENERGY LABELING AND ENERGY AUDITS

Residential energy-efficiency programs increase energy efficiency, relieve energy cost burden, and improve the health of the occupants receiving the benefits of the program. When an energy-efficiency program is designed specifically for low-income communities, it has the added benefit of providing services to those that are most vulnerable. In Nevada, through the Weatherization Assistance Program (WAP), the Nevada Housing Division (NHD) provides low-income families energy audits that identify qualified energy-efficiency measures that are then implemented at no cost to qualified owners and renters. NHD's weatherization program includes funding from the Governor's Office of Energy (GOE) thorough the Home Energy Retrofit Opportunity for Seniors (H.E.R.O.S.) program, which provides an additional $8,000 maximum per home in weatherization assistance to low-income seniors who qualify.

According to a paper published by the National Association of State Energy Officials (NASEO), the benefits of these programs can be enhanced by obtaining an energy label, which provides additional value to participants by documenting the upgrades and improvements to the residence. This can be accomplished through various forms of documentation, energy audits and the results of the implemented measures, energy savings figures, or energy labeling that shows pre and post energy costs and energy use.

Residential energy labeling broadly refers to providing standardized energy performance information about a home. An energy label can convey energy use and cost information and is usually accompanied by an analysis that measures the efficiency of the home. An energy label can inform prospective buyers or renters about the current energy costs of the home, allowing a more-informed decision before occupying it.

If a policy is adopted, an energy label would provide various benefits to the residential community, such as: consumer protection after improvements have been implemented, assistance to the homeowners in making informed decisions about energy improvements, and providing potential purchasers the opportunity to understand the current energy costs and usage of a home.

A home buyer energy audit with a home energy score would provide a potential buyer of a residence the current efficiency status of the home. This would include information about

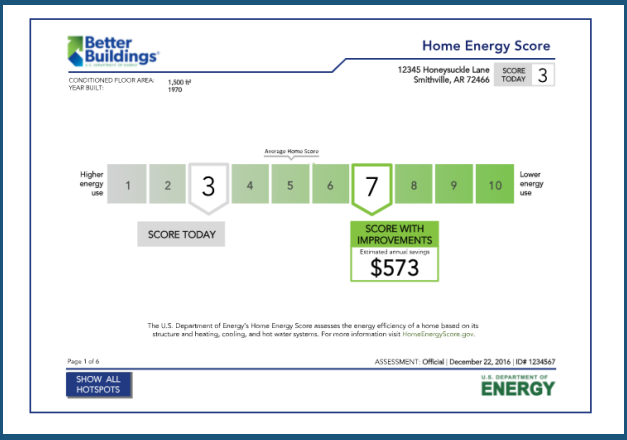
the expected monthly utility bills, what could be improved prior to the final closing of the transaction, as well as how the improvements would affect the overall price of the home.

Such audits encourage home energy-efficiency investments and expand consumer options. If a buyer desires an efficient home and an audit shows that it is, sellers have the potential of being the top choice for consumers who are considering multiple options.

If a policy is adopted, an energy auditor or Home Energy Score Certified Assessor would perform and provide an energy audit to buyers during the purchase of a residence, similar to an appraisal or home inspection. The audit would be provided to the purchaser and the seller prior to the closing to allow for the negotiation of implementing the measures before the closing occurs. This will increase awareness of efficiency measures available to the buyer along with the cost-benefit of implementing the measures to allow further insight into total home ownership costs.

Through the U.S. Department of Energy's (DOE) Better Buildings Solution Center, a Home Energy Score program was launched in 2012, which is a standardized methodology for measuring a home's efficiency and producing an efficiency "rating." The Score informs the home buyer or homeowner how much energy the home is expected to use, how much this will cost them, and how to cost-effectively lower energy expenses. Over the past eight years more than 90,000 homes have been scored.

Developed by DOE and its national laboratories, the Home Energy Score provides homeowners, buyers, and renters directly comparable and credible information about a home's energy use. Like a miles-per-gallon rating for a car, the Home Energy Score is based on a standard assessment of energy-related assets to easily compare energy use across the housing market.



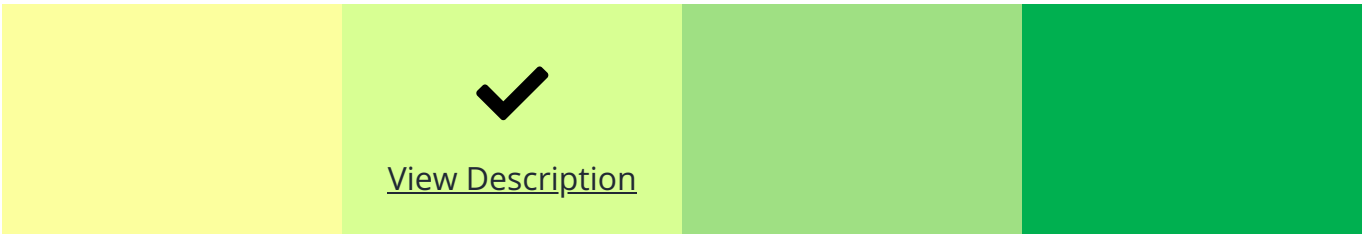
EXPAND

Source: DOE Better Buildings

GREENHOUSE GAS IMPLICATIONS

While DOE and other states have adopted similar policies or created programs, the impacts are calculated based on energy savings rather than greenhouse gas (GHG) emissions reductions. However, there are tools available that can calculate what the savings would equate to. So, with accurate data for Nevada on what the actual savings achieved are, there is a way to convert that calculation into emissions reductions.

Understanding the full GHG implications of this policy would require the estimated changes in net electricity consumption over time as a result of adoption. More-detailed information from energy providers on the anticipated GHG emissions profile of supplied energy over time for major regions of the state would also be necessary.



CLIMATE JUSTICE

During the Green Building listening session, Nevadans expressed support of improved efficiency in homes and businesses. Several stakeholders at the Urban Planning listening session emphasized that additional outreach specifically to low-income communities, communities of color, and Indigenous communities is necessary to ensure fair and equitable policies.

Ensuring equity and social justice for all Nevadans is a top priority that should be considered in the adoption of policies or programs surrounding energy audits, energy scores, and energy labeling. These policies can benefit low- to moderate-income (LMI)

communities, primarily through an energy labeling program. This could also happen through an energy audit program that would allow the owner of the property to implement measures prior to renting, creating healthy and efficient residences for the tenants. Providing home buyers, owners, and renters with energy audit results and recommendations will increase education and awareness of energy efficiency. Additional disparities and mechanisms to implement cost-saving efficiency benefits for renters should be further explored.

Additionally, the recommendations provided in the audit report could include information about available assistance for weatherization and energy-efficiency upgrades, such as DOE's WAP, the GOE's H.E.R.O.S. program, and loan programs for energy improvements from the Federal Housing Administration (FHA), Fannie Mae, and Freddie Mac. Some of those programs may require an energy audit as a prerequisite, so having one in hand could speed the process.

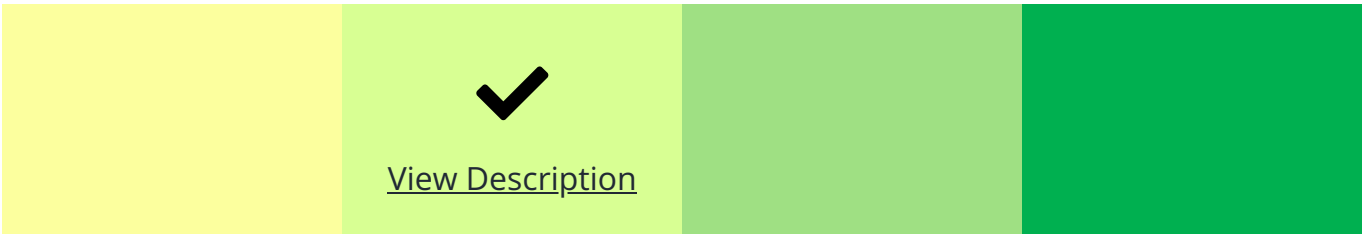
During a residential sale transaction, home buyers will then have the information they need to pursue improvements that could lower utility bills and make homeownership more affordable in the long term. In addition, knowing that a specific home is expected to have high energy costs could help a prospective home buyer avoid making a costly mistake.

An energy labeling program could cast a wider net than an energy audit, in that it could encompass units for rent as well as commercial properties. Lower-income households are far more likely to rent and therefore be impacted by this program. Lower-income households, whether homeowners or renters, typically are in older properties and pay a larger percentage of their income for energy costs.

Additional research and discussion are needed to determine if it is more appropriate to have the seller incur the costs of the energy audit instead of the buyer. Negative impacts could include higher closing costs for the buyer or the seller, so it would be beneficial to determine how this is addressed in the residential sales contract.

If sellers were required to have an audit done before listing the home, buyers would have that data available to them while browsing the multiple listing service (MLS). Knowing that their house has a low score may motivate a seller to make inexpensive improvements such as caulking and weatherstripping before listing. This would also eliminate any perception that an energy audit could slow down the buying process. It would also eliminate redundancies where the audit ends up being performed multiple times at the same house if multiple buyers back out or have funding fall through.

Unfortunately, the full effects of an energy audit and labeling program are unknown for Nevada and further analysis is needed to determine how this would benefit the LMI community, communities of color, and Indigenous communities. Additionally, collaboration with the real estate industry is needed to ensure the appropriate balance of policy benefits and respect for private property rights is achieved.



INTEGRATED ECONOMIC ASSESSMENT

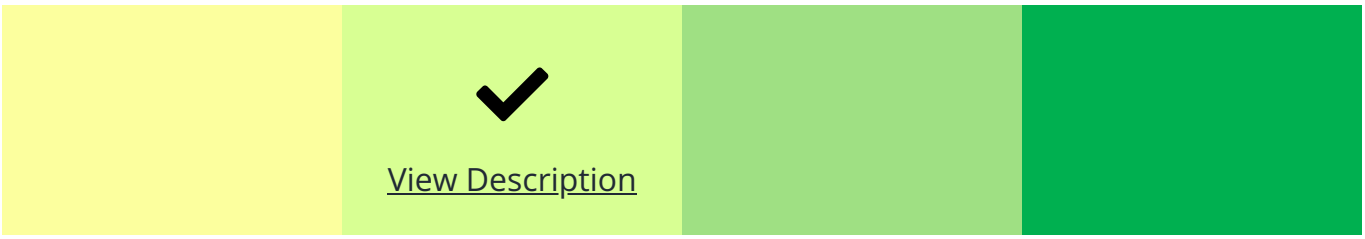
The consideration and implementation of rulemaking around home buyer energy audits and energy labeling requires coordination among the GOE, the Department of Business & Industry (Real Estate Division & Financial Institutions Division), the Nevada Legislature, and local governments, in consultation with the Nevada Division of Environmental Protection (NDEP).

To implement policies such as these, the cost to the state would likely be minimal. However, further research is required to determine how many new full-time equivalent (FTE) staff would be required. Based on programs implemented in other states, it is likely that the agency responsible for oversight, implementation, and compliance would need funding to administer and support the programs.

In Utah, HB 235 (2020) created a home energy information pilot program led by Office of Energy Development (OED). This program is designed to develop a scorecard that home buyers and realtors may use to assess energy efficiency of a home, energy use, and emissions associated with energy use of a home as compared to homes of a similar type. The bill provided a one-time general fund appropriation of $50,000 to the OED in FY 2021.

In Montana, energy labeling stickers must be affixed to the electrical panel of all new residential buildings. While the staffing and budget costs are unclear, the Energy Efficiency and Compliance Assistance division shows the need for at least 1 and up to 7 FTE.

The actual staffing and budget for Nevada to implement these policies is unknown. Further research must be conducted in order to determine what these needs would be.



IMPLEMENTATION FEASIBILITY

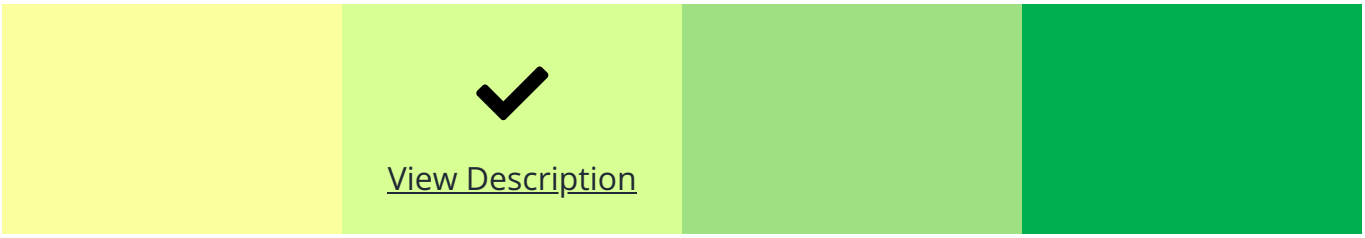
The Nevada Legislature may need to pass new legislation and amend existing legislation to implement this policy. It appears that the Nevada Revised Statutes do not provide explicit legal authority to require disclosure of the cost of operating a home or business before sale of commercial property, or before leasing residential or commercial property.

NRS 113.120 grants the Nevada Real Estate Division (NRED) authority to adopt regulations prescribing the format and contents of a form for disclosing the "condition" of residential property offered for sale, including the condition of any electrical, heating, cooling, plumbing, and sewer systems on the property, and of the condition of any other aspects of the property which affect its use or value (NRS 113.120(1)). The form must allow the seller to indicate whether or not each of those systems and other aspects of the property has a defect of which the seller is aware.

This statute may not grant NRED authority to require disclosure of the cost of operating a residence, including energy costs. NRS 113.120 focuses on the condition of equipment (e.g., whether it is working properly or defective). The cost of operating a property, including energy cost, is not necessarily related to the condition of equipment. Equipment may be in perfect condition, working properly, with no defects, and have high (or low) operating costs.

NRS 645D sets forth the requirements for conducting an energy audit. However, NRS 645D does not specifically discuss incorporating energy audits into the home-buying process. NRED determines what a seller must disclose during the home-buying process through NRS 113.120. Although this statute provides authority to prescribe the format and contents of the disclosure form, it does not impose an obligation to perform a home inspection or an energy audit, nor does it explicitly authorize NRED to impose such obligations.

Neither home energy labeling nor energy audits are currently required in Nevada before selling or renting a home. The legislature could amend NRS 113.120, and NRED could amend NAC 113.150 and the residential disclosure form to implement this policy.



View Description

ADOPT ENERGY CODES FOR NET-ZERO BUILDINGS

The International Energy Conservation Code (IECC) is an international standard developed through a consensus-based public process every three years. Each new published version achieves a higher efficiency in the built environment. The most-recent version of the IECC for 2021 is expected to have a 10% savings over the 2018 IECC. The IECC is known for addressing the energy-efficient design of buildings and innovation of the codes while protecting the health and safety of the public.

Development and adoption of the energy codes can be instrumental in achieving Nevada's climate goals. The IECC is developed on a triennial schedule through a fair, robust process that includes building officials, national builders, state government officials, and others that are responsible for the adoption of the codes. During the 2021 IECC development and adoption process, the Nevada Governor's Office of Energy (GOE) participated along with the Nevada Division of Environmental Protection (NDEP) in the public comment hearings in Las Vegas and the online vote. Both processes requiring voting members to qualify under the International Code Council Policies as defined in Council Policy 28.

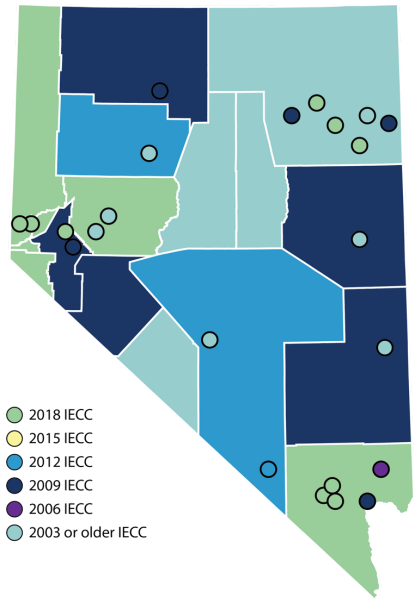
Pursuant to NRS 701, the GOE must adopt the most recently published version of the IECC or provide reason against the adoption of the standard. Upon each publication and adoption, the GOE is required to submit a statement to the U.S. Department of Energy (DOE) identifying the analysis conducted and whether the version was adopted in the state. In 2017, the GOE adopted regulations that authorized the automatic adoption of the most-recent IECC on a triennial basis.

Energy codes are projected to save U.S. homes and businesses $126 billion between 2012 and 2040. These numbers were calculated with the assumption that new, updated codes would continue to be adopted.

In order to effectuate change in the built environment, the adoption of the IECC as it is published allows Nevada to support robust, strong energy codes that continue to improve and provide affordable, comfortable, safe, and innovative residences and businesses to all Nevadans. To increase the efficiency of the built environment, states have also adopted above-code programs, which provide incentives for local jurisdictions to adopt the current code with amendments to increase the efficiency by a certain percentage.

Currently in Nevada, the GOE adopts the IECC for subsequent incorporation by local governments. However, this is done on a cycle that is incongruent with the adoption at the state level. Some jurisdictions have not adopted an energy code at all, while others have adopted the 2018 IECC as shown in Figure 1.

Figure 1. IECC Code Adoption in Nevada. (Data from IECC)



EXPAND

GREENHOUSE GAS IMPLICATIONS

The DOE is required by federal statute (42 U.S.C. 6833) to determine if the newly published version of the standard would achieve greater efficiency in buildings when compared to the previous version. Quantifying greenhouse gas (GHG) reductions through the adoption and implementation of the 2021 IECC has not been done. However, previous determinations have concluded that a 5.1% savings in the 2018 IECC over the 2015 IECC was achieved. Based on the EPA's AVERT tool, this avoided 102,412 lbs of SO_2, 107,840 lbs of NO_x and 137,570 tons of CO_2 (Table 1).

Table 1. Avoided emissions and electricity generation displaced by EE/RE policies and

programs as calculated using the EPA AVERT tool.

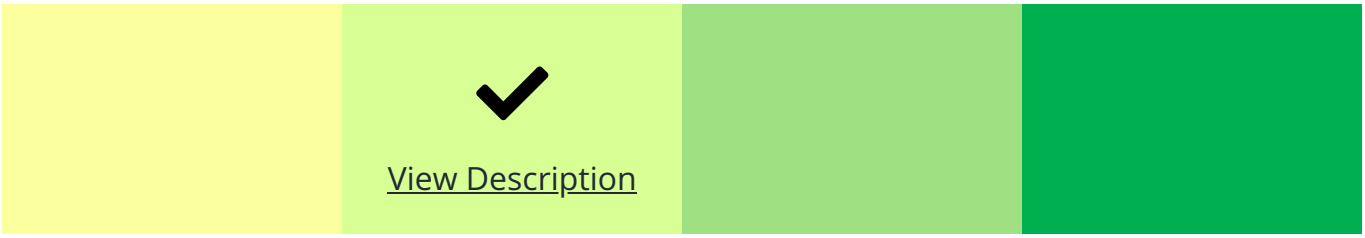
Annual State Emission Changes (Northwest Region) Due to Changes in Nevada

STATE	SO_2 (lbs)	NO_x (lbs)	CO_2 (tons)	PM 2.5 (lbs)
Idaho	-277	-24,299	-35,136	-4,097
Montana	-105,132	-187,160	-86,769	-17,065
Nevada	-102,412	-107,840	-137,570	-18,582
Oregon	-150,537	-117,902	-102,872	-19,507
Utah	-105,865	-295,200	-157,507	-15,455
Washington	-52,544	-192,908	-169,709	-9,808
Wyoming	-176,063	-209,222	-118,515	-7,118

Annual Regional Displacements (Northwest Region) Due to Changes in Nevada

	Original	Post-Energy Efficiency/Renewable Energy	Energy Efficiency/Renewable Energy Impacts
Generation (MWh)	132,302,160	131,218,660	-1,083,500
Total emissions of fossil electricity generating units			
SO_2 (lbs)	95,417,940	94,680,110	-737,830
NO_x (lbs)	144,287,390	143,152,860	-1,134,530
CO_2 (tons)	104,233,730	103,425,650	-808,070
PM 2.5 (lbs)	10,942,010	10,850,380	-91,630

For this policy, estimates in the changes in net electricity consumption over time as a result of policy adoption consistent with the IECC would be necessary to get a clear picture of what GHG emissions reductions could be achieved and on what time horizon.



CLIMATE JUSTICE

Statewide IECC adoption would ensure efficiency standards and lower energy bills for all Nevadans, including those in low- to moderate-income (LMI) communities.

Adopting the IECC is expected to have a positive impact on LMI communities, communities of color, Indigenous peoples, and other vulnerable populations. Efficiency requirements found in the IECC will lower utility energy bills, thus reducing the energy cost burden on each family. Energy burden is defined as the percentage of a household's income that goes toward energy bills such as electricity and natural gas. Studies show that low-income households have energy burdens that are three times higher than other households. Reducing energy costs would free up additional funds for households to put toward other uses.

Adopting the IECC may also have the additional benefit of creating healthier indoor environments. By requiring new construction and renovations to include efficient insulation, weatherization, and HVAC systems, the Code may lead to improved air quality, and in turn, fewer health issues.

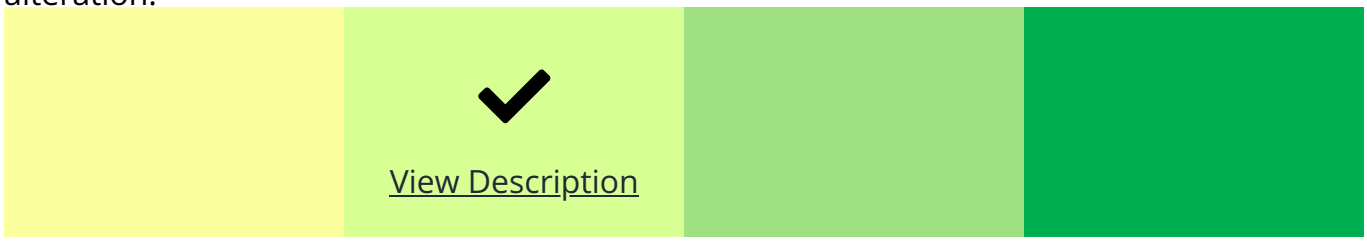
Renters may benefit the most from these codes, as that group generally does not make upgrades or repairs to their rented units themselves. This group is therefore dependent on the existing quality of new construction, or on the building owner to perform renovations in a certain manner. Aging apartment buildings are likely to require renovation and repairs that would trigger IECC requirements. In addition, new-build affordable housing is often in the form of apartment buildings. However, this is also expected to benefit homebuyers

acquiring newly built housing. This might include affordable single-family housing, and housing constructed using loans from United States Department of Agriculture (USDA) Rural Development or similar.

Establishing a reasonable timeline for the implementation of the IECC will ensure that local jurisdictions adopt it efficiently. Creating incentives may ensure that the code is adopted quickly. The sooner the IECC is implemented, the more people will benefit.

A 2015 study determined that adopting that year's IECC version would save households over $500 per year compared to the 2006 version. By continuing to implement the most-recent version of the Code, local jurisdictions could ensure even greater household savings in the future.

Implementing the IECC is not expected to have negative impacts to vulnerable populations. Since the Code pertains to new construction and alteration (renovations and repairs), it will have no effect on households who live in existing buildings that are not undergoing alteration.



INTEGRATED ECONOMIC ASSESSMENT

Financial implications of IECC code adoption varies greatly depending on the scope of authority defined by any authorizing language.

States are classified on a spectrum as either a 'Home Rule' state or a 'Dillon Rule' state. In a Home Rule state, the authority having jurisdiction (AHJ) is authorized to adopt codes and standards—without the state or in contradiction to the state. However, in Dillon Rule states, the state is the AHJ. Nevada is a Dillon Rule state with limited home rule for some local government functions, and building code adoption is currently a home rule arrangement.

For example, in Colorado, a Home Rule state, legislation was passed in 2019 that requires local jurisdictions to adopt and enforce one of the three most-recent versions of the IECC

upon updating a local building code. The fiscal impact to the state is minimal, however there is no information on the impacts to the local governments or AHJs.

In Utah, HB 218 (2019) adopted the 2015 IECC for residential buildings and 2018 version for commercial buildings. The fiscal note for HB 218 showed $0 expected cost impact to state government, local government, businesses, and individuals. There are two staff members listed as building code specialists, but the budget is unclear (DAS).

In Montana, there were further expenses to the state based on the adopted code 2012 IECC and the stretch code created through SB 49 (2009) for new State-owned and -leased buildings under the state's High-Performance Building Standards. These buildings must exceed the IECC most recently adopted by Montana's Department of Labor & Industry (DLI) by 20% to the extent it is cost effective. The fiscal note for SB 49 showed expenditure of $62,306. This is for 1 full-time equivalent (FTE) to continue work on the high-performance building standard, as well as $2,200 in initial-year operating expenses to implement. The Energy Bureau within Montana Dept of Environmental Quality has two branches: Energy Efficiency and Compliance Assistance (EECA), and Energy Planning and Renewables. EECA shows energy code staffing of at least 1 and up to 7 (possibly 3 energy engineers, 1 small business ombudsmen, 2 energy resource professionals).

