

## ELECTRIFYING NEVADA'S 21<sup>st</sup>-CENTURY TRANSPORTATION SYSTEM

ACTIONS | OPPORTUNITIES | ASPIRATIONS

JANUARY 2019

# ACKNOWLEDGEMENTS

This Report was made possible by a grant from the Nevada Governor's Office of Energy (GOE). The mission of the GOE is to ensure the wise development of Nevada's energy resources in harmony with local economic needs and to position Nevada to lead the nation in renewable energy production, energy conservation, and the exportation of energy. The authors gratefully acknowledge Angela Dykema, GOE Director, for her foresight in approving this project and advancing the issue of transportation electrification, and also Mark Brady of GOE staff for his helpful oversight and guidance along the way.

The authors could not have written this Report without the many dedicated Nevada state employees, and also public interest advocates, who generously provided their time and attention to give information and critical insights regarding the content herein. Nancy Admundsen, Charlene Albee, Lynne Barker, Roman Borisov, Bruce Breslow, John Candelaria, Carlos Cardillo, David Carr, Amy Cummings, Anne-Marie Cuneo, Adam Danise, Elspeth DiMarzio, Danilo Dragoni, Cameron Dyer, Laura Fucci, Dawn Gibbons, Nathan Goldberg, Dallas Harris, Ivie Hatt, Bryan Heller, Brian Hoeft, Louis Holland, Diana Hollander, Charla Honey, Jude Hurin, Denise Inda, Daniel Inouye, David Jickling, Robert Johnston, Sigurd Juanarajs, Jeffrey Kinder, Rodney Langston, Tracy Larkin, Lester Lewis, Percy Lucban, Bob Madewell, Andy Maggi, Rudy Malfabon, Thomas Martin, M.J. Maynard, Devin Middlebrook, Leslie Mujica, Joseph Norby, Fred Ohene, Joey Paskey, Joseph Perreira, Jonas Peterson, Tom Polikalis, Ann Pongracz, Tina Quigley, Craig Raborn, Alyssa Rodriguez, Sondra Rosenberg, Kylie Rowe, April Sanborn, Mark Schlader, Brandon Schneider, David Swallow, Mike Sword, Robert Tekniepe, Kate Thomas, Marco Velotta, Kevin Verre, John Vinski, Joanna Wadsworth, Ann Wilkinson, Kandee Worley, Tina Wu, and Rudy Zamor.



Thanks to all of the following:

#### Authors

*Electrifying Nevada's 21st Century Transportation System: Actions, Opportunities, Aspirations* was written by Lauren Rosenblatt and Marie K. Steele, Principals of e-centricity, LLP.

#### Disclaimer

This report was prepared as an account of work sponsored by the Governor's Office of Energy, an agency of the Nevada State government. Neither the State of Nevada nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise neither constitutes nor implies its endorsement, recommendation, or favoring by the State of Nevada government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the State of Nevada government or any agency thereof.

e-centricity, LLP has exercised all reasonable skill and care in the performance of our services and we shall be liable only to the extent we are in breach of such obligation. While the information is provided in good faith, the ideas presented in the report must be subject to further investigation, and take into account other factors not presented here, before being taken forward. e-centricity, LLP shall not in any circumstances be liable in contract, or otherwise for (a) any loss of investment, loss of contract, loss of production, loss of profits, loss of time or loss of use; and/or (b) any consequential or indirect loss sustained by the client or any third parties.

\* Cover photo courtesy of Regional Transportation Commission for Washoe County © 2018



# CONTENTS



#### EXECUTIVE SUMMARY

4



INTRODUCTION	10
• Acronyms	10
• The Context for Transportation Electrification in Nevada	11
<ul> <li>Methodology and Map for This Report</li> </ul>	13



AN ACTION PLAN 28 FOR NEVADA



CONCLUSION 50



#### OPPORTUNITIES 14 AND OBSTACLES

Nevada Policies and Planning	
That Benefit from Electrified	
Transportation Solutions	15
Policy in Action	21
Challenges	25



BIBLIOGRAPHY 51

#### APPENDICES

A	Entities Interviewed for This Report
В	Nevada Laws and Codes Supporting Transportation Electrification
С	Federal Dollars Available for Advanced and Electrified Transportation Projects
D	Action Items by Agency
E	Electric Load Potential from Transportation Electrification

55 56 65

67

68

3

# EXECUTIVE SUMMARY

## OVERVIEW

**Nevada's future is electric,** powered by its abundant sunshine and geothermal resources. Since the late 1990s, the State's energy policy has been to maximize the use of these resources for energy independence and also develop the markets for it. As recently as 2016, Nevada's Governor Brian Sandoval emphasized the strategic importance of the energy industry, directing a path to "become the nation's leading producer and consumer of clean and renewable energy."

Just as the clean energy industry has reached momentum in Nevada, a fast growing population is putting pressure on its environment and its infrastructure. According to the World Population Review, Nevada currently has the 6th-strongest growth rate in the country, a 7.05% population increase between 2010 and 2015. More people and more vehicles on the road powered by fossil fuels means more greenhouse gas emissions contributing to air quality degradation. Indeed, both northern and southern Nevada struggle to maintain compliance with federal Clean Air Act standards for ozone levels, and Clark County is in partial non-attainment for ozone levels in 2018. Transportation system maintenance and modernization are also strained by an increasing number of users accompanied by decreasing federal and state transportation dollars. In this context of more transportation system users and fewer transportation dollars, Nevada is working to establish itself as a transportation leader that supports advanced, overwhelmingly electrified, transportation technologies for mobility and connectivity across the State.

Transportation electrification strikes a chord that resonates with some of Nevada's most significant policies, and hits no low notes. Electrifying the movement of goods and people around the State moves the needle forward on all of Nevada's priorities for growth and livability – energy independence, clean energy, clean air, economic mobility, and an efficient transportation system. The time is right for Nevada's policy makers and government actors to take hold of the opportunity presented by emerging, electrified transportation technologies. In other words, **transportation electrification is a winning strategy** for the priority policies Nevada already has in place.





# THE OPPORTUNITY

At this time, The United States is witnessing a shift away from the internal combustion engine as the primary technology of transportation. Electric vehicles are gaining market traction across the nation thanks to advances in battery technology: the cost for an EV battery has dropped 85% or more per kilowatt-hour in the past 8 years. Battery improvements are solving both the "range anxiety" and the pricing that have been a drag on EV adoption since early models became available. Both Nissan and Bloomberg New Energy Finance estimate that unsubsidized prices for EV models will be comparable to their internal combustion engine counterparts by 2025. Nevada's neighbor to the west is boosting electric vehicle sales and uptake, which will have cross-border implications. With the coming of costcompetitive models, mass market adoption in Nevada and all around it is about to hit an inflection point.

Nevada is currently in an ideal position to take advantage of this coming wave of electrification.



The Nevada Division of Environmental Protection reports that as of 2015, mobile source/vehicle emissions are now the primary source of greenhouse gas emissions, having surpassed those from electric generation. As of 2018, Clark County is in partial noncompliance with Clean Air Act ozone standards, and Washoe County is close to noncompliant levels. electrified, zero-emission More vehicles on the roads means less smog contributing to harmful ozone. Nevada could soon join the more than a dozen states already implementing zero- and low-emission vehicle targets and mandates.



Sun is plentiful in Nevada, which supports a thriving solar energy industry and the companion battery market. Transitioning storage Nevada's transportation sector from internal combustion engines that burn fossil fuels to electric battery-powered technologies will create new electric demand that can be served by a growing, instate renewable energy industry.



Transportation, like energy, is a pillar of Nevada's strategy for growth. As a leader in enabling autonomous, connected, electric, and shared (ACES) vehicles on its streets and highways, Nevada is becoming a destination for advanced transportation solutions. The Nevada Center for Advanced Mobility reflects the State's commitment to these emerging, electrified technologies. Furthering this investment with a policy of transportation electrification is good for clean energy, good for mobility, and great for the State's growth.



The fuel and maintenance savings of certain medium- and heavyduty electric vehicle technologies, such as buses, over conventional technologies is already proven. Initial capital costs are nearing parity with conventional vehicles and fast declining. Government fleets can take advantage of these savings, leaving more funds for agency programming.



Advanced and electrified transportation presents an enormous opportunity for workforce development. Talent will be needed to design, manufacture, install, and service the advanced vehicles and also the infrastructure supports them. That that infrastructure includes software, hardware (devices and sensors), and communications equipment, which will demand a spectrum of skills – from advanced cybersecurity and data science capabilities through repairs and customer service to support the new technologies.







# THE CHALLENGES

# Transportation electrification will require focus and leadership.

As a policy in its own right, it involves a complex of government agencies and missions focused on their own, distinct goals and objectives. The government actors across the range of transportation, energy, air quality, and economic development priorities will need direction and coordination. These agencies and actors have the expertise and talent, but need an agency lead and express mandate to support their elevating transportation electrification as a priority rather than an incidental strategy.



### Transportation electrification will require transportation funds.

With increased fuel efficiency in motor vehicles has come decreased revenues at the gas pump, the primary source of funds both in Nevada and nationally to maintain and develop the transportation system. Much of the cost of transportation electrification will fall within existing budgets to maintain a 21st-century transportation system. Moreover, the overlap with clean energy, clean air, and economic development priorities means that the State's activities and funding in all of these areas offer the opportunity for program and spending synergies and efficiencies. The State will need to tackle the overall transportation funding shortfall, however, if it is to realize the benefits of its investment in advanced transportation solutions.



#### Transportation electrification will require smart investment in an uncertain environment.

Smart investment will need cross-agency collaboration on studies and pilots to test "next-gen" technologies, ensuring positive outcomes and that fast-moving developments don't make the technology obsolete before the government reaps the benefits of a significant investment. These pilots must extend to understanding vehicle charging needs and patterns to ensure that electrified transportation and the energy sector realize their greatest synergies. Multiple government agencies will be involved in finding the right resolution for each of the many issues raised by transportation electrification, from the high-tech world of cybersecurity to more tangible questions such as where to put the public charging infrastructure.



# THE ACTION PLAN

This Report takes a closer look at how Nevada has awakened to the possibilities of electric vehicles and advanced, electrified transportation solutions, but is just beginning to understand how the benefits extend far beyond transportation goals to economic development, clean energy, and clean air. The research did not produce any serious objections to an electrified transportation regime. Cost of implementation is always a factor, particularly for a state committed to a low tax burden. But, as identified in the pages that follow, electrified and advanced transportation technologies have become costeffective, and in some areas, compelled solutions for meeting the State's transportation needs and objectives.

This Report has identified sixteen objectives supporting five transportation goals. Each of the sixteen objectives are furthered by specific action items detailed within. The five goals and supporting objectives are summarized as follows:



#### Establish the leadership and funding needed to drive the trend.

Nevada's policy- and decision-makers within the Legislature and Governor's office can initiate action with three simple actions of their own. Expressing transportation electrification as a State priority and establishing an agency lead to coordinate the complex actions needed to support the objectives are two of the steps in the right direction. The third step involves addressing the transportation funding shortfall by authorizing exploration of gas tax alternatives for all transportation users perhaps by participating in road user fee pilots that would apply to all vehicle technologies, both gas- and electric-powered.

### Electrify regional mobility and connectivity through bus electrification.

Regional mobility and connectivity is about public transit. In Nevada that means buses, and electrified public transportation and school bus fleets present significant electricity demand. Electric buses when compared to conventional technologies reduce emissions and urban noise levels, and could decrease total cost of ownership. In addition, the heavy-duty batteries inside electric buses present the potential to lower the overall cost of operating the electric grid on behalf of all customer rate classes. Nevada's transportation providers and school districts can further the objectives to electrify public transit buses and school buses with incremental studies and investment in new vehicles. With direction from the Legislature or Governor, the Public Utilities Commission can begin to explore how to optimize the integration of the bus batteries with electric grid operations.

















Nevada is an important freight hub and has its fair share of commercial operations with medium- and heavy-duty vehicles. Nevada has already made incentives available for charging infrastructure that could apply to these vehicle types and could encourage use of those incentives accordingly. Legislative or gubernatorial leadership on a mobile sources emissions target could also generate an air quality action plan that creates incentives for commerce and industry to embrace electric vehicles. Furthermore, the Governor could direct state agencies to consider collaborative, bulk procurement of electric vehicles for their respective fleets, which could help lower the cost of converting to electric sooner.

#### Electrify multimodal transportation.

On-demand and micro-transit by both public and private providers is becoming significant enough to be considered as an opportunity for transportation electrification. Major ride-hailing companies, bike share operators, and others raise the question of how to make these transportation options electric. The answer is that these technologies will need access to public charging infrastructure. The Legislature and Governor can leap over this challenge by mandating a public charging infrastructure assessment to determine siting, construction, operating standards and other needs for public charging. The Legislature and Governor could also consider adjusting the existing taxation regime for the ride-hailing companies so that it is "smart" – connecting revenues to charging infrastructure investment and also investment in the public transit those services complement. More generally for light-duty electric vehicle uptake, select state agencies such as the Governor's Office of Energy can encourage uptake by supporting public awareness and education around this technology, and local governments can make electrified micro-transit such as e-bike share available on their local streets.

#### **Continue to invest in advanced, electrified transportation solutions.**

This goal advocates direct support of advanced transportation technologies, in particular autonomous and connected vehicles, based on the assumption that these technologies are, or will be, overwhelmingly electric. The State's transportation agencies should continue to invest in autonomous and connected technologies, and also intelligent transportation systems more generally, for Nevada's streets and highways. In addition, the transportation agencies and local governments should be thinking about updating their policies for "Complete Streets," which are meant to ensure streets accommodate all transportation users, so that they accommodate advanced transportation technologies with required design and infrastructure.

#### Electrify efficient movement of goods and services.











The table below shows the objectives discussed in full in the section <u>"An Action Plan for Nevada."</u> The remainder of this Report offers the reasons why Nevada should embrace transportation electrification as a key component of its future, as well as forty-one practical and (perhaps) inspirational action items for how the dozens of stakeholder agencies across the State can do it.