The fiscal impact falls largely to the AHJs that have the responsibility of adopting the codes. The AHJs must adopt the family of international construction codes, including the IECC, each adoption cycle due to their nature of working in conjunction with each other. They must also implement and enforce the code in their jurisdictions, which requires staff and funding.

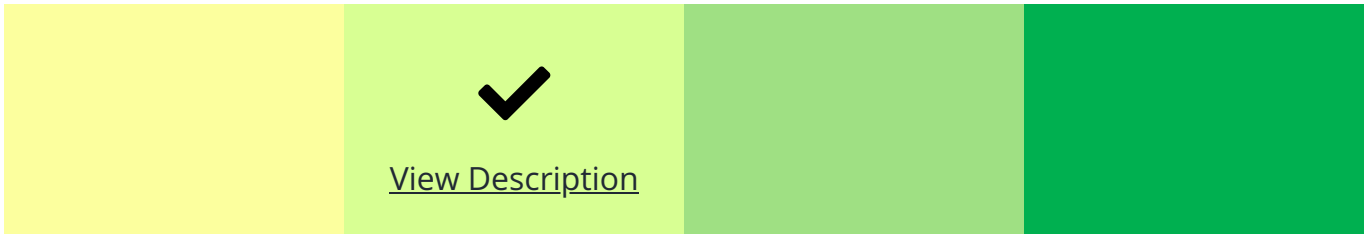
While it is difficult to assess the impact on Nevada, implementation of energy codes does require resources for ongoing administration. Further analysis is required and AHJs should be included in that analysis to identify specific resource requirements.

> "Internationally, code officials recognize the need for a modern, up-to-date energy conservation code addressing the design of energy-efficient building envelopes and installation of energy-efficient mechanical, lighting, and power systems through requirements emphasizing performance. The International Energy Conservation Code is designed to meet these needs through model code regulations that will result in the optimal utilization of fossil fuel and non-depletable resources in all communities, large and small.

This code contains separate provisions for commercial buildings and for low-rise residential buildings (three stories or less in height above grade). Each set of provisions, IECC—Commercial Provisions and IECC—Residential Provisions, is separately applied to buildings within their respective scopes. Each set of provisions is to be treated separately. Each contains a Scope and Administration chapter, a Definitions chapter, a General Requirements chapter, a chapter containing energy efficiency requirements and existing building provisions applicable to buildings within its scope.

This comprehensive energy conservation code establishes minimum regulations for energy-efficient buildings using prescriptive and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and new energy-efficient designs. This IECC is fully compatible with the Family of International Codes."

— International Code Council



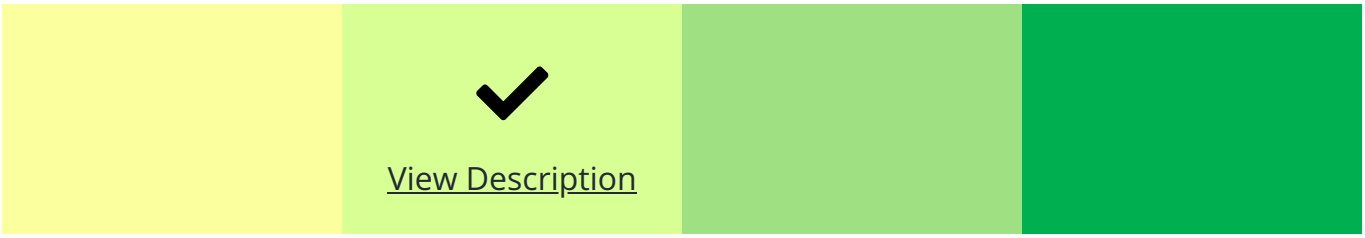
IMPLEMENTATION FEASIBILITY

There may be adequate legal authority currently to implement this policy, but, it may be prudent for the Nevada Legislature to amend NRS 701.220 to provide explicit direction.

The GOE director has the authority through NRS 701.220 to adopt regulations for the conservation of energy in buildings, including manufactured homes. The regulations "must include" 1) adoption of the most-recent version of the IECC and 2) any amendments to the IECC that will not materially lessen the effective energy-savings requirements and are deemed necessary to support effective compliance and enforcement (NRS 701.220(1)). It may be prudent for the legislature to amend NRS 701.220(4) to explicitly add a reasonable deadline (e.g., 18 months after the director adopts the most-recent version of the IECC) for local governments to adopt these standards.

In addition, legislation could be included allowing the director to adopt other codes and standards, such as the International Green Construction Code (IgCC) or the National Green Building Standard (ICC 700-2020).

Under NRS 701.220(4), the governing body of a local government that is authorized to adopt and enforce a building code "shall incorporate" the director's standards into its building code. However, it is possible that a county government could assert that its building code is a "matter of local concern," as defined in NRS 244.143, and refuse to adopt the director's standards, such as a stretch code. We believe this argument is likely to fail because "matters of local concern" excludes state interests that require statewide uniformity of regulation (NRS 244.143(1)(c)(1)). The legislature made it clear that Nevada has an interest in uniform, state-wide, minimum standards for conservation of energy and energy efficiency in buildings, which must be incorporated into local building codes (NRS 701.220(4)). In addition, NRS 244.143 explicitly states, "If there is a . . . statutory provision requiring a board of county commissioners to exercise a power . . . in a specific manner, the board may exercise the power only in that specific manner." Here, NRS 701.220(4) explicitly provides that local governments "shall incorporate" the director's standards into their building codes. Still, additional analysis of Nevada's home rule statute is recommended prior to adoption of this policy.



EXPAND THE PROPERTY-ASSESSED CLEAN ENERGY (PACE) PROGRAM

Property-assessed clean energy (PACE) is a financing mechanism that enables low-cost, long-term funding for energy efficiency and renewable energy projects. PACE financing is repaid as an assessment on the property's regular tax bill and is processed the same way as other local public benefit assessments.

Existing Nevada law sets forth the procedures for a governing body to acquire, improve, equip, operate, or maintain local improvement districts that include various types of projects, including energy-efficiency improvement projects and renewable energy projects (NRS 271.265-271.630).

The Governor's Office of Energy (GOE) sponsored AB 5 in the 2017 Session of the Nevada Legislature as PACE-enabling legislation, which provides for the creation, by a local government, of a local improvement district that includes an energy-efficiency improvement project or a renewable energy project on commercial private property.

For a PACE program to be implemented, the local governing body must adopt a resolution for the creation and administration of a PACE program for the purpose of financing energy efficiency or renewable energy projects. The legislation does not mandate that the local government adopt a PACE program; it is strictly voluntary, but it does require that a resolution be adopted, and procedures must be put in place if the local government chooses to implement a PACE program.

AB 5 enables a lien to be attached to the property, which is superior to the mortgage and runs with the property, thus allowing the property to be sold and payments to continue through the next owner, just as property taxes are paid.

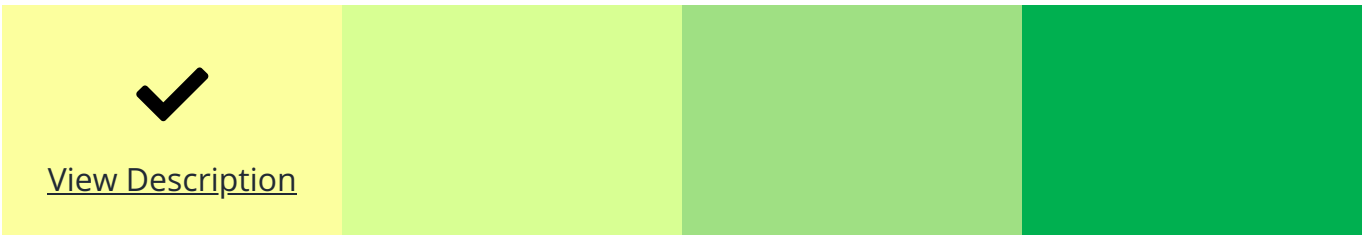
The City of Las Vegas, the City of Reno, and the City of Fernley have adopted commercial PACE (C-PACE) resolutions creating energy-improvement districts for the purpose of implementing their individual C-PACE programs. These programs are designed to help qualifying commercial, industrial, and multi-family (with five or more units) property owners access long-term financing for the installation of qualifying energy-efficiency improvements and renewable energy projects.

This policy analysis explores how to further develop and adopt C-PACE statewide and the effectiveness of adopting a statewide residential PACE program.

GREENHOUSE GAS IMPLICATIONS

Assessing the greenhouse gas (GHG) impact of this policy is predicated on robust estimates of changes in net electricity consumption over time. While there are resources that identify emissions reductions through PACE programs elsewhere for both commercial and residential properties, this has not been modeled for Nevada.

However, the PACE program will expand adoption of energy-efficiency measures necessary to reduce GHG emissions. Further analysis of implemented programs in the state would provide the data necessary to fully analyze the impacts an expanded C-PACE program would have.



CLIMATE JUSTICE

During the Green Building listening session one participant mentioned the PACE funding mechanism as capable of driving energy efficiency and conversion to green energy at the scale necessary to address climate change.

Many other participants emphasized the jobs that energy-efficiency retrofits would provide in construction and other sectors. Other participants in the listening session, including one representing seniors and another representing Latinx businesses, emphasized freedom of choice rather than mandates. As a funding mechanism, PACE would meet the demand for free choice.

A potential positive impact would be through financing of improvements to new and existing low-income housing and multi-family housing more generally. Benefits cited

include improved living conditions for tenants, reduced utility bills, and lower subsidies needed to make an affordable housing project viable. PACE helps building owners finance projects and the benefits trickle down to tenants of all income levels. Access to clean energy and an improved quality of life are coupled with increased building value for the owner, resulting in benefits for all parties.

> **"Residential property assessed clean energy (R-PACE) financing is a game-changing financing mechanism that can help states deliver high-performance, net-zero energy (NZE) homes at no additional up-front cost."**
>
> —Green Building Listening Session

In residential PACE, a potential impact to homeowners—particularly low-income homeowners—could arise from limited exposure to the program. This could be mitigated by ensuring the community has access to program design recommendations provided by the U.S. Department of Energy (DOE) that address the unique needs and potential vulnerabilities of low-income and elderly households. This would also help ensure that PACE financing is used appropriately and at the least cost for low-income households and other households that meet program eligibility criteria. Although at first glance PACE increases monthly or annual payments, it is important to note that 10- to 20-year amortization enables positive cash flow realized when the annual energy savings are larger than the repayment. PACE programs allow a property owner to finance the upfront cost of energy or other eligible improvements on a property and then pay the costs back over time. This affords a unique opportunity for property owners to implement improvements without a large upfront cash payment, bringing energy-efficiency upgrades within reach for many sectors of the population. The common misconception of difficulties selling the property can be dispelled if proper education is provided to the community, homeowners, realtors, and appraisers. Demonstrating the added value that comes with a property's improvements is a first step but assisting homeowners in determining whether this is a good option for them is just as important to their success.

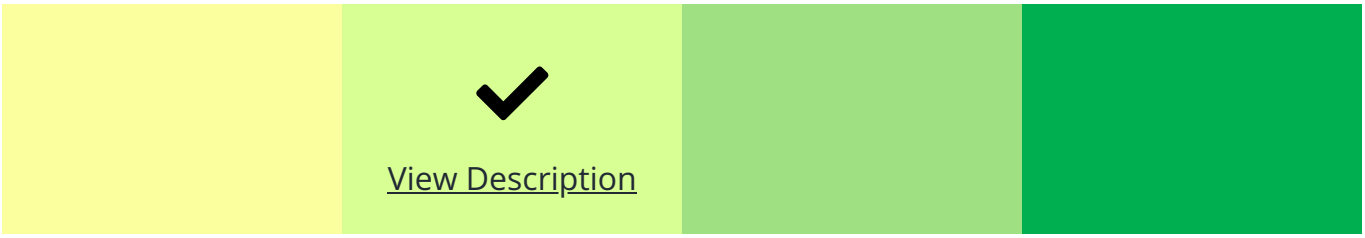
Residential PACE can be an effective tool to ensure climate justice by creating opportunities that would otherwise be out of reach for many. Energy efficiency is a pivotal tool for reducing energy costs and enhancing home energy security in low-income households. In addition, PACE financing has the potential to help increase energy conservation, which

would result in a reduction of GHG emissions and an improved quality of life for vulnerable populations.

For some types of affordable housing it may be necessary to find out more about the current status of U.S. Department of Housing and Urban Development (HUD) rules regarding PACE and utility allowances. Current status of Federal Housing Finance Agency (FHFA) rules regarding mortgages and PACE financing may also be important for multi-family housing and residential housing.

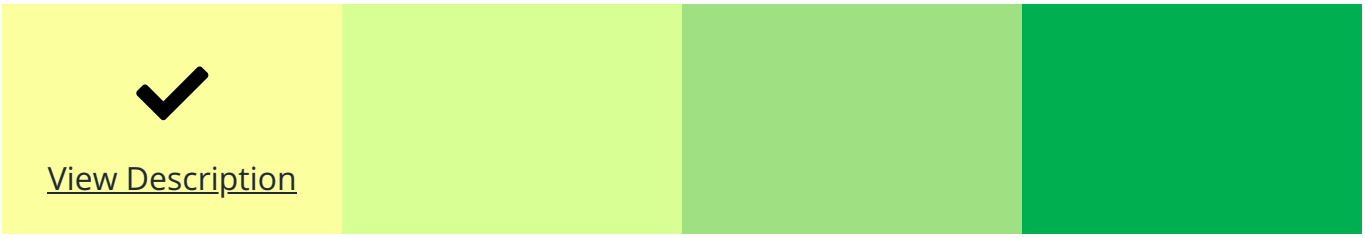
The DOE toolkit provides on overview on how to utilize C-PACE financing to fund resilience projects to make improvements to buildings more resistant to natural disasters and other threats.

An in-depth review of residential PACE programs in other states would prove beneficial in determining the benefits and risks to vulnerable populations. A comprehensive review of these options and case studies may reveal residential PACE is an effective financing tool for improving opportunities for low-income and vulnerable populations to adopt energy-efficient measures.



INTEGRATED ECONOMIC ASSESSMENT

Further analysis is needed to determine the potential fiscal and staffing impacts of expanding the current C-PACE legislation to include residential PACE would have on the state and local governments.



IMPLEMENTATION FEASIBILITY

New state legislation is likely not required to further develop and adopt the commercial PACE program statewide. The Nevada Legislature would likely have to enact new legislation to create a residential PACE program.

In 2017, the GOE sponsored AB 5, which enabled a commercial PACE program in Nevada. AB 5 gave municipalities power to create a district to finance one or more energy-efficiency improvement projects or renewable energy projects on private commercial or industrial property, which includes any real property except 1) residential dwellings with fewer than five individual dwelling units and 2) property financed by a government-guaranteed financing program that prohibits the subordination of the government's interest in the property or otherwise prohibits a contract under AB 5 (NRS 271.6312(1)(a)).

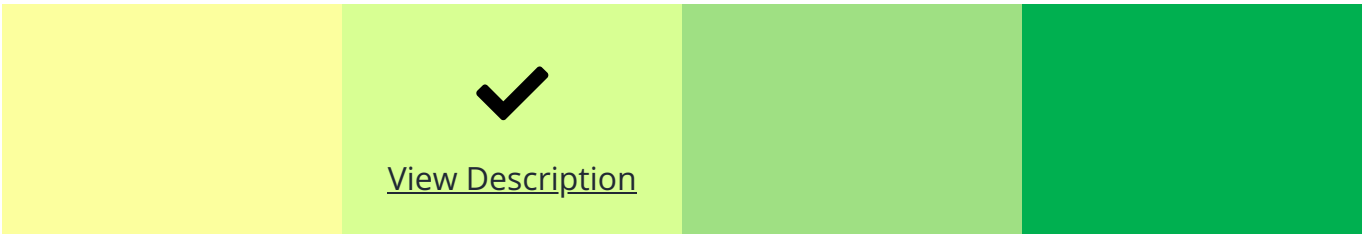
The GOE director has authority to encourage further development and adoption of Nevada's commercial PACE program. The director has authority to encourage the development of any sources of renewable energy and any energy projects that will benefit the State and any measures that conserve or reduce the demand for energy, or that result in more-efficient energy use (NRS 701.390(2)). Under NRS 701.380(1)(b), the director also has a duty to spend the money in the Trust Account for Renewable Energy and Energy Conservation to:

1. Educate persons and entities concerning renewable energy and measures that conserve or reduce the demand for energy, or that result in more efficient use of energy; and
2. Create incentives for investment in and the use of renewable energy and measures that conserve or reduce the demand for energy, or that result in more-efficient energy use.

The director also has authority to evaluate the effectiveness of adopting a statewide residential PACE program. Residential PACE allows homeowners to finance energy efficiency, renewable energy, and other eligible improvements on their homes using private sources of capital. Under NRS 701.180, the director has authority to:

1. Acquire and analyze information relating to energy and to the supply, demand, and conservation of its sources, and
2. Study means of reducing inefficient uses of energy and encourage the maximum utilization of existing sources of energy in the State.

To enable residential PACE in Nevada, the legislature would likely have to adopt new legislation. NRS 271.6312(1)(a) limits the PACE program to commercial and industrial properties.



EXPAND ENERGY-SAVINGS PERFORMANCE CONTRACTING

Energy-savings performance contracts (ESPCs) have provided a tool for states, municipalities, and school districts to achieve sustainability goals, budget reductions, and efficiency of the built environment through an alternative financing mechanism since the mid 1990s.

An energy services company (ESCO) is contracted to perform a financial-grade operational audit for the project, which identifies the specific measures and ultimate savings from those measures. The ESCO guarantees these savings and the contract is "paid back" based on the actual savings incurred, essentially eliminating the need to pay for the measures from the approved capital budget.

This policy option considers utilizing ESPCs to identify opportunities for energy conservation measures, and then implementing the measures that will have the largest effect on reducing greenhouse gas (GHG) emissions. Performance contracting is well suited for State-owned buildings and what is often referred to as the "MUSH" market, an acronym for municipalities, universities, schools, and hospitals.

The U.S. Department of Energy (DOE) developed an ESPC toolkit with input from states, municipalities, and school districts as part of its ESPC Accelerator, which began in 2013 and ended in 2016. Over the three-year period, DOE partnered with 25 different state and local agencies to identify barriers around ESPCs and developed solutions for success.

Nevada participated in the DOE ESPC Accelerator and as a result designed and implemented the Performance Contracting Audit Assistance Program (PCAAP) in the Governor's Office of Energy (GOE). Through this program, the GOE provides incentives to public facilities that wish to enter into an ESPC by covering the costs of the investment-grade audit (also known as the financial grade operational audit) up to $0.10 per square foot. Since PCAAP's inception in 2014, GOE has awarded $1.7 million to accelerate performance contracting resulting in projects totaling $100 million, while creating an estimated 730 jobs and saving over 51 million kWh and 463,000 therms annually.

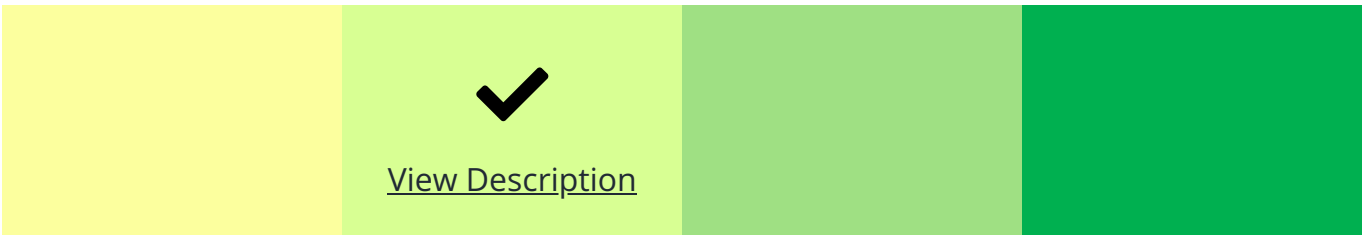
GREENHOUSE GAS IMPLICATIONS

ESPC programs have been implemented in more than 10 states. Statutes supporting performance contracting are in all 50 states, Puerto Rico, and Washington, D.C. Quantifying GHG emissions reductions from implementing ESPC policies focused on MUSH projects has been done in other states and could be modeled for Nevada specifically.

An example of this can be found by looking at how Colorado established its Energy Performance Contracting (EPC) program in the mid-1990s. Since then, 152 public jurisdictions have worked with an ESCO identifying close to $35 million in annual utility savings. As of June 2018, 206 active and completed projects have improved the performance of public school and university buildings, veterans facilities, libraries, parks, community centers, wastewater treatment plants, prisons, and other government buildings in communities across 75% of Colorado's counties.

Through these improvements, state agencies, colleges and universities, counties, cities and towns, school districts, and special districts have saved to date:

- Electricity: 193 million kWh
- Natural gas, propane, heating oil, and coal: 10.3 million therms
- Water: 507,560,000 gallons
- Annual utility cost savings: $34.2 million
- Operations & maintenance (O&M) cost savings: $3 million

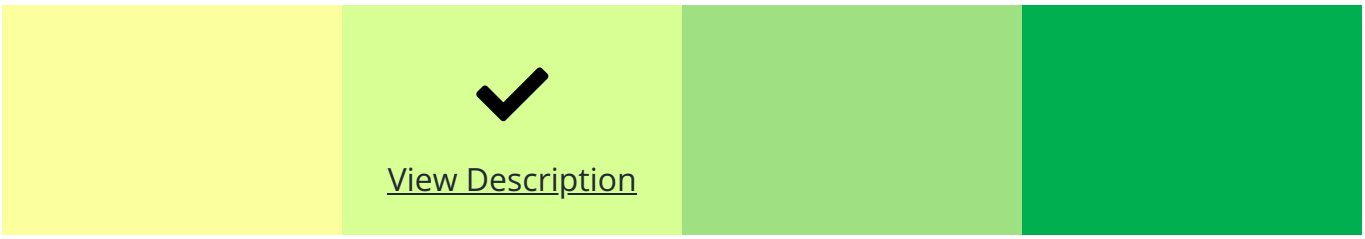


CLIMATE JUSTICE

Because performance contracts are most suited to the MUSH market, Nevada's public buildings, hospitals, and schools would benefit from enhanced performance contracting policies.

Housing authorities in Nevada have a unique opportunity to improve the health and safety of its residents while providing affordable housing opportunities. For example, in Rockford,

Illinois, the Rockford Housing Authority (RHA) implemented a successful EPC, regaining its reputation for providing quality affordable housing, improving the economy.

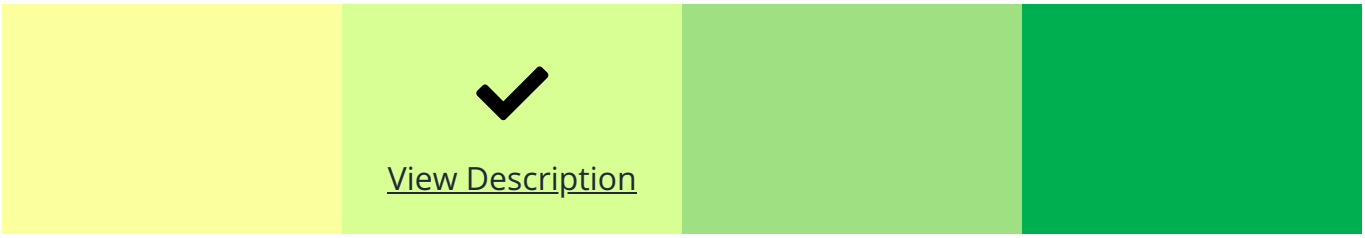


INTEGRATED ECONOMIC ASSESSMENT

In order to lower the barrier to entering into a performance contract in Nevada, the GOE, State Public Works Division (SPWD), and Purchasing maintains a list of pre-qualified ESCOs that agencies can choose to select from without having to go through the solicitation process. In addition, the use of a third party (or owner's rep) is required in Nevada.

GOE currently allocates ~0.20 full-time equivalent (FTE) toward the implementation of the PCAAP program and would expect to need additional staff if these policies were updated or expanded.

Out of five states that have adopted ESPC policies, the Energy Conservation and Management Division (ECMD) of New Mexico details in its Energy, Minerals & Natural Resources Department *2019 Annual Report* that there are at least two FTE staff specific to performance contracting now, and that in 2014 there was a state agency study group established to promote and improve ESPC. The report finalized in December 2014 contains recommendations for improved program functioning in states. Specifically, on pages 44–48 of the report, additional staffing and other needs are identified to perform utility bill monitoring and reporting, an additional FTE within the state energy office, a third-party evaluator, and staff education and maintenance training programs.



IMPLEMENTATION FEASIBILITY

The Nevada Legislature will likely have to amend NRS 332 and 333A to prioritize improvements that promised the largest GHG emissions reductions. It likely will also have to pass new legislation to expand ESPC to include privately-owned commercial buildings.