### **Electrifying Nevada's 21st-Century Transportation System**

Objectives	Actions, Opportunities, Aspirations		
Establish Leadership on Transportation Electrification	(1) Set an express policy mandate	<b>(2)</b> Create an authority to lead transportation electrification as a policy objective and outcome	(3) Address the state funding shortfall for transportation resulting from the diminished fuel tax receipts
Electrify Regional Connectivity and Mobility	<b>(4)</b> Electrify public transit buses	(5) Electrify school bus fleets	<b>(6)</b> Optimize integration of all EV load into electric grid
Electrify Multimodal Transportation for Reduced Congestion and Livable Communities	<b>(7)</b> Use Transportation Network Company (TNC) taxes to support electrified micro-/ on-demand transit	<ul> <li>(8) Create public charging infrastructure to support all vehicles</li> <li>(9) Support electric vehicle uptake as a personal vehicle option</li> </ul>	(10) Provide the rights of way and non-monetary support needed to place e-bikes and e-scooters as a local transportation option
Support Advanced, Electrified Transportation Technologies Development	<b>(11)</b> Continue to test and develop autonomous and connected technologies for local transportation options	<b>(12)</b> Invest in Intelligent Transportation Systems (ITS) infrastructure	<b>(13)</b> Invest in Complete Streets with a view of integrating advanced transportation options and electrified public transit
Electrify Efficient Movement of Goods and Services	<b>(14)</b> Electrify fleets providing ground services at the airports	<b>(15)</b> Promote electrified long-distance freight and commercial operations fleets	(16) Assess procurement options for medium- and heavy-duty vehicles in government fleets







# ACRONYMS

5G	Fifth Ge
ACES	Autonor
AV	Autonor
AVNC	Autonor
BUILD	Better under F
CAMPO	Carson
CMAQ	Congest Progran
DAQ	Clark Co
DERA	Diesel E
DMV	Departr
DSRC	Distribu
EERE	Office of
EEMS	Energy
EV	Electric
FAST	Freeway Nevada)
FAST Act	Fixing A
FHWA	Federal
FTA	Federal
GOE	Governo
GOED	Governo
HSIP	Highwa
ICE	Internal
ITS	Intellige
ITS JPO	Intellige
MPO	Metropo
NCAM	Nevada
NDEP	Nevada

n Generation Cell Phone Communications	NDOE	Nevada Department of Education	
onomous, Connected, Electric, Shared	NDOT	Nevada Department of Transportation	
onomous Vehicle	NHFP	National Highway Freight Program under FAST Act	
onomous Vehicle Network Company	NHPP	National Highway Performance Program under FAST Act	
er Utilizing Investments to Leverage Development	NSHE	Nevada System of Higher Education	
er FAST Act	NHTSA	National Highway Traffic Safety Administration	
on Area Metropolitan Planning Organization	ΝΤΑ	Nevada Transportation Authority	
gestion Mitigation and Air Quality Improvement gram under FAST Act	OSIT	Office of Science, Innovation, and Technology	
k County Department of Air Quality	PUC	Public Utilities Commission of Nevada	
sel Emissions Reduction Act	RTC Southern Nevada	Regional Transportation Commission Southern Nevada	
artment of Motor Vehicles	<b>RTC</b> Washoe	Regional Transportation Commission Washoe County	
ributed Short Range Communications	STBG	Surface Transportation Block Grants under FAST Act	
ce of Energy Efficiency and Renewable Energy (U.S. DOE)	TE-JPO	Transportation Electrification Joint Program Office	
rgy Efficient Mobility Systems (within U.S. DOE's EERE)	TIDP	Technology Innovation and Deployment Program under FAST Act	
tric Vehicle	TIFIA	Transportation Infrastructure Financing and Innovation Act under FAST Act	
eway and Arterial System of Transportation (in Southern			
ada)	TNC	Transportation Network Company	
ng America's Surface Transportation Act	TRPA	Tahoe Regional Planning Agency	
eral Highway Administration	UNLV	University of Nevada Las Vegas	
eral Transit Administration	UNR-CAR	University of Nevada Reno Center for Applied Research	
ernor's Office of Energy	U.S. DOE	United States Department of Energy	
ernor's Office of Economic Development	U.S. DOT	United States Department of Transportation	
nway Safety Improvement Program under FAST Act	U.S. EPA	United States Environmental Protection Agency	
rnal Combustion Engine	VMT	Vehicle Miles Traveled	
lligent Transportation Systems	VW Fund	VolksWagen settlement of United States v. Volkswagen Group	
lligent Transportation Systems Joint Program Office		of America, et al., to be spent on zero emission vehicles and	
ropolitan Planning Organization		allocated to states for investment in transportation projects that reduce NOx emissions	
ada Center for Advanced Mobility within GOED	ZEV	Zero-Emission Vehicle	
ada Division of Environmental Protection			







# THE CONTEXT FOR TRANSPORTATION ELECTRIFICATION IN NEVADA

Dubbed the "Loneliest Road in America," a stretch of Nevada's Highway 50 will take you 350 miles Both Nissan and Bloomberg New Energy Finance estimate that unsubsidized prices for EV models will east from Fernley, a half hour outside Reno, to the Utah border. Driving the near-empty road be comparable to their ICE counterparts by 2025. With the coming of cost-competitive models, mass through history, from petroglyphs to former mining towns, does not conjure images of the world's market adoption is about to hit an inflection point. most populous nations or prolific carmakers. Yet, those are the forces changing the landscape on Within this context, Nevada's own strategies for advancing mobility include embracing advanced this highway and beyond.

transportation technologies — which are overwhelmingly electric. Moreover, electric vehicle sales in The roads and highways of the United States, remote and main-line, are waking up to an electrified Nevada were up 74% in 2017 compared to 2016. At the same time, Nevada still lags the nation in new transportation sector. Governments are pressuring the fossil fuel economy because of concerns electric vehicle sales, showing there is room to accelerate putting zero- and low-emission vehicles (ZEVs about climate change and air pollution. Energy independence, i.e., eliminating dependency on and LEVs) on the road. Although Nevada does not have its own climate change or ZEV/LEV mandates, imported fossil fuels, is both a buzzword and a threat in the geopolitical arena. And as governments, strategic neighbors with cross-border influence like California and Colorado do. Lowering vehicle from populous U.S. states to the largest economies of Europe and Asia, eye transportation energy emissions is also highly compatible with addressing the State's challenges with ozone levels and clean consumption as the key to reducing dependence on gas and oil, the energy and transportation air generally. In addition, Nevada wants to position itself as a leader in renewable energy production. sectors are responding. Indeed, electric cars are only one piece of the transportation transformation, Sun is plentiful in Nevada, which supports a thriving solar energy industry and the companion battery which embraces air and maritime travel as well. storage market. Converting the transportation sector increases load on Nevada's electric system, accelerating new energy resource development — both solar and geothermal — to serve the State's Advances in battery technology are helping to drive the trend: the cost for an EV battery has dropped growing needs and also demand beyond its borders. Coming full circle, as the grid supply in Nevada 85% or more per kilowatt-hour in the past 8 years. Battery improvements are solving both the "range converts to cleaner, renewable sources, environmental advocates and concerned government actors anxiety" and the pricing that have been a drag on EV adoption since early models became available. see electrification of transportation as the next frontier in air quality protection.



China is waging a "war on pollution," and by 2025 at least 20% of the cars sold in the country must be all electric. India has declared that all new vehicles it produces will be EVs by 2030.



The automakers Volkswagen, Mercedes, and BMW, to name a few, will be rolling out their all-electric models over the next decade.



Just this year, California, — the world's fifth-largest economy, — has addressed its own air quality issues by mandating 5 million EVs on its roads by 2030.





One of the world's largest automakers, GM, has indicated it will offer at least 20 models of EVs by 2023 as it accelerates its separation with gasoline and diesel.





#### As of 2015, greenhouse gas emissions from the mobile source sector surpassed electric generation becoming the primary source of greenhouse gases in Nevada. - NDEP

Electrified and advanced transportation applications increasingly offer elegant solutions to the pressures the growing population is putting on Nevada's infrastructure and environment. While Nevada does not currently have an explicit mandate for an electrified transportation sector, it seeks to further the EV market by supporting charging stations and related infrastructure development. The state has also followed transportation technology to the next generation, nurturing an ecosystem for the testing and commercialization of connected and autonomous vehicles. The Legislature made Nevada the first state to open its doors to autonomous vehicle testing in 2011. Las Vegas launched the nation's first autonomous shuttle pilot 2017. Electric bus manufacturer Proterra initiated its first autonomous bus pilot in Washoe County, partnering with UNR's Center for Applied Research and Living Lab Coalition. The Governor's Office of Energy has initiated and co-chairs an intermountain-west consortium of states working together to identify interstate "electric highways" and to standardize technical specifications and other relevant regulations. These technologies and the related infrastructure promote mobility and multimodality, and the ability to experiment in new and different ways than with conventional technologies – and these technologies will be overwhelmingly, perhaps exclusively, electric.

Nevada's future is electric. Renewable energy will fuel Nevada's leap feet-first into advanced transportation technologies, and both will drive a new economic diversity and growth. And as it grows into a leading role in the new energy and transportation economies, the world will see what Nevada has to offer. Highway 50 is not so lonely after all.

#### TRUCK ON I-15 NORTH | Passing Ivanpah Solar Plant On Way to Nevada

### 99





# METHODOLOGY AND MAP FOR THIS REPORT

The research and analysis underlying this Report were divided into two work phases.

#### Work Phase 1

Involved conducting interviews with government officials at approximately two dozen state agencies Describes the context for government action in Nevada to implement a policy of transportation and political subdivisions that have missions and programs affecting transportation, energy, air electrification. It describes the existing policies and planning objectives that would benefit from a quality, and economic development. These interviews rested on a comprehensive review of the transportation electrification policy — clean air, a robust renewable energy sector, and a modern transportation system — and summarizes the relevant activity today of various government agencies. policies, statutes, regulations, and programming within the selected agencies' areas of oversight. To understand how Nevada might implement transportation electrification, government actors were Electric vehicles are an obvious component of transportation electrification, but this Report also asked how they currently use their authority, what challenges they face in pursuing their missions, addresses government policy and actions to promote advanced transportation solutions that are and how they view transportation electrification fitting within their agency objectives. or will be electric-powered. Section III ends with an analysis of the major challenges that agencies confront in embracing transportation electrification: lack of strong policy direction, funding, and

**APPENDIX A** provides a list of the agencies interviewed.

**APPENDIX B** provides a list of relevant statutory authority that does or could support efforts to further a policy of transportation electrification.

#### Work Phase 2

Involved an extensive literature review, identified in the Bibliography, and interviews of representatives of federal programs, trade associations, advocacy organizations, consultants, technology manufacturers, and transportation service providers within the advanced transportation ecosystem.

Sections I and II of this Report summarize and introduce its contents. The remaining sections of this Report reflect the research, interviews, and analysis of each work phase.

#### Section III

uncertainty around the emerging technologies in question.

#### Section IV

Provides the recommended strategies. Because transportation electrification most directly affects the transportation system, the strategies are organized around broad transportation objectives. Each strategy supports a specific outcome within each objective, and the action items for each strategy explain how both transportation and non-transportation agencies are necessarily involved in the outcome or might get involved to realize the full potential of that outcome. Each strategy also points to the source of funds that are the likely resources to support it.

#### Section V

Offers concluding remarks.



OPPORTUNITIES AND OBSTACLES

to Electrify Transportation in Nevada





# **NEVADA POLICIES AND PLANNING** THAT BENEFIT FROM ELECTRIFIED TRANSPORTATION SOLUTIONS

Transportation is about more than just moving from point A to point B. Indeed, the Nevada Department of Transportation's mission statement is to provide "a transportation system that enhances safety, quality of life, and economic development." Nevada's transportation system and choices affect air quality, energy use, and the ability of goods and people to efficiently move to where business and trade happen.

**Figure 1** shows how Nevada's policies around clean air and renewable energy are furthered by policies that promote electrified transportation. Clean air and renewables are important factors in economic development in Nevada and will drive economic growth. Furthermore, advanced transportation technologies, which are or will be reliant on electricity, are increasingly embedded in the complex of transportation objectives and challenges facing the State. In this way, advances in transportation not only support growth in their own right, but sustain Nevada's clean air and energy objectives as well.



#### **DESIRED POLICY OUTCOMES**









#### **Electric Vehicles** for Clean Air

Nevada's clean air policies derive principally from the federal Clean Air Act's National Ambient Air Quality Standards (NAAQS), which establish criteria pollutant levels. To meet these standards, Clark and Washoe Counties are responsible for planning and implementation of air quality protection measures within their respective territories.

The Nevada Department of Environmental Protection (NDEP) implements the State's plan to maintain air quality compliance in the remainder of the state, and ensures that the Washoe County Health Department's and Clark County Department of Air Quality's plans are not in conflict with the federal act. Nevada's state air quality policy is thus primarily one of federal compliance, and local governments rely on this state-regional planning and implementation framework to maintain air quality standards.

Cities and counties, however, also acknowledge clean air as a qualityof-life issue. Urban counties and cities must produce Comprehensive Master Plans under state law, which may - or must, in the case of Clark County – include elements addressing land use, transportation, and conservation. Sustainability departments within the counties and cities are tasked with reviewing these plans, policing them for environmental health concerns and potential mitigation measures.

Resulting policy objectives and planning measures, including those for air quality, are thereby internalized by the local government planning documents. In turn, these plans are absorbed by the state-mandated regional process for coordinating plans of constituent counties and cities.

Clark and Washoe Counties are both enrolled in the U.S. EPA's Ozone Advance Program, in which they further compliance with federal NAAQs for ozone by taking additional, voluntary measures to ensure attainment.

#### VALLEY OF FIRE STATE PARK | Near Las Vegas, Nevada







Through this planning process, maintenance and protection of air quality informs overall planning. The Tahoe Regional Planning Agency, covering the Lake Tahoe Basin and its municipalities, is arguably an exception to this process in that its planning priority is protecting the lake and environment.

66

Consequently, environmental protection and mitigation measures, including clean air policies and reducing contaminated runoff, are drivers rather than factors in the overall regional plan. In all cases, however, air quality is an important consideration for preserving the local environment in a way that encourages population and economic growth.

EVs and electrified mass transit benefit air quality by displacing ICE vehicles that produce high greenhouse gas emissions. In recent decades, the standardization in cars of better emissions-reduction technology has been a significant factor in Nevada and many states for attainment of NAAQS. Even lower- and zero-emission vehicles will continue that trend.

Cleaner transportation could avoid future air quality compliance issues as well. Clark County has an issue of non-attainment for ozone federal limits, and that issue is looming for northern Nevada. In addition, encouraging EVs and other forms of electrified transit balances additional activity in the manufacturing and construction sectors that reflect Nevada's economic growth. The RTC is committed to sustainability both within our organization and across the Truckee Meadows. Sustainability is a core principle of the RTC and helps guide our investments as we plan for the future of our community. The battery electric bus program is a natural extension of our commitment to sustainability and has been overwhelmingly embraced by our passengers and community as a whole and we are well underway to being 100% electric by 2030.



- RTC Washoe











#### **Electric Vehicles for Renewable Energy Development**

Nevada's Governor and Legislature support energy policies promoting and favoring development of renewable energy resources. Nevada's Renewable Energy Portfolio Standard dates back to 1997, and the Legislature has since mandated several incentives to encourage the building of renewable resources and compatible storage within Nevada.

The GOE is the primary government agency responsible for planning and implementing many of those policies and incentives. The PUC also implements the state's energy policies as the regulator of the electric utility that owns and operates the majority of electricity infrastructure and services in Nevada. Through GOE grants and PUC regulatory oversight, the State has implemented directives and incentives to build more renewables and encourage investment in clean energy, both grid-scale and distributed.

Cities and counties have their own energy policies around supplying and reducing their own energy demands. These policies serve budgeting for operating costs and secondarily as a matter of promoting environmental health and air quality policies. Local governments are uniformly committed to reducing reliance on fossil-fueled energy resources. These commitments are typically expressed in planning for green building, energy efficiency, and renewable energy projects — both on behalf of the government's own operations and for mechanisms encouraging adoption of those practices by the public it serves.

Electrification of transportation furthers these energy policies because of the increased load it will represent for Nevada's grid. Rapid uptake of EVs will accelerate daily and annual peak capacity requirements, hastening the need for and development of new, locally-produced renewable resources to serve Nevada and beyond.

An additional benefit of more EVs interconnecting to the grid is the use of their batteries to smooth spikes in supply due to increased renewable intermittent resources. These batteries may also be used for ancillary services required to manage the more variable demand that electric vehicles will bring to the grid. Moreover, the vehicles themselves could factor into energy resource planning as non-stationary grid equipment, taking excess power from renewables when available and providing stored energy supply during times of peak demand. In sum, electrified transportation will precipitate the need to increase energy resources in the state, expediting the rebalancing of supply away from fossil fuels and towards clean energy.

people of the State...



"The Legislature finds that: Energy is essential to the economy of the State and to the health, safety and welfare of the

Planning for energy conservation and future energy requirements should include consideration of state, regional and local plans for land use, urban expansion, transportation systems, environmental protection and economic development." - NRS § 701.010







#### **Advanced Transportation Technologies** for an Advanced Transportation System

Transportation policies in Nevada arise from a web of agencies and government planning. NDOT has policy and planning authority for transportation investment in interstate and state highways and also on behalf of the State's non-urbanized populations. State law requires that it ensure balanced transportation planning across the state, as well. Pursuant to federal law and the requirements of federal transportation funds, transportation planning for urban areas must be coordinated by a state-designated MPO. The RTC Washoe and RTC Southern Nevada perform this function for Washoe County and Clark County, respectively. The TRPA and CAMPO act as the MPOs for Lake Tahoe Basin and Carson City, respectively.

The state and regional transportation plans both inform and are informed by the city-state-regional master planning and coordination process required under state law.

*Transportation policies and objectives in the various state and local* planning documents express a first priority of mobility through *maximum system efficiency* – excepting the Tahoe Regional Planning Agency, for which protection of the area's water and air quality takes precedence. **Figure 2** shows that transportation priorities, although discussed as separate goals, are highly interdependent such that emphasis in any one area ultimately contributes to overall system efficiency and mobility.

#### FIG. 2 | Transportation Policies as Expressed in Nevada's Planning Documents

Relationship of key transportation concepts, expressed as relative number of times addressed in twenty planning documents issued by Nevada government agencies and political subdivisions.



These goals extend to movement of both goods and people. Nevada is a distribution hub of growing importance; the efficiency accomplished through a well-maintained and safe system of streets and highways is particularly important for freight transport. Planning goals are uniform in seeking to reduce congestion on all streets and highways with a multimodal system. Streets must be structured to accommodate vehicles while also conducive to using and connecting with alternative or public transportation.

Land use planning policies favor increasing density and mixeduse development, which in turn improves connectivity of residents to services and business centers in a manner that reduces per-person automobile trips and vehicle miles traveled. Planners across these jurisdictions are united in understanding that reducing congestion reduces the number of vehicles on the road and the time they spend idling, thereby reducing the internal combustion engine's effects on air quality. Improved regional connectivity through public and mass transit also reduces vehicles on the road, to the benefit of air quality, and improves mobility in both the north and south where many people commute between cities for work and recreation.

EVs and emerging transportation technologies play a role in responding to these objectives. In his State of the State address for 2017, the Governor gave a nod to Nevada's leadership in furthering research and development in connected, automated, and aerial transportation of people and goods — all of which are or are trending towards electricity as fuel. Likewise, Nevada's 79th (2017) Legislature has declared deployment of EVs as a State policy. It also updated existing laws that enable and govern the operation in Nevada of transportation network companies and autonomous vehicles and vehicle networks.

"[I]t is the policy of this State to expand and accelerate the deployment of electric vehicles and supporting infrastructure throughout this State."

electric-powered Advanced, transportation technologies promote existing transportation system needs while also offering a path towards electrification of the entire sector. ACES technologies require roads, advanced telecommunications, and complete streets that accommodate all forms of traffic and transport options. Government is already investing in this



#### - NRS § 701B.670

infrastructure to support existing transportation goals and also smart cities aspirations. Moreover, ACES deployment could be both incremental and experimental, located and relocated based on performance and outcomes at particular sites. This in-field experimentation, requiring much lower capital investment, will provide needed data on congestion and other issues pressuring today's system. It will also provide practical data on land use and urban design, informing planning and development activities going forward. In other words, the feedback loop assists efforts and outcomes emphasized by transportation planning and projects regardless of technology. At the same time, it demonstrates that the future transportation regime is trending electric over ICE.



#### FIG. 3 | Electric and Advanced Transportation Timeline

Laws, Regulations, Incentives, Programs and Pilots



# POLICY IN ACTION

Nevada's public sector has already taken initial and specific steps to electrify transport and adopt advanced transportation solutions. <u>Appendix B</u> provides a table of non-specific existing legal authorities for Nevada's various government agencies and political subdivisions that could also be relevant to transportation electrification. It describes how the authority does or could be amended to support efforts described in this Report. The remainder of this section summarizes and provides the highlights of government actions for EVs and advanced transportation to date.

#### **Action for Electric Vehicles**

According to the U.S. Energy Information Administration, Nevada does not currently support many of the basic policies that states with zero- and low-emission vehicle mandates do. Nevada has focused somewhat on electric charging infrastructure, but has been less strong on other, typical forms of support. These other policies include rebates, tax credits, and tax exemptions on the initial purchase of an EV. In addition, although Nevada has authorized free parking and dedicated highway lane access for EVs, those policies have either expired or not been implemented. Nevada does, however, provide smog check exemption for new, low-emission vehicles and for battery-electric vehicles.

Actions around EVs fall into two categories: incentives and pilots for EV charging infrastructure, and purchase of electric vehicles and transit buses to replace a portion of government fleets. Figure 3 shows a timeline of these actions taken to date, the most significant of which are detailed more fully below. 21





In April 2014, the RTC Washoe became one of the first transit agencies in the country to place electric vehicles into revenue service.

Nevada Electric Highway. In 2015 Governor Brian Sandoval announced the Nevada Electric Highway, which involved placing direct-current fast chargers along Nevada's highway connecting its urban centers. The Governor subsequently incorporated the plan into the 2016 Strategic Planning Framework for Nevada, appointing the GOE to lead an expanded project that seeks to provide charging infrastructure on all of the State's major highways by 2020. The Nevada Electric Highway strives to comply with the federal FAST Act, which requires charging stations be located every 50 miles.

Multiple funding sources support the charging stations for the Electric Highway. These include Nevada's portion of the VW Fund, from the Volkswagen settlement with the U.S. government concerning diesel emissions standards violations; electric ratepayer funds for incentives offered under the Electric Vehicle Infrastructure Demonstration Program, administered by the State's major electric utility; and federal and state grants including monies administered directly by the GOE. The allocation of VW Fund monies maximizes the 15% allowed specifically for charging infrastructure in order to support the installations along the Electric Highway.

GOE leadership is leveraging the commitment to the Nevada Electric Highway by simultaneously leading, as the co-chair, the Regional Electric Vehicle "REV" West Plan to coordinate priority corridors and technical standards for electric vehicle charging infrastructure across state lines.

22





creating the Electric Vehicle Infrastructure Demonstration Program. In order to "expand and accelerate the deployment of electric vehicles and supporting infrastructure throughout this State," the program directs the State's major electric utility to take action under PUC oversight. These actions include promoting electric vehicle infrastructure, including, without limitation, education and awareness programs for customers of the utility; programs to provide technical assistance related to the charging of electric vehicles to governmental entities or

federal grant for downtown autonomous circulator project

the owners or operators of large fleets of motor vehicles; and programs to create partnerships with private organizations to promote the development of electric vehicle infrastructure. The program launched in September 2018, repurposing \$15 million in rate-payer incentives originally approved for renewable generation incentives. The program currently supports "level 2" and also fast charger installations, technical advisory services, a customized grant program, for public-private investment opportunities in infrastructure, and an EV value calculator.

Charging Station Shared Investment Program. In 2013 and 2014, the State's major electric utility, NV Energy, piloted the NV Energy Charging Station Shared Investment Program. The utility partnered with nearly 50 government and commercial customers to double the public charging infrastructure available state-wide. To receive the incentive, customers were required to provide free electric vehicle charging for five years and share charging data with the utility.

The Tahoe Regional Planning Agency created the 2017 Tahoe-Truckee Plug-In Electric Vehicle Readiness Plan for education and infrastructure, in which municipal changes to codes and permitting processes are a major feature of the efforts to facilitate siting and installation of charging stations.

**Electric Vehicle Demonstration Program.** Initiated and informed by a 2016 PUC EV Infrastructure investigatory docket, which built upon the NV Energy Charging Station Shared Investment Program and in which stakeholders discussed promoting EVs in Nevada, the 79th (2017) Legislature passed Senate Bill 145

**EV Electric Tariffs.** Approved by the PUC, Nevada's main electric utility has offered since 2009 a time-of-use tariff for residential customer EV owners. This tariff, designed to encourage EV charging at night when capacity is high and energy prices are lower, now extends to both single-family and multi-family residential rate classes and also commercial rate classes, and most recently includes a proposal for a tariff that relieves demand charges associated with direct-current fast charger installations.







Alternative Fuels in Public Fleets Program. NDEP has for years administered the Alternative Fuels in Public Fleets Program as a component of compliance with federal air quality standards. Government fleets in Clark and Washoe counties with more than 50 vehicles must convert 20% of annual new vehicle purchases to alternative or clean fuel technologies. In 2016, the program updated its regulations to give greater compliance credit to allelectric vehicles.

To date, public fleets have focused conversion efforts mainly on the light-duty vehicles used by employees and also installation of solar-covered parking canopies. Out in front of this conversion activity stands RTC Washoe, which has converted 21 of its public transit bus fleet to all-electric.

Building Codes for EV Infrastructure. On a local level, governments are already evaluating possible amendments to their building and planning codes to incorporate EV charging and EV charging readiness into new development. Some of this work is enabled by the Nevada Electric Vehicle Accelerator (NEVA) and also the Southwest Energy Efficiency Project (SWEEP), which provide government agencies education and other support for developing codes and standards to support charging station networks and uptake of electric vehicles. Some local authorities, such as the Tahoe Regional Planning Agency, have committed to code updates as part of their regular planning process.

#### **Action for Advanced Transportation Solutions**

Regarding advanced transportation solutions, Nevada is a leader in ITS that promote system efficiency through traffic management and congestion relief, and also in piloting and

creating needed regulations for ACES vehicles. Figure 3 provides a timeline of policies and programming that have furthered ITS and advanced transportation.

RTC Washoe is a member of UNR's Center for Applied Research Living Labs coalition, which will test synchronized, intelligent mobility solutions in urban environments. RTC Southern Nevada has partnered with Aptiv and Lyft to deploy self-driving ride-hails on the Las Vegas Strip.

NDOT and the RTCs use ITS infrastructure for traffic management: coordinated traffic signal timing on major arterials in urban areas; closed-circuit television cameras; dynamic message signs; nonintrusive video image detection; ramp meters; and a Highway Advisory Radio system on the State's freeways. With support from GOED, the RTC Southern Nevada and the City of Las Vegas are currently installing the next generation of intelligent infrastructure to test data collection and related analytics, traffic management, and modes of transit. These technologies extend to pedestrian safety projects. Nevada has also long been open to autonomous and connected technologies starting with the Nevada Legislature enacting in 2011 the nation's first law to permit autonomous technologies testing. The Nevada Transportation Authority (NTA) regulates and administers the permitting of autonomous vehicle companies operating in Nevada, and the Department of Motor Vehicles (DMV) regulates and administers the certification of those companies testing their technology in the State. In 2017, the Legislature authorized the RTCs to "conduct research for and otherwise develop and implement transportation projects

that promote innovative transportation and transit technology, including, without limitation, autonomous technology." RTC pilots and partnerships to test connected and autonomous vehicles on local urban streets are ongoing.

Experimentation with public transit offerings may also lead to more applications for ACES vehicles. RTC Southern Nevada is testing the use of networked vehicles to ferry customers the first-mile/last-mile beyond the bus stop, experimenting with the technology and the public-private partnership. Other experimental or evolving multimodal services that represent potential applications for ACES include car and van pools and paratransit services. At present, public transit planning continues to consider light rail or the modern streetcar for meeting regional needs in southern Nevada, but experimentation and eventual adoption of electric buses could ultimately transform into an autonomous technology that more efficiently fills that mass transit need.

"[Nevada taken an international has] 66 leadership role in the development of unmanned aerial systems, autonomous vehicles, and water technology through our economic development effort.

– Governor Sandoval (2017)

Bus rapid transit versus light rail is a long-running and open debate. Autonomous and connected technologies that improve bus capabilities and provide more options for microtransit connections could change the balance of the argument in the future.











# CHALLENGES



### **Policy and Public Opinion**

Policies and implementation of transportation plans and initiatives show that Nevada is receptive struggle to justify prioritizing investments in EV infrastructure for a small group of users. Applications of advanced transportation solutions to reduce cars on the road also must compete with the to next-generation solutions, but significant challenges arise from the legacy of a system developed for dependency on the private, internal combustion engine automobile. convenience of personal cars. Fuel costs, congestion, and parking in the urban centers is not yet troublesome enough for people to rethink the comfort of their own vehicles. And in a state with As a general matter, there is no express state or local mandate to incline investments towards EVs or low taxes and therefore limited funds, it is hard to find means and opportunities for incentives that other advanced transportation technologies beyond authorizing funds to study them. Motivation in encourage alternative vehicles or use of public transit. Consequently, *transportation policies* other states for EVs and other electrified options does not apply in Nevada. For example, California's and decisions are responsive to the demands of the greater public opinion, which mandate to build EV charging stations and push sales of EVs rest on the state's years-long inability today leans in favor of roads to accommodate personal automobiles.

to attain compliance with the NAAQS ozone standard. Relatedly, Nevada does not have a climate change action plan or other goals to reduce greenhouse gas, other than sustainability initiatives at the local level.

Needless to say, advanced transportation solutions requiring significant funding have the greatest issues with political will. The light rail project in southern Nevada, studied and discussed for more than fifteen years, is an obvious example. The recent rollout of Lime Bike in Reno offers a For many government actors the question of how to integrate EVs and advanced transportation more tangible example. The need for public sector spending on rights of way to accommodate technologies is one of ripeness. The limited EV car models and prices are still somewhat prohibitive bike docking stations impeded project permits. Lime Bike dissolved the impasse with its dockless to adoption, in that heavier-duty vehicles are not yet widely available and light-duty EVs remain system, requiring the city to permit — but not fund — deployment of the infrastructure and bikes. more expensive than ICE automobiles. Government budgets and staff resources, already stretched,













Of greatest significance is the challenge of funding. Federal transportation dollars are allocated to Fuel indexing that ties the fuel tax rate to inflation — passed in 2017 by popular measure in several each state based on a programmatic basis, or awarded for riskier or more experimental projects or counties including Clark and Washoe — has helped with increasing state gas tax revenues. In addition, almost all counties have also leveraged their statutory authority to collect an additional studies through various competitive grants. local gas tax in the maximum amount allowed (nine cents per gallon).

**<u>Appendix C</u>** shows the various sources of federal funding that might be applied to transportation projects to further advanced transportation and alternative vehicle technologies.

State funds, derived from gas and special fuel taxes and driver's license, vehicle registration, and motor carrier fees are restricted under the state constitution. These funds must be used for the State's cover additional transportation projects. highways, although investments in ITS for traffic management may be eligible as road efficiency improvements. Regional road impact fees assessed to new developments and a portion of sales and Needless to say, EVs and connected and autonomous cars also depend upon a network of safe and use tax may be applied only to road capacity increases and roads and transit, respectively. Nevada well maintained roads. Therefore, both state and national politics must land on a solution as to taxes the transportation network companies operating within the state, generating an unrestricted how EVs will contribute equitably towards road upkeep. The technology for collecting road usage fees has been tested successfully across the country. The Nevada DMV has also proposed some pool of funds for transportation investments beyond roads, but this fund is much smaller. technology-based solutions for collecting fees from EVs, but those have run into technical hurdles Funding is waning because it relies primarily on state and national fuel taxes, that have not yet been solved.

which are diminishing due to vehicle fuel efficiency and the uptake of gaselectric hybrids and EVs.



These additional revenues still fall short of needs. Moreover, general funds, derived from property tax collections that have not yet recovered from the Great Recession and sales tax revenues that are stretched in the absence of a state income tax, are simply not available at the local level to





Finally, uncertainty around these advanced, electrified technologies slows commitments to projects. And the manner in which governments procure equipment and services to react to new technologies It is difficult to predict which advanced technology will dominate, and if any may also be a challenge. Governments will have to act quickly and be able to choose from a range of service providers, which could be hard to do if procurement approval is not streamlined or agile, expensive investments could be overtaken by "next-gen" technology or made or if selected providers must be chosen only from a pre-approved list of vendors. obsolete due to advances in alternative solutions. Local governments therefore rely on the expertise of the MPOs to make advanced and large investments on behalf of the regions. The DMV has previously raised and remains supportive of a government-sponsored body or committee While this strategy is successful in many ways, the benefits of certain investments could have less with the authority to collaborate and plan around the issues that advanced transportation systems significant effects on less dense environments or areas where communications infrastructure and present. A priority aim of this authority would be to create a unified vision and streamlined regulatory smart phone ownership is not uniform. In short, smaller cities must defer to the MPOs and larger scheme that addresses public safety and the rights and obligations of operators, and that is in place to cities regarding regional transportation investment, which increases their respective uncertainties quickly implement regulations when they materialize on the national level. On that front, the National as to what technologies will advance first and when it will reach them. Highway Traffic Safety Administration is developing national standards, although the process is slow and uneven. When it does produce standards for alternative transportation technologies, Nevada will With respect to EVs in particular, the PUC will need to study how to best integrate them into the

need a designated lead agency or authority to respond and internalize those standards. electric grid. Many advanced technologies are still in the testing phase, and awaiting standardization of technical specifications and safety regulations. They also involve large amounts of data, which The remainder of this Report provide an action plan for how government agencies and actors may bring additional burdens to implementation and management. The communications infrastructure move forward electrified transportation in Nevada, leveraging legislation and programming in place presents as-yet-unresolved issues of cybersecurity, data management, and data governance. to date and overcoming the challenges described above.