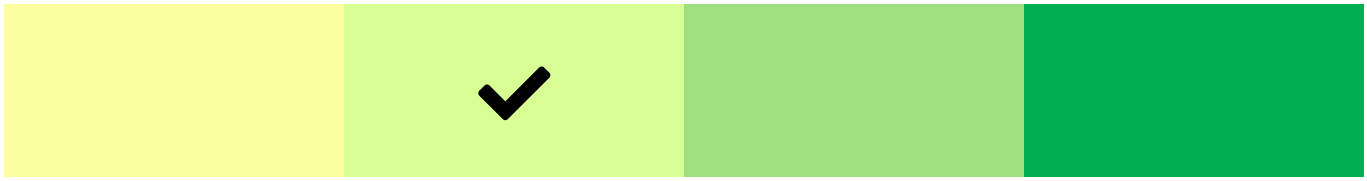
Nevada statutes already provide ESPC programs for eligible Nevada government entities (i.e., counties, cities, school districts, state colleges, state universities, State of Nevada agencies). NRS 332 (Purchasing: Local Governments) and 333A (Purchasing: State Performance Contracts for Operating Cost-Savings Measures). The GOE offers a number of services to support ESPC, including monetary assistance for a financial-grade operational audit. These statutes would likely need to be amended to prioritize improvements that promised the largest GHG emissions reductions.

The Nevada Legislature would likely need to adopt a new statute to extend ESPC to privately-owned commercial buildings. Nevada's current statutes (NRS 332 and 333A) are limited to Nevada government entities.

In 2016, Hawaii published a revision to its *Guide to Energy Performance Contracting (EPC)* detailing the process of how to adopt and implement ESPC in the state.

At least 10 states have adopted ESPC policies through enacting legislation. For Nevada to expand its current legislation, it is important to review what has been successful in other states. The National Association of State Energy Officials (NASEO) in partnership with the National Association of Energy Service Companies (NAESCO) and the Energy Services Coalition (ESC) published *NASEO-ESC-NAESCO State ESPC Program and Project Principles 2019*, which provides key attributes for states on implementing these policies. This includes administrative support, guidance on the attributes of services, a process roadmap, and seven other key strategies for successful policies and programs.

Another important factor to think about when adopting statewide ESPC policies is what happens to the savings from the projects. Generally, most agencies that have general funds are not allowed to keep the realized savings and must return any funds back to the general fund. In North Carolina, there is a proposed bill (H828) that would allow all of these agencies to retain the savings and use them for additional energy and water upgrades to state facilities.



	View Description		

TRANSITION FROM RESIDENTIAL AND COMMERCIAL USE OF NATURAL GAS

In order to meet Nevada's long-term goal of zero or near-zero greenhouse gas (GHG) emissions by 2050, transitioning away from natural gas is necessary. While Nevada's electricity sector transitions from fossil fuels to zero-emissions renewables, the state must also transition from fossil-fuel combustion in homes and commercial buildings in the form of burning gas for cooking, hot water, and space heating.

Before eliminating natural gas as a fuel source entirely, consumer choice, especially in existing structures, as well as affordability and equity, should be carefully considered. Other steps include the need to adopt all electric appliance standards and green construction codes. Part of the transition also includes evaluating the construction of gas pipelines for new construction in both residential and commercial buildings to assist in the shift to renewable energy.

A potential first step in a phased transition from gas would be to allow consumers the choice between gas and electric on existing buildings but require all-electric in new construction. This would preclude establishing new pipelines, thus avoiding future stranded assets. New pipelines would also lock in emissions for years, weakening Nevada's ability to meet emissions-reduction goals according to *Pathways and Policies to Achieve Nevada's Climate Goals*.

GREENHOUSE GAS IMPLICATIONS

Nevada's GHG emissions from the residential and commercial sectors were 4.6 $MMTCO_2e$ in 2016 and accounted for 10% of the state's total inventory. Emissions are projected to increase to 4.7 $MMTCO_2e$ by 2039 under current policies. While it is clear that shifting toward building electrification could reduce GHG emissions, the trajectory of reductions would depend on the phasing of a transition strategy.

View Description

CLIMATE JUSTICE

Limiting the need for new gas lines and adopting all-electric standards would reduce negative health impacts and energy cost burden on the low- to moderate-income communities if done in a manner that minimizes appliance conversion and adoption costs borne by consumers and owners. Prioritizing equity and affordability to the most-vulnerable families as well as ensuring that the current workforce is not displaced will have the most positive impact.

This topic proved to be of significant concern during the Green Building listening session. Several Nevadans expressed the need for a choice when it comes to natural gas or electric in new construction and retrofits of residences. Many others, particularly in rural communities with limited access to the grid, and those with commercial kitchens, indicated that access to gas was necessary.

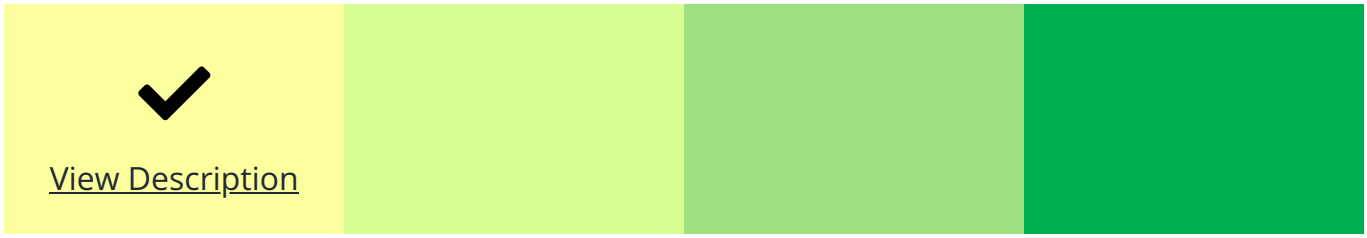
However, research shows that NO_2 and CO released by burning gas ovens can compromise indoor air quality and the health of families and those working in commercial kitchens (e.g. Zhu et al., 2020). Similar to outdoor air pollution, children are particularly vulnerable and those that live in homes with gas stoves are 42% more likely to have asthma than children who live in a home with induction cooktops and electric ovens (RMI 2020).

Further research and engagement with communities across Nevada is needed to properly analyze and assess the climate justice issues. There is also a need to engage in discussions about the risks of indoor gas use.

View Description

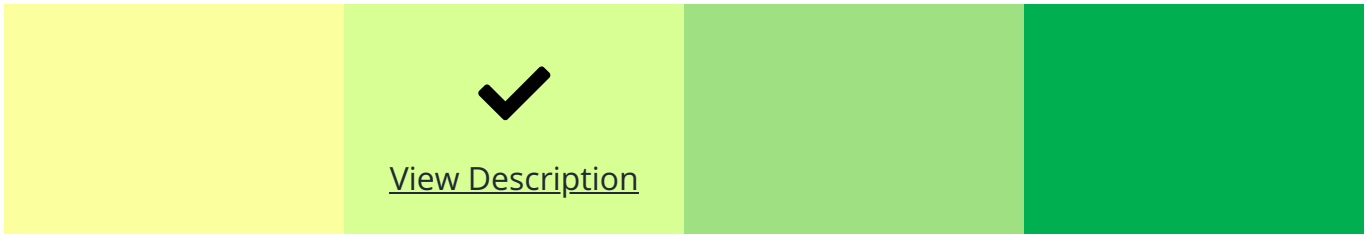
INTEGRATED ECONOMIC ASSESSMENT

Designing, facilitating, and implementing a phased transition from gas in the residential and commercial sectors will require careful planning and engagement. The only known communities that have enacted building electrification policies are the City of Berkeley, California, and more recently the City of San Francisco. Although it is unclear what investments would be needed to support a transition toward building electrification transitions, additional investments to support administrative functions would likely be necessary.



IMPLEMENTATION FEASIBILITY

The Governor's Office of Energy (GOE) director likely has the authority to evaluate a freeze or limitation on installation of gas lines to newly constructed homes and businesses. Ultimately, analysis, in coordination with the PUCN, is needed to develop the most prudent course of action for a long-term transition from domestic and commercial use of gas. Legislative authority may be needed to assist with this transition.



EXPAND URBAN FORESTRY PROGRAMS

Nevada could benefit from a statewide urban forestry strategy that would bolster current efforts across communities, building on the Urban and Community Forestry Program in the Nevada Division of Forestry (NDF).

Planting, growing, and maintaining urban trees and community forests can sequester carbon and help cities adapt to higher temperatures and other climate change impacts, as well as urban heat island (UHI) effects. Shading provided by trees can also reduce the amount of energy needed to heat and cool nearby buildings.

Trees take time and continuous care to grow large and provide optimal benefits to people and communities. However, urban and community forests in Nevada have been in decline for over a decade.

Although Nevada does not have a specific policy to address urban forests or tree protection—NRS 528.098 only has a definition of Urban Forestry and NRS 527.050 provides some protection for vegetation, but mostly state and federal listed species—NDF manages a federally funded Urban and Community Forestry Program that provides technical and financial assistance throughout Nevada.

Many Nevada cities and towns have urban tree programs with staff experts, tree ordinances, and management plans, and 12 cities are currently recognized under the Arbor Day Foundation's Tree City USA Program. The City of Las Vegas is updating its *Master Plan*, and outlines specific steps for the city to expand its urban forestry program (Box 1).

Statewide tree planting programs or initiatives can also be very effective ways to promote, engage, and involve the public and private industry. In New York City, for example, over 50,000 people were engaged in a citizen science effort to plant 1 million trees across the area.

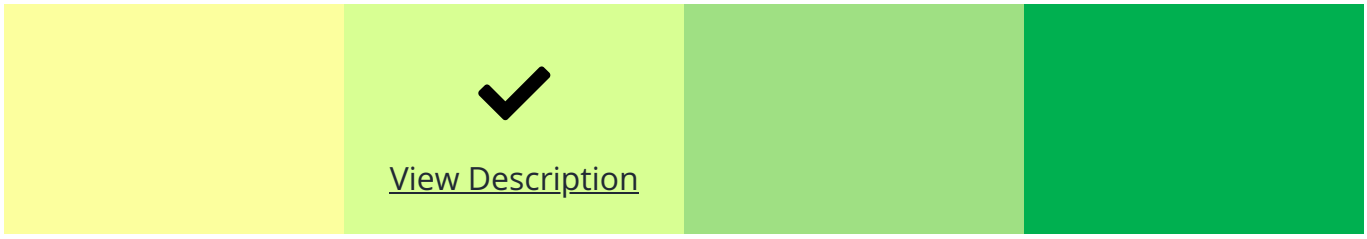
An integrated statewide strategy could support adoption of these programs across Nevada, with a particular benefit to underserved communities. Such a strategy could include, for example, requirements for increased tree coverage when constructing residences and

commercial buildings. This increase in canopy coverage would help reduce UHI effects, if strictly enforced.

Box 1. The City of Las Vegas Master Plan Update: Urban Forestry Section

The Master Plan update includes many recommendations for the Las Vegas area that could be adapted, as needed, and applied statewide. Key actions from the Master Plan Update: as well as the Shades of Green Dec 07 NDF Best Management Practices for Urban Trees in Southern Nevada.

- Maintain Tree City USA recognition.
- Plant 60,000 "bulletproof" native and adaptive trees on public and private property that are tolerant to heat, cold, and wind; water-efficient; low-maintenance; non-invasive; and pest and disease resistant. (Note that these are mostly novel forest ecosystems in Nevada, meaning forest ecosystems where forests don't normally grow, and therefore, the need to understand which trees and plants are appropriate for a changing climate in any given region is important.)
- To further reduce extreme heat and the UHI effect, support and accent trees with heat- and water-efficient native and adapted plants, including shrubs, groundcover, vines, agaves, cacti, succulents, yuccas, ornamental grasses, and perennials.
- Strengthen landscaping requirements within LVMC Title 19 to ensure trees and landscaping are not lost due to exceptions and waivers of codified standards.
- Institute resilient urban design best management practices to ensure high-quality landscape architecture for public facilities and private developments.
- Have tree experts/arborists/urban foresters on staff for policy guidance, enforcement, and to provide technical assistance to the public.



GREENHOUSE GAS IMPLICATIONS

Urban forests' have the ability to achieve greenhouse gas (GHG) reductions through carbon sequestration, as well as providing shade and cooling effects that can reduce air conditioning demands of nearby buildings. However, Nevada-specific data and research

are needed to understand the carbon sequestration and energy-saving potential of Nevada's urban forest ecosystems. With a current LiDAR and Multispectral remote sensing dataset, which Nevada does not have, the U.S. Forest Service (USFS) iTree software can generate these estimates along with other urban forest benefits.

There are tools available to estimate urban forests' current carbon sequestered and rates of carbon sequestration, but these estimates require data on the current urban forest to have any acceptable accuracy. With up-to-date tree data, the iTree software can make a number of estimates of the value of a single tree and entire urban forest, including carbon sequestration. There are a number of other climate change and carbon tools here: https://www.fs.usda.gov/ccrc/tools/list?tools_tab=1.

There are estimates in academic literature. However, since Nevada is the driest state in the United States and most of its cities and towns are in areas where natural forests do not grow, the challenges and outcomes to urban forestry practices are relatively unique, and any estimates applied to Nevada's urban forests should come from site-specific, Nevada data.

Indeed, there are assumptions that can be made regarding relative impact and timeframes, but this will require site-specific data for those assumptions to have validity and utility toward understanding urban forest climate impacts in Nevada.

CLIMATE JUSTICE

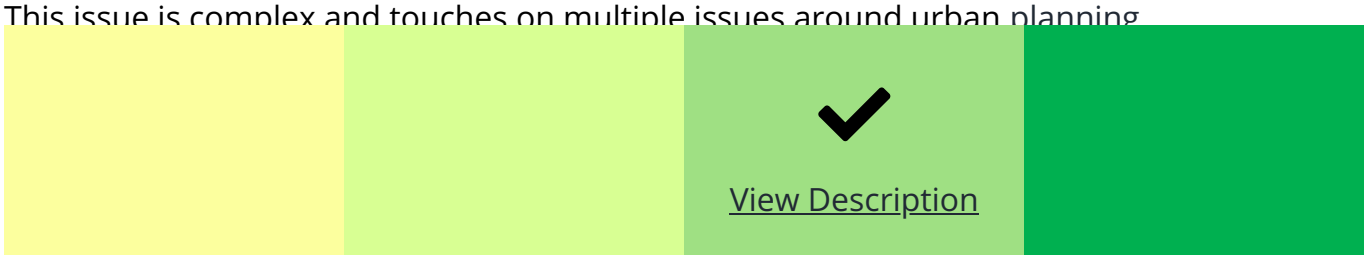
Urban and community forestry can improve public health by reducing exposure to extreme heat, which is most prevalent in low-income communities.

For example, as part of a case study identifying the ways in which ecosystems contribute to the well-being of people living in the Willamette Valley of Oregon, U.S. Environmental Protection Agency (EPA) researchers modeled the impact of trees on public lands within the Urban Growth Boundary of Corvallis. Impacts included reductions in four air pollutants

(O3, NO2, SO_2, PM10), carbon sequestration, decreased stormwater runoff, building energy savings due to shading, and—thanks to city trees—increased real estate values (Phillips, 2011). Boise, Idaho, had similar results.

Urban tree coverage may be disproportionately low in poor and minority urban communities, meaning that these communities are being deprived of public environmental benefits, a form of environmental and climate injustice. Indeed, during listening sessions, Nevadans living in urban areas, particularly in Las Vegas, expressed a need for additional greenscape and a desire for more trees, particularly in low-income neighborhoods.

Expanding tree planting and tree protection could benefit urban communities, but affordability of trees and tree planting, along with watering expenses, could be a challenge. This issue is complex and touches on multiple issues around urban planning.



INTEGRATED ECONOMIC ASSESSMENT

Expanding urban forestry programs would require additional resources. Additional staff, especially tree experts, may be needed to fully implement this policy.

Building on lessons from other states, some use reclaimed/recycled urban wood programs that generate income on the sale of wood products, which can help fund tree programs, sequester carbon in wood products, and provide jobs and potential expansion of tree service products.

Indeed, the NDF funded Urban and Community Forestry Program can provide federal dollars to match state funds for tree programs, but not at the scale necessary to offset UHI impacts, particularly in low-income communities. In the past, Nevada's 28 conservation districts have been an excellent partner in applying for Urban and Community Forestry grant dollars to organize community tree plantings, tree care workshops, arborist training, and participate with the NDF nursery for tree sales. Leveraging these initial investments is an opportunity to expand and protect underserved communities.

Any upfront investment would be matched by increases in public health and the wellbeing of urban areas, particularly when connected with low-income communities. With current data, iTree software has the ability to calculate and apply monetary value to the services provided by trees and urban forests. Typically, the return on investment (ROI) is very high for planting and growing trees.

For example, in Redlands, California, where a successful urban forestry program has been implemented (Box 2), research has shown that trees lining the streets of California produce benefits exceeding $1 billion in value. For every $1 spent on tree plantings and care, the community receives $5.82 worth of returned investment value, on average. This financial accounting does not factor the value-add of psychological and physiological benefits to humans.

Box 2. Redlands, California: Urban Forestry

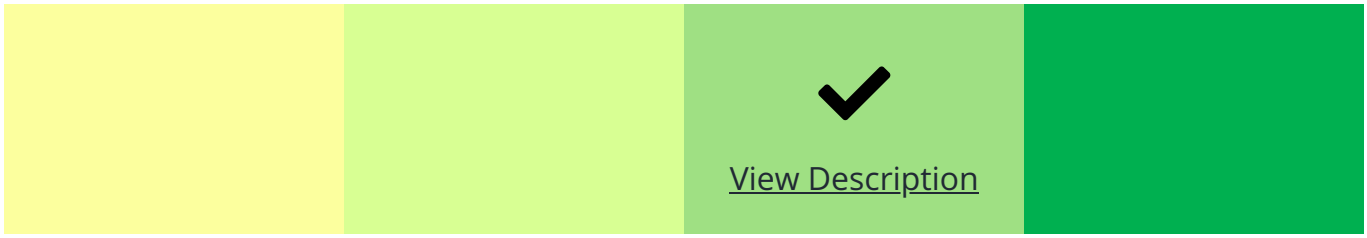
The City of Redlands California has a Tree City USA designation and comprehensive Street Tree Policy and Protection Guidelines Manual, in accordance with Redland Municipal Code 12.52.070, that could be adapted into a successful statewide Urban Forest Policy for Nevada. "Importance of urban street tree policies: A comparison of neighbouring Southern California cities," analyzed the different impacts of policies in two cities, Loma Linda and Redlands. The authors described the effectiveness of policies that can maximize the benefits of street trees, and how policies that are poorly conceived, or absent, negatively impact urban forests.

The City of Redlands considers the tree canopy as one of its most-valuable assets, and the care for the community forest must be a public/private partnership. Redlands City Council established Resolution 5574 to form the Redlands Street Tree Committee comprising appointed citizens. Resolution 6249 expanded the committee's duties to include policy advisory to the City Council and staff for planting, care, and removal of trees.

Redlands Municipal Code 5.04.90 requires landscapers, private gardeners, and arborists to be licensed and/or permitted to work on City trees using the protocols outlined in the Street Tree Policy and Protection Guidelines Manual. Policy 3.22b in The City of Redlands' General Plan, City Design Section, outlines additional guidelines to "Maintain and improve Redlands' tees, parks, and citrus groves." Policy 3.29q directs the plantings of large-scale trees on arterial streets. Policy 3.10 directs for the planting of medians and other landscapes that would reduce the expanse of pavement.

Taking a top-down approach through the City Council, intertwined with a grassroots approach by citizen committee members, has ensured the City of Redlands is working in unison for the cultivation and preservation of its community forest. The policies enabled different bodies of

government to work alongside the private sector to invest in and protect the urban tree canopy.

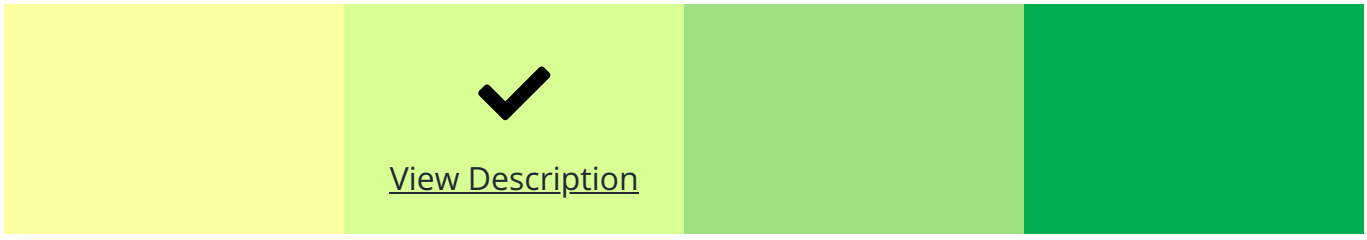


IMPLEMENTATION FEASIBILITY

New legislation may be needed to fully implement this policy and build on NDF's existing Urban and Community Forestry Program. In addition to the statutes and programs described above, the following may provide potential models:

1. Heat Island Community Actions Database (searchable database of state and municipal heat island reduction policies)
2. Miami-Dade County Landscape Ordinance, Miami-Dade County Code of Ordinances Chapter 18A
3. Clark County Unified Development Code
    1. Design and Layout of Parking, Clark County Code of Ordinances 30.60.050(c)(9) (parking lot landscaping to reduce heat island effect)
    2. Site Landscape & Screening Standards, Clark County Code of Ordinances 30.64 (one purpose is to reduce heat)

There appear to be no conflicting federal laws that govern public lands use and federally owned land, but more research on this issue would be required.



MONITORING, MODELING, AND MANAGING GREENHOUSE GAS EMISSIONS

The 2019 greenhouse gas (GHG) emissions inventory prepared by the Nevada Division of Environmental Protection (NDEP) under NRS 445B.380 provides an informative assessment of current statewide GHG emissions and is a helpful starting point for identifying the major sectors expected to drive future GHG emissions in Nevada.

> **In order to support a comprehensive and consistent evaluation of GHG emissions-reduction benefits from policies across the state, Nevada's inventory capabilities would need to expand.**

In order to support a comprehensive and consistent evaluation of GHG emissions-reduction benefits from policies across the state, Nevada's inventory capabilities would need to expand. This includes:

- access to input data that are current and specific to Nevada by emissions sector, locality, and individual policy; and
- an integrated GHG inventory framework that:
  - includes algorithms reflecting the interconnected nature of policies across sectors, jurisdictions, and time scales, and
  - synchronizes with existing processes, analyses, and resources used for local and regional development, land use, and transportation planning.

CURRENT NEVADA EMISSIONS INVENTORY EFFORTS

> **Several state, regional, and local agencies, as well as larger private entities, are engaged in GHG emissions inventory efforts**

to meet a range of objectives.

Several state, regional, and local agencies, as well as larger private entities, are engaged in GHG emissions inventory efforts to meet a range of objectives. The GHG Inventory Working Group reached out to numerous entities to assess the current practice of emissions inventory efforts statewide and to understand how these efforts may support or complement the State Climate Strategy and the broader goals of the State of Nevada Climate Initiative (NCI).

The GHG Inventory Working Group convened a series of group and individual discussions in August, September, and October 2020 with representatives from the following organizations to assess current efforts and plans for GHG inventories in Nevada. These discussions were intended to develop mutual understanding of the scope of each entity's emissions tracking and platform, as well as to learn more about opportunities and impediments to GHG emissions reporting that could complement and inform NDEP's statewide reporting:

- City of Henderson
- City of Las Vegas
- City of Reno
- Clark County School District (CCSD)
- Clark County Department of Environment and Sustainability
- Clark County Department of Aviation (CCDOA)
- Nevada Department of Transportation (NDOT)
- Regional Transportation Commission of Washoe County (RTC Washoe)
- Southern Nevada Regional Transportation Commission (RTCSNV)
- Tahoe Regional Planning Agency (TRPA)
- Washoe County Air Quality Management Division
- Washoe County School District (WCSD)

GHG emissions inventory efforts are not mandated by state law, or local codes or ordinances, but completed at the discretion of

local governing bodies within individual resolutions or as part of master plan documents.

Inventory efforts currently conducted and planned within Nevada fall into three categories:

- **Jurisdiction-wide or "community-scale" inventories** that include GHG emissions for all sectors and all sources generated within a certain jurisdiction (e.g., state, county, or city);
- **Regional transportation-sector inventories** associated with the transportation sector for designated metropolitan planning areas (MPAs); and
- **Operations inventories**, which are typically self-assessments of an individual organization's direct (and in a smaller number of cases, indirect or value-chain) GHG emissions.

JURISDICTION-WIDE INVENTORIES

As required by NRS 445B.380, NDEP has produced four GHG inventories (published in 2008, 2012, 2016, and 2019). NDEP uses the U.S. EPA State Inventory Tool and U.S. Energy Information Administration *Annual Energy Outlook*. This is supplemented with available Nevada-specific electricity generation projections, Nevada state demographer population projections, and modifications to conform to updated Intergovernmental Panel on Climate Change (IPCC) pollutant global warming potentials. Because of how data flows and is processed through the EPA State Inventory Tool, NDEP inventories have been approximately three years behind. For example, the 2019 inventory calculates emissions based on 2016 data. For 2017 through 2039, the NDEP inventory projects statewide GHG emissions by emissions sector through 2039, with projections starting from 2016 emissions data as the baseline inventory.

Some of the larger municipalities in Nevada, including Reno (2014) and Las Vegas (2020), have completed jurisdiction-wide GHG emissions inventories. In 2011, the Washoe County Air Quality Management Division completed a community-scale GHG inventory for Washoe County. Following up on previous GHG inventory efforts by the Southern Nevada Regional Planning Coalition in 2017, the Clark County Department of Environment and Sustainability is currently scoping a county-wide GHG inventory effort.

However, NRS 278.160 does not require GHG emissions inventories be included in community master plans. NRS 278.160(2) allows local jurisdictions to prepare and adopt, as part of their master plans, additional planning and reports that in the judgment of that local authority's governing body relates to the physical development of the local jurisdiction. This may include GHG emissions inventories and projections. These GHG emissions inventory efforts are not mandated by state law, or local codes or ordinances, but completed at the discretion of local governing bodies within individual resolutions or as part of master plan documents.

The most recent Reno, Washoe County, and Las Vegas GHG emissions inventories do not contain projections. The *Las Vegas Draft 2050 Master Plan* indicates it will prepare GHG emissions projections going forward. Las Vegas also includes in its draft *2050 Master Plan* the goal of completing annual GHG emissions inventories. Reno's 2017–2036 master plan, *Reimagine Reno,* incorporates by reference the goal from its *2019–2035 Sustainability and Climate Action Plan* to complete GHG inventories on a three-year cycle.

A key difference between the NDEP inventory, which is mandated by state statute, and local jurisdiction inventories is how electricity generation emissions are segregated from residential/commercial and industrial emissions. In the NDEP inventory, these three sectors are tracked individually. In the local jurisdiction inventories, electricity generation is a subset of residential, commercial, and industrial sector emissions rather than a separate sector. These are the types of baseline differences that need to be accounted for to compare GHG emissions-reduction impacts of policies that may be implemented locally, regionally, and statewide. Further review is needed to understand what portion of electricity generation accounted for within the local emissions inventories may originate from electricity generated outside of the state. For the NDEP inventory, only GHG emissions from electricity generation within state boundaries is included in emissions calculations. Since Nevada-based power plants generate most of the electricity consumed in the state, this is not expected to have a significant impact.

REGIONAL TRANSPORTATION-SECTOR INVENTORIES

Federally-designated metropolitan planning organizations (MPOs)—including RTCSNV, RTC Washoe, TRPA, and others—complete regional transportation plans at least every four years as required by federal regulations (23 CFR Part 450). As part of developing these plans, MPOs analyze alternatives against a number of criteria, including air quality projections. These regional transportation plans project MPA-wide air emissions for *Clean*

Air Act criteria pollutants. This information is also incorporated into air quality planning documents required by the *Clean Air Act* by local agencies in Washoe and Clark County. Except for TRPA, these emissions estimates do not currently include GHG emissions projections.

Because TRPA is an MPO partially located in California, it is required under California statutes (2008 CA SB 375) to coordinate both transportation and land-use planning to evaluate and reduce GHG emissions. TRPA completed a 2017 *Linking Tahoe: Regional Transportation Plan* that integrates land-use planning and transportation demand scenarios into GHG emissions projections. The TRPA has released a draft 2020 transportation plan that includes these same elements.

NDEP statewide GHG emissions inventory estimates for the transportation sector are based on statewide fuel consumption data and estimated combustion efficiency. There are also default assumptions regarding vehicle miles traveled and assumed vehicle age distribution contained within the EPA State Inventory Tool. Moving towards transportation-sector GHG emissions projections, this high-level, coarse calculation cannot account for different long-term transportation and land-use development patterns resulting from different local and regional policies and scenarios.

OPERATIONS INVENTORIES

Several organizations (e.g., RTCs, CCSD, WCSD, cities, CCDOA), including several private entities (and in 2020, NDOT), have completed GHG emissions inventories of agency operations. These include assessments of GHG Protocol Scope 1 (direct emissions associated with burning fossil fuels, such as natural gas for space heating and hot water or gasoline and diesel for internal combustion engine cars), Scope 2 (indirect emissions associated with purchased energy, especially for electricity consumption), and in limited cases Scope 3 (emissions associated with upstream and downstream supply-chain) emissions sources.

Platforms and reporting mechanisms used include those provided by the Carbon Footprint Registry (formerly the Climate Registry), Carbon Disclosure Project (CDP), Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), and the EPA Simplified GHG Emissions Calculator.

These detailed, bottom-up inventories are very important to understand the carbon footprint of individual government agencies and individual entity operations. They provide the underlying basis for illustrating and defining "lead-by-example" practices and help to identify opportunities for improvements in efficiency, cost-savings, and procurement policies that can reduce GHG emissions. However, these inventories are limited in their potential to contribute to statewide inventories across all sectors or for understanding the relative impact of policies across sectors and jurisdictions.

Detailed, bottom-up inventories are very important to understand the carbon footprint of individual government agencies and individual entity operations. However, these inventories are limited in their potential to contribute to statewide inventories across all sectors or for understanding the relative impact of policies across sectors and jurisdictions.

GHG DATA NEEDS IDENTIFIED BY 2019 NDEP GHG EMISSIONS INVENTORY

Section 11 of the 2019 NDEP GHG inventory identifies several data needs that would help to ensure the statewide inventory is complete and up to date. For example, a qualitative assessment of the ability of identified policies to support long-term goals of net-zero GHG emissions by 2050 could not be performed due to lack of data.

In the 2019 inventory, NDEP specifically identified the need to further research available knowledge and state of the practice related to carbon sequestration on Nevada rangelands. Among the uncertainties in the NDEP GHG emissions inventory, these data could have a significant effect on estimates of net GHG emissions from the state both now and in the future. A description of that effort is under way as further described in Box 1.

Box 1. Natural and Working Lands Carbon Sequestration Project

Effective carbon sequestration, or carbon storage, is a key element in reducing GHG emissions in the environment—and fostering healthy natural ecosystems is necessary to this process.

The Nature Conservancy, together with the Nevada Division of Natural Heritage, is working on a project to model the estimated amount of net carbon stored per acre through transforming non-native grasslands to native vegetation and evaluate the estimated cost of storing net carbon through the native grassland restoration process.

The proposed project aligns with the policies outlined in NDEP's 2019 GHG emissions inventory, including:

- Promote land management practices that increase carbon sequestration by natural lands that are typical and/or native to Nevada.
- Expand specific programs to restore and enhance habitats with measurable carbon sequestration co-benefits.
- Promote land management practices that decrease the risk of catastrophic wildfires.

Calculating the net carbon storage and cost of restoration of Nevada's grasslands provides several additional benefits. Enhancing carbon sequestration below ground in rangeland soils serves as a more-stable carbon sink compared to forests, where the majority of carbon sequestration occurs in the trees, which can then burn, be logged, or be developed. Restoring grasslands reduces wildfire frequency and is less expensive than other rangeland restoration practices. This process provides additional benefits as well, including enhancing habitat for Greater Sage-Grouse and insect pollinators. Additionally, we would see an increase in the quality of forage for herbivores and livestock.

GHG DATA NEEDS IDENTIFIED BY CLIMATE MITIGATION POLICY EVALUATIONS

The individual evaluations of climate mitigation policies illuminated additional data needs. In many cases, the impact of a policy, program, or regulation on GHG emissions could not be estimated because of a lack of data.

The underlying factor that affects GHG emissions projections for many policies is the percent of electricity consumed in Nevada that comes from renewable sources. Nevada's current statutory requirement to achieve a 50% renewable portfolio standard by 2030 will impact the GHG emissions-reduction effectiveness of policies across sectors.

> **The individual evaluations of climate mitigation policies illuminated additional data needs. In many cases, the impact of a policy, program, or regulation on GHG emissions could not be estimated because of a lack of data.**

For example, policies that increase electrical efficiency of appliances and buildings, or increase the relative percentage of electric vehicles compared to internal combustion engine vehicles on the road, will result in different levels of GHG emissions reductions depending on the percentage of Nevada's electricity that comes from renewable sources.

For policies that may be implemented on a local or regional level, additional information on the percentage of renewable energy supplied to individual areas of the state and effects of the wholesale energy market on these areas would be needed. In many cases, it may be more appropriate to provide a range of GHG emissions-reduction projections for a given policy to account for uncertainties, rather than a single point estimate.

FRAMEWORK FOR FUTURE STATEWIDE GHG INVENTORY EFFORTS

After discussions with organizations and stakeholders across Nevada, the state could benefit from an integrated statewide GHG emissions inventory framework. There are multiple items that must be considered in developing a framework for a comprehensive, statewide GHG emissions inventory.

- Operations inventories focused on individual entity emissions impacts will be helpful to identify "lead-by-example" areas for government and private-sector GHG emissions reductions, but will likely remain difficult to integrate and separate from the statewide inventory. These efforts may be summarized in a separate lead-by-example compilation of operations inventories if they are reported in a consistent format.
- Estimates of cumulative statewide GHG impacts of land use, development, and regional transportation policies in the statewide inventory may benefit from regional and local planning efforts (e.g., master plans and regional transportation plans) that incorporate GHG emissions inventories and projections.
- Regional and local planning efforts that incorporate GHG emissions inventories and projections would need to incorporate consistent format, methodology, and

accounting for comparisons across jurisdictions and sectors.
- The statewide framework for projections could be adapted to synchronize with regional and local planning cycles (e.g., master plans and regional transportation plans) thereby taking advantage of existing planning resources and local planning expertise and knowledge.
- All governmental entities expressed a strong interest in continued interagency collaboration on consistent GHG inventory practices but noted that available resources for GHG inventory efforts are very limited. The statewide framework will benefit from ongoing collaboration such as regular meetings and updates from agencies. This can include introduction of opportunities and platforms to help integrate complementary GHG emissions reporting across jurisdiction and for the state to remain engaged with and connected to local and regional efforts.

The World Resources Institute has developed a comprehensive *Policy and Action Standard* that provides a standardized framework for estimating and reporting the change in GHG emissions and removals resulting from policies and actions. Together with an inventory platform, adaptation of this standard (or another systematic framework), could help to integrate consistent GHG emissions-reduction analysis of policies across planning organizations.

> **The state could benefit from an integrated statewide GHG emissions inventory framework.**

The GHG Inventory Working Group performed an initial survey of available inventory platforms that can perform integrated, modular, and interactive cross-sector and potentially cross-jurisdiction GHG emissions-projection analysis of individual and related policies. Either these or other platforms will require further evaluation of cost and identification of additional resources to use effectively. The examples below may warrant further consideration based upon a preliminary evaluation of the parameters of each tool's modeling capabilities, ease of use, extent of adoption, and the cost of the platforms:

- Open-Source Energy Policy Simulator (EPS) developed by Energy Innovation: Policy and Technology LLC (https://us.energypolicy.solutions/)
    - This open-source computer model is designed to inform policymakers and regulators about climate and energy policies, individually or as a package, that will most-effectively reduce GHG emissions. EPS can model the economic

sectors required to be analyzed in the NDEP annual report, and includes outputs such as job impacts, cash flow, multiple pollutants, and public health.

- Low Emissions Analysis Platform (LEAP) developed by the Stockholm Environment Institute (https://leap.sei.org/)
    - LEAP is a software tool for creating quantitative modeling of energy systems, pollutant emissions from energy and non-energy sources, and costs and benefits and related externalities. It has been used in multiple states and as the basis for many countries to meet their commitments to the Paris Agreement. Licensing and training can be low-cost, but customized modeling would require more-significant investment.

COMPLEX CLIMATE CHALLENGES FOR NEVADA

While the science of climate change is beyond question, the solutions necessary to reach net-zero greenhouse gas (GHG) emissions and manage the current and future impacts of climate change are complex. The impacts transcend sectors and scales, while the solutions require coordination and collaboration across jurisdictions, multiple levels of government, and with the private sector. Thus, there is no single solution to addressing climate change in Nevada. Instead, a broad scope of issues must be considered together in order to develop sound policy that will match available clean technologies to maximize GHG emissions reductions while protecting Nevada's communities and natural resources from climate impacts. This broad-scope approach is also the recipe necessary for Nevada to fully leverage the economic benefits of the rapidly emerging clean energy future.

> **Implementing a single policy, program, or plan without considering the constellation of connected issues has the potential for adverse consequences.**

Implementing a single policy, program, or plan without considering the constellation of connected issues has the potential for adverse consequences. For example, most large-scale mitigation actions involve significant financial investments and actions by local, state, and federal governments—in partnership with the private sector—to retool or deploy new infrastructure. This infrastructure may be vulnerable to natural hazards, which are in many cases becoming more frequent, more intense, and more unpredictable. To manage future risk, planning must integrate the medium- and long-term vulnerabilities to infrastructure posed by increasingly volatile environment conditions. These climate mitigation efforts must also avoid compromising other GHG emissions-reduction activities, while reducing exposure and vulnerability to the impacts of climate change.

> **Multiple complexities that should be considered in order to develop a catalog of climate-related policies, programs, and**

> **plans that are harmonized within and across different levels of governance and economic sectors.**

The following topics represent opportunities to significantly reduce Nevada's GHG emissions. Each topic lays out multiple complexities that should be considered in order to develop a catalog of climate-related policies, programs, and plans that are harmonized within and across different levels of governance and economic sectors. To achieve this outcome, first and foremost, it is critical to establish strong collaboration and communication among federal, state, tribal, and local governments across Nevada, along with the private sector. An integrated governance framework is needed to guide such a strategic approach to managing climate change. The governance section provides the "building materials" necessary to create a Nevada-specific framework for addressing climate change across the state.

TRANSPORTATION TRANSFORMATION

The transportation sector is currently Nevada's greatest source of GHG emissions. A two-pronged approach to reduce transportation demand, particularly in urban areas, while significantly increasing the percentage of low- and zero-emissions vehicles on Nevada roads can dramatically reduce transportation-related GHG emissions while advancing the state's economic recovery and rebuilding post-COVID. There are also tangible benefits to the health and safety of Nevadans as air quality would be improved as tailpipe emissions are reduced.

Achieving Nevada's net-zero GHG emissions by 2050 goal will require major changes to the state's transportation systems, as well as shifts in travel patterns and personal transportation choices. This in turn will require various degrees of buy-in across Nevada's urban and rural communities. Ameliorating GHG emissions will also necessitate a more-strategic approach to Nevada's investment in transportation infrastructure that includes consideration of the multiple cascading impacts of climate change. Other states are already navigating these issues and succeeding in building modern, low-emissions, climate-resilient transportation systems while accelerating consumer adoption of clean vehicles and alternative transportation options.

During the climate strategy listening sessions, participants broadly supported shifting away from fossil-fueled vehicles, but also identified issues that need to be considered in shifting toward new and expanded transportation alternatives.

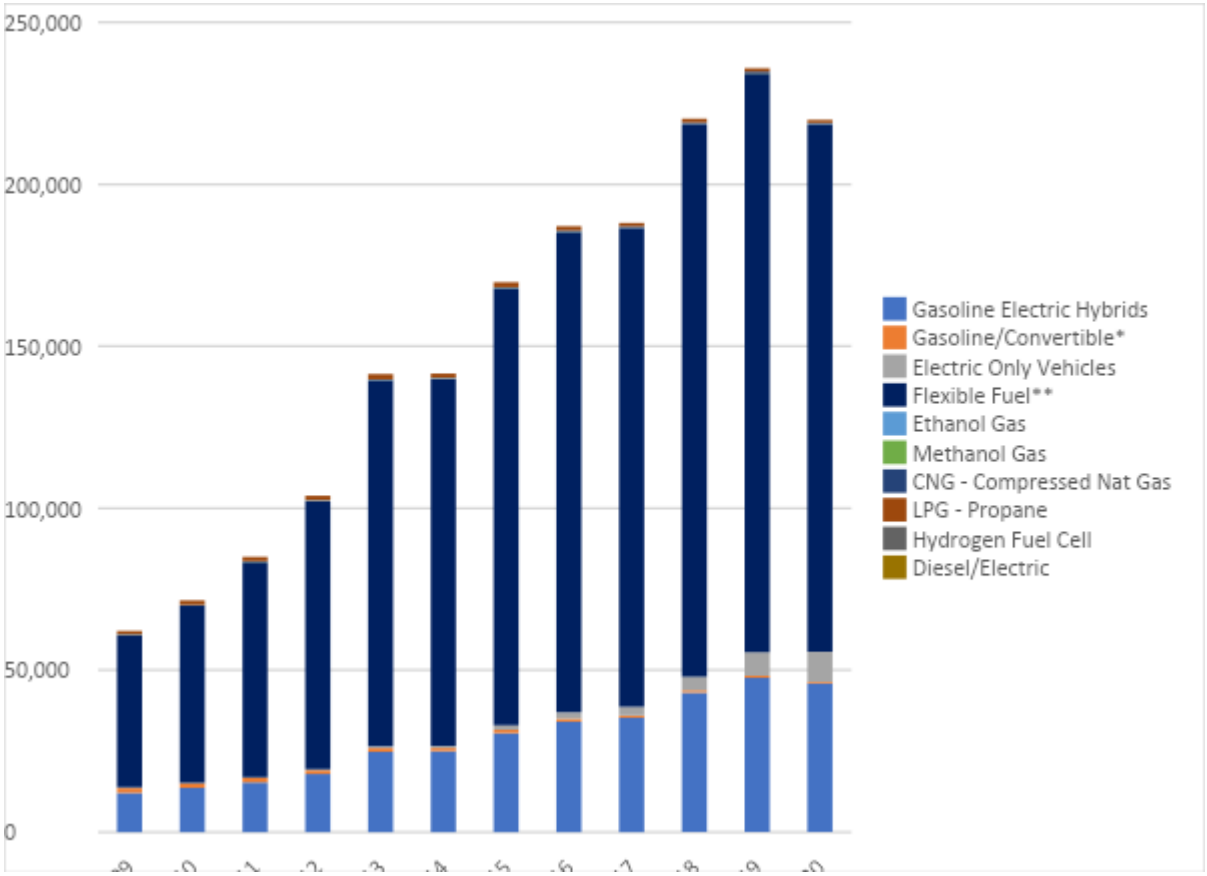
The majority of GHG emissions from the transportation sector come from highway vehicle use by both passenger cars and heavy-duty commercial vehicles. However, through time, the fuel mix used by vehicles registered in the state has expanded slightly to include a small portion of alternative fuels and zero-emissions options (Table 1; Figure 1).

Table 1. Nevada DMV Registrations by Fuel Type

Fuel Type	FY2009	FY2010	FY2011	FY2012	FY2013	FY
DIESEL	87,896	85,032	85,693	87,840	99,758	88
GASOLINE	2,031,726	1,985,469	1,954,411	1,981,939	2,243,994	1,
GASOLINE/ELECTRIC (HYBRID)	12,116	13,650	15,359	17,957	24,773	25
GASOLINE - CONVERTIBLE	1,478	1,455	1,393	1,145	1,172	96
ELECTRIC	155	175	168	231	486	68
FLEXIBLE FUEL	47,031	54,596	66,500	82,937	112,997	11
ETHANOL GAS ONLY	37	22	13	14	13	12
METHANOL GAS ONLY	78	73	75	79	91	99
COMPRESSED NATURAL GAS	183	166	150	152	252	18
PROPANE	1,031	1,398	1,320	1,336	1,636	1,
HYDROGEN FUEL CELL	-	-	-	-	-	-
DIESEL/ELECTRIC	-	-	-	-	-	-
UNKNOWN	14,492	12,964	11,905	11,042	11,048	8,

Fuel Type	FY2009	FY2010	FY2011	FY2012	FY2013	FY
NONE	144,654	141,124	142,716	144,689	163,685	14
Total Vehicle Registrations	**2,340,877**	**2,296,124**	**2,279,703**	**2,329,361**	**2,659,905**	**2,**

Figure 1. Nevada DMV Registrations of Alternative Fuel, Low-, and Zero-Emissions Vehicles



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Nevada is making initial progress on transportation transformation by pursuing low-emissions vehicle (LEV) and zero-emissions vehicle (ZEV) 'clean car' *regulations* for passenger vehicles and through slowly increasing investments in electric vehicle (EV) charging infrastructure. As Nevada seeks to accelerate clean transportation options, immediate hurdles include expanding vehicle choice in Nevada and promoting greater consumer awareness. This is a particular challenge in rural communities where light-duty

gas and diesel trucks command a larger market share than in the urban areas of Nevada, while current low- and zero-emissions light-duty truck options on the market are either not available, unaffordable, or unappealing, according to several rural stakeholders. Comments from members of the Nevada community point out that rural residents working on farms and ranches also require larger vehicles.

Affordability is a shared concern across the state. Although the initial investment in these vehicles can be offset by reduced fuel and maintenance expenses, and with federal tax credits, accessibility and affordability of new EVs to marginalized and vulnerable communities was a concern participants expressed in the climate strategy stakeholder process and another reason to provide alternatives to personal automobiles in addition to a cleaner fleet. Also, California's recent push toward sales of only zero-emissions vehicles by 2035 could expand affordable options available on the secondary market here in Nevada.

Range anxiety is another commonly cited barrier to widespread adoption of EVs. To address the need to support charging on long-distance, point-to-point trips, multiple efforts to expand the network across the Western United States are under way. These include the West Coast Electric Highway (between California and British Columbia) and the Regional Electric Vehicle Plan for the West (REV West), including the Nevada Electric Highway between Las Vegas and Reno. The Electric Vehicles Roadmap Initiative by the Western Governors' Association could lay the groundwork to further expand charging infrastructure across the Western United States.

Expanding at-home and workplace charging is also needed. There are currently 272 public charging stations and 923 outlets across Nevada (DOE 2020), but it is unknown how many homes in Nevada can accommodate charging. The average cost of installing a charger at home (Level 2 or higher) is $1,200, with an average range between $850 and $2,200. This is an additional expense for a homeowner that could offset some of the long-term benefit of reduced maintenance costs. Supporting installation of neighborhood or community charging stations could be an option that could also ensure accessibility for renters. This is important as approximately 45% of households in Nevada reside in rental properties where installation of a charging station may be an additional investment that a landlord is not willing to incur (Nevada Housing Division, 2017).

To address affordability concerns and overcome consumer hesitance in purchasing EVs, every LEV/ZEV state has implemented incentives tied to the purchase of these vehicles at some point (Table 2). Nevadans participating in listening sessions and submitting

comments indicated the need for incentives, particularly to allow low-income households access to electric vehicles. Given the success of incentives in promoting LEV and ZEV adoption in other states, this is a policy area that Nevada should explore in better economic times. In the near term, the state is constrained by a reduced state budget and a narrow tax structure.

Table 2. Incentive Structures Adopted by LEV/ZEV States

		INCENTIVE OPTION			
State	**ZEVState?**	**Income Tax Credit**	**Sales Tax Credit**	**Rebate**	**$ Source for Rebate**
CA	Y			$2,000 (income limits)	Cap-and-trade $ Low-carbon fuel standard revenue
CO	Y	$4,000			N/A
CT	Y			Up to $5K	Utilities
MA	Y			$2,500	Cap-and-trade $
MD	Y		Sales Tax Exemption [ended 7/1/20]		N/A
ME	Y			$2,000	VW settlement $
NJ	Y		Waive Sales Tax	$5K	Utilities
NY	Y			$2,000	Utilities
OR	Y			Up to $5K	Tax on auto dealers
PA	N			$750	Utilities gross receipt tax

State	ZEVState?	Income Tax Credit	Sales Tax Credit	Rebate	$ Source for Rebate
RI	Y			Suspended 2017	No funding source
VT	Y			$4,000 (income limits)	State funds & utilities
WA	N		Sales Tax Exemption		N/A

Both Maryland and Rhode Island have sunset their incentive programs because of a lack of program funding.

Electrification of freight vehicles is a popular option across U.S. states that is rapidly expanding with commitments to fully electrify vehicle fleets from industry partners, including Walmart, Amazon, Uber, and Lyft. This, coupled with California's recent announcement to only sell zero-emissions vehicles in the state beginning in 2035, could significantly drive up demand for battery production and related advanced manufacturing. Supporting the workforce pipeline and implementing retraining programs to support this growing industry can create more jobs for Nevadans. This could offset reduced demand for traditional auto mechanics and impacts to small businesses associated with gas stations.

Nevada is uniquely poised to capitalize on its unique assets by leveraging growth in the EV sector to become a hub for transportation electrification. In considering the entire battery production supply chain, there is already an increase in the need for lithium at the front end, growing demand for advanced manufacturing of batteries, and active research to identify recycling and green disposal options at end of life—all of which Nevada is already actively engaged with.

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need for lithium at the front end, growing demand for advanced manufacturing of batteries, and active research to identify recycling and green disposal options at end of life—all of which Nevada is already actively engaged with.

Nevada has the largest lithium prospects in the United States, and the only active lithium mine in North America (i.e., Silver Peak). Increasing global demand for battery production is prompting the mining industry to pursue a new extraction enterprise at Thacker Pass, the largest known lithium resource in the country. Several entities are considering investments or have already secured rights to a lithium claim in Nevada. This would certainly lead to expanded job opportunities. Of course, the environmental impact of mining to the landscape and water resources must also be carefully considered. Similarly, the disposal of batteries is another environmental challenge given the mix of chemicals and metals that comprise the components and no efficient, cost-effective mechanism for recycling is yet available.