# AN ACTION PLAN FOR NEVADA



28



To transform Nevada's transportation sector away from a gasoline-fueled ICE regime, this Report recommends over forty action items to further sixteen objectives that electrify

#### FIVE TRANSPORTATION GOALS

- Transportation electrification policy leadership and support
- Regional connectivity and mobility solutions
- Multimodal transportation options for reduced congestion and livable communities
- Advanced and future transportation technology development
- Efficient movement of goods and services

The action items supporting the objectives address the policy gaps, funding shortfalls, and uncertainties inherent in the significant and often risky investments in transportation. This Report recognizes that governments and their officials act based on objectives and outcomes to achieve broad policy goals, and those goals tend to be technology-agnostic. The recommendations therefore group opportunities to promote electrified options by broader needs and objectives of Nevada's transportation plans and programming. In this way, readers can better understand how each specific action to promote electrified technologies fits within the transportation policy framework aimed at generally improving guality of life for Nevadans.

Although electrifying transportation fundamentally İS about transportation projects and decisions, these action items necessarily call upon the expertise and authority of numerous non-transportation government agencies. The

#### FIVE GOALS, SIXTEEN OBJECTIVES

#### Establish Leadership on Transportation Electrification

- (1) Set an express policy mandate
- (2) Create an authority to lead transportation electrification as a policy objective and outcome
- (3) Address the state funding shortfall for transportation resulting from the diminished fuel tax receipts

#### ×

- (4) Electrify public transit buses
- (5) Electrify school bus fleets
- (6) Optimize integration of all EV load into electric grid

### Electrify Multimodal Transportation for Reduced Congestion and Livable Communities

- (7) Use TNC taxes to support electrified micro-/on-demand transit
- (8) Create public charging infrastructure to support all vehicles
- (9) Support EV uptake as a personal vehicle option
- (10) Provide the rights of way and non-monetary support needed to place e-bikes and e-scooters as a local transportation option

#### **Electrify Regional Connectivity and Mobility**











reach of transportation electrification to energy, economic development, and environmental goals means that Nevada's transportation agencies cannot accomplish the mission on their own. The first objective, to establish leadership on transportation electrification, intends to set the stage for the massive and coordinated effort required across agency agendas and jurisdictions. Some agencies will need to consider opening their regulations to how the new technologies change existing regimes or oversight. Other government actors will need to embrace new and unprecedented funding mechanisms, or find synergistic programs at other agencies that could create funding efficiencies. Many of the action items involve collaborative studies and pilots meant to increase understanding of certain technologies as an incremental step towards investing in the right solution at the right time.

In the pages that follow, the Report sets forth the independent and coordinated actions for each strategy. Some steps and collaboration are necessary to realize the outcome, and other actions are suggested as opportunities to maximize the practical and economic potential of the technology. All are presented as falling within the relevant government agency's existing authority, except where noted. Appendix B, which lists the legal authority across various agencies that supports aspects of transportation electrification, also notes where amendments to that authority could further support the policy. Appendix D tabulates all actions by agency as a quick reference for suggested areas of responsibility.

#### Support Advanced, Electrified Transportation Technologies Development

- (12) Invest in ITS infrastructure

### Electrify Efficient Movement of Goods and Services

(11) Continue to test and develop ACES technology for local transportation options

(13) Invest in Complete Streets with a view of integrating advanced transportation options and electrified public transit

6

- (14) Electrify fleets providing ground services at the airports
- (15) Promote electrified long-distance freight and commercial operations fleets
- (16) Assess procurement options for medium- and heavy-duty vehicles in government fleets





# ✓ ESTABLISH LEADERSHIP ON TRANSPORTATION ELECTRIFICATION

The Legislature and Governor can elevate transportation electrification to a distinct policy objective as a natural evolution of Nevada's energy policy. That policy as expressed in NRS section 701.010 recognizes and endorses the need to develop markets - including transportation load - for its developing renewable energy resources sector. The potential for growth of electrified transportation already exists in Nevada's commitment as early as 2011 to ACES technologies, its relatively modern electric grid, and its proximity to California's burgeoning EV market. Setting forth an express policy of transportation electrification will signal market participants and federal programs to invest money in researching and developing electrified and advanced transportation technologies on the streets and highways of Nevada.

Many of the recommendations in this report call on the Nevada Legislature and Governor to authorize various forms of government action to facilitate the growth of electric and advanced transportation solutions, and a clear statement of a transportation electrification policy could be set forth in any such legislation or executive order. For example, a statement of policy may be incorporated into legislation establishing leadership of the policy within a specified government agency. Alternatively, Nevada may consider setting a mobile sources emissions target. Across the country, states are recognizing that transportation emissions have overtaken electric generators as the foremost threat to air quality. Nine states have joined together in a Zero-Emission Vehicle (ZEV) Action Plan. Several more - including Colorado, one of Nevada's partners in creating regional electric vehicle corridors - have adopted low emission vehicle standards to complement existing national standards. Nevada could take action in a different way, by setting forth a target for vehicle emissions reduction that creates opportunities for putting more electrified, cleaner vehicles on the road without creating an expensive mandate.

Importantly, transportation electrification is more than the sum of its parts, furthering Nevada's various goals related to economic development, the environment, energy, and transportation. NDOT has acknowledged the shift in transportation energy and that emerging transportation technologies compel it to rethink its role as an agency. Even so, the many factors influencing transportation electrification may stretch any one government agency — including those focused on transportation — beyond the scope of its authority and capabilities, or compete for priority with existing programming. The GOE could lead the many agencies and commercial actors involved in moving transportation electrification forward, if given the right resources and authority to oversee properly-constituted and collaborative committees or task forces. Alternatively, a transportation electrification joint program office, or TE-JPO, could be created within an agency or combined agencies that already have the resources to support it. The parent agency could be an expanded GOE, or perhaps a newly-constituted Governor's Office of Economic Development, Innovation, and Energy (GO-EDIE) that recombines much of the funding and expertise of GOED, GOE, and OSIT. The overlapping missions of economic diversity, energy, and improved communications infrastructure and innovation would realize substantial synergies



and efficiencies from shared staff and other resources, which would also beneficially assist the multiple government actors that must collaborate on transportation electrification.

Funding transportation electrification will rely in large part on the solution to funding the overall transportation funding shortfall. Increased fuel efficiency of all vehicles means much less revenue from the gas taxes that all states and the federal transportation authorities rely upon to maintain the transportation system. Nevada must consider near- and long-term solutions to the funding gap for all transportation system users left by its own diminishing gas tax revenues. Eventually, Nevada and the nation will need to adopt a more comprehensive solution for funding that collects from all transportation technologies on the roads and their users.

Oregon Department of Transportation leads the western states in piloting road user charges. It estimates that by replacing the gas tax with a usage fee, a fuel-efficient Prius would ultimately contribute \$100 more to the transportation system, but also save about \$700 in fuel costs against a less fuel-efficient Ford F-150 driving the same number of miles and thereby contributing the same amount of money to the roads.

Usage fees based on vehicle miles traveled, rather than gas taxes, have gained traction in many states and nationally as a fairer way to fund maintenance and modernization of the transportation system. NDOT had previously studied user-based fees and participates in the ongoing conversation hosted by the Road Use Charging (RUC) West consortium, but Nevada might also consider working with academic and industry partners on federally-funded, mileage-based usage fee pilot for the region. As an interim measure, charging a modest fee at registration to the growing population of EV owners would accomplish the fairness inherent in their contributing to the roads they share.

#### **1. Set express policy mandate.**

 $(\mathbf{?})$ 

(\$)

**WHO:** Legislature, Governor, NDEP, Clark County DAQ, Washoe County Health Department

FUNDING: Operational budgets and federal CMAQ grants for designing and implementing a mobile sources emissions target action plan

1a. Set forth a policy of transportation electrification in legislation and executive orders authorizing government actions to further it. Both the Legislature and Governor can embrace transportation electrification as its own distinct policy, recognizing how it furthers development of Nevada's abundant renewable energy to enhance energy independence, clean air, and economic development. A statement of policy would be best placed in establishing leadership within a specific agency or setting a mobile source emissions reduction target.

1b. Create a mobile sources emissions reduction target. Should the Governor or Legislature seek ways to further transportation electrification, establishing a mobile sources emissions reduction target avoids the expense of a mandate. In addition, a voluntary mobile source emissions reduction plan as part of the state air quality plan may receive federal Clean Air Act compliance credit. It also extends naturally from existing voluntary measures to maintain air quality compliance, including the quadrennial Greenhouse Gas Emissions Inventory (a baseline) and Clark and Washoe counties' enrollment in the U.S. EPA's Ozone Advance Program. With legislative or gubernatorial direction, the air quality agencies could craft regulations and design and implement an action plan to meet the target.

"[A] publicly visible, long-term commitment to deploy [EVs]—or complementary climate commitments with PEV components . . . provide a strong signal to automakers, utilities, investors, and consumers, providing the certainty necessary to attract investment and grow the [EV] market."

– NASEO/Cadmus (2018)

#### 2. Create an authority to lead transportation electrification as a policy objective and outcome.



\$

WHO: Legislature, Governor

**FUNDING:** Fund efficiencies gained by combining the operational budgets of GOED, GOE, and OSIT; Renewable Energy Account funds received by GOE; federal transportation allocations to Nevada and competitive U.S. DOT, U.S. DOE, and U.S. EPA grants for specific transportation projects that can incorporate electrified or advanced technologies









2a. Establish and authorize an office to coordinate crossjurisdictional actions. A joint program office with its own staff dedicated to transportation electrification could support and coordinate the many agencies and political subdivisions involved in the issue. The staff would be housed under and possibly shared with a parent agency, but could support and take direction from an executive board. Board membership should sufficiently represent the missions and services of NDOT, the MPOs (both RTCs, TRPA, and CAMPO), DMV, NTA, GOE, PUC, GOED, OSIT, NDEP, Clark County DAQ, Washoe County Health District, county school districts, and cities and counties. Tasks and activities of a transportation electrification joint program office (TE-JPO) might include, without limitation, identifying funding, pilots, and research opportunities for the office and for the various member agencies; assisting member agencies with coordination and management of inter-agency projects; participating in national and regional conversations about relevant technical, safety, and other standards and regulations for emerging technologies; identifying state funds and non-monetary incentives available for investment in electrified and advanced transportation solutions; maintaining a current view on load growth and the availability and growth of in-state renewable energy resources; coordinating creation and amendment of regulations and oversight authority as needed to keep pace with technology; and supporting independent research projects as requested by the board and/or its member agencies. The TE-JPO might also establish and maintain Nevada's status within various federal programs of interest — for example, as a member of the Clean Cities Coalition eligible for certain Department of Energy support of new vehicle technologies.

TE-JPO staff may reside in an expanded GOE empowered to lead. The GOE might initiate the mission with a transportation

electrification task force authorized by the Governor. Another option that could provide much needed synergies and resources for the effort would be to combine budgets and staff of GOE, GOED, and OSIT. Their missions of energy sector development, economic development, and increasing broadband and innovation in the State all converge in transportation electrification. Thus, their resources and missions are mutually reinforced in staff dedicated to the tasks outlined above.

The Surface Transportation Alternative Funding Program set aside \$95 million for pilots to demonstrate user-based alternative revenue mechanisms for the Highway Trust Fund.

#### **3. Address the state funding shortfall for** transportation resulting from the diminished fuel tax receipts.



\$

WHO: Legislature, Governor, DMV, NDOT, MPOs (the RTCs, TRPA, and CAMPO), GOE, TE-JPO

**FUNDING:** Federal Surface Transportation Funding Alternatives Program, matched with in-kind contributions from state agencies

3a. Participate in a regional mileage-based user fee pilot. Finding a way for all users and all technologies to contribute towards maintaining the transportation system across the country has national support. Federal funding remains through 2020 for a

study that includes and coordinates western states surrounding a major interstate corridor. The study would work with willing participating drivers of all vehicle types to test one or more technologies that track miles traveled and calculate and allocate usage fees. A TE-JPO could support the pilot by pursuing federal funds and coordinating collaboration led by NDOT and including the MPOs and the DMV. The Regional Electric Vehicle (REV) West Plan co-chaired by the GOE, or the RUC West consortium, might be relied upon as an effective means to enjoin other states' participation. The TE-JPO could also support educating the public of the need for alternative funding mechanisms for the transportation system and how vehicle miles traveled (VMT) systems work in lieu of a gas tax. Lessons learned from the pilot would inform a new legal and regulatory regime that collects state transportation dollars through VMT technology.

**3b.** Authorize and impose a modest increase in registration and renewal fees for EVs. Nevada is currently home to only a small number of EVs, but that number is expected to grow fast in the coming few years. A modest fee at the time of vehicle registration could help compensate for the gas tax that EVs do not pay but that is needed to support the roads that all vehicles rely upon. This fee might include a sunset provision that coincides with state adoption of a mileage-based user fee or other gas-tax alternative to fund transportation needs.

Colorado EV owners pay an additional \$50 in annual registration fees to support both EV charging infrastructure and the state's general fund for road and transportation projects.





# ELECTRIFY REGIONAL MOBILITY AND CONNECTIVITY

Regional mobility and connectivity is about public transit. In Nevada that means buses, and electrified public transportation and school bus fleets present significant electricity demand. Electric buses when compared to conventional technologies reduce emissions and urban noise levels, and could decrease total cost of ownership. In addition, the heavy duty batteries inside electric buses present both challenges and opportunities for operation of the electricity grid, including the potential to lower the overall cost of operating the electric grid on behalf of all customer rate classes.

"Falling battery prices will make e-buses fully cost competitive on a [total cost of ownership] basis in almost all configurations within 2-3 years."

- Bloomberg New Energy Finance, Electric Buses in Cities (2018)

Nevada can tap into resources already available to electrify this transportation goal. The MPOs and the school districts could access federal grants to initiate cost-benefit studies, pilot relevant technologies on Nevada's roads and highways, and continue to test new vehicle features and value-added use cases of the bus batteries as they emerge. With direction from the Legislature and Governor and also stakeholder interest, the PUC can tackle the issues around integrating and optimizing the bus fleets with electric utility operations and costs.

As an initial matter, bus fleet operators for both public transit

applications and the school districts must perform a cost-benefits analysis of the purchase price, fuel, and lifetime maintenance costs and savings of e-buses. Each bus fleet and the conditions in which it operates is unique, and thus requires its own economic analysis as to the viability of and the timing of transitioning to the new technology. Any such analysis should consider grants available to assist with the vehicle purchase and also expenditures required to transition from one type of fueling equipment to another. Any benefits identified must be proven for each fleet by testing a limited number of buses to show viability for specific routes on both northern Nevada hills in wintertime and in the summer Nevada heat — and also gather hard data on the electricity demand and charging patterns of the buses. Bus electrification in Nevada has already begun with public transit, specifically electrification of transit buses used by RTC Washoe.

Pacific Gas & Electric predicts that its proposed subscription rate plan for commercial EV chargers could save a transit agency up to 34% on charging expenses.

An additional benefit of e-buses is the opportunity it offers for reducing the average cost of electric grid operations for ratepayers. To advance this benefit, the GOE or the bus fleet owners could petition the PUC to initiate an investigation followed by a rulemaking, or the Legislature or Governor could direct that action. This opportunity and its benefits are even larger than simple time-of-use charging currently available to certain Nevada EV owners and operators. Transit bus fleet electricity demand is typically large and greatest overnight, using excess generation

capacity in a manner that could decrease the cost to maintain that capacity. School buses have short-range, definitive schedules that may enable charging or feeding into the grid at prearranged times, which offers a mechanism to the utility for managing and shaping load throughout the day. School buses might also be available as mobile capacity for grid outages or emergency response situations, or for critical infrastructure in distress.