One concern about transportation electrification is how the power system will handle a rapid ramp up in demand for charging along with the introduction of more-variable electrical loads. However, EVs present beneficial opportunities to the grid as distributed battery resources that could provide demand response services. Additionally, managed EV charging through proper price signals can benefit the grid. Should a very rapid increase in EV adoption occur, there is a small risk of increasing GHG emissions by the energy sector if new renewable development and deployment does not keep pace (Stokes 2020). However, this is unlikely given the breadth of renewable energy development opportunities across Nevada, and the hurdles that must be overcome to increase EV adoption in the state.

Beyond transportation electrification, there are other opportunities to reduce transportation GHG emissions. These include the use of other alternative fuels and transportation demand management, which are utilized in other states and countries.

In January 2017, the Federal Highway Administration (FHWA) established an Alternative Fuel Corridor for vehicles that are fueled with compressed natural gas (CNG), electricity (EV), hydrogen, liquefied natural gas (LNG), and liquefied petroleum gas (LPG). These corridors have alternative refueling sites along a designated route on the National Highway System. Nevada has already had several corridors designated and/or ready for EV, CNG,

and LPG, with even more pending that will include LNG. While Nevada does not currently have any public hydrogen fueling stations or identified corridors, California has a network in place. As increased emissions-control regulations in California take effect, it is likely that the demand will increase for hydrogen fueling stations, along with EV charging stations on Nevada's interstates and other key corridors. Utah and Colorado are actively evaluating hydrogen fuel options, which will increase both opportunity and demand for stations across the state. Other countries utilizing hydrogen for transportation include Germany, Italy, and Denmark.

Consideration of the lifecycle GHG emissions from various alternative fuels (e.g. may provide additional information regarding fueling and charging infrastructure strategies beyond consideration of just tailpipe emissions.

> **Beyond transportation electrification, there are other opportunities to reduce transportation GHG emissions. These include the use of other alternative fuels and transportation demand management, which are utilized in other states and countries.**

In addition to reducing transportation vehicle emissions, other strategies to reduce dependence on single-occupant vehicles (SOVs) and vehicle miles traveled (VMTs) can have important impacts on other criteria pollutants as well as health, safety, and equity of the population.

Transportation demand management is a set of strategies that aim to reduce the overall use of vehicles in the transportation system. Generally, this concept can include incentives for use of alternative modes such as more-frequent and/or free transit, improved active transportation networks, or incentives to carpool or telecommute. In addition, managing demand can also include disincentives such as pricing strategies for use of SOVs. The ideal transportation demand management strategies utilize a combination of incentives and disincentives to encourage travel behavior changes. However, these approaches include challenges such as public and agency support, as well as funding. Implementing demand management includes not just the transportation sector, but must involve land-use considerations in order to be effective.

VMTs in Nevada are growing faster than the population. Also, driving distances are increasing on average due to poor land-use planning and urban sprawl development patterns. According to the Nevada Department of Transportation (NDOT), between 2008 and 2018, lane miles in Nevada have expanded from 72,000 to more than 102,000 miles, representing a 42% increase. Projections indicate that over the next 10 years they will go up by another 30%, fueled by a 14% increase in miles traveled per citizen. If this trend does not change, GHG targets will be difficult to meet, even with aggressive changes to vehicle efficiency and fuel type, due to turnover rate of vehicles and other transportation-related GHG emissions, such as roadway building and maintenance.

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In the simplest terms, transportation demand management encourages travelers to travel less or utilize less-energy-intensive modes of travel. In order to make that shift, options must be provided that are equally effective from a time and cost perspective compared with using a personal vehicle. Those alternatives—such as transit, walking, and biking—require investments at the federal, state, and local levels, as well as ensuring transportation efficiency and modal options are considered in the planning, zoning, and development processes. Some examples may include:

- Expansion of regional and interregional transit services through increased frequency, expanded service areas, and improved reliability;
- Adoption of a statewide transportation demand management program for large employers to actively participate in minimizing the vehicle trips their business creates. This is a strategy already in place in the urbanized Southern Nevada and Washoe areas as part of their air quality mitigation efforts, but could be expanded and measures can be improved to better evaluate the effectiveness at the statewide level;
- Adoption of pricing strategies such as increasing fuel taxes or creating a per-mile fee to reduce SOV usage, or parking pricing strategies that encourage alternatives to SOVs;

- Adoption of land use policies that include an analysis of transportation impact with a set of incentives or fees to limit the anticipated increase in VMTs;
- Creation of a process that would require an analysis of alternatives—such as operational improvements, transit options, or HOV lanes—prior to any proposed highway expansion; and
- Creation of a vehicle rebate program ("cash for clunkers") that provides incentives for alternative/lower-emitting transportation modes (e.g., bicycles, e-bikes, transit) and not just lower-emissions vehicles.

However, due to the level of complexity and variety of strategies, careful planning is necessary before recommending any specific policies or strategies on this topic.

Most states that have travel demand strategies as part of their climate, air quality, or transportation plans provide general strategies with overarching policies, such as a VMT target reduction, but generally fall short of specific statewide mandates. This allows for regions to develop a combination of strategies within their programs that are best suited for that particular region's travel needs and options.

Changing travel behavior is challenging and will take a coordinated effort at multiple levels of government as well as an equitable transportation funding solution to provide improved alternatives to current travel patterns. While the state continues to develop policies to reduce GHG emissions from transportation and other sectors, an effort to evaluate more-sustainable and equitable funding for transportation must be undertaken simultaneously and in concert with the climate strategies. Without that coordination, other transportation concerns (e.g., equity, state of good repair, congestion) will overshadow the efforts to reduce GHG emissions. By evaluating and developing solutions that adequately and equitably fund transportation needs while reducing environmental impacts, a sustainable solution can be developed that meets multiple goals and garners support from a variety of stakeholders and interests.

Electrification Coalition Roadmap for Transportation Electrification in Nevada

The Electrification Coalition (EC) is a nonprofit, nonpartisan organization focused on eliminating the United States' dependence on foreign oil in order to support domestic national security priorities. In early 2020, the EC announced that Nevada was selected as one of five states that would receive support to develop a comprehensive roadmap to support planning

that would move the state toward electrification of transportation. The effort will involve stakeholder convenings including key state and local government officials with the intention of outlining a path forward that will navigate key roadblocks and address challenges. The final report should be complete in 2021.

TRANSMISSION PLANNING & GRID MODERNIZATION

Power-sector issues extend beyond Nevada's borders. In Nevada, the majority of the power supply is generated and used in state. Modest amounts are imported from Arizona (19%), Idaho (4%), Utah (2%), and California (1%) (FEWSION 2.0). Nevada does export power to California (14%) and Arizona (14%) (FEWSION 2.0). As Nevada is also geographically located between large urban and economic centers across the West, it serves as a transmission "hub" and plays a critical role in the delivery of electricity for the region. Consequently, transmission and distribution grid planning and modernization are a West-wide effort and the influence of climate change across all these states must be considered in managing both current and future supply and demand.

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Existing power supplies are threatened by the impacts of climate change. Diminishing freshwater availability may compromise hydropower and thermoelectric power plants that use surface water in Arizona. Declines in the water supply from the Colorado River that feeds Lake Mead has already impacted hydropower generation at Hoover Dam. Hoover

Dam supplies power for three Western states (Nevada, Arizona, and California), and has a capacity of 2,080 MW. However, for every foot that Lake Mead drops, 5.7 MW of capacity is lost. Today, with water elevations at the lake hovering around 1,080 during the summer months, the dam generates in the range 25% of its original capacity. If the lake drops below 1,050, Hoover Dam can no longer generate electricity.

Wildfire is a threat to power-sector infrastructure, particularly to the transmission lines that transect the Sierras and the Rocky Mountains. Aging energy infrastructure can also spark wildfires, as was the case with some of the 2017 northern California wildfires that were started by PG&E power lines. In the aftermath, electricity utility companies across the West, including NV Energy, have either shutdown electricity delivery to customers, or prepared to, on days where the National Weather Service has issued a red flag warning and there is a high fire risk. Given that these tend to occur during the hottest days, curtailing power can pose heat-related health risks as no air conditioning is available. Further, seniors and other vulnerable populations may not be able to refrigerate important medication or power medical equipment.

The combination of a growing population and increasing temperatures is expected to increase total energy demands across the United States (NCA 2018). Cooling degree days are already increasing in the West, as are the duration of heat waves, particularly in Southern Nevada. Extreme heat and associated spikes in air conditioning demand are already taxing power systems, highlighting the urgency of modernizing power systems (See Box 1).

Box 1. Interconnected Climate Challenges: Late Summer 2020

Record-breaking heatwaves, high winds, and other extreme weather events remain a constant and critical threat to Nevada's power grid and public safety. As temperatures rise, so does the demand placed on the power grid due to the need for air conditioning and refrigeration. Strong windstorms have damaged power lines, which can result not only in the loss of power, but also have led to devastating wildfires across the West. It is becoming increasingly common for utility companies to address this strain on power supply by asking residents to reduce their power usage during the hottest parts of the day. Some have even implemented scheduled power outages, or "rolling blackouts," across entire sections of cities and communities to prevent excessive strain on power supply grids. At issue is that the "hottest part of the day" is getting longer, and the strain on power supplies is growing.

In August 2020, both California and Nevada utilities issued blackout warnings to customers as a record-breaking heat wave hit the region and air conditioning demand soared. Californians were subject to blackouts in August, and subsequent investigations illuminated challenges balancing the supply and demand, mismanagement of the natural gas power systems, and failure to plan for such extreme events. This happened again in October when extreme Santa Ana winds threatened to fuel already raging wildfires across the state, forcing the utilities to shut power in a preemptive attempt to reduce fire risks.

As more and more Western states and utilities pursue higher renewable portfolio standards, carbon policies, and aggressive climate goals, states need to work together to keep costs down and maintain reliability for customers. With leadership from governors, states can coordinate and collaborate on solutions to achieve carbon-reduction goals, realize economic and customer benefits, improve transmission system planning, protect state sovereignty over resource and procurement choices, and develop an equitable, independent governance that includes a role for states.

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Nevada is currently engaged in power-related planning on multiple fronts.

Nevada and other Western states are working with the Center for the New Energy Economy (CNEE) to facilitate a conversation among governors for regional cooperation on electricity issues such as transmission, resource adequacy, GHG accounting, and clean energy standards. Further, under the direction of Governor Sisolak, the director of the Governor's Office of Energy (GOE) and the Public Utilities Commission of Nevada (PUCN)

are engaging in discussions across the Western states with stakeholders to evaluate regional energy market options.

Serviced by the California Independent System Operator (CAISO), many utilities in the West participate in a sub-hourly, real-time market, known as the Western Energy Imbalance Market (EIM), to balance supply and demand in five-minute and fifteen-minute intervals. NV Energy was the second utility to join the EIM in 2015 (following PacifiCorp in 2014). The EIM footprint includes portions of British Columbia, Washington, Oregon, California, Nevada, Arizona, Idaho, Utah, and Wyoming, and will be expanding to include Montana and New Mexico. Since inception, the EIM has resulted in gross benefits of over $800 million, with Nevada customers having seen a benefit of $82 million. CAISO has initiated expansion of the EIM to add an "Extended Day Ahead Market (EDAM)," that would likely result in even more customer benefits. Nevada has a strong history of working with California and CAISO on energy issues.

Nevada is a transmission "hub" and plays a critical role in the delivery of electricity for the region, exporting 1,291 MW of renewable energy to surrounding states (out of more than 4 GW of in-state nameplate renewable energy capacity as of 2018). Utilities and clean energy advocates are aligned on EIM and expansion of the market as it is good for customers and good for the environment.

States are also working together through multiple venues on a variety of other issues:

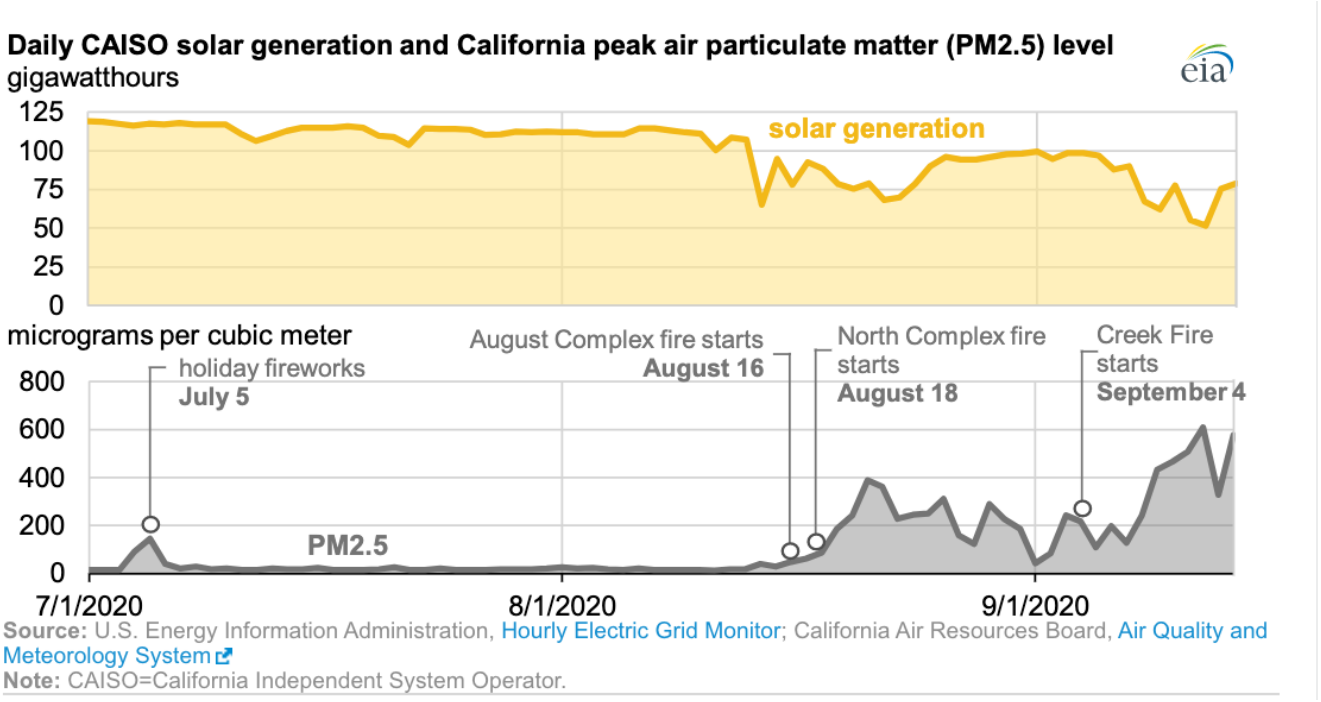
- **Western EIM Body of State Regulators (BOSR):** PUC commissioners meet periodically to discuss Western EIM.
- **Western Interstate Energy Board (WIEB) and Committee on Regional Electric Power Cooperation (CREPC):** PUC commissioners and governors' energy advisors meet twice per year to discuss energy issues facing the West.
- **Joint Action Framework on Climate Change MOU**: PUCs from California, Oregon, Washington, Nevada, and Colorado are collaborating and sharing best practices for decarbonizing the energy sector.

As planning for a future grid continues, the current threats and vulnerabilities to both power supplies and energy demands, as well as how these may change in the future, must be considered. For example, as ecosystems shift and different forests change, wildfire vulnerabilities will change in the decades to come (NCA 2018). The shifting risk regimes for both power plants and transmission lines do influence optimal siting for both. Incorporating climate impacts on energy (e.g., IAEA 2019; Cronin et al., 2018; NCA 2018)

Given the state's solar potential and significant geothermal resources, there is great opportunity to expand power generation from renewable resources. While the grid modernization efforts under way will enable the appropriate incorporation of renewable resources, siting of these generating assets (which affects transmission design) should consider how climate change may alter their performance.

Given the state's solar potential and significant geothermal resources, there is great opportunity to expand power generation from renewable resources. While the grid modernization efforts under way will enable the appropriate incorporation of renewable resources, siting of these generating assets (which affects transmission design) should consider how climate change may alter their performance. As an example, diminished air quality from acute events like wildfires can compromise solar power generation, as was the case during the 2020 California fires when airborne particulate concentrations were high enough that solar production dropped by 30% (Figure 2).

Figure 2. Daily CAISO Solar Generation and California Peak Air Particulate Matter Level



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Source: https://www.eia.gov/todayinenergy/detail.php?id=45336

These planning efforts are well-positioned to address the demand for onboarding renewables while navigating the complexities of a changing climate and how that might impact energy systems in the future. However, for Nevada, although the regulatory authority of the PUCN does include requirements related to environmental protections, there is no explicit requirement to demonstrate adequate preparation for risks to any assets posed by the long-term impacts of climate change (e.g., wildfire, flooding, cooling demands). Other states have requirements that climate change projections are explicitly addressed and incorporated into planning more broadly for state-funded or state-regulated projects (e.g., California).

Nevada requires electric utilities to file an integrated resource plan (IRP) with the PUCN on or before June 1 every three years. The IRP requires the electric utility to present its plan for investments to the PUCN that will permit the utility to provide reliable service to its customers in a manner consistent with public policies over a 20-year planning period. A transmission plan and a distributed resources plan are two subsets of the overall IRP. The transmission plan provides a summary of the capabilities of the utility's transmission system, including import and export limits and the capacity of significant electric transmission paths, and sets forth the utility's transmission needs over the 20-year IRP analysis period. The distributed resources plan provides an analysis of the amount of distributed energy resources (DERs) that can be accommodated on each of the utility's electric feeders, identifies any constraints or upgrades on the electric grid, and analyzes whether DERs may provide solutions to those constraints.

There is, however, SB 329, passed by the 2019 legislature and signed by Gov. Sisolak, which requires electric utilities to submit natural disaster protection plans to the PUCN on or before June 1 every third year. SB 329 requires the natural disaster protection plans to contain procedures and protocols in relation to the utility's efforts to prevent or respond to natural disasters.

URBAN PLANNING

Urban planning is a broad and complex category that is critically important to overall GHG

reduction as well as adaptation planning. Globally, cities consume over 60% of all energy and account for 70% of GHG emissions. Embedded in urban planning are issues of transportation, transmission, green buildings, and land use. From an environmental, financial, and social perspective, resilience needs to be considered across multiple levels of governance, particularly as many of the decisions related to urban planning occur at the local level. Simply, decisions made at the local level can have tremendous impact on the state's ability to meet GHG emissions-reduction targets and ensure the resilience of Nevada's communities.

For example, a net-zero-emissions commercial building may actually have a large carbon footprint if it generates a large amount of VMTs for the workforce or if its construction reduces the carbon sequestration potential of the land it is built on. In addition, depending on the proximity of the residence to the workplace, actual costs for fuel and maintenance of vehicles has the potential to be higher when the person must travel further.

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Balancing numerous needs is challenging to say the least, but an increased effort to understand the impacts and tradeoffs of urban planning and land-use decisions is critical not just to meet the state's climate goals, but also to support economic development, equity, access, and quality of life goals. To that end, there are multiple issues that will require discussion, collaboration, and collective decision-making across state and local planning organizations.

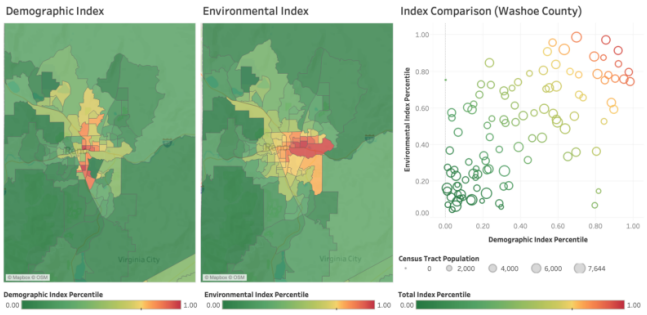
One challenge requiring a coordinated effort is addressing extreme heat. Reno and Las Vegas are among the fastest-warming cities in the entire United States (Climate Central 2019). Climate change has increased temperatures across NV by about 2°F and the urban heat island effect (UHI) warmed the states major cities by an additional 3-5°F. One unique aspect of the UHI is that the temperature in one part of Las Vegas, for example, can be over 10ºF warmer than another part of town. Las Vegas has also been identified as the city with the most-intense UHI during both the daytime and the nighttime. The National Oceanic and Atmospheric Administration (NOAA) has a useful interactive tool that shows the areas of the United States that have heightened vulnerability to extreme heat based on multiple socioeconomic indicators, including Southern Nevada. Indeed, a recent analysis

shows that low-income households tend to live in hotter parts of both Las Vegas and Reno than wealthier families (NPR 2019).

> **Extreme heat in urban areas is clearly a social justice issue.**

Extreme heat causes more fatalities each year than any other weather-related event, including hurricanes, floods, and wildfires (NOAA 2020). With income disparities in exposure to extreme heat in urban areas, this is clearly a social justice issue. The mortality risk during a heat wave is amplified by exposure to poor air quality (NCA 2018), which also maps to where lower-income communities are located in the urban areas of Nevada (Evolved Energy 2020, Figure 3.) Poor HVAC and inadequate construction of schools in historically marginalized communities is also resulting in underperformance of Black and Hispanic students on standardized tests on days where temperatures exceed 80°F (Park et al., 2020).

Figure 3. Clark (Left) and Washoe (Right) Counties Census Tracks Ranked by Socioeconomic Vulnerability and Environmental Pollution (Source: Evolved Energy 2020)



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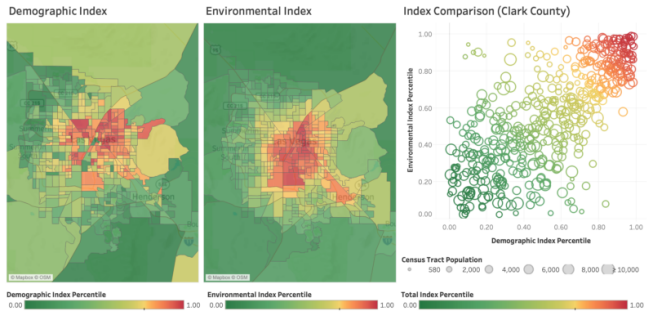


EXPAND

Nevadans are experiencing the impacts of extreme heat firsthand and many expressed grave concerns about exposure of marginalized and low-income community members, as well as outdoor workers, to extreme temperatures through the summer—particularly in Las Vegas. Participants in listening sessions advocated for increasing the urban tree canopy, creating more public green spaces, and re-developing and developing affordable green building design in low-income communities. Nevadans also highlighted in the listening sessions the need for financial assistance to pay for HVAC installation and to pay the power bills associated with running these systems on the hottest days of the year.

The disparate temperatures across Nevada's major urban centers is largely the result of differences in landscape, urban design, materials used for construction, and relative elevation—all related to the UHI. According to a recent analysis by the Urban Land Institute, green spaces and urban tree canopies can effectively reduce localized temperatures. However, there are a few issues that need to be considered, particularly in desert environments. Specifically, any water requirements for landscaping is a concern given the how little precipitation falls across Nevada. Also, although trees reduce GHGs, if poorly designed, tree canopy can also trap other tailpipe emissions (NOx and PM2.5) and create hot spots of poor air quality (Gallagher 2015). Fortunately, these issues can all be overcome if urban forestry is carefully considered in planning and implementing UHI

> **Through the lens of air quality, transportation also has a clear connection with smart design and planning strategies that can attenuate extreme heat while also improving air quality.**

Through the lens of air quality, transportation also has a clear connection with smart design and planning strategies that can attenuate extreme heat while also improving air quality. Air quality is one of the top concerns of Nevadans, and those communities exposed to extreme heat also experience poor air quality (Figure 3). Fortunately, solutions that will improve air quality, reduce UHI effects, and reduce GHGs can be achieved by integrating mass transit, along with other modal options such as safe walking and biking, with urban planning and other strategies to reduce overall VMTs (cars and trucks).

Right now, the City of Las Vegas, Clark County, and the Southern Nevada Regional Transportation Commission are revisiting their master plans. Many of the considerations above are included in the draft documents, particularly issues related to urban forestry and sustainability. In 2019, the *Truckee Meadows Regional Plan* was updated to provide the framework for regional growth in Washoe County for the next 20 years. The plan focuses on the coordination of master planning in Reno, Sparks, and unincorporated Washoe County as it relates to population, regional form and land-use pattern, public facilities and service provision, natural resources, and intergovernmental coordination. Key components of the updated plan include urban growth tiering standards and stronger policies to coordinate land use decision-making with public facility investment in new growth areas and a collaborative effort to map natural resource areas that should be protected.

Coordination across regional organizations, municipalities, and the state can ensure that emerging policies are harmonized and optimized in order to reach GHG emissions-reduction goals, while also reconciling the disproportionate exposure of vulnerable communities to poor air quality and extreme heat. The role of cities, counties, and other local governments developing and implementing plans to minimize their carbon footprint within their growth planning is critical to Nevada's overall efforts to mitigate GHG pollution and establish more-resilient communities in the face of climate change impacts that are already being felt.

That said, modernizing land-use regimes to better align with the state's GHG emissions-reduction goals is a challenge requiring commitment from policy makers at all levels in Nevada. Attention should be paid to the GHG impacts of new development by both project proponents and relevant local governments. Projects that significantly increase overall GHG pollution should be mitigated or denied. While respecting the jurisdictional primacy of local governments for land-use decisions, state resources from a variety of agencies could be enhanced to provide technical modeling assistance and policy coordination.

Further, as we heard during the listening sessions, Nevada's unique depreciation system for property tax assessment places tremendous fiscal pressure on local governments to incorporate newer housing product as replacement for the depreciating tax base of Nevada's older neighborhoods. A fuller examination of tax policy and local government fiscal capacity from a climate perspective should be pursued.

GREEN BUILDINGS

Net-zero or low-carbon buildings is a nationwide conversation focused around increased efficiency in the built environment, reducing GHG emissions, and improving the performance of existing and future building stock. Increased efficiency in the built environment is recognized globally as a necessary step to aid in reducing GHG emissions. Without a comprehensive suite of policies that dramatically increase the efficiency of both existing and new buildings in Nevada, the state will not reach the net-zero emissions goal by 2050.

Policy options to optimize efficiency include building performance standards, beneficial electrification, alternative financing for the low- and moderate-income (LMI) communities, and education surrounding green building practices. However, the state has limited authority when it comes implementing building efficiency policies. Much the responsibility

along with enforcement is executed and handled by local governments or authorities having jurisdiction (AHJs).

> **Without a comprehensive suite of policies that dramatically increase the efficiency of both existing and new buildings in Nevada, the state will not reach the net-zero emissions goal by 2050.**

For example, increased adoption around energy building codes requires the local governments or AHJs to also adopt the state code, train building officials on the new requirements, provide tools and resources for continuity in implementation of the code, and offer continuing educational opportunities. This also necessitates that builders and trades understand the requirements under each new code so they also have the tools necessary to modify the planning process on a three- to four-year cycle.

The clearest benefit of adopting energy efficiency codes for new commercial and residential structures is cost. During initial construction is the most cost-effective time to ensure the highest level of efficiency has been achieved without additional financial burdens on the owners. Retrofitting to reconcile issues (e.g., poor insulation, inefficient HVAC systems, inadequate construction) can cost the owner an estimated two to four times more than the initial expense during construction depending on various factors. This estimate does not even consider the lost savings on energy bills.

However, there is also a need to support the retrofit of residential and commercial properties that perform poorly with respect to energy efficiency. This is particularly important in low-income neighborhoods that are disproportionately exposed to extreme heat and poor air quality. These communities not only need smart, affordable green design that will offset urban heat and reduce energy bills, but also access to air handling systems that can provide clean indoor air.

Green architecture and design, the relative location and height of buildings, even the color of materials used in construction, can play a key role in achieving energy efficiency while also reducing costs. For example, $1 billion in energy expenses could be avoided in a year if all commercial buildings in the United States had light-colored roofs. And the UHI increases cooling demand for a typical building by 13% on average, making green design all the more important.

In order to achieve increased energy efficiency across the built environment, there are challenges to navigate. Some of the policy options require discussion that would benefit from convening representatives from the state, industry, municipalities, and other stakeholders in order to determine a path forward that would serve the goals of multiple interests.

All stakeholders must have a voice, and the health of the most vulnerable populations cannot be sacrificed, nor should industry and labor be overburdened. During the listening sessions, multiple stakeholders expressed support for efficiency in the built environment. Nevadans also indicated that in order to be fair and equitable, the overall effectiveness and cost of energy efficiency programs or policies must be evaluated.

> **Shifting away from natural gas is necessary to meet the 2050 net-zero GHG emissions goal.**

Shifting away from natural gas is necessary to meet the 2050 net-zero GHG emissions goal. While some voices in Nevada applaud a transition away from natural gas to renewables, others cited concerns about the impacts to low-income households, rural communities, and small business, citing the comparative cost of electricity and natural gas. Indeed, consumer choice is important, and there should be options for consumers while existing gas pipelines are available. However, new pipelines will only lock in emissions for years, compromising Nevada's ability to meet emissions-reduction goals. There are also co-benefits to eliminating in-home gas stoves in particular. A growing body of research indicates that using natural gas indoors can lead to poor indoor air quality, compromising respiratory health. Low-income households are more prone to exposure to these conditions as result of aging, inefficient appliances, and could benefit from a shift to electric appliances. One study, for example, shows significant improvements in the health of low-income households that moved from conventional to green housing with electric appliances.

In order to manage the natural gas transition, the state could move forward with a phased approach, allowing consumers to still have the ability to choose between gas and electric on existing buildings and require an all-electric option in new construction. This would mitigate the need for costly investments in new gas pipelines and infrastructure and would provide a timeline of when this fuel source can be phased out to help achieving the state's emissions-reduction goals. Decision-makers/policy-makers should consider giving the

PUCN authority to evaluate natural gas resource needs in order to meet expected customer demand over a long-term planning horizon and similar to how electric utility needs are evaluated, and in the context of GHG emissions.

In order to meet Nevada's goals, all avenues of emissions reductions must be considered and a long-term plan should be developed in the near term. Transitioning from domestic and commercial gas use and adopting all-electric standards will reduce negative health impacts and energy burden on LMI communities. Prioritizing equity and affordability for the most-vulnerable families, as well as ensuring that the current workforce is not displaced, will have the most positive impact.

LAND USE AND NATURAL & WORKING LANDS

Natural and working lands represent both challenges and opportunities for addressing climate change in Nevada. They can function to sequester carbon emissions or serve as GHG emitters depending on landscape type and land management practices. To fully understand these dynamics and design appropriate land use policies that will also reduce GHG emissions, it is important to first accurately quantify the emissions and sequestration impacts of different changes to natural and working lands.

However, most contemporary tools for quantifying carbon-sequestration capacities of natural lands focus disproportionately on forest lands, and not the sagebrush and rangeland ecosystems prevalent across most of Nevada. Research is under way to make progress toward a more-accurate accounting of the carbon balance associated with the Nevada landscape, with a first step focused on native grasslands.

> **To fully understand these dynamics and design appropriate land use policies that will also reduce GHG emissions, it is important to first accurately quantify the emissions and sequestration impacts of different changes to natural and working lands.**

Along the same lines, Nevada is also home to more wetland areas than generally

perceived. Globally, wetlands generate more methane emissions than any other source and are a net emitter of GHGs (e.g., Moomaw et al., 2018). Nevada currently lacks a complete inventory of wetland systems, thereby limiting the state's ability to accurately calculate carbon flux. Changes in soil, water, and ambient temperature can further alter the carbon balance of wetlands in either direction. Despite the complexities of GHG emissions associated with wetlands, these systems do provide ecosystem services including stormwater capture and infiltration, recreational opportunities, and refuge for wildlife.

Forests in Nevada can and do sequester carbon. However, burning forests and other vegetation releases GHGs back into the atmosphere, driving a short-term increase in emissions. The fire cycle in Nevada is markedly different than it was 100 years ago and has shifted even in the last several decades. The evolution of the contemporary fire cycle has been attributed to complex variables including the century-long federal practice of fire suppression and climate change. Poor forest and rangeland health, as well as increasing temperatures and drying vegetation—spanning both public and private land ownership boundaries—has impacted the fire regime with increased fuel loads. Expansion of pinyon-juniper woodlands and dramatic increases in annual, invasive species such as cheatgrass are replacing sagebrush and native habitats and vegetation communities. These changes are altering the timing, frequency, duration, and intensity of wildfires throughout the West, and ultimately, the fire management and suppression strategies.

Land management, particularly of forests and rangelands, is a focal point in the prevention and mitigation of the large-scale fires that have been impacting Nevada. This is particularly important for the protection of people and property at the wildland-urban interface (WUI), but also in ensuring that the landscape in Nevada does not become a net source of GHG emissions.

Undisturbed landscapes have the most potential to sequester carbon. However, there are examples of landscape degradation across Nevada that can compromise the natural processes that balance carbon between the atmosphere and the landscape. These include over-grazed land, non-reclaimed mining sites, and the lack of old-growth forests due to over-harvesting.

Maintaining the landscape's integrity also has other benefits. For instance, desert "crusts" across the Southwest United States keep sand and soil on the ground, reducing the severity of wind-driven dust storms. These storms not only expose people to dust particles, but also heavy metal pollutants, chemicals, and bacteria that impact public health. This is

one example of why land use and expanding the footprint of development, commercial, industrial, and outdoor recreation activities must be carefully considered.

> **Land-use decisions should consider evolving and emerging climate impacts. As Nevada grows and urban areas in particular expand to meet the demands of a growing population, communities and infrastructure will be increasingly exposed to climate-driven natural hazards.**

Land-use decisions should consider evolving and emerging climate impacts. As Nevada grows and urban areas in particular expand to meet the demands of a growing population, communities and infrastructure will be increasingly exposed to climate-driven natural hazards. Beyond wildfire, for example, flooding also poses a risk. Both Reno and Las Vegas already experience urban flooding and are particularly vulnerable to increases in the frequency and size of flood events as the climate warms.

Nevada's Unique Flora & Fauna

The impacts of climate change and land use on Nevada's natural lands should also be considered in terms of flora and fauna. The Silver State has 309 endemic species of plants and animals found nowhere else on earth and ranks 11th in the United States for total species diversity. Nevada also ranks third in the nation for the highest number of species at-risk.

Situated along the Pacific Flyway, with a high diversity of habitat types, over 490 different species of birds have been recorded in the state. The spatial distribution of Nevada's resources is wide, often with low density. However, places such as the Lahontan Valley concentrate large numbers of migrating shorebirds, and the Carson Valley is known for high numbers of overwintering raptors. The Nevada Division of Natural Heritage (NDNH) tracks and monitors over 600 species of flora and fauna throughout the 300+ mountain ranges, valleys, and basins located within the state. The U.S. Fish and Wildlife Service's Endangered, Threatened, Proposed, and Candidate Species list currently contains 30 species. Several of those species are aquatic, and therefore dependent upon healthy watersheds.

It is also important to incorporate land use, among other issues, in planning for expansion of utility-scale solar and other clean energy infrastructure across Nevada. Indeed, from extraction of fossil fuels to power plant siting, many types of energy-related activities across the West have the potential to disturb the landscape. In Nevada, solar development can impact desert crusts, the endangered desert tortoise, and other important parts of the state's ecosystems. All of these issues should be considered and balanced with the benefits to these same ecosystems (and Nevada's communities) that can be realized by expanding renewable energy in order to achieve net-zero GHG emissions.

As siting of energy development in Nevada is predominantly on federally-managed public lands, the state's role in decisions is largely confined to agency comments and reviewing land management plans for consistency with state and local plans under the *National Environmental Policy Act* (NEPA) and the *Federal Land Policy and Management Act* (FLPMA). Better coordination of this engagement in federal processes by state agencies should be supported. In addition, this engagement should shift to a more-proactive "smart from the start" planning posture to enhance the state's support of optimized siting that better balances clean energy goals with impacts to natural lands, cultural resources, recreation, wildlife, and other conservation values.

Creative solutions to land use and deployment of large-scale solar have been proposed, including using reclaimed mining lands and other degraded landscapes. However, as with any large-scale solar development, opportunities must also be considered for their proximity to and integration with existing and new electricity transmission infrastructure.

Expanding community and rooftop solar (recurring suggestions from participants in stakeholder listening sessions) are also possibilities. However, there is a concern with respect to the scaling of rooftop solar and its ability to meet Nevada's forecasted load. In addition, there are policies in place to allow for residential and small commercial rooftop solar, but there is a policy gap to allow larger installations for parking lots and large rooftops on the customer side of the meter. Attention should be given to policy solutions that will allow for such installations to become more widespread. Distributed renewable generation has an important role to play in Nevada's clean energy future, and is an important part of helping disadvantaged communities realize the benefits of the clean energy revolution. This is an important area for further evaluation by policymakers, electricity providers, and regulatory agencies in coordination with relevant stakeholder groups.

> **The contemporary pressures of growth, drought, limited water supply, and other impacts of climate change are threatening the continued resilience of Nevada's traditional ranching and agricultural economies.**

Nevada's cultural heritage is deeply rooted in the ranching and agricultural production that facilitated westward expansion during the gold rush. Nevada's rural communities are largely dependent upon, and committed to, preserving their cultural heritage and way of life. However, the contemporary pressures of growth, drought, limited water supply, and other impacts of climate change are threatening the continued resilience of Nevada's traditional ranching and agricultural economies.

Multiple programs are in place to support rural communities that can help build resilience to climate-related threats. The Bureau of Land Management (BLM), for example, is working with livestock operators to create more flexibility and options for operators to use as responses to changing field conditions such as drought and wildfire. The Desert Farming Initiative (DFI) at the University of Nevada, Reno is identifying multiple species suitable for agricultural producers in Nevada under different climatic conditions. The Natural Resources Conservation Service (NRCS) Great Basin Plant Materials Center (GBPMC) in Fallon develops native plants for restoration purposes and researches different species that may be suitable for agricultural production.

> **Many of the concerns that Indigenous people voiced regarding climate change were connected to the land: invasive species, medicinal plants, traditional foods, water, and wildlands.**

Tribal communities across Nevada are an important part of Nevada's cultural heritage. The Washoe (Wa-She-Shu), Northern Paiute (Numu), Western Shoshone (Newe), and Southern Paiute (Nuwu) people have been living with and managing vast areas of Nevada for thousands of years. The Indigenous peoples of Nevada possess a unique knowledge and cultural understanding of the state's climate and ecosystems that can be valuable resources for managing the landscape and achieving climate-action goals. During discussions supporting the development of the strategy, many of the concerns that

Indigenous people voiced regarding climate change were connected to the land: invasive species, medicinal plants, traditional foods, water, and wildlands. Already, several tribes across the West and in Nevada are coordinating and developing plans to address climate change.

> **Any issue related to natural and working lands, as well as land use, requires involvement from and collaboration with federal land management agencies, owing to the large amount of public land in Nevada.**

Any issue related to natural and working lands, as well as land use, requires involvement from and collaboration with federal land management agencies, owing to the large amount of public land in Nevada. More than 85% of lands in Nevada are managed and administered by federal land management agencies such as the BLM and U.S. Forest Service (USFS) alongside other federal agencies such as the U.S. Geological Survey (USGS), NRCS, Department of Defense (DOD), Department of Agriculture, (DoA), Department of Energy (DoE), Environmental Protection Agency (EPA), National Park Service (NPS), and others.

There have been successful collaborations between federal agencies and state entities that can be leveraged and provide models for how to address new and emerging challenges that climate change pose to public and private lands. One example is Nevada's Sagebrush Ecosystem Council (SEC), which represents the successful application of a Nevada Conservation Credit System (CCS) to mitigate disturbances such as mining and geothermal development on state, federal, and privately-owned land. The success of this effort is a model largely based on the coalition of interagency researchers coupled with private citizens, industry, and academia. Such examples can used to define best practices for further efforts involving multiple interests.

Land pressures from climate change and urbanization will continue as Nevada grows and the climate continues to change. Collaborative, multi-disciplinary, science-based approaches that address issues across jurisdictional boundaries are needed to ensure that Nevada's lands are being used responsibly while protecting ecosystems and natural resources. Better land-use planning will require active coordination among federal, state,

tribal, and local governments and private-property owners in order to accomplish Nevada's climate action goals.

THE ECONOMICS OF CLIMATE ACTION

Whether it is mitigating greenhouse gas (GHG) emissions, or developing strategies to protect communities and natural resources from the compounding impacts of increasing temperatures, additional investments are necessary to combat climate change. Identifying resources to support climate action is imperative, as inaction is a far costlier proposition.

The costs of inaction on climate change can manifest directly, indirectly, and through market volatility and trepidation prompted by uncertainty and risk. Direct costs are primarily associated with infrastructure losses caused by the increasing frequency and intensity of extreme weather and natural hazards associated with increasing temperatures. Indirect costs manifest as suppressed growth and valuation tied to impacts on both physical assets and people, such as the diversion of resources to support rebuilding and recovery after a massive storm or wildfire. There is also a cost associated with climate-induced market uncertainty, including from destabilization of socioeconomic and geopolitical systems, such as a significant drought driving intergovernmental conflict over water resources, reducing consumer and investor confidence.

Identifying resources to support climate action is imperative, as inaction is a far costlier proposition.

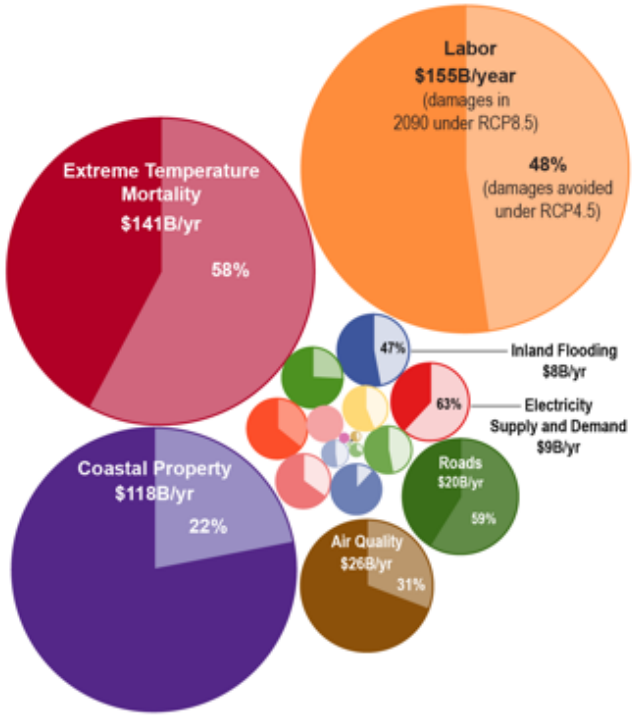
Since 1980, climate change has cost the U.S. economy an estimated $1.1 trillion (NCA, 2018). A significant contributor to these costs is the increasing number of billion-dollar weather and climate disasters (NOAA, 2020).

Across the West, the massive rain and snow storms caused by atmospheric rivers have cost $51 billion over the past 40 years, with an average of $1 billion annually (Corringham et al., 2019). Other billion-dollar events that have touched Nevada map to wildfire and drought, with the 2012–2015 drought across the American West costing the state $55.7 billion (NOAA, 2020). Preliminary estimates indicate the unprecedented 2020 wildfires across the Western United States could exceed $20 billion in direct costs alone, in addition to the

profound impacts to decimated local economies, communities exposed to record-breaking poor air quality, and to the families who have tragically lost loved ones.

By the end of the century, climate change could cost the United States hundreds of billions every year under current policies (NCA, 2018; Figure 1). Fortunately, upfront investments to support climate mitigation, resilience, and adaptation can offset the overwhelming cost of inaction.

Figure 1. Economic Impacts of Climate Change and Climate Action in the United States.



Annual Economic Damages in 2090		
Sector	**Annual damages under RCP8.5**	**Damages avoided under RCP4.5**
Labor	$155B	48%
Extreme Temperature Mortality◊	$141B	58%
Coastal Property◊	$118B	22%
Air Quality	$26B	31%
Roads◊	$20B	59%
Electricity Supply and Demand	$9B	63%
Inland Flooding	$8B	47%
Urban Drainage	$6B	26%
Rail◊	$6B	36%
Water Quality	$5B	35%
Coral Reefs	$4B	12%
West Nile Virus	$3B	47%
Freshwater Fish	$3B	44%
Winter Recreation	$2B	107%
Bridges	$1B	48%
Munic. and Industrial Water Supply	$316M	33%
Harmful Algal Blooms	$199M	45%
Alaska Infrastructure◊	$174M	53%
Shellfish*	$23M	57%
Agriculture*	$12M	11%
Aeroallergens*	$1M	57%
Wildfire	−$106M	−134%

EXPAND

The projected costs associated with climate change impacts based on the current emissions trajectory are compared with the long-term savings that could be achieved by reducing GHG emissions and keeping warming below the 2°C (3.6°F) threshold. (Source: U.S. National Climate Assessment, 2018)

The social cost of carbon (SCC) is the metric used to define the cost of inaction. The SCC for a given year is defined as "an estimate, in dollars, of the present discounted value of the future damage caused by a 1-metric ton increase in carbon dioxide CO_2 emissions into the

atmosphere in that year, or equivalently, the benefits of reducing CO_2 emissions by the same amount in that year (NASEM 2017)." Since 2008, the federal government has been required to use the SCC in its cost-benefit analyses. However, the SCC was not standardized until the Obama administration convened an Interagency Working Group (IWG), which developed a harmonized methodology for determining the value of the SCC based on scientific and economic expertise and decades of climate research. Table 1 shows a range of SCC values and discount rates per year, as established by the IWG. Discount rates convert future damages into present-day values, thus "a high discount rate means that future effects are considered much less significant than present effects, whereas a low discount rate means that they are closer to equally significant (RFF 2019)".

Table 1: Social Cost of Carbon ($/ton CO_2), 2025–2050

Discount Rate	In 2007 $			In 2015 $		
	2025	2030	2050	2025	2030	2050
5%	$14	$16	$26	$17	$19	$31
3%	$46	$50	$69	$56	$60	$83
2.50%	$68	$73	$95	$82	$88	$115

2007$ values from IWG Technical Support Document, 2016 revision
2015$ values derived from 2007$ values using the Bureau of Labor Statistics' Inflation CalculatorNOTE: For additional detail on the mechanics and limits of the SCC – and how its use has changed under the Trump administration – please see this explainer from Resources for the Future. Also see how the Climate Impact Lab is exploring how to establish an SCC at a granular level across the U.S. as well as impacts to morbidity and mortality.

> **Estimates suggest that by meeting the state's emissions-reduction targets, Nevada would prevent between $172 and $786 million of economic damages by 2030 and up to $4 billion by 2050.**

Using the SCC in each target year, estimates suggest that by meeting the state's emissions-

reduction targets, Nevada would prevent between $172 and $786 million of economic damages by 2030 and up to $4 billion by 2050 (Table 2).

Table 2. Estimated Avoided Costs of Meeting Nevada's GHG Emission Targets Under SB 254

	2025	2030	2050
Emissions-reduction Target (%)	28% reduction below 2005	45% reduction below 2005	100% reduction below 2005 (net-zero)
Estimated Additional Emissions Reductions ($MMTCO_2$)	2	9	37
Range of Social Cost of Carbon ($ millions, 2015 dollars)	$34-$165	$172-$786	$1,106-$4,042

Range of costs are calculated by multiplying the SCC (in 2015 $) from Table 1 by the additional emissions reductions ($MMTCO_2$) per year. Additional emissions reductions are estimated by subtracting the reference CO_2 emission projections from the emission projections that meet SB 254's emission targets. $MMTCO_2e$ is from Nevada's Statewide Greenhouse Gas Emissions Inventory and Projections, 2019. Calculations assume a 1:1 ratio of $MMTCO_2e$:$MMTCO_2$, thus these calculations err on the conservative side. Because the Inventory only projects to 2039, emissions were assumed to change linearly through 2050.

Recognizing that upfront investment will significantly reduce future costs and improve the health and safety of Americans, states are developing creative approaches to finance climate action now. While some of these programs are directly funded by state appropriations, more often these investments are leveraged—if not fully supported—by federal grant programs, tax credits, and bond subsidies. Table 2 outlines federal programs that have been available at some point to support state climate-related activities. Although not all are currently operational and funded, there are some opportunities that could be pursued now to garner additional resources.

FEDERAL CLIMATE-RELATED FUNDING PROGRAMS

(compiled by the United States Climate Alliance)

GRANT PROGRAMS

Current Programs to Enable Investment in Clean Energy, Low-Carbon Transportation, and Building Efficiency

- State Energy Program (SEP):
    - Created in 1996 by merging the State Energy Conservation Program and the Institutional Conservation Program. Housed in the U.S. Department of Energy (DOE) and provides funding and technical assistance to states to enhance energy security, advance state-led energy initiatives, and maximize the benefits of decreasing energy waste.
    - In 2009, the *American Recovery and Reinvestment Act* (ARRA) allocated $3.1 billion for the program with no matching fund requirements.
    - Gives states full autonomy to administer funds to programs or projects that align with state-specific energy initiatives, including building codes, appliance standards, public benefits programs, renewable portfolio standards, retrofit programs, skill trainings, alternative fuels, technical assistance services, solar and wind energy development.
    - Every dollar invested into the SEP saved $4.50 in energy costs.
- Weatherization Assistance Program (WAP):
    - Began in 1976 from Title IV of the *Energy Conservation and Production Act* and is housed in the DOE.
    - Provides states with funds to help low-income households increase the energy efficiency of their homes and improve their health and safety.
    - Gives complete autonomy to state governments to administer funds in accordance with state-specific production capacity and energy goals.
    - Supports 8,500 jobs and provides weatherization services for 35,000 homes every year. In 2009, ARRA invested $5 billion into WAP. Oak Ridge National Laboratory found that the ARRA investment resulted in a program-wide energy savings of $1.1 billion.
- Low- and No-Emissions Bus Program:
    - Housed in the U.S. Department of Transportation (DOT) but administered by the Federal Transit Administration (FTA). Supports the transition of the country's public transit fleet from diesel to battery electric or hydrogen fuel cell vehicles.
    - Established in 2015 from the *Fixing America's Surface Transportation Act* (FAST Act) and is allocated a set $55 million per year until FY 2020. Congress has passed legislation to increase the program's funding for the past two years. The FTA announced that for FY 2020 there will be $130 million available in grants to state and local governments.