Relying on appropriate studies focused specifically on e-bus charging, a PUC public process would seek to understand and incorporate the bus batteries' value as electric grid equipment into the regulations governing the rate that the buses pay for their electricity demand. The PUC might ultimately approve distinct rate classes, or distinct electric tariffs submitted by the electric utility, for either or both public transit and school buses that reflects the "value of transit (VOT)" or the "value of school buses (VOSB)" – i.e., the balancing of fleet demand with use of the fleet as a grid asset. Alternatively, the process could result in regulations generally applicable to heavy duty vehicle batteries, with a commercial vehicle rate class and tariff.

As e-bus fleets grow throughout Nevada, fleet operators should consider how to increase the return on investment beyond more or longer routes. For example, public transit operators and motor coaches bringing tourists in from out of town might jointly invest in and share charging infrastructure. Platooning technology could evolve for e-buses running on dedicated center lanes to create a multi-car mass transit option akin to light rail but at a lower cost. Third parties or the electric utility might consider owning the school e-bus batteries, apart from school district 34



ownership of rest of the bus, formalizing use of the batteries as non-stationary storage for the grid while defraying the total cost of the buses for the school district. Electric school buses may also offer the opportunity to pilot and demonstrate autonomous technology for safety and other features. In addition, e-bus batteries may have a second life that offer economic potential on the asset after its full depreciation.

Platooning involves the use of vehicle-to-vehicle communications and sensors, such as cameras and radar, to virtually connect two or more trucks together in a convoy. The virtual link enables all of the vehicles in the platoon to communicate with each other, allowing them to automatically accelerate together, brake together, and enables them to follow each other at a closer distance than is typically possible with unlinked trucks.

– U.S. DOE EERE

While the PUC currently has process in place to consider how ebus electricity demand might dramatically accelerate the coming transportation electric load, legislative or gubernatorial direction could help prioritize the engagement of resources on this issue. The State's largest electric utility incorporates transportation load projections in its distributed resource plan and integrated resource plan, but those projections may not yet account for the unexpected acceleration of EV uptake that has already occurred nationally. Legislative or gubernatorial direction to the PUC to study the question of growing transportation load would prompt initiation of a forum in which all stakeholders can work together to better understand when EV demand on Nevada's electricity grid will hit an inflection point. An investigatory docket under this direction may also be the opportunity for the utility and stakeholders to consider non-stationary storage as a component of storage technologies used in grid operations, and also the electric utility's role in owning and operating charging infrastructure.

UBS, a Swiss bank, is predicting that electric vehicles will represent 14% of global car sales by 2025, adjusted from its estimate of just 1% in 2017.

#### 4. Electrify public transit buses.



(\$)

WHO: Legislature, Governor, MPOs (RTCs, TRPA, and CAMPO), PUC, UNR CAR, NCAM, TE-JPO

**FUNDING:** Federal transportation allocations to Nevada under NHPP, STBG, CMAQ; federal loans under TIFIA; rebates under EPA's Clean Diesel Program (DERA); competitive grants for studies and pilots through TIDP, Advanced Transportation and Congestion Management Technologies Deployment Program, ITS JPO, BUILD, and EERE; public private partnerships for infrastructure and for non-transit applications using the vehicle batteries

4a. Perform a cost-benefits study comparing fuel and maintenance costs of electric buses and currently-in-use technology. RTC Southern Nevada will need to do an initial analysis of using ebuses on its routes, incorporating a comparison of e-bus total cost of ownership with that of the compressed natural gas buses it currently uses; RTC Washoe has already proven the viability and value proposition of using EVs on its routes with its investment in 21 e-buses through 2018.

4b. Pilot service routes to demonstrate bus range and viability and provide data on charging and usage patterns. RTC Southern Nevada could test electric buses on the Strip or on any one or more of its bus rapid transit corridors. RTC Washoe has demonstrated its e- buses can handle both local and regional routes, and a grant from the GOE is assisting it with understanding how energy storage might lower the costs of charging under the current applicable electric tariff. That data, and perhaps additional advanced monitoring and data analytics capabilities, might also be applied to study and assess the value of utilitymanaged charging and how it could further reduce electricity charges under a redesigned electric tariff.

The RTC Washoe capital plan for its new buses predicted that 13 e-buses would save an estimated \$10M in fuel and maintenance over 12 years, with an estimated \$12.5M total cost for those buses plus charging facilities. - RTC Washoe (2015). These savings reduce the purchase price per bus to less than \$200,000, representing a decrease of nearly \$100,000 per bus against the average cost of a conventional diesel bus.

4c. Investigate and create regulations for Value of Transit. Upon legislative or gubernatorial direction, or a petition from an interested stakeholder, the PUC could initiate an investigation of an appropriate rate class and electric tariff considerations for transit e-buses. Investigation results may prompt the Legislature to consider requesting PUC regulations for an economic development tariff that applies to transit e-buses. With appropriate direction, the PUC would follow with a rulemaking





to create regulations for a "VOT" that would factor into tariffs applicable to transit e-buses.

4d. Use e-bus technology on the ground to test evolving applications and additional value propositions. The MPOs could test additional routes and applications for their e-bus fleets, perhaps with studies and funding support from the TE-JPO. For example, high traffic corridors such as the Strip, Boulder Highway, and Sahara Avenue or Charleston Boulevard in southern Nevada, and regional connections in the Reno-Sparks-Carson City area in northern Nevada, offer test beds for e-bus rapid transit in dedicated, center-running lanes. The Strip already has center lane real estate potentially convertible to a dedicated lane, where on-/off-boarding passengers can connect to existing, overhead walkways to safely travel to either side of Las Vegas Boulevard. The MPOs might also explore the possibility of publicprivate partnerships to invest in infrastructure, gather data, and test emerging connected and autonomous features. Pairing the heavy-duty charging stations with solar canopies and storage as a microgrid pilot could offer additional cost savings and be supported in part by federal funds. In addition, the bus batteries may be evaluated for "second-life" use in emergency response and other applications when no longer efficient for the buses.

#### 5. Electrify school buses.



(\$)

WHO: Legislature, Governor, school districts, PUC, TE-JPO, NDOE

FUNDING: Federal transportation allocations to Nevada under STBG, CMAQ; federal loans under TIFIA; federal rebates under EPA's Clean School Bus Program

(DERA); competitive grants for studies and pilots through TIDP, Advanced Transportation and Congestion Management Technologies Deployment Program, ITS JPO, BUILD, and EERE; public private partnerships for investment in vehicle batteries and infrastructure.

5a. Access federal funding available to test electric school **buses.** School districts are eligible to participate in pilots to study bus range and maintenance, and also charging cycles that benefit load management on the electricity grid. A TE-JPO could support the school districts in accessing the resources needed for these pilots. Alternatively, the State's major electric utility might include a battery pilot in its annual plan to explore how it could use the school bus batteries as electricity grid equipment. In addition school districts could petition for, or the Legislature or Governor could direct, a PUC investigatory docket exploring the "Value of School Bus" as discussed below.

"Clark County School district has the second largest bus fleet in the nation: 1,698 buses travel 23M miles annually across the Las Vegas Valley."

**5b.** Investigate and create regulations for Value of School Bus. Upon legislative or gubernatorial direction, or a stakeholder petition, the PUC could open an investigation of an appropriate rate class and electric tariff considerations for school e-buses. The Legislature's continued consideration of storage targets for the electricity grid, based on 2017 legislation, might prompt the Legislature to additionally direct the PUC to investigate a nonstationary storage target. Such a target would increase the bus battery value as compliance credits. The investigation might also explore how the tariff could incorporate low-cost federal

– McMahon (2017)

hydropower allocations to the extent a school district receives one. Lessons learned from the school districts and the electric utility jointly assessing scheduled and managed charging in a school ebus battery pilot would be used in a follow-on PUC rulemaking, as directed or requested, to create regulations for a "VOSB" that would factor into the tariffs applicable to school e-buses.

"Agencies and school districts can also use vehicle-togrid technology to offset the costs of electric buses. This is particularly valuable for school buses. When equipped with vehicle-to-grid technology, electric buses can use their batteries for energy storage, providing a service to the grid by reserving and selling electricity back at times of high demand."

– U.S. Public Interest Research Group (2018)

**5c. Explore alternative ownership models that could support** school bus fleet conversion. The school districts could perform a cost-benefit analysis of converting to e-buses, perhaps with support from the GOE or by extension the TE-JPO. The study should include assessing ownership models where the utility or other third party owns the batteries and/or charging infrastructure. Bus batteries may also be valuable to city and county emergency management and response: during an inclement weather or crisis situation the buses could act as additional energy supply to critical infrastructure such as hospitals, police stations, fire stations, and even the schools they serve. Bus batteries may also have a second life that offer economic potential on the asset after its full depreciation.

5d. Continuously pilot new autonomous technology safety features as developed and available. Once the school districts own and










operate school buses, they could use the fleet vehicles as test beds, under appropriate conditions, for autonomous technology safety features as they emerge. The vehicles might also further public acceptance of autonomous vehicle features by demonstrating the safety and viability of those features once proven.

"In Nevada, there are approximately 181,000 kids who ride school buses to over 17 school districts, which serve more than 473,000, over half of whom are Latino or black. With so many children exposed to pollution, more than 1 in 12 kids suffer from asthma."

- Chispa Nevada

### 6. Optimize integration of all EV load into electric grid.

**WHO:** Legislature, PUC, TE-JPO



FUNDING: Operational budget of PUC for recurring dockets; Renewable Energy Account funds administered by GOE for studies

6a. Incorporate updated transportation load projections into utility **planning dockets.** The Legislature or Governor can direct the PUC to oversee an investigation into growing transportation load. In a separate docket or perhaps within existing resource planning dockets, the utility may be charged to better define EV uptake and its effects on electric demand in Nevada. Monetary and staff support from the TE-JPO for studies could help the investigation with expert projections as to how quickly the coming new model availability will accelerate EV adoption in the State.

## "EVs use approximately 2,700–3,300 kWh per year." - EPRI (2018)

That means that if 100,000 EVs simultaneously charge 8 hours overnight, the electric grid would need more than 100 MW of capacity available to serve only that load.

Any such investigation and related studies would additionally inform a state-wide assessment of charging infrastructure needs, discussed in a strategy recommended below.

**6b.** Model the integration of this variable load and define rights of ownership and operation. Non-stationary storage offered by vehicles is new to grid operations. The utility will need to update is existing operational and load-resource planning models to reflect this this equipment. With a stakeholder request, perhaps from the GOE, the PUC could oversee a stakeholder conversation about the utility's modeling of this growing and important electricity demand and also the utility's role in the competitive arena of charging infrastructure. This conversation conceivably fits within the existing integrated resource planning process or within the utility's periodic rate cases.

According to an article by the Fraunhofer Institute for Systems and Innovation Research, the electric grid can integrate up to 30% more excess renewable electricity by coordinating EV charging and demand response as a means of load shifting.

– Gnann (2018)





LAKE TAHOE NEVADA STATE PARK



## ELECTRIFY MULTIMODAL TRANSPORTATION FOR REDUCED CONGESTION AND LIVABLE COMMUNITIES

On-demand and micro-transit by both public and private providers is likely to grow and has already become significant enough to be considered as an opportunity for transportation electrification. NDOT and the RTCs already provide non-fixed route and on-demand travel to select customer bases, including paratransit services in urban and rural areas, and fixed-route deviations for the elderly and mobility-challenged in rural service territories. As commercial operators come on the scene - such as the major ride-hailing companies (TNCs), bike share operators, and others – the question becomes how to make these transportation options electric.

The interplay between fixed-route public transit and the customized, on-demand travel now being offered by private operators is a debate around a complex set of issues and beyond the scope of this Report. Nonetheless, customers have embraced the ride-hailing and bike share as a convenience or to complement public transit services. Significantly, the major providers or these services are pledging to "go electric."

The city of Centennial, Colorado subsidized ridehailing services to and from the local light rail station and found it to be a cost-effective way of increasing transit and rail ridership.

To electrify multimodal transportation, the Legislature or Governor will need to mandate a state-wide charging needs

assessment to evaluate numbers and siting needs for a sufficient charging network. The prime factor in electrifying ondemand and micro-transit transportation is availability of public charging infrastructure. Networked cars operating continuously for many hours require access to public charging, often multiple times a day and at different locations. Without access to wellplaced fast and reliable chargers, the time burdens of charging will undermine the operational and commercial viability of the networked fleets. NDOT would be an ideal choice to lead this assessment in a public process in which all government entities and commercial actors that influence the placement and use of charging infrastructure participate.

Uber, the ride hailing company, has announced its EV Champions Initiative to encourage EV adoption by its drivers and promote public charging infrastructure.

To enhance microtransit offerings, the RTC Southern Nevada is currently experimenting with private partners to reduce the cost of its paratransit services and to reach employment centers not well-connected to public transit.

An initial public charging infrastructure assessment would both prepare for and induce the coming electricity demand, and a requirement of reassessment every two to three years would ensure the network is responsive to current demand. Ideally, any such mandate would direct that all public charging infrastructure be enabled to communicate with the utility, i.e., "managed," and be installed by certified electricians. Mandating managed charging stations is critical to enabling the utility to integrate the variable demand into its distribution grid load management by isolating charging stations as needed, or through pricing signals that discourage charging or encourage feeding into the grid to help shape load.

Lyft estimates it will provide over 1 billion rides in autonomous vehicles fueled entirely by renewable energy by 2025.

Additional and important questions to be addressed in the charging needs assessment would need to be addressed in a PUC public process. These issues include the need and mechanisms for standardizing communications protocols, data exchange with the utility, and payment processing systems across different charging infrastructure makes and models; the possibility of aggregating charging stations under common control for purposes of supply purchasing and demand response actions; appropriate electric tariffs for the energy supplied to the charging stations, including green tariffs that link energy supplied at the charging station to renewable sources of energy; and what incentives monetary and non-monetary — could be provided to encourage installation of charging stations. The best arms of government



to fulfill this mandate would be a combination of NDOT and the PUC hosting the open proceedings to answer these questions, with participation by all government entities that influence the placement and use of charging infrastructure. Again, government and non-government stakeholders would need to participate to ensure successful outcomes.

While a public charging needs assessment sets a baseline for an infrastructure network, it also raises the question of funding to build it. The TNCs are likely to be the most immediate and significant users of the network. These entities are already subject to a specific taxation regime in Nevada for the privilege of operating in the State, and that regime could be re-envisioned to tie those operations to the business needs and externalities they create. Restructuring the tax so that the distributions both fund charging infrastructure and the public transit that the services complement could be a winning strategy for all of the public and private service providers and customers, as well.

Finally, government actors can make it easier for individuals to choose electrified transport over ICE technologies by raising awareness and facilitating making the option available. Public education should be a multi-pronged approach providing information and also non-monetary incentives that increase individual perception around making the choice to go electric. For example, electric tariffs setting the "fuel cost" for EVs is an important element of the decision to adopt an EV. With a petition from a stakeholder or legislative or gubernatorial direction, the PUC could explore the possibility of home vehicle charging submetering in an investigation and/or rulemaking. Also, making non-automobile options available is an important element of an electrified multimodal transportation system. Bike share programs have proven popular. Electric bikes and scooters

are predicted to become a crowd-pleasing micro-transit option, and could boost electricity demand. Eventually, e-bike and escooter share programs, once on the ground, could grow into a recognizable element of distribution grid load.

## 7. Use TNC taxes to support electrified micro-/on-demand transit.

(?)

WHO: Legislature, DMV, NDOT, the MPOs (RTCs, TRPA, and CAMPO), cities and counties, TE-JPO



**FUNDING:** Operational budgets of DMV, NDOT, MPOs, cities and counties, TE-JPO

## 7a. Initiate a regulatory process to shape Nevada's tax on TNCs to support its public charging needs and reflect its role in the

transportation system. Policy makers are already rethinking the taxation regime that currently governs operations of networked transportation providers such as Uber and Lyft in Nevada. The Legislature may direct the DMV to initiate a rulemaking to revise existing regulations implementing the networked vehicle taxation laws. A robust taxation regime creates a nexus between the business operations being taxed and distribution of tax revenues to address externalities raised by those operations. With participation by NDOT, the MPOs, cities and counties, the commercial entities involved, and the TE-JPO to support, the revised tax regulations could reflect the right balance to address networked vehicle costs and benefits to the public. For example, revenue collections could incorporate a congestion "surcharge,"

perhaps tied to the choice of ride hail over a public transit option available on the same route, and distribute the collections to public transit operators for the lost ridership; in exchange, some tax revenues could also be set aside specifically for investment in a convenient and accessible, public fast-charging network. Perhaps some tax revenues could subsidize an incentive discount for ride-hailing/sharing customers willing to wait longer for an EV over an ICE vehicle. The regulatory process could also consider requiring the software technology for ride-sharing/hailing and mobility as a service to incorporate dynamic taxation, which would price the tax by taking account of transportation system circumstances such as relative congestion at the time of using the platform.

7b. Create a flexible TNC taxation regime. Legislative direction regarding the TNC tax regulations should additionally incorporate a requirement that new regulations include a mechanism for adjusting collections and distributions over time. Periodic changes to collections and distributions will best serve the evolving needs of and synergies between public transit and complementary micro-/on-demand transit. Any such requirement should also direct that the mechanism for regulatory updates appropriately socialize the decision-making process among the relevant transportation authorities to avoid imbalanced prioritization of any one set of needs or preferences.

"[T]racked PEVs in the Maven program (a PEV rental fleet for Uber and Lyft owned by General Motors) [] found that each vehicle drives an average of 180 miles and uses about 50kWh of electricity per day."

– Jenn (2018)







### 8. Create public charging infrastructure to support all vehicles.

WHO: Legislature, Governor, PUC, NDOT, MPOs (RTCs, TRPA, and CAMPO), cities and counties, TE-JPO, GOE, UNR-CAR, NCAM

(\$)

(?)

**FUNDING:** Operational budgets to run or participate in regulatory dockets; Renewable Energy Account funds administered by GOE for supporting studies

8a. Initiate a public regulatory process to conduct a state-wide charging needs assessment. While charging stations are, alone, a commercial enterprise, a well-conceived public charging network that meets the needs of current and projected EV adoption by individuals and TNCs is a public good. Sufficient, well-placed infrastructure starts with a comprehensive, on-the-record proceeding to assess and optimize the amount, siting, and type of charging equipment to be installed. Either the Legislature or Governor could direct the agency with the capabilities to host this public process — most likely NDOT — to lead the inquiry. The assessment should also cover the need for make-ready electrical equipment, and supporting hardware and software for open and standardized communications protocols and payment processing systems across different charging infrastructure makes and models. The assessment would necessarily consider all vehicle categories, road and highway, urban and rural areas, off-road electrification, and airport and freight truck electrification. In order to be a credible baseline for use by both public and private entities making charging infrastructure investment decisions, the proceeding should include active participation by the PUC, MPOs, counties and cities, the TE-JPO, utilities, commercial transit providers, charging infrastructure

companies, environmental groups, automobile manufacturers, and stakeholders in the efforts to electrify long-haul freight. The PUC proceeding described in the following paragraph would also be a necessary source of information for a comprehensive and valid assessment.

The UK's Automated and Electric Vehicles Act 2018 requires public EV charging to be "smart" so that it can be controlled through the cloud to adjust charge and discharge rates for the benefit of grid operations.

8b. Create regulations governing technical aspects and tariffs for the public charging infrastructure network. With the expected growth in installed charging infrastructure, now is the time to address the technical aspects of connecting that infrastructure to the electricity grid. The Legislature could direct the PUC to both investigate and craft regulations to resolve technical questions related to the electric utility's ability to interact with and manage the charging stations. At minimum, the process should cover the communications and data exchange protocols internalized by the chargers for the purpose of data flowing to and from the utility, which will also be of interest to EV equipment manufacturers. The process could also consider the possibilities of aggregating charging stations, how to link them to renewable energy supply, and how to encourage installations. The process may support a PUC recommendation to the Legislature to extend or augment the existing \$15 million EV Demonstration Program that provides incentives to invest in charging infrastructure.

8c. Conduct targeted data gathering to support the public proceedings. To support and inform the charging needs assessment and investigation of technical requirements for charging infrastructure, the TE-JPO could sponsor in-state studies on charging habits. TE-JPO staff could also look for lessons from other states that are performing infrastructure needs assessments or otherwise gathering their own data on who is charging and when. The TE-JPO might also research whether any local permitting or interconnection rules could be eased to speed the charging station installation process; how incentives could be shaped to ensure that stations are sited so as to be accessible and convenient for TNC vehicles; and ways to directly link the energy supplied at charging stations to in-state renewable resource development, perhaps through renewable energy credits or creative structuring of tax abatements.

8d. Revisit the public charging needs assessment every two to three years. Over time, as the public charging infrastructure network evolves and reliance on the same increases, various additional questions will arise as to how to enable the next generation of infrastructure. These questions include how to evolve the engineering and siting of infrastructure to accommodate autonomous vehicles; opportunities for publicprivate partnerships for charging infrastructure investment; and the potential for using the charging infrastructure as mechanism for peer-to-peer energy resales on the distribution grid. Researchers at UNR-CAM and NCAM and their private partners could be engaged to answer these questions.

The City of Las Vegas's Downtown Circulator is another example of a public microtransit service in that it provides regular, fixed-route shuttle service within a relatively small area that connects with, but is not covered by, other public transit options.





### 9. Support EV uptake as a personal vehicle option.



WHO: Legislature, Governor, PUC, TE-JPO, state and local government authorities over building and development codes



**FUNDING:** Operational budgets of TE-JPO, PUC, state and local government departments

9a. Create a website and social media campaign on the benefits of purchasing an EV. Industry uniformly reports that education on the benefits of EVs is an important but much overlooked aspect of encouraging technology adoption.

"Percentage of US consumers that identify themselves at each purchase funnel stage:

Awareness, 96% | Familiarity, 50% | Consideration, 29% | Purchase, 4%"

– McKinsey (2017)

Nevada has already authorized EV Demonstration Program funds administered by the State's main electric utility to support education, which could be done with a well-designed website. Website information should include but not be limited to total cost of ownership calculations that incorporate federal and state monetary incentives to the extent available; fuel and maintenance savings; vehicle ranges and other capabilities; location of charging stations throughout the state; electric tariffs available for EV charging at home; and any existing non-monetary incentives such as dedicated lane access on the

freeways or free parking offered by local jurisdictions. With appropriate support from equipment makers, the website host could also plan and execute periodic "ride and drives" or other awareness-raising events.

New EV sales in Nevada in 2017 were up by 74% compared to 2016. But Nevada still lags the nation in new EV sales – 0.87% compared to 1.3% nationwide according to GlobalAutomakers.

**9b. Explore submetering of EV home charging systems.** Nevada's major utility already offers an electric service time-of-use rate designed for EV owners' charging needs, but does not separately meter the energy consumed specifically by the vehicle. Upon direction by the Legislature or Governor, or petition by an docket and pilot. Most charging equipment has or can be much home energy consumption is directed to vehicle charging,

interested party, the PUC could investigate technical, cost, and security issues related to submetering with an investigatory retrofitted with revenue-grade submeters that would inform how which could increase awareness of the EV value proposition over an ICE vehicle. Moreover, with this information the PUC could apply the lessons learned from any pilot to regulations for an electric utility residential tariff designed to apply exclusively to vehicle charging demand.

**9c.** Update building and development codes to accommodate **EV charging stations.** Advocacy groups in Nevada such as the Southwest Energy Efficiency Project and Nevada Electric Vehicle Coalition currently offer support for EVs and EV charging infrastructure with programs to help government update building codes. These efforts could be expanded under GOE leadership or perhaps with support of the TE-JPO, which could also support any necessary, preliminary studies on particularly challenging issues such as how to count EV charging spots towards required numbers of parking spots for commercial establishments and how to site and manage charging in parking garages and lots for multi-unit dwellings. The review would support state, county, and city planning and public works departments to determine how their building and development codes may be updated. The desired outcome would be to remove barriers to or encourage charging infrastructure installations and also the distributed energy resources or storage to support them.

Chargepoint estimates that incorporating EV readiness requirements into building codes could yield a potential savings of between \$2,100 to \$5,325 for each charging spot in new construction over a later retrofit.

9d. Establish advisory support for the EV ecosystem. The GOE or the TE-JPO could increase public awareness of and access to EVs and EV charging infrastructure by offering advisory services to new entrants to the EV ecosystem. For example, resellers of conventional vehicles who have a growing supply of used EVs and need to understand better the customer benefits and any issues that may come with a pre-owned EV will need a resource to answer their questions. Likewise, the office could support employers or multi-unit dwelling owners who want to install charging infrastructure but who need advice on federal and state incentives or green building credits that may be available, how to construct and site the charging station, and how to meter and resell the electricity.









# 10. Provide the rights of way and non-monetary support needed to locate e-bikes and e-scooters as a local transportation option.



**WHO:** DMV, MPOs (the RTCs, TRPA, and CAMPO), cities and counties, TE-JPO

\$

**FUNDING:** Operational budgets for DMV, MPOs, cities and counties, TE-JPO

**10a. Support bike and scooter share programs and their conversion to electric devices.** As e-bike share and e-scooter share have evolved into dockless systems, local governments can enable the service by permitting it within their jurisdictional limits. In addition, because e-bikes and e-scooters present uncertainty as to whether they fall within moped or motorcycle regulations, local governments will need to work with the DMV and its regulatory process to determine appropriate regulations for those devices. Regulatory clarity should open the door to deployment. Dockless electric-powered devices also clear hurdles in that they do not require public investment to accommodate installations like the docked systems did. With uptake, e-bikes and e-scooters could become an important element of electrified multimodality.

**10b. Educate the public on how to use the e-bike and e-scooter shares.** Bike and scooter share users sometimes obstruct sidewalks and right of ways when relinquishing the devices upon completion of their trips. Cars and pedestrians are uncertain as to how to share the roads and sidewalks. A TE-JPO could support local governments with a public educational website and/or public service announcements on how to use the service while being conscious of the rights of other street and transportation users.

A local government may consider internalizing those rules into their codes and incorporating a minor fine or penalty for users caught improperly interfering with traffic or obstructing sidewalks.





## ✓ SUPPORT ADVANCED, ELECTRIFIED TRANSPORTATION TECHNOLOGIES DEVELOPMENT

This goal advocates direct support of advanced transportation technologies, in particular autonomous and connected vehicles, based on the assumption that these technologies are, or will be, overwhelmingly electric.

Nevada has led the way nationally by opening its streets and highways to testing autonomous vehicles and establishing the GOED's Nevada Center for Advanced Mobility to incubate advanced mobility solutions. Technology pilots by the MPOs and local governments on local streets, for example, to move people between residential and commercial areas, could offer the additional benefit of generating data on patterns of pedestrian and vehicular traffic. This data has independent value, as it informs land use and development trends, which in turn inform the goal of transit-oriented development uniformly expressed in all of Nevada's regional and local planning documents. These pilots also educate the public, increasing public acceptance of these technologies.

Furthering applications of autonomous and connected vehicles also requires formulating safety and technical standards to ensure adequate operational and consumer protections. It will be important for Nevada's transportation agencies to follow the

According to the Intelligent Transportation Society of America, ITS investments are eligible for nearly all federal transportation program allocations.

evolution of these standards nationally, and pilots of autonomous and connected vehicles on Nevada's streets and highways should as rule incorporate technology and safety standards as they develop on the national scene. This regulatory consistency with other states and nationally offers a form of non-monetary support to the AV ecosystem. Other non-monetary forms of support that Nevada could offer include balanced licensing burdens for testing and operating the technology, and workforce development within the State's education system for the new jobs the AV ecosystem will generate.

Related to but distinct from the AV ecosystem is the ITS infrastructure needed for all connected vehicle technologies. Indeed, ITS infrastructure supports autonomous and connected vehicles as well as many other advanced transportation solutions. NDOT and the RTCs have been investing in ITS technologies, through Southern Nevada's FAST and other applications throughout the state that some may now consider conventional, e.g., metering on highway on-and off-ramps and coordinated signaling of traffic lights. Smart technologies have continued to develop over the years to address safety, reliability, and travel demand management on the streets and highways, but evermore creative technologies are moving towards applications that address additional challenges in the areas of mobility, accessibility, and environmental concerns. These applications increasingly rely on connectivity: vehicle-to-vehicle (V2V) connectivity and vehicle-to-infrastructure (V2I) connectivity.



The RTC of Southern Nevada's Freeway and Arterial System of Transportation (FAST) operates nearly 650 cameras, 547 freeway flow detectors and 70 ramp meters that enable technicians to efficiently coordinate more than 1,350 connected traffic signals. This regional traffic management system also provides travel times, emergency notifications and safety messages through 120 dynamic message signs and 16 travel time signs.













Consequently, moving forward ITS solutions with more investment and studies by Nevada's transportation agencies means moving forward autonomous-connected vehicles.

As NDOT and the MPOs design transportation projects, they may tap into federal transportation funds increasingly available to ITS and related communications infrastructure. That communications infrastructure includes Distributed Short Range Communications and 5G cell phone technology, combined with edge computing devices. They offer the range and fast communication speeds needed to communicate to vehicles in the seconds or meters in advance so that the vehicle can react in real time or on the spot to existing conditions. The RTCs and local governments have already begun to work with commercial providers to install this equipment: the City of Las Vegas's Connected Corridor is one example, and small technology in the City of Henderson is another.

ITS and related infrastructure raise their own set of challenges. The Center for Applied Research at UNR, and the cybersecurity community seeded by the military bases in Nevada, might offer resources to address some of these challenges. Connectivity with any car on the road requires harmonization of technical and communications protocols, and also data sharing protocols; presents challenges around cybersecurity of the devices, vehicles, and communications between them; raises personal privacy concerns; and presents the challenge of maximizing the potential of the data collected. In addition, advanced transportation and ITS require a properly-trained workforce, an issue that could be addressed by Nevada's universities and agencies involved in education.

Finally, Nevada's streets need to be made ready for this new transportation infrastructure. "Complete Streets" refers to

transportation policies – local, state, and federal – that seek to develop and retrofit streets to accommodate all forms of transportation and public right-of-way users. Complete Streets policies in Nevada that accommodate autonomous car and shuttle services and parking/charging needs — which also accommodate conventional and ICE-powered connected cars - will support the AV evolution. Planning documents by the transportation authorities and political subdivisions of the State have embraced Complete Streets as an essential policy for smart development. Because Complete Streets projects tend to satisfy the gamut of transportation goals, including mobility through multimodal transportation, efficiency, improved air quality, safety, and even ITS applications, the projects are eligible for most forms of federal funding. Additional funding might come through various forms of co-investment by private commercial developers that benefit from streetscapes inviting all forms of access along with foot traffic.

## **11. Continue to test and develop ACES** technology for local transportation options.

UNR-CAR, NCAM

 $(\mathbf{?})$ 

\$

**FUNDING:** Federal transportation allocations to Nevada under STBG, CMAQ; competitive grants for studies and pilots through TIDP, Advanced Transportation and Congestion Management Technologies Deployment Program, ITS JPO, BUILD, and Vehicle Technologies Office of the DOE's EERE; public private partnerships; university research grants; operations budget for TE-JPO

WHO: Legislature, NTA, MPOs (the RTCS, TRPA, and CAMPO), cities and counties, DMV, OSIT, NSHE, TE-JPO, **11a.** Advance autonomous technologies and their acceptance with more public pilots. Local governments in partnership with the MPOs or with a commercial provider should continue to test slow-moving autonomous shuttle services, as in downtown Las Vegas, in and around multiple local population centers. Shuttles serving high profile areas such as university and convention center campuses and popular shopping centers both further the technology and help raise public awareness and acceptance, as would permitting commercial interests with local delivery services to test autonomous delivery vehicles.

After 5,000 driverless rides in Las Vegas, 96% of Lyft/ Aptiv's autonomous ride-hail customers indicated they would use the service again.

**11b.** Use existing systems to develop and test autonomous technologies and identify technology challenges. Advanced transportation is currently generating an enormous amount of data. Bus, shuttle, and ride sharing and ride hailing services can collect and analyze the data their vehicles are generating to be used in applying autonomous technologies on the same routes. One way to address the uncertainty as to how to use this wealth of data could be to preserve it and make it available to data scientists willing to sift it. The MPOs could sponsor collection, housing, and analysis and use of the data in partnership with a multi-agency committee involving NDOT, DMV, OSIT, cities and counties, UNR-CAR, and NCAM. The committee could be coordinated and supported by the TE-JPO. A committee so composed should be well-equipped to address the technology challenges that will be presented by and identified from the testing of AVs, vehicle-to-vehicle communications, and vehicleto-infrastructure communications.







In the first autonomous bus program in the U.S., UNR-CAR's Living Labs is using RTC Washoe's Proterra e-buses to collect route data for application in autonomous safety features.

11c. Follow and adopt national standards for autonomous and connected technologies as they evolve. The DMV is currently following standards development for autonomous technologies. The TE-JPO could support the DMV within the same multiagency committee described above in following standards developments on the national front, including communications and data sharing protocols between vehicles and with static and dynamic infrastructure (such as street lights and temporary work zones). As NHTSA, FHWA, and other federal agencies develop and issue autonomous and connected technology, testing, and safety standards, this partnership would ensure those changes are internalized in any ongoing pilots or studies in Nevada and also reflected in relevant regulations as appropriate.

11d. Support the autonomous technology ecosystem. Nonmonetary incentives for commercial providers testing AV technologies in Nevada include regulatory consistency throughout the state, operating license relief, public education of viability and safety, and workforce training. The TE-JPO could support a review of state and local traffic laws for updates that may be needed to accommodate AV operations. The Legislature may also consider directing the NTA to enact some form of licensing fee relief for TNCs, taxis, limousines, and any other intra-city transportation services that are willing to test autonomous versions of their vehicles. In addition, the multiagency committee described above could collaborate on public education of the technology and also workforce training needs. For example, with the advice and consultation of OSIT's STEM

program and also NSHE, the committee could sponsor high school and higher education curricula that prepare students to be part of the workforce supporting these new technologies.

### **12. Invest in ITS infrastructure.**

 $(\mathbf{?})$ 

(\$)

WHO: NDOT, MPOs (RTCs, TPRA, CAMPO), counties and cities, UNR-CAR, NCAM, NDOE, NSHE, TE-JPO, OSIT

**FUNDING:** Federal transportation allocations to Nevada under NHPP, STBG, HSIP, CMAQ, NHFP, HRD; federal loans under TIFIA; competitive grants through TIDP, Advanced Transportation and Congestion Management Technologies Deployment Program, ITS JPO, BUILD, and EEMS Program of the DOE's EERE Vehicle Technologies Office; university research grants; operational budgets of relevant agencies

12a. Direct more transportation dollars to projects that invest in ITS. NDOT and the MPOs, as the primary architects of how Nevada spends its federal transportation allocation, could place increasing funding emphasis on projects that require communications equipment needed for vehicle-to-vehicle and vehicle-to-infrastructure connectivity. The TE-JPO could help identify competitive grant opportunities to support these installations. It could also explore the potential to monetize local government rights of way and unconventional real estate such as light poles, where sensors and edge computing devices needed for the fast communications could be installed. The MPOs and local governments, perhaps supported by the TE-JPO, should also become active in the conversation about assigning bandwidth to these communications devices, as currently the transportation industry is competing with media interests for the relevant spectrum that these devices would use.

A 2015 Intelligent Transportation Society of America study concluded that connected vehicle applications can result in \$178.8 billion in societal benefits annually if deployed across the entire U.S. vehicle fleet.

12b. Actively engage the ITS challenges. Connectivity with any car on the road requires harmonization of technical and communications protocols and also data sharing protocols; Nevada will need to follow the conversations about these standards that are taking place nationally and internationally. ITS also present particular challenges around cybersecurity of the devices, vehicles, and communications between them; of personal privacy; and of maximizing the potential for the data collected. TE-JPO could support a collaboration of UNR-CAR and the community of cybersecurity experts known to exist in Nevada to design projects to address these challenges in creative ways.

The ITS JPO Data Program sponsors the development of data management products that state and local governments can use to manage the big data emerging from the changing transportation environment. The Operational Data Environment is a real-time data acquisition and distribution software system that processes and routes data from connected vehicles, personal mobile devices, infrastructure sensors, and other sources as needed and distributes data to subscribers. The Public Data Hub is the public access point to U.S. DOT-funded ITS research data to support third-party research, evaluation, and application development.





The U.S. DOT sponsors an ITS Professional Capacity Building Program, an ambitious technology transfer effort to promote implementation of connected vehicle research by private industry and public transportation agencies.

12c. Train the workforce needed for advanced transportation.

ITS require a trained workforce with installation, hardware, and software expertise. The NDOE and NSHE could be key collaborators in translating some of the ITS learning into educational curricula. To further advance the learning and knowledge transfer around advanced transportation technologies, UNR-CAR, NCAM and/or the TE-JPO might also work with the public and private sources of data to anonymize and release the data streams. Sponsoring a data exchange could allow machine-to-machine exchange of sensor data accessible to data scientists, who could look for patterns in the data that suggest transportation system inefficiencies requiring solutions. The data scientist could potentially be incentivized through a competition format sponsored by the government or universities, the results of which would show the value of any such data when it is made generally available for access by multiple, selfidentified interests.

**13. Invest in Complete Streets with a view** of integrating advanced transportation options and electrified public transit.

 $(\mathbf{?})$ 

(\$)

counties, TE-JPO

**FUNDING:** Federal transportation allocations to Nevada under STBG and CMAQ; competitive grants under STBG set aside for Transportation Alternatives, Advanced Transportation and Congestion Management Technologies Deployment Program, and BUILD; operations budgets of MPOs, cities and counties, and TE-JPO; partnership with businesses within a business improvement district

**13a. Update Complete Streets Guidelines to accommodate** advanced transportation technologies and solutions. The MPOs and local governments have adopted Complete Streets policies, but will need to revisit them periodically to keep up with fastevolving transportation technologies. A regular review of policies and design guidelines written or as adopted by the MPOs and local governments could be assisted by a TE-JPO. This regular updating would help planning and development divisions timely recognize and understand the nature of lane and curbside modifications needed for vehicle drop-offs, communications infrastructure needed for connected vehicles, and other street fixtures required for advanced technologies.

13b. Engage commercial developers and local businesses in Complete Streets investments. Local governments could consider permitting or property tax relief to private commercial developers willing to invest in the street frontage of their developments in a manner that reflect a city's Complete Streets planning. Alternatively, cities could tap into their mechanisms for special assessments on properties in a collaboration with the property owners. Businesses within a defined commercial

WHO: MPOs (the RTCs, TRPA, CAMPO), cities and

area – particularly businesses interested in redeveloping the area — may agree to a business improvement district property tax assessment in exchange for having a voice in a Complete Streets improvement plan that relies on the funds collected.

The land area of a cityscape is 25% to 35% streets.

– Cohen (2017)

LVGEA's 2018 Las Vegas Perspective Community Survey found that the #2 choice in transportation to improve quality of life would be buses running in dedicated lanes between suburban and downtown locations.













## ► ELECTRIFY EFFICIENT MOVEMENT OF GOODS AND SERVICES

Electrification of medium- and heavy-duty vehicles, such as ground services equipment and trucks, is great for air quality, and advanced transportation solutions contribute to efficient movement of goods and services. In 2018 NDEP awarded the first round of projects receiving money from Nevada's portion of the VW Fund that settled the national lawsuit against Volkswagen for diesel emissions noncompliance. Over \$5.2 million will be spent on electrified ground support equipment of select airlines at both the McCarran and Reno-Tahoe International Airports. In addition, at the direction of the 70th (2017) Legislature, the PUC has overseen the creation of the EV Demonstration Program to award up to \$15 million in incentive payments to EV charging infrastructure installations. The project payments and costs to administer the program are passed through to the utility customer base, implicitly acknowledging that more EV charging infrastructure and the increased transportation load that comes with it should ultimately lower system costs for all customers and bring other value to grid operations. The major airport authorities should consider and seek these funds, as the charging infrastructure that supports the movement of goods, including at airports, is eligible for the incentives.

Nevada can prepare for and promote this next wave of electrification that will come from medium- and heavy-duty vehicles. Should the Legislature adopt a mobile sources emissions target for the State, it might also direct a program similar to the existing Alternative Fuels in Fleets Program, administered by NDEP, to be used as a tool for meeting the target. The program requires government entities that operate fleets of 50 vehicles

or more to purchase alternative-fuel or clean vehicles for 20% of all new or replacement vehicles purchased annually. This program or one similar could be used to recognize compliance efforts with any mobile sources emissions reduction action plan implemented by NDEP, Clark County DAQ, and Washoe County Health District, and perhaps extended to commercial fleets. Likewise, should the PUC investigate the growing transportation load growth, it can ensure that electric grid planning timely incorporates increased load from electrified long-haul trucking, and that appropriate regulations govern the large and fast superchargers the trucks will require.

In the meantime, cash-strapped government fleets should also be considering all angles to bring down the cost of converting to EVs. Federal grants defray costs, but bulk purchasing or leasing and rental options may be another cost-cutting solution. To the extent a government agency is accessing federal funds to purchase electric vehicles, however, the rules and restrictions imposed on applying those funds could complicate bulk purchasing for those not similarly restricted in their purchasing. A TE-JPO or the GOE or NDEP could support a study of the challenges and potential opportunities for a statewide bulk purchasing program. With respect to the early releases of medium- and heavy-duty vehicles, which are anticipated to have high price points, bulk procurement could ease pricing barriers and speed adoption of the electric options when they are available.

According to Alaska Airlines, Seattle-Tacoma International Airport's conversion of ground services equipment to electric is projected to save \$2.8 million in fuel costs and 10,000 tons of greenhouse gas emissions – the equivalent of taking 1,900 cars off the road.

## 14. Electrify fleets providing ground services at the airports.

**WHO:** NDEP, PUC, airport authorities, TE-JPO



(?)

**FUNDING:** Operational budgets of NDEP, PUC, airport authorities, TE-JPO; VW Diesel Mitigation Fund until exhausted; EV Demonstration Program incentives until exhausted or extended

14a. Continue electrification of ground support equipment at McCarran and Reno-Tahoe International Airports. Nevada's continued allocation of the VW Fund monies may be further extended to additional ground services equipment at the McCarran and Reno-Tahoe International Airports. The TE-JPO could also identify alternative funding sources available to further the efforts to electrify all ground services at each airport.

14b. Apply a portion of Nevada's EV Demonstration Program funds to expanding ground support vehicle electrification at both major airports. Strategically-placed charging infrastructure at airports promotes other potential possibilities for electrification,











such as the convenience shuttles and coaches that move people around the airport and to nearby locations like off-airport hotels. This charging infrastructure is eligible for the monetary incentives administered by the utility and overseen by the PUC. In addition to facilitating the site selection and construction of needed charging infrastructure on airport grounds, the airport authorities might also consider offering some form of relief for the fees to operate at the airport as an incentive for any airport shuttle that converts to an electric vehicle.

## **15. Promote electrified long-distance** freight and commercial operations fleets.

WHO: PUC, TE-JPO

(\$)

FUNDING: Federal grants from U.S. DOE; U.S. EPA Clean Diesel Program

**15a. Encourage conversion of government and commercial fleets** to hybrid and all-electric medium- and heavy-duty vehicles. Many fleets use medium- and heavy-duty equipment that can be partially battery-powered, such as the aerial lift on a bucket truck. These hybrids use a battery to power the hydraulics of the vehicle so that the equipment may be used without ICE idling. Should the Alternative Fuels in Fleets Program be used to meet a mobile sources emissions reduction, and perhaps extended to commercial vehicles, these purchases could qualify for compliance credits. In addition, the TEJPO could pursue federal funding to support these purchases, including securing a Clean Cities Coalition designation in Nevada to obtain U.S. DOE funds earmarked for medium- and heavy-duty fleet conversions.

#### 15b. Prepare the electric grid for long-haul freight electrification.

As transportation loads become a more significant feature in electric grid planning, the PUC has the authority to ensure that the projections incorporate trends in freight electrification. Furthermore, as a transport hub, Nevada may likely be an early mover on charging infrastructure installations for trucks. These installations will require a timely PUC rulemaking and regulations for interconnection standards and a tariff applied to the specialized fast chargers needed to power the trucks.

McKinsey Energy Insights predicts electric trucks will capture 15% of the truck market by 2030.

Tesla will begin production of its all-electric semi-truck in 2019, with a reported range of up to 500 miles per charge.

### **16. Assess procurement options for** medium- and heavy-duty vehicles in a fleet.

 $(\mathbf{?})$ 

(\$)

WHO: NDEP, GOE, TE-JPO

**FUNDING:** Operational budgets of relevant agencies

16a. Explore a bulk buying or creative leasing program for government fleet conversion. A TE-JPO, or the GOE or NDEP, could study government fleet procurement needs for medium- and heavy-duty vehicles to understand the challenges and potential opportunities for a state-wide bulk purchasing program.

The Climate Mayors EV Purchasing Collaborative, a coalition of 19 cities and 2 counties, launched an online portal to give cities equal access to competitive bids on EVs and charging infrastructure.









# CONCLUSION

The disruption of the transportation sector is no longer speculative. It is happening all around us. With the appropriate strategic leadership and execution, as opposed to waiting and seeing, Nevada is poised to benefit significantly from the convergence of the transportation and energy sectors. An electric, 21st-century transportation system will support Nevada's goal to be a leading producer of renewable energy, and also the pioneer that is defining and pushing the limits of advanced mobility in the United States. To be that vanguard, it is imperative that Nevada mobilizes a regime to accelerate the electrification of all modes of transportation.

I believe the auto industry will change more in the next five to 10 years than it has in the last 50.  $\mathcal{PP}$ – Mary Barra, General Motors Chairman and CEO









## BIBLIOGRAPHY

#### Nevada Government-Sponsored Plans, Studies, Reports, Web Pages

City of Henderson, Downtown Master Plan (June 17, 2014).

City of Henderson, Henderson Strong Henderson Comprehensive Plan (May 2017).

City of Henderson, Economic Development Strategy (May 2017).

City of Las Vegas, Master Plan 2020 Transit Element (Feb. 20, 2008).

City of Las Vegas, Master Plan 2020 Transportation and Streets and Highways Element (Apr. 15, 2009).

City of Las Vegas, Mobility Master Plan 2016 (May 2016), available at http://mobilitymasterplan.vegas/wp-content/uploads/2015/01/ CLVM\_Master-Plan\_Book\_Final\_2016-05-16.pdf.

City of Las Vegas, Vision 2045 Downtown Las Vegas Master Plan (Apr. 2017).

City of North Las Vegas, Complete Streets Policy, available at http://www. cityofnorthlasvegas.com/docs/CommDev/CompleteStreetsPolicy.pdf.

City of Reno, Reno Resilience 2017 Sustainability Report (2017).

City of Reno, Reimagine Reno City of Reno Master Plan (Dec. 2017).

Clark County, Comprehensive Master Plan Transportation Element 2016 (Aug. 2016).

Clark County, Title 30, Development Code, Chapter 30.60, Parking and Loading Regulations, available at https://www.clarkcountynv.gov/comprehensive-planning/zoning/Pages/Title30.aspx.

Clark County Department of Air Quality, Ozone Advance Program Progress Report Update (July 2017).

Clean Energy Project, Renewable Energy Powers Silver State as a Clean Energy Hub (March 2014).

Dep't of Motor Vehicles, Nevada Emissions Control Program, http:// www.dmvnv.com/emission.htm (last visited Dec. 2, 2018).

Dep't of Transportation, Freight Planning, https://www.nevadadot. com/mobility/freight-planning (last visited Dec. 2, 2018).

Dep't of Transportation, Integrated Transportation Reliability Program, https://extsites.kimley-horn.com/projects/ NevadaITRP//project.html (last visited Dec. 2, 2018).



Dep't of Transportation, Safety Management Plan, https://www.nevadadot.com/projectsprograms/programs-studies/safety-management-plans-smp (last visited Dec. 2, 2018).

Dep't of Transportation, Southern Nevada Traffic Study, http:// www.ndotsnts.com/ (last visited Dec. 2, 2018).

Dep't of Transportation, Transportation Alternatives Program, https://www.nevadadot. com/projects-programs/transportation-alternatives-program (last visited Dec. 2, 2018).

Dep't of Transportation, 2009 Nevada Highway Cost Allocation Study Compilation Report (March 17, 2009).

Dep't of Transportation, Nevada Vehicle Miles Traveled (VMT) Fee Study - Phase I (Dec. 2010).

Dep't of Transportation, Nevada Statewide Rest Area and Rest Stop Initiative (June 27, 2014).

Dep't of Transportation, Las Vegas NFL Stadium Sites Traffic Assessment (Oct. 4, 2016).

Dep't of Transportation, 2017-2019 Biennial Budget Overview (Jan. 31, 2017), available at https://www.leg.state.nv.us/App/InterimCommittee/REL/Document/9839.

Dep't of Transportation, State Highway Preservation Report to the 2017 Legislature (Feb. 2017).

Dep't of Transportation, NDOT Complete Streets Policy (June 2017).

Dep't of Transportation, One Nevada Transportation Plan Draft (Oct. 2018).

Dep't of Transportation, Southern Nevada Traffic Study (Nov. 2019).

Division of Environmental Protection, Nevada Diesel Emission Mitigation Fund - VW Settlement, 2018 Funding Awards, https://ndep.nv.gov/air/ vw-settlement/2018-demf-awards (last visited Dec. 2, 2018).

Division of Environmental Protection, Nevada Statewide Greenhouse Gas Emissions Inventory and Projections 1990-2030 (2016).

Division of Environmental Protection, Report on Assembly Bill 146 Study Concerning the Inspection and Testing of Motor Vehicles and Systems for the Control of Emissions from Motor Vehicles in Nevada (June 15, 2016).

Division of Environmental Protection, Nevada Beneficiary Mitigation Plan for the Volkswagen Environmental Mitigation Trust (Mar. 12, 2018).

Las Vegas Global Economic Alliance, Comprehensive Economic Development Strategy (July 2013).

Las Vegas Global Economic Alliance, 2018 Las Vegas Perspective Community Survey (2018).

Office of the Governor, Nevada Strategic Planning Framework 2016-2020 (Apr. 11, 2016), http://gov.nv.gov/StrategicPlan/Generations-to-Come/ (last visited Dec. 2, 2018).

Office of the Governor, State of the State Address (Jan. 17, 2017), http://gov.nv.gov/About/state-of-the-State/ (last visited Dec. 2, 2018).

Office of the Governor, Executive Budget 2017-2019 (Jan. 17, 2017).

Governor's Office of Economic Development, Moving Nevada Forward: A Plan for Excellence in Economic Development 2012 - 2014 (Feb. 2012).

Governor's Office of Energy, Nevada Electric Highway, http://energy.nv.gov/ Programs/Nevada\_Electric\_Highway/ (last visited Dec. 2, 2018).

Governor's Office of Energy, 2017 Status of Energy Report (2017).

Guinn Center, Nevada Budget 101: A Primer for the 2017-2019 Biennium (Feb. 2017).

Regional Transportation Comm'n Southern Nevada, Coordinated Public Transit and Human Services Transportation Plan, https://www.rtcsnv.com/planning-engineering/transportation-planning/coordinated-public-transit-human-services-transportation-plan/ (last visited Dec. 2, 2018).

Regional Transportation Comm'n Southern Nevada, On Board, http://onboardsnv.com/ (last visited Dec. 2, 2018).

Regional Transportation Comm'n Southern Nevada, Southern Nevada Strong Livable Centers Study, https://www.rtcsnv.com/livablecenters/ (last visited Dec. 2, 2018).

Regional Transportation Comm'n Southern Nevada, Transportation Alternatives Program, https://www.rtcsnv.com/planning-engineering/transportation-planning/transportation-alternatives-program/ (last visited Dec. 2, 2018).

Regional Transportation Comm'n Southern Nevada, 2015-2019 Transportation Improvement Program 2015-2019, https://www.rtcsnv. com/planning-engineering/transportation-planning/2015-2019transportation-improvement-program/ (last visited Dec. 2, 2018).

Regional Transportation Comm'n Southern Nevada, Regional Complete Streets Study (June 2012).

Regional Transportation Comm'n Southern Nevada, Regional Transportation Plan 2013-2035 (Dec. 2012).

Regional Transportation Comm'n Southern Nevada, Coordinated Transportation Plan (March 12, 2015).

Regional Transportation Comm'n Southern Nevada, Southern Nevada Transportation Safety Plan (Aug. 2015).

Regional Transportation Comm'n Southern Nevada, Transportation Investment Business Plan (Apr. 2016).

Regional Transportation Comm'n Southern Nevada, Access 2040 Regional Transportation Plan 2017-2040 (Feb. 9, 2017).

Regional Transportation Comm'n Southern Nevada, Clark County Parking Study - Phase 2 (Feb. 2017).

Regional Transportation Comm'n Southern Nevada, Regional Bicycle and Pedestrian Counts Phase 2 (Feb. 2017).

Regional Transportation Comm'n Southern Nevada, Southern Nevada Crash Analysis Report 2011-2015 (Sept. 2017).

Regional Transportation Comm'n Southern Nevada, Congestion Management Process 2018 (May 2018).

Regional Transportation Comm'n Washoe County, Electric Bus Initiative Capital Project (2015).

Regional Transportation Comm'n Washoe County, Complete Streets Master Plan (July 2016).

Regional Transportation Comm'n Washoe County, 2040 Regional Transportation Plan (May 18, 2017).

Regional Transportation Comm'n Washoe County, Sustainability Plan (June 2017).

Regional Transportation Comm'n Washoe County, FFY 2018-2022 Regional Transportation Improvement Program (Aug. 17, 2017).

Regional Transportation Comm'n Washoe County, Virginia Street Bus RAPID Transit Extension Supplemental Land Use and Economic Development Information and Supporting Documentation Templates (Sept. 2017).

Regional Transportation Comm'n Washoe County, Washoe County Regional Travel Characteristics Study (Apr. 12, 2018).

Southern Nevada Regional Planning Coalition, https:// www.snrpc.org/ (last visited Nov. 30, 2018).

Southern Nevada Strong, Regional Plan, http://sns.rtcsnv. com/regional-plan/ (last visited Dec. 2, 2018).

Tahoe Regional Planning Agency, 2017 Linking Tahoe: Regional Transportation Plan (Apr. 2017).

Tahoe Regional Planning Agency, Tahoe-Truckee Plug-In Electric Vehicle Readiness Plan (May 2017).

Truckee-Meadows Regional Planning Agency, 2012 Truckee-Meadows Regional Plan (v.13, Oct. 18, 2018).

Washoe County Department of Community Development, Master Plan Land Use and Transportation Element (Sept. 2011).

Washoe County Health District, Air Quality Management Division, Ozone Advance Path Forward (Feb. 2, 2017).

#### Publicly Available Studies, Reports, Journal Articles, Web Pages

American Public Transportation Association, Bus Rapid Transit Working Group, Designing Bus Rapid Transit Running Ways (Oct. 2010).

Association of Global Automakers, Nevada EV Sales, https://www.globalautomakers. org/advocacy/energy-and-environment/electric-drive/ev-sales/nevada.



Bloomberg New Energy Finance, Electric Buses in Cities (March 29, 2018).

Bloomberg New Energy Finance, Electric Vehicle Outlook 2018, https:// about.bnef.com/electric-vehicle-outlook/#toc-download.

California Air Resources Board, Innovative Clean Transit Workshop to Discuss Regulatory Proposal (June 13, 2018), https://arb.ca.gov/msprog/ ict/meeting.htm (find "Regulatory Workshop" for date "June 13, 2018" and click on "presentation" link under "Agenda/Materials").

Matt Casale, Brendan Mahoney, U.S. Public Interest Research Group, Paying for Electric Buses (Fall 2018).

Cenex, V2G Market Study (July 2018).

Colorado Energy Office, et al., Colorado Electric Vehicle Plan in Support of Executive Order Colorado's Clean Energy Transition (Jan. 2018).

Electrification Coalition, ZEV State Policy Rankings (June 2018).

Electric Power Research Institute (EPRI), Electric Vehicle Driving, Charging, and Load Shape Analysis (July 2018).

Peter Fox-Penner, Will Gorman, Jennifer Hatch, Long-term U.S Transportation Electricity Use Considering the Effect of Autonomous-Vehicles: Estimates & Policy Observations, 122 Energy Policy 203 (2018).

Gensler for the Urban Land Institute, The Game-Changing Impacts of the Driverless Car on the Future of Cities (2017).

Till Gnann, Anna-Lena Klingler, Matthias Kühnbach, The load shift potential of plug-in electric vehicles with different amounts of charging infrastructure, 390 Journal of Power Sources 20 (2018).

Anand R. Gopa, Julia Szinai, Next 10, Electric Vehicles and the California Grid (July 2018).

Gridwise Alliance, EVs - Driving Adoption, Capturing Benefits (July 2018).

Hawaiian Electric Companies, Electrification of Transportation Strategic Roadmap (March 2018).

International Truck, UPNEXT, Will Electric Charge Ahead of Diesel? (2018).

Alan Jenn, National Center for Sustainable Transportation, UC Davis, Policy Brief: Electrifying Ride-Sharing: Transitioning to a Cleaner Future (Apr. 2018).

Trieu Mai, Paige Jadun, Jeffrey Logan, Colin McMillan, Matteo Muratori, Daniel Steinberg, Laura Vimmerstedt, Ryan Jones, Benjamin Haley, and Brent Nelson. 2018. Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-71500.

Juan Matute, David Peterson, Electric Vehicle Service Provider Networks and Market Distortions, UCLA Luskin School of Public Affairs EVS26 International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium (May 2012). McKinsey & Company, Electrifying insights: How automakers can drive electrified vehicle sales and profitability (Jan. 2017).

Julia Michaelis, Till Gnann, Anna-Lena Klingler, Load Shifting Potentials of Plug-In Electric Vehicles—A Case Study for Germany, 2018 World Electric Vehicle Journal 9 (June 30, 2018).

National Association of State Energy Officials, Electric Vehicle Policy Baseline for the Intermountain States (Report to REV West) (Oct. 2018), https://www.naseo. org/publications (click "Transportation" tag, follow hyperlink for report).

National Association of State Energy Officials and Cadmus, PEV Policy Evaluation Rubric: A Methodology for Evaluating the Impact of State and Local Policies on Plug-in Electric Vehicle Adoption (Sept. 2018), https://www.naseo.org/ publications (click "Transportation" tag, follow hyperlink for report).

National Governors Association, Governors Staying Ahead of the Transportation Innovation Curve: A Policy Roadmap for States (Jul. 20, 2018), https:// www.nga.org/center/publications/ (click on title, "20 Jul 2018").

National Grid System Operator, Future Energy Scenarios, http:// fes.nationalgrid.com/ (last visited Dec. 2, 2018).

National Renewable Energy Laboratory, U.S. Department of Energy, Electric Ground Support Equipment at Airports (Dec. 2017).

New York State Energy Research and Development Authority, Report No. 16-02, Electricity Rate Tariff Options for Minimizing Direct Current Fast Charger Demand Charges (Dec. 2015).

Ofgem, Future Insights Series, Implications of the transition to Electric Vehicles (July 23, 2018).

Oregon Dep't of Transportation, Oregon's Road Usage Charge: OReGO Final Report (April 2017).

Todd Schatzki and Robert N. Stavins, Analysis Group, Key Issues Facing California's GHG Cap-and-Trade System for 2021-2030 (July 2018).

Schneider Electric, Managing the Energy Transformation: The Disruptive Power of Fleet Electrification (2018).

Siemens, Cities in the Driving Seat: Connected and Autonomous Vehicles in Urban Development (July 2018).

Mark Singer, National Renewable Energy Laboratory, The Barriers to Acceptance of Plugin Electric Vehicles: 2017 Update, Technical Report NREL/TP-5400-70371 (Nov. 2017).

Peter Slowick, Nic Lutsey, The International Council on Clean Transportation, The Continued Transition to Electric Vehicles in U.S. Cities (July 2018).

Smart Electric Power Alliance, Utilities and Electric Vehicles: Evolving to Unlock Grid Value (March 2018).

United Kingdom Dep't for Business, Energy, and Industrial Strategy, Industrial Strategy Automotive Sector Deal (2018). United Kingdom Dep't for Transport, Transport Energy Model Report (2018).

United Kingdom Dep't for Transport, The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy (July 2018).

United States Dep't of Transportation Federal Highway Administration, FHWA Forecasts of Vehicle Miles Traveled (VMT): Spring 2018, https://www.fhwa.dot.gov/policyinformation/tables/vmt/vmt\_forecast\_sum.cfm (last visited Dec. 2, 2018).

United States Dep't of Transportation Federal Transit Administration, Grant Programs, https://www.transit.dot.gov/grants (last visited Dec. 3, 2018).

United States Dep't of Transportation, Automated Vehicles 3.0: Preparing for the Future of Transportation (Draft Oct. 24, 2018).

United States Energy Information Administration, Analysis of the Effect of Zero-Emission Vehicle Policies: State-Level Incentives and the California Zero-Emission Vehicle Regulations (Sept. 2017).

United States Environmental Protection Agency, Green Book, Nevada Nonattainment/ Maintenance Status for Each County by Year for All Criteria Pollutants, https://www3. epa.gov/airquality/greenbook/anayo\_nv.html (last visited December 9, 2018).

United States Environmental Protection Agency, Sources of Greenhouse Gas Emissions, https://www.epa.gov/ghgemissions/ sources-greenhouse-gas-emissions (last visited Dec. 2, 2018).

United States Environmental Protection Agency, Memorandum from Richard D. Wilson, Acting Assistant Administrator for Air and Radiation, to EPA Regional Administrators 1-10, Voluntary Mobile Source Emission Reduction Programs in State Implementation Plans (SIPs) (Oct. 24, 1997), available at https://19january2017snapshot.epa.gov/state-and-localtransportation/incorporating-voluntary-mobile-source-emission-reduction-programs\_.html.

Vehicle Technologies Office, Office of Energy Efficiency and Renewable Energy, Department of Energy, Alternative Fuels Data Center, https://afdc.energy.gov/data/ (last visited DEc. 2, 2018).

Vehicle Technologies Office, Office of Energy Efficiency and Renewable Energy, Department of Energy, U.S. DRIVE Electrical and Electronics Technical Team Roadmap (2017), available at https://www.energy.gov/eere/vehicles/us-drivepartnership-plan-roadmaps-and-accomplishments (follow hyperlink for title).

World Economic Forum, The Future of Electricity: New Technologies Transforming the Grid Edge (March 2017).

#### News Articles, Press Releases, Blogs

Mick Akers, Las Vegas Review-Journal, Las Vegas uses artificial intelligence to reduce I-15 crashes (Nov. 19, 2018, 5:09 pm), https://www.reviewjournal.com/traffic/las-vegas-uses-artificial-intelligence-to-reduce-i-15-crashes-1531260/.

Areg Bagdasarian, GreenBiz, Steep utility fees are killing electric-car



charging stations (Jan. 12, 2018, 1:35 am), https://www.greenbiz.com/ article/steep-utility-fees-are-killing-electric-car-charging-stations.

Mary Barra, USA Today, General Motors CEO: We call for federal electric and zero-emission vehicle policies (Oct. 26, 2018, 12:01 ET), https://www. usatoday.com/story/opinion/2018/10/26/general-motors-zero-emission-vehicle-electric-cars-mary-barra-ceo-column/1760801002/.

Mary Barra, Forbes, Davos 2016: GM Boss Sees A Revolution In Personal Mobility (Jan 18, 2016, 12:53 pm), https://www.forbes.com/sites/joannmuller/2016/01/18/ davos-2016-gm-boss-sees-a-revolution-in-personal-mobility/#39893ee46bff.

Laura Bliss, CityLab, Why Seattle is America's Bus-Lovingest Town (May 11, 2018), https://www.citylab.com/transportation/2018/05/ seattle-the-city-that-respects-the-power-of-the-bus/559697/.

Laura Bliss