    - Grant funds go directly to state and local governments. In FY 2019, seventeen U.S. Climate Alliance states received $38.9 million to fund battery-electric buses, charging infrastructure, and workforce development needs for electric vehicle deployment.
- Diesel Emissions Reduction Act (DERA):
    - Created in the *Energy Policy Act of 2005* and appropriated funds through state and federal loan programs to retrofit diesel vehicles and promote emissions reductions from diesel engines.
    - Base funding to states is determined by overall participation—if all states qualify for funding, each state receives 2% of the appropriated funds. A state that matches funding from DERA receives an additional 50% of the amount allocated to the specific state.
    - In 2010, DERA was amended to offer rebates as a new funding mechanism and authorize $100 million for the period FY 2012 through FY 2016.
- Clean Cities Coalition Network:
    - Housed in the DOE's Vehicle Technologies Office (VTO). Builds local partnerships to advance affordable domestic transportation fuels and other fuel-saving technologies and best practices.
    - Since 1993, VTO has distributed $460 million in transportation project awards. The VTO awards competitive grants that are cost-shared. Traditionally, projects from the Clean Cities Coalition Network have leveraged 2:1 matching funds from public and private partners.

Reinstate Energy Efficiency Conservation Block Grant Program to Enhance States' Ability to Lower Energy Bills

- Energy Efficiency Conservation Block Grant Program (EECBG):
    - ARRA-created program housed in the DOE. Provides direct funding to larger municipalities and states to support local government projects and consumer initiatives to lower energy costs and reduce fossil-fuel emissions.
    - Efficient and effective in job growth and retention. During the period 2009–2015, $2.2 billion in EECBG funding for broad programs resulted in a net gain of 62,902 job years, meaning that a job was created or retained for every $36,260 in program expenditures.

Programs to Build Resilience, Restore Environmental Quality, and Address COVID-19 and Climate Impacts

- Building Resilient Infrastructure and Communities (BRIC)
    - New pre-disaster hazard mitigation program from the Federal Emergency Management Agency (FEMA) that supports states, local communities, tribes, and territories as they undertake mitigation projects to reduce risks from disasters and natural hazards.
    - Aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience.
    - Replaces the existing Pre-Disaster Mitigation (PDM) program and is a result of amendments made to Section 203 of the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act) by Section 1234 of the *Disaster Recovery Reform Act of 2018* (DRRA).
    - FEMA published notice of the BRIC proposed policy in the Federal Register for public comment, which closed on May 11, 2020. Following the review and adjudication of comments received on the proposed policy, FEMA anticipates finalizing the proposed policy and releasing a Notice of Funding Opportunity by fall 2020.
- Hazard Mitigation Grant Program (HMGP):
    - FEMA program. Supports cost-effective post-disaster projects and is the longest-running mitigation program among FEMA's three grant programs.
    - Helps communities implement hazard mitigation measures following a Presidential Major Disaster Declaration in the areas of the state, tribe, or territory requested by the governor or tribal executive. Enacts mitigation measures that reduce the risk of loss of life and property from future disasters. Studies have shown that every $1 spent on hazard mitigation projects equals $4 of future damages mitigated.
    - HMGP recipients (states, federally-recognized tribes, or territories) have the primary responsibility for prioritizing, selecting, and administering state and local hazard mitigation projects.
    - Authorized under Section 404 of the *Stafford Act*.
    - FEMA provides up to 75% of the funds for mitigation projects. The remaining 25% can come from a variety of sources (e.g., cash payment from the state or local government, donated resources, Increased Cost of Compliance funds from a flood insurance policy, or loans from other government agencies).
- Clean Water and Drinking Water State Revolving Funds (SRFs):
    - The U.S. Environmental Protection Agency (EPA) has two programs: the Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving

Fund (DWSRF).
    - CWSRF was created in the 1987 amendments to the Clean Water Act. DWSRF was created in the 1996 amendments to the *Safe Drinking Water Act*.
    - Both SRFs are a federal/state partnership to help ensure clean and safe drinking water across the nation. They make low-interest loans for important water quality projects that are repaid to the SRFs to then be used for other projects. The federal government awards each state a capitalization grant to go into the SRFs. Each state must provide a 20% match to the federal funds. States have the discretion to set specific loan terms, including repayment periods and interest rates.
    - CWSRF has provided $138 billion to communities through 2019. DWSRF has provided more than $38.2 billion to water system projects though 2018.
- EPA's Geographic Programs:
    - Support efforts to protect and restore various communities and ecosystems impacted by environmental problems.
    - Recent geographic focus areas include Chesapeake Bay, Gulf of Mexico, Lake Champlain, Long Island Sound, Lake Pontchartrain, Southeast New England Estuary, Great Lakes, South Florida, San Francisco Bay, and Puget Sound.
- Rural Energy Savings Program (RESP):
    - U.S. Department of Agriculture (USDA) program. Provides loans to rural utilities and other companies that provide energy-efficiency loans to qualified consumers to implement durable, cost-effective energy-efficiency measures.
    - Funds may be used for implementing energy-efficiency measures to decrease energy use or costs for rural families and small business.
- Conservation Stewardship Program (CSP):
    - Natural Resources Conservation Service (NRCS) program. Helps farmers and ranchers maintain, improve, and expand activities that benefit natural resources (including soil, water, air, and wildlife habitat) or conserve energy.
    - Payments are based on performance. As with EQIP, CSP can promote carbon sequestration by improving soil health.
- Environmental Quality Incentives Program (EQIP):
    - NRCS program. Provides financial and technical assistance for activities that benefit air quality, water quality, soil and water conservation, and wildlife habitat.
    - It incentives practices such as cover crops, transition to resource conserving crop rotations and precision agriculture technologies along with a similarly

broad suite of incentive practices for ranchers and non-industrial private forest operators.

Broadband Expansion

- ReConnect Program
    - A broadband pilot program from the USDA that offers federal loans, grants, and combinations thereof to facilitate broadband deployment in rural areas. Provides funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband service to rural areas without sufficient broadband access (defined as 10 Mbps downstream and 1 Mbps upstream). $600 million available for the second round of funding (application period closed April 2020).
    - Established through the *Consolidated Appropriations Act in 2018*.
    - Cooperatives, nonprofit organizations, mutual associations, for-profit corporations, limited liability companies, states, local governments, territories, or possessions of the United States and Native American Tribes are eligible to apply.

TAX CREDITS AND BOND SUBSIDIES

Power

- Section 48 Business Energy Investment Tax Credit (ITC):
    - Federal corporate tax credit for capital investments in renewable energy projects administered by the Internal Revenue Service (IRS) and documented in §48 of the IRS tax code.
    - Enacted in 2006. Current incentive is 26% for solar, fuel cells, small wind; 10% for geothermal, microturbines, and combined heat and power (CHP).
    - Expiration dates are based on when construction began.
    - The *Consolidated Appropriations Act*, signed in December 2015, included several amendments to this credit that applied only to solar technologies and PTC-eligible technologies. However, the *Bipartisan Budget Act of 2018* reinstated this tax credit for the remaining technologies that have historically been eligible for the credit.
- Renewable Electricity Production Tax Credit (PTC):
    - Available to wind facilities commencing construction by December 31, 2019 and all other qualifying facilities commencing construction by January 1, 2018. Value

of the credit for wind stepped down in 2017, 2018, and 2019.
    - Tax credit is $0.015/kWh in 1993 dollars and is adjusted for inflation by multiplying the tax credit by the inflation adjustment factor. The estimated 2020 tax credit is $0.015/kWh.
    - Originally enacted in 1992. Has been renewed and expanded numerous times, most recently by ARRA (2009), the *American Taxpayer Relief Act of 2012*, the *Tax Increase Prevention Act of 2014*, the *Consolidated Appropriations Act of 2016*, and the *Bipartisan Budget Act of 2018*.
- 45Q Tax Credit:
    - Establishes a tax credit on a per-ton basis of sequestered CO_2. During the period 2008–2018, the incentive was $20 per metric ton for CO_2 storage and $10 per metric ton for CO_2 used for enhanced oil recovery (EOR) or natural gas recovery (NGR).
    - In February 2018, the *Bipartisan Budget Act* amended the tax credit and increased it for new facilities that are in service whose construction begins January 1, 2024 for a 12-year period. The new credit is up to $35 per metric ton for EOR and non-EOR CO_2 air capture projects, with credit increasing until 2026, and $50 per metric ton for CO_2 storage, with the credit increasing until 2026.

Vehicles and Fuels

- Section 30D Plug-In Electric Vehicle Credit:
    - Enacted in the *Energy Improvement and Extension Act of 2008*. ARRA amended the tax credit in 2009 to include vehicles purchased after 2010.
    - Available for the purchase of a new qualified plug-in electric vehicle that uses an external source of energy to recharge the battery, and meets specific emissions standards.
    - Credit can range from $2,500 to $7,500, but this could vary based on battery capacity.
    - Credit begins to phase out for manufacturer's vehicles when at least 200,000 qualifying vehicles have been sold for use in the United States. As of January 2020, Tesla vehicles are no longer eligible for the tax credit. As of March 2020, GM vehicles are no longer eligible.
- Alternative Fuel Infrastructure Tax Credit:
    - Established in the *Energy Policy Act of 2005*. Available for the cost of installing alternative fueling equipment, specifically: natural gas, propane, liquefied hydrogen, electricity, E85, or diesel fuel blends containing up to 20% biodiesel.

- Credit can be 30% of the cost, up to $30,000. Business tax credits that are unused can be carried backward one year and forward 20 years.
- Consumers who purchase qualified fueling equipment for residential property can receive a tax credit up to $1,000. Was set to expire in 2017 but has been extended to the end of 2020.

Residential Upgrades

- Section 25D Residential Renewable Energy Tax Credit:
  - Taxpayer may claim a credit of 30% of qualified expenditures for a system that serves a dwelling unit located in the United States that is owned and used as a residence by the taxpayer. Expenditures include labor costs for on-site preparation, assembly, or original system installation, and for piping or wiring to interconnect a system to the home.
  - Incentive amount is 26% of cost and includes: solar water heat, solar photovoltaics, geothermal heat pumps, wind (small), and fuel cells using renewable fuels.
  - The *Bipartisan Budget Act of 2018* reinstated the tax credit for fuel cells, small wind, and geothermal heat pumps. The tax credit for all technologies now features a gradual step down in the credit value.
  - Residential Energy Efficiency Tax Credit:
    - The *Bipartisan Budget Act of 2018* reinstated this tax credit for purchases made in 2017. Any qualified equipment installed prior to January 1, 2018 is eligible.
    - Applies to energy-efficiency improvements in the building envelope of existing homes and for the purchase of high-efficiency heating, cooling, and water-heating equipment.

- Maximum tax credit for all improvements made during the period 2011–2016 is $500. Cap includes tax credits for any improvements made in any previous year.

- Low-Income Housing Tax Credit (LIHTC):
  - Subsidizes the acquisition, construction, and rehabilitation of affordable rental housing for low- and moderate-income tenants.
  - Enacted as part of the *Tax Reform Act of 1986* and has been modified numerous times.
  - Federal government issues tax credits to state and territorial governments. State housing agencies then award the credits to private developers of affordable rental housing projects through a competitive process. Developers generally sell

the credits to private investors to obtain funding. Once the housing project is placed in service (essentially, made available to tenants), investors can claim the LIHTC over a 10-year period.
    - Since the mid-1990s, it has supported the construction or rehabilitation of about 110,000 affordable rental units each year—over 2 million units in all since its inception.

Manufacturing

- Section 48C Advanced Manufacturing Tax Credit:
    - In 2009 through ARRA, Congress provided $2.3 billion for a 30% tax credit that supported 183 domestic clean energy manufacturing facilities and thousands of jobs.
    - DOE and the U.S. Department of the Treasury worked in partnership to develop, launch, and award the funds for the program.
    - Qualifying manufacturing facilities included the production of: solar, wind, geothermal, or other renewable energy equipment; electric grids and storage for renewables; fuel cells and microturbines; energy storage systems for electric or hybrid vehicles; CO_2 capture and sequestration equipment; equipment for refining or blending renewable fuels; and equipment for energy conservation, including lighting and smart grid technologies.

Agriculture

- Federal Research and Development Tax Credits:
    - Federal government's primary means for rewarding business for investment in research.
    - The *Protecting Americans from Tax Hikes Act of 2015* (PATH Act) permanently extended the research and development (R&D) tax credit and expanded its provisions.
    - Would need to be expanded to include improved products and processes like regenerative agriculture and healthy soil practices.

Energy and Resiliency Bond Subsidies

- Qualified Energy Conservation Bonds (QECBs):
    - Federally subsidized bonds that finance energy efficiency and renewable energy projects at the state and local level. Authorized by Congress in the *Energy*

Improvement and Extension Act of 2008 (EISA), which authorized $800 million bonds across the country.
    - In 2009, ARRA increased the QECBs to $3.2 billion to go towards states, territories, and local governments.
    - States have used QECBs to fund a number of projects that included but are not limited to: green community programs, rural development, renewable energy facilities, mass commuting projects, and a reduction of energy in state buildings by at least 20%.
    - The *Tax Cuts and Jobs Act of 2017* eliminated QECBs in 2018.

- Clean Renewable Energy Bonds (CREBs):

- The *Energy Improvement and Extension Act of 2008* allotted $800 million in new CREBs. ARRA added $1.6 billion into new CREBs. The *Tax Cuts and Jobs Act of 2017* repealed section 54C of the Internal Revenue Code, which authorized the use of CREBs.

- Was mostly applicable for the public sector (e.g., state/local government, schools) to finance renewable energy projects.

- Eligible renewable and other technologies include: geothermal electric, solar thermal electric, solar photovoltaics, wind (all), biomass, hydroelectric, municipal solid waste, landfill gas, tidal, wave, ocean thermal, and anaerobic digestion.

- Advance Refunding Bonds:
    - Issued more than 90 days before a portion of the bond must be repaid. Typically used to take advantage of a lower interest rate by refinancing debt services.
    - The *Tax Cuts and Jobs Acts of 2017* eliminated local municipalities to induce cost savings from advance refunding bonds.

> **Beyond federal funding for climate-related programs, there are opportunities for Nevada to generate resources to support climate action by pricing carbon.**

Beyond federal funding for climate-related programs, there are opportunities for Nevada to generate resources to support climate action by pricing carbon.

Implementing market-oriented solutions to address environmental issues is not a novel concept. In 1990, for example, a national cap-and-trade program for sulfur dioxide emissions from power plants was included in the Clean Air Act to reduce acid rain. Since 2005, a number of U.S. states have explored and/or implemented a variety of mechanisms that would put a price on carbon in order to reduce GHG emissions while also providing baseline resources to support climate action. These a low carbon fuel standard (LCFS) for transportation fuels, carbon taxes, and cap-and-trade programs.

Financing Incentives for Technology Adoption: Green Banks

Incentives have proven a useful tool for supporting market adoption of new technologies intended to reduce GHG emissions. These include grants, bonds, loans, tax credits, rebates, and other creative solutions such as performance contracting, property-assessed clean energy (PACE), and revolving loan funds that reduce upfront costs. The implementation of green banks has served an important role in supporting these investments. In Nevada, the Nevada Clean Energy Fund is a green bank focused on acceleration of clean energy technology. The National Climate Bank Act introduced by Senators Markey and Van Hollen and Representative Debbie Dingell in 2019, was included in the Clean Future Act climate legislation package introduced by Energy & Commerce Committee Chairman Frank Pallone. The National Climate Bank can create over 5 million jobs and will be provided $20 billion as part of the $1.5 trillion Moving Forward Act. (**Source:** National Climate Bank Fact Sheet, provided by Coalition for Green Capital)

Both cap-and-trade and carbon taxes can be deployed to reduce GHG emissions, but the mechanics of how they incentivize reductions varies. The fundamental difference between a carbon tax and a cap-and-trade program is that the former sets the price and lets the market determine the quantity of emissions, while the latter sets a firm cap on emissions and the market determines the price.

As summarized by the Center for Climate and Energy Solutions, “Each approach has its vocal supporters. Those in favor of cap-and-trade argue that it is the only approach that can guarantee that an environmental objective will be achieved, has been shown to

effectively work to protect the environment at lower than expected costs, and is politically more attractive. Those supporting a carbon tax argue that it is a better approach because it is transparent, minimizes the involvement of government, and avoids the creation of new markets subject to manipulation (C2ES 2009)."

A cap-and-trade approach (also called cap-and-invest) sets a firm cap on emissions from one or more sectors that declines over time. Compliance entities, such as a power plant, must secure carbon allowances equal to their emissions. State regulators can sell these allowances through an auction platform, generating auction proceeds. The proceeds can then be reinvested to support state climate action priorities. The key feature of this type of system is a mechanism that decreases the total allowable emissions total over time, which means less allowances available per auction.

Both options leverage market drivers in order to reconcile the negative impacts of GHG emissions. Both can also be designed to avoid disproportionate impacts on vulnerable communities, and proceeds can be directed at investments that directly support disadvantaged and marginalized populations.

Thus far, no U.S. states have adopted the tax option, although the State of Washington tried twice to implement a carbon tax through ballot measures. British Columbia, Canada, instituted a revenue-neutral carbon tax of $10 CAD per tonne of CO_2e in 2008 that gradually rose to $40 CAD per tonne CAD in 2019.

Beginning in the early to mid-2000s, a number of U.S. states and Canadian provinces began pursuing cap-and-trade programs. The Regional Greenhouse Gas Initiative (RGGI) formed in the Northeast and Mid-Atlantic, while the Western Climate Initiative (WCI) formed in the West.

RGGI has been successfully implementing a linked, interstate carbon market for the electric power sector since 2008 and is the first established market-based mechanism to control GHGs in the United States. This initiative established a cap-and-trade program for the power sector across 10 Eastern states in the Northeast and Mid-Atlantic: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. (Virginia will become the 11th state to join in January 2021 and Pennsylvania is currently developing their regulations with a plan to join in 2022). Power plants larger than 25 MW are required to hold allowances equivalent to their GHG emissions and to surrender those allowances at the end of each three-year compliance period. According to the RGGI website: "A CO_2 allowance represents a limited authorization

to emit one short ton of CO_2 from a regulated source, as issued by a participating state. Regulated power plants can use a CO_2 allowance issued by any participating state to demonstrate compliance in any state. They may acquire allowances by purchasing them at regional auctions, or through secondary markets."

Proceeds generated are re-invested in participating states to support state-specific climate action goals. These include re-investing in projects that support energy efficiency, clean energy and transportation, enhancement of natural and working lands, community adaptation and resilience, and the creation of state green banks. In 2018, RGGI realized $248 million in proceeds.

Beyond the revenue generated to support state climate priorities, RGGI has achieved a 50% reduction in power-sector GHG emissions while GDP across the participating states continues to grow (RGGI, 2020). The market has also significantly improved the health of children across the region, avoiding more than 500 pediatric asthma cases and 100 preterm births, with associated avoided costs in the range of $191–$350 million (NIH, 2020).

Building on the success of RGGI, a number of RGGI states—with the addition of Virginia, Pennsylvania, and the District of Columbia—are working to "design a regional low-carbon transportation policy proposal that would cap and reduce carbon emissions from the combustion of transportation fuels." The Transportation & Climate Initiative (TCI) is currently undergoing its policy design process, with a final memorandum of understanding planned for release in 2020 and a model rule for winter 2020–2021.

Initiated in 2013, California's cap-and-trade program, administered by the WCI, covers 85% of the state's total GHG emissions and is the only multi-sector cap-and-trade program in the U.S. As with RGGI, statewide limits are placed on GHG emissions with the cap declining over time, as well as similar allowance and auction processes. However, one difference is that the California cap-and-trade program incorporates a floor price for allowances that increases over time. This "creates a steady and sustained carbon price signal to prompt action to reduce GHG emissions."

Auction proceeds from California's cap-and-trade program contribute to the state's Greenhouse Gas Reduction Fund, which are in turn allocated to the California Climate Investments programs. Projects funded by these programs include energy efficiency installations, land restoration, urban tree planting, rebate programs, and many other initiatives designed to further reduce California's GHG emissions. In 2019, $5.3 billion in

projects were supported across the state, including in excess of $1 billion for new projects in California's disadvantaged communities (CCI 2020).

In 2014, the California cap-and-trade program linked with the program in Quebec. For a brief period in early 2018, Ontario also joined the network. However, in July 2018, Ontario's government revoked their cap-and-trade regulation. Nevertheless, the California-Quebec Cap-and-Trade Program continues.

Although an important tool, carbon pricing alone is insufficient to reach net-zero targets by mid-century. To be fully effective, market-based solutions should be used with additional, complementary mitigation-focused policies (WRI, 2019; CGEP, 2020). This suite of supporting policies must be unique to the carbon-pricing market in place. For these reasons, it is critical to establish a framework (e.g., CGEP, 2019) that will identify the policies that dovetail with and bolster an appropriate carbon price solution.

NEVADA'S CLIMATE OPPORTUNITY: ECONOMIC RECOVERY & REVITALIZATION

Climate change touches everything. No sector of the global economy—including Nevada's —will escape its effects. There are real and prescient concerns. But new opportunities arise from challenges. Nevada can respond to the looming effects and threats of climate change by continuing to diversify, and by creating new, clean, and green jobs that benefit both the economy and the environment.

> **Implementing policies aimed at reducing greenhouse gas (GHG) emissions will create new jobs and contribute to sustaining the state's economic diversification strategy.**

Implementing policies aimed at reducing greenhouse gas (GHG) emissions will create new jobs and contribute to sustaining the state's economic diversification strategy—an important goal. Additionally, the current economic crisis created by COVID-19 has meant the loss of thousands of jobs across the state. As heard in the Climate Strategy Listening Sessions, Nevada can proactively address the need for more workforce training and retraining by leveraging the Nevada System of Higher Education's demonstrated ability to respond to economic and workforce priorities, including climate action. By making climate a central consideration of job growth and economic development strategies and "hard-wiring" climate consideration into all economic development initiatives, Nevada can work toward "future proofing" the state's job sectors and economy from a climate perspective. The result of this effort in Nevada can be more and better jobs that are less prone to climate-driven impacts or their fallout, greater prosperity for individuals and businesses, and increased opportunity for all.

CLIMATE-CONSCIOUS ECONOMIC RECOVERY AND RESILIENCY

Climate change is "expected to cause substantial net damage to the U.S. economy" (NCA, 2018). The ability to proactively anticipate, prepare for, and respond to climate change-related economic and job impacts requires climate-conscious economic stabilization, recovery, and development.

Just as it is necessary to design and build climate-resilient infrastructure (i.e., transportation, water, energy, and telecommunications systems) that is more flexible and responsive to a variety of climate impacts, climate-conscious economic recovery and development efforts seek to better prepare for the looming economic effects of a changing climate, enabling agility and resilience in the state's economy in the face of disruptions climate change causes.

Nevada has begun the process of diversifying its historic dependence on hospitality, gaming, and entertainment. While these traditional economic activities have been and will continue to be important for Nevada, the COVID-19 pandemic and resulting economic recession has illustrated why increased diversification is essential. As Nevada build a cleaner and more climate-resilient future aligned with the state's economic agenda.

> **The Governor's Office of Economic Development (GOED) publication *A New Economic Agenda for Nevada: Final Report* identifies climate change as the one of the most-significant threats facing the state's economy. However, by employing strategic and targeted approaches to climate-resilient economic development, innovation, and workforce training, climate change action can generate more and better jobs, optimize educational and workforce pipelines, and improve the state's economic resilience.**

In Nevada, climate change and environmental degradation already pose significant threats to our lands and waters, air quality, and health—and to sustained economic and job growth and prosperity. For example, rising temperatures will combine with water and energy resource constraints to magnify economic impacts due to climate change, for example affecting both the value and supply chains of mining, which could have both direct (operational and performance-based) and indirect (securing of supplies and rising energy

costs) impacts. The economic threat climate change represents to prosperity in Nevada grows significantly in the mid- to long-term. For example, snow level elevation changes and changing snow conditions threaten the supply chain of water resources for arid agriculture and the snow sports segment of Nevada's growing outdoor recreation economy. Tourism, which accounts for 26% of the state's total employment, will be directly affected by increased heatwave days, and could lead to commercial aviation impacts.

Indeed, the Governor's Office of Economic Development (GOED) publication *A New Economic Agenda for Nevada: Final Report* identifies climate change as the one of the most-significant threats facing the state's economy. However, by employing strategic and targeted approaches to climate-resilient economic development, innovation, and workforce training, climate change action can generate more and better jobs, optimize educational and workforce pipelines, and improve the state's economic resilience. The *Nevada Recovery and Resiliency Plan* released by GOED (December 2020) states "cleantech proved to be resilient when the [COVID-19] downturn came and will be [part of] the foundation for the future."

Virtually all activities associated with climate-resilient economic recovery and development efforts support the specific strategic directions and action recommendations outlined in *A New Economic Agenda for Nevada: Final Report*. Similarly, the GOED *Nevada Recovery and Resiliency Plan* identifies five strategic categories for initiatives the state must enact to ensure medium-term economic resilience and prosperity following the disastrous economic impacts of the COVID-19 pandemic:

- Regionally-Designed Industrial Clusters
- Statewide Integration and Connectivity
- Technology-Driven Development
- Responsible and Sustainable Growth
- Comprehensive Placemaking

These categories provide a useful architecture in which to embed climate-related job growth, economic recovery, and resilience actions and investments.

BETTER JOBS FORWARD

The COVID-19 pandemic's effect on jobs in Nevada cannot be overstated, causing a

February–September 2020 loss of 129,400 jobs, or more than 9% of the state's workforce, often affecting underrepresented segments of the state's population. Nevada can and should ensure that climate action is a part of the state's economic recovery, resilience, and job-growth efforts, and represents more-inclusive economic growth—and as was voiced in climate listening sessions—becomes "hard-wired" into the state's economic development efforts.

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CLEAN ENERGY TECHNOLOGIES

Three key clean energy sectors in Nevada—energy efficiency, solar energy generation, and storage—already represent 32,000 jobs in the state, and account for 91 percent of the state's clean energy jobs. The larger clean energy sector experience 32.43 percent job growth in 2018, helping rank the state third nationwide for jobs in energy storage (E2 2019).

"Nevada's natural resources can be an economic driver. We see an opportunity with electric vehicles and related infrastructure to cut fueling for public and private fleets. Clean energy could fuel thousands of new jobs through targeted clean energy investments by the federal and Nevada state government[…]If we're going to rebuild, let's do so strategically and position ourselves for long-term success. Let's focus on investments in clean energy, energy-efficiency projects, and electric vehicles that will grow jobs, keep our environment healthy, save

> **businesses and consumers money, and help us become more resilient to climate change. We need to plan for a climate-friendly, low-carbon economy now; we've seen with COVID-19 what happens when we don't listen to scientists."**
>
> *– Ann Silver, Reno Sparks Chamber of Commerce*

ENERGY EFFICIENCY AND GREEN BUILDING

Because the energy-efficiency sector represented the largest share of jobs and the greatest absolute growth among U.S. Climate Alliance states, Nevada can and should integrate into regional and global value and supply chains tied to energy-efficiency growth. Doing so would also support the economic recovery and resilience goal GOED identified.

ALTERNATIVE TRANSPORTATION

Building on the state's identified categories for strategic effort—Technology-Driven Development and Statewide Integration and Connectivity—Nevada is well-positioned geographically and from a workforce opportunity standpoint to grow alternative transportation technologies and related jobs, building on its investments in and groundwork for battery storage and renewable energy generation jobs and growth.

GRID MODERNIZATION AND STORAGE

Nevada is poised to lead the growth of global energy storage supply chains. The state can and should seize this opportunity. This includes developing Nevada's lithium sector, not only to close a critical gap in Nevada's energy storage production, but also to enable Nevada to become a net exporter of lithium. Additionally, the *Nevada Jobs Project: A Guide to Creating Advanced Energy Jobs* identifies two economic clusters showing particular promise: solar energy and batteries.

> **Nevada is poised to lead the growth of global energy storage supply chains. The state can and should seize this opportunity.**

WATER CONSERVATION TECHNOLOGIES

Climate change requires wise planning and use of water resources. Additionally, Nevada is naturally the driest state in the country, a condition that climate change will only exacerbate. Water conservation technology growth represents an opportunity to advance identified strategic economic resilience goals including building upon regionally-designed industrial clusters in the state. Because of Nevada's previous investments, water technologies is area of opportunity for continued job and economic growth. Strategic investments in research, development, and commercialization of water conservation technologies can build upon Nevada System of Higher Education (NSHE) programs already in place (e.g. Box 1) and position Nevada as a leader of water conservation technologies, jobs, and value/supply chains.

Water conservation technology growth represents an opportunity to advance identified strategic economic resilience goals including building upon regionally-designed industrial clusters in the state.

Box 1. WaterStart

WaterStart accelerates the development and adoption of innovative water technologies across Nevada. Addressing 16 identified water priorities in the state, WaterStart has developed solutions for dozens of companies worth more than $30 million and created 168 new jobs through water-wise technology growth and solutions in three years. The program was launched with funding from GOED's Knowledge Fund, leveraging the expertise at the Desert Research Institute.

RECYCLING

As heard in the State *Climate Strategy* economic recovery listening session, recycling creates at least nine times more jobs than landfilling or incineration. In 2016, the U.S. Environmental Protection Agency (EPA) reported that recycling and reuse provided 1.25 million American jobs, whereas landfilling and incineration provided 250,000 jobs.

Recycling and reuse generated annual payrolls of nearly $37 billion and more than $236 billion in annual revenues. The EPA and the National Recycling Coalition assert that reaching a 75% recycling rate is achievable, and if reached will generate 1.5 million new jobs and create environmental benefits equivalent to removing 50 million cars from the road each year. Additionally, in the listening session we heard about the need for increased domestic recycling program capacity, particularly in low-income and underrepresented communities across the state. One promising industrial recycling opportunity for the state may lie in developing a site in Southern Nevada as a combination rare earth metals concentrator and recycling facility. One result from doing so would be a reduction in carbon emissions associated with the export of Nevada's rare earth metals to China, where these metals are currently processed and then shipped back for industrial use. This would also address a strategic national security concern for rare earth metal supply chains.

ADDITIONAL

State-identified areas of special economic development and job growth attention—including aerospace and defense, agriculture, mining, and hospitality—represent significant job growth opportunities in ways that advance both the economic and climate agendas of the state.

WORKFORCE DEVELOPMENT, TRAINING, AND EDUCATION

According to GOED's *A New Economic Agenda for Nevada*, "While Nevada's economy has been successful in diversifying broadly (away from concentration in tourism, gaming, and entertainment, for example), at a narrower level, diversification may still be concentrated in lower-wage sub-sectors."

This represents an opportunity to grow higher-wage, higher-skilled jobs associated with GHG mitigation, climate adaptation, and climate resilience. This is aligned with GOED's articulation that "Nevada must provide opportunities for skill development and workforce training for workers with lower levels of formal educational credentials or education. This is important to ensure that these often-enterprising and hardworking workers are not discouraged from participating in the labor force and have opportunities for growth" (SRI, 2018). NSHE institutions and the state should continue focusing on building a workforce

skillset for yet-to-come and emerging industries, similar to how it has navigated needs surrounding advanced manufacturing and battery storage technologies.

> **NSHE institutions and the state should continue focusing on building a workforce skillset for yet-to-come and emerging industries.**

Energy efficiency jobs are primarily associated with green construction, with emphases on green building practices, architecture, building performance, building code officials, builders, trades, engineers, and others that are not always included as green jobs. Each of these sectors require workforce training and increased knowledge of the ever-changing technologies that drive change in green building practices. As was heard in the listening session, Nevada has, in addition to NSHE programs, skilled labor training and workforce development programs with the building and construction trades councils and other trade unions that can and do support green building and energy efficiency training needs—key tools to help address these needs.

The current workforce of building code officials is expected to retire in the next 10–15 years, leaving vulnerabilities in the implementation and compliance of new codes aimed at improving building efficiency and reducing the built environment's carbon footprint. Opportunities to learn about this career and technical pathway are not currently provided in K-12 schools, except through independent nonprofits. This deficit represents a strategic opportunity for action to reflect the needs for energy efficiency, building performance, and building code enforcement workforces that are the basis for a more-climate-conscious built environment.

Connecting Clean Energy and Education: UNLV Solar Decathlon

Initiated in 2002 and designed to highlight the inventiveness and creativity of architectural students around the world, the U.S. Department of Energy Solar Decathlon is a showcase of sustainability and innovation. Every other year, students from universities across the globe participate to conceptualize, design, and build the future of earth-friendly construction. Incorporating the latest eco-friendly techniques, these projects serve to demonstrate as a proof of concept what can be accomplished using a variety of methods and integrating the

surrounding environment. The Solar Decathlon is more than a competition. It is a unique learning experience for consumers and homeowners as they discover the latest technologies and materials in energy-efficient design, clean energy technologies, smart home solutions, water conservation measures, electric vehicles, and high-performance buildings.

Of the many teams that vie for a spot in the competition, the program from UNLV has been one of the most successful at demonstrating that sustainable building can not only be functional, but stylish. Looking at their most recent build, "Mojave Bloom", it is clear that the surrounding environment has influenced the home's design. This build aims to be an energy-neutral or "autonomous" home able to thrive in the harsh Mojave Desert climate and operate independent of all public utility services. Mojave Bloom combines new and emerging off-shelf renewable energy systems, technologies, products, and appliances that promote sustainability. This 400- to 600-square-foot smart solar home has been conceptualized as a place of healing and respite for military veterans suffering the adverse mental health impacts from wartime trauma. There is a significant need for veteran housing in the Las Vegas Valley. Three student team members are military veterans, and the students will also gather feedback during focus groups with the community to aid design plans.

Programs such as Project ReCharge, administered through the Nevada nonprofit Envirolution, provide opportunities around the state for teachers in middle and high schools to obtain science, technology, engineering, arts, and math (STEAM) training and curriculum that they then can pass on to their classrooms year after year to help develop and train our future workforce on the importance of building efficiency. These programs are opportunities to invest in the future workforce that will continue the fight against climate change.

The NSHE research enterprise is also uniquely poised to contribute to clean technology through research, development, and innovation that is connected with climate-action goals. From geothermal energy research at the University of Nevada, Reno to WaterStart (see Box 1) to laboratory discoveries at the University of Nevada, Las Vegas (UNLV) that could revolutionize energy, research in Nevada can play an important role in bolstering advances in clean energy and climate-friendly technology.

CLIMATE GOVERNANCE

State governments across the United States committed to climate action have adopted different governance approaches to address climate change within their organizational structures. While multiple options exist, the following guiding principles—based on repeated research and on positive experiences from other states —should be considered in a design appropriate for Nevada.

INTERGOVERNMENTAL & INTERAGENCY COORDINATION

Robust communication, coordination, and collaboration within and across all levels of government is necessary for successful climate action (Moser & Ekstrom, 2010). Consequently, organizational structures need to ensure active participation across all agencies and departments of the executive branch, as well as with counties, cities, regional entities, and other government jurisdictions.

> **Robust communication, coordination, and collaboration within and across all levels of government is necessary for successful climate action.**

The complexities of climate change make cross-scale, intragovernmental, and intergovernmental coordination essential. Risks evolve over time, vulnerabilities are intertwined across sectors and scales, climate impacts can cascade across sectors and geographies, and adaptation actions require input from multiple levels of government (Moser & Hart, 2015; Moser & Hart, 2018). Climate mitigation and adaptation actions require harmonization of local, regional, state, and oftentimes federal policies. Multi-jurisdictional concerns are also important as Nevada adapts to worsening drought, more-frequent floods, more-extreme heat, an extended wildfire season, and other consequences of climate change. These types of impacts are most often dealt with at local and regional scales, but the response can be supported by higher levels of government.

Already, multiple municipalities and regional organizations across the state have developed, or are in the process of developing, resilience or sustainability plans that directly address climate change. While a few of these efforts include components aimed at reducing GHG emissions, the majority are focused on how to address the impacts of climate change.

Northern Nevada Climate Resilience Advocacy Group

Extraordinary progress is happening right now in Northern Nevada due to action taken by the Climate Resilience Advocacy Group and the Solar Energy Innovation Network. The Climate Resilience Advocacy Group is a collaborative effort of city representatives focused on strengthening the resilience of the City of Reno to climate-related risks and mitigating impacts to critical resources such as drinking water, agriculture, and native wildlife species. Concurrently, the Solar Energy Innovation Network is working in conjunction with the U.S. Department of Energy to develop a valuation methodology to determine the value of resilience that can be provided by solar-plus-storage systems, including finding cost-savings opportunities, offering improvements to emergency response, and other public benefits. This work will ultimately inform future policy direction for the City of Reno for incorporating solar-plus-storage applications in resilience strategies for emergency response and public safety networks. These efforts are critical for Nevada, given the immense potential and opportunities for renewable energy solutions at the local governmental level. According to the Center for Climate and Energy Solutions, approximately 82% of the U.S. population resides in urban centers and this number is growing. In fact, the City of Reno makes up over half of the population of Washoe County, and the county saw a growth rate of 1.8% in 2017 alone (U.S. Census Bureau). This positions cities like Reno to be leaders in reducing emissions and advancing sustainable and resilient solutions.

STAKEHOLDER & COMMUNITY ENGAGEMENT

Nevadans clearly indicate the future they want: cleaner air, better health, an equitable society, economic stability, investment in renewable energy, and a clean environment. In order to get there people need to be engaged in the planning process (e.g. Bockstael & Berkes, 2017). A robust and meaningful stakeholder engagement framework, including direct representation by Nevadans, should be integrated into a governance model.

Whether it is shifting to mass transit from driving alone to work, moving a winter-based recreation business to a model that supports more summertime activities, or modifying outdoor activity schedules to avoid poor air quality during wildfire season, people will have to change behavior in response to climate change. Given the scale of individual action necessary to mitigate GHG emissions and adapt to the changes that will come with increasing climate-driven disruptions that communities are facing, proactively engaging with Nevadans to build support and buy-in for climate action and to help shape the most appropriate responses is critical (Moser, 2014; Moser & Pike, 2015; Rumore et al., 2016).

> **A robust and meaningful stakeholder engagement framework, including direct representation by Nevadans, should be integrated into a governance model.**

Throughout the climate listening sessions, during briefings, and via comments submitted by email, Nevadans were clear that they want to engage and they want to be a part of the process. Expanding the communication enterprise around climate, providing inclusive educational opportunities for the public to learn more about climate change, and continuing to seek input from communities across the state were common refrains.

Formal mechanisms that also ensure that representatives and advocates across different interest groups and communities have a voice should also be considered in developing an organizational structure for climate (Mohnot et al., 2018; USDN, 2017; NAACP, 2017). Advocates from underserved communities, environmental interest groups, and business and industry partners, among others, all have important perspectives, unique insights, and expertise that would contribute to the overarching goals of the State of Nevada Climate Initiative (NCI).

Integrating people into the climate-action framework could help the state address these concerns of the community, while building toward the collective vision of the future.

EXECUTIVE LEADERSHIP & STAFF

Another common barrier to climate action is lack of executive leadership that has authority on climate issues. High-level leadership on climate at any government level and in any

organization helps ensure that climate action remains at the top of the agenda, becomes integrated in decision-making, sustains momentum, and has the necessary resources, capacity, and authority to be implemented (Moser et al., 2017). Given the multiple scales of coordination necessary across sectors and transcending governmental jurisdictions, dedicated leadership at least at the state level with a distinct focus on climate change should be in place.

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Addressing climate change appropriately requires unique expertise and skills. Traditional approaches to planning do not necessarily translate to climate change, particularly because of the scale, scope, and complexity of the problem and the uncertainties involved. Whether it's flood-resistant roadways or opening cooling centers during heat waves or wildfire mitigation in forest-reliant communities, what worked in the past may not be sufficient for what is to come. Planning approaches that integrate climate change considerations are unique and focused more on managing risk than optimization. Dedicated leadership to help develop and advance climate action is more likely to ensure timely progress than mere calls for action without such capacity (Moser et al., 2017). Thus, to support the scale and scope of necessary climate action, a state-level staff focused specifically on climate change would need to be established and built out to meet the state's needs.

Indeed, most states that are actively engaged on climate issues have a point person charged exclusively with addressing climate change issues with authority across the executive branch. In most states, this is a climate czar, chief resilience officer, or other chief executive in the governor's office (e.g., Florida, Oregon, New Jersey, Virginia, Rhode Island); sometimes this is also a cabinet position leading an agency focused on climate (e.g., North Carolina, Colorado, New York, Michigan). Some states have adopted a 'special advisor to the governor' model (e.g., Colorado, Washington), and others have a chief resilience or sustainability officer embedded within an executive branch department or office that is granted authority across agencies. Some have some combination (e.g., California). Regardless of the model, all have or intend to expand staff in order to meet the growing demands to address climate in the state.

Clearly, based on the analysis of possible mitigation policies alone, and comparison with other states, there will be a need for additional investments to support climate action in Nevada, including support for an appropriate level of administrative leadership.

ADAPTIVE GOVERNANCE

Extreme weather events and many climate-related natural hazards are becoming increasingly volatile, posing risks to the health and safety of all Nevadans and compromising the state's natural resources. Climate experts are confident that the extreme events of tomorrow will be quite different than those that most Nevadans are accustomed to, meaning that the systems that worked in the past may not be sufficient for the future (Milly et al., 2008; Chester & Allenby, 2018; Hasnoot et al., 2020). For this reason, it is important to implement a governance structure that is nimble and can pivot quickly in response to unprecedented events and emerging threats (Wurtzebach et al., 2019; Crowe et al., 2016; Plummer et al., 2013). A staff dedicated to dealing with climate change would be an important component here, as climate-related issues are not going to go away. Further, building capacity and institutional flexibility will also ensure that Nevada successfully navigates what is likely to be a fundamentally different future. This means, in part, adding capacity; but it also means training existing staff in how to adapt what they already know how to do for a continuously changing and frequently disrupted future.

> **It is important to implement a governance structure that is nimble and can pivot quickly in response to unprecedented events and emerging threats.**

For example, the COVID-19 pandemic and resulting economic downturn have necessarily reinvigorated planning for economic diversification across Nevada, led by the Governor's Office of Economic Development (GOED). Given the significant opportunity to establish Nevada as an epicenter for electric vehicles across the entire supply chain—including lithium mining for batteries, advanced manufacturing of vehicles, and battery recycling technology—the state could establish and deploy a task force to develop a specific strategic thrust for climate-oriented economic development.

These types of targeted, specific climate efforts that leverage opportunities or that require rapid response in a crisis necessitate a team dedicated to climate issues.

SCIENCE-BASED CLIMATE ASSESSMENT

Over the past several decades, the primary mechanism for connecting climate science with decision-making has been through "climate assessments." Assessments are processes that aim to distill the state of knowledge on climate change, identify key vulnerabilities, and establish how well challenges and potential solutions are understood. They often result in extensive reports that catalog impacts, risks and vulnerabilities, and identify opportunities for climate mitigation and adaptation. Crafted by climate experts and scientists over many years, these assessments are developed through a consensus process and are considered to be the authority on climate change science. They aim to be policy-relevant without being policy-prescriptive by providing decision-makers with the best-available knowledge and information to inform climate action. Examples include the Nobel-prize winning reports of the Intergovernmental Panel on Climate Change (IPCC), as well as the federally-mandated *U.S. National Climate Assessment*, and regional- and state-level assessments.

> **States across the West have adopted their own climate assessment processes in order to respond to climate risks and vulnerabilities unique to their part of the country.**

Now, there is a movement toward "sustained climate assessment," which is a more-flexible, accessible model that will better deploy climate science to inform decision-making than a series of reports. A federal advisory committee (FAC) was convened during the Obama administration to develop recommendations for how this new concept could be implemented for the *U.S. National Climate Assessment*. Although disbanded under the Trump administration, the FAC informally continued its work. The recommendations that emerged, while comprehensive, point toward a process that is iterative, engaging, focused on what decision-makers and practitioners need, and brings science into action (Moss et al., 2019; Moss et al., 2019). In addition to a federal commitment to such a flexible and sustained approach to assessment, the idea hinges on building out and drawing on a

nationwide network of experts beyond those in federal agencies to bring the best-available expertise to bear on the complex challenges of climate change.

States across the West have adopted their own climate assessment processes in order to respond to climate risks and vulnerabilities unique to their part of the country (e.g., California, Montana, Colorado, Oregon, North Carolina). Some have employed the more-traditional approach of producing one-time or periodic assessment reports, while others have committed to a more-sustained assessment model to produce the information state- and local-level decision-makers need, and still others have adopted a hybrid. However, they all engage climate experts that provide objective perspectives and technical advice. Along with access to the most-credible and cutting-edge scientific insights, engaging experts through a formal mechanism has the added benefit of providing a unique resource to help identify and tailor climate information that will support policy development, planning, and decision-making (Box 1). This approach lends itself to transitioning to the sustained assessment model. Given the climate expertise in Nevada, particularly within the Nevada System of Higher Education (NSHE), the state could benefit from integrating science into the governance of climate. Science-based information about climate impacts is an important first step to support the assessment process, and more specifically, the directive to state agencies related to climate assessment in the governor's Executive Order 2019-22.

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Box 1. Climate Data & Information

There is no one-stop-shop for climate information in the United States. The federal government's Resilience Toolkit aims to be a central hub, but the EPA, NASA, NOAA, USDA, and DOI (among others) all have climate websites with datasets, visualization, and education tools. Indeed, climate has a touchpoint with the authorization of virtually every federal agency. However, states are making significant progress in tailoring information to meet the needs of their citizens. Many have developed custom data portals that integrate multiple threads of federal data that have been customized in collaboration with state and local planners, resource managers, and others who need to ingest climate information in order to make decisions that

could be impacted by climate change (e.g., Massachusetts, Rhode Island, Oregon, Delaware, North Carolina, California). The available science can be tailored to Nevada's needs in order to characterize local risks and create solutions. Further, by scientists directly engaging with decision-makers, researchers can learn where practitioners need more or better-tailored information, and then develop research programs and projects to fill those gaps. Integrating science and decision-making can optimize resources and minimize climate risks.

DEDICATED RESOURCES

It is clear that billions of dollars could be saved in the long-term if upfront investments are made to 1) prepare communities for the impacts of climate change and 2) mitigate GHG emissions that would amplify these impacts in the future. While there are resources required to support climate action that protects state assets and the implementation of policies and programs at the state level, municipalities are likely to bear the bulk of the financial burden of building climate-resilient communities.

There are different mechanisms that states can adopt to finance climate action at multiple scales, include leveraging federal resources and putting a price on carbon. There are also specific ways in which state governments can deploy resources and coordinate with local entities to build climate-resilient financial systems (Box 2). The economic impacts of climate change are significant, but building resilient financial systems embedded in governance is critical to protecting the economic interests of Nevadans.

Box 2. Building Climate Resilience in Nevada: State Climate Resilience Checklist

Moving forward, Nevada will need to institute a robust approach to support climate-resilience planning. This approach should be embedded within the governance structure ultimately adopted, including integrating mechanisms to build resilient financial systems. The checklist below was developed to support the fundamental underpinnings of what is needed to develop, implement, and strengthen state resilience planning. The table below provides a framework for climate resilience described in "How State Governments Can Help Communities Invest in Climate Resilience."

State Resilience Framework	Climate-Resilient Financial Systems

State Resilience Framework	Climate-Resilient Financial Systems
Have an interdepartmental body to coordinate climate resilience action	Provide local governments with climate data and risk analysis
Have principles or other guidance for state investment in resilience building	Provide local governments with technical guidance and assistance for developing climate resilience plans
Have a state climate resilience plan	Provide local governments with communications assets/support for building public commitment to resilience
Have resilience standards for state infrastructure	Provide local governments with support in developing local “ready to go” projects for resilience building
Have resilience standards for state infrastructure	Provide local governments with authority to generate and spend local funds for resilience
Have resilience policies for utilities (e.g., water, electric)	Provide local governments with ways to leverage private investments for local resilience development
Have an insurance commission with climate-risk policies for the insurance sector	Have funds that can be used to buy out at-risk properties
Dedicate specific revenues/funds for use in climate resilience strengthening	Provide real estate developers or owners with incentives to strengthen property resilience
Generate additional revenue exclusively for resilience building	Have building codes that require strengthened resilience of properties and buildings

State Resilience Framework	Climate-Resilient Financial Systems
Have criteria for investing state funds equitably in climate resilience	Have an infrastructure bank whose funds can be used for resilience strengthening
Have research, funding, outreach, or other resilience-building partnerships with universities, nonprofits, or networks	
Have an agenda for federal policies/programs to support state and local resilience building	
Include resilience building in the state's all hazard mitigation plan	
Provide ways for local governments to address regional and metropolitan resilience challenges and opportunities	

NEVADA'S CLIMATE LEGACY: NEXT STEPS TOWARD CLIMATE ACTION IN NEVADA

The process and organizational approach to developing the 2020 *State Climate Strategy* could be used as a basis for building out a robust climate governance structure that would support the long-term goals of the State of Nevada Climate Initiative. For example, the collection of interagency working groups focused on different climate-related topics could serve as the mechanism for collaboration across the Nevada executive branch. Further, the momentum of the listening sessions has established a baseline for community engagement that can be expanded to solicit input on multiple, and perhaps more specific,

climate-related topics, including responses to the different components of the first iteration of the *State Climate Strategy*.

> **Establishing a robust governance structure will ensure that the state is in a position to address the climate crisis on multiple fronts. An organizational construct with clear processes and related authorities to reduce emissions and manage the cascading impacts of climate change will position Nevada to navigate the challenges and opportunities ahead.**

Nevada will continue to take action on climate change. Climate change is happening now and will demand that state leaders work effectively to minimize risk and put Nevada on a path to reduce its own contributions to this global problem while benefitting from emerging opportunities in clean and resilient technologies. Establishing a robust governance structure will ensure that the state is in a position to address climate on multiple fronts. An organizational construct with clear processes and related authorities to reduce emissions and manage the cascading impacts of climate change will position Nevada to navigate the challenges and opportunities ahead.

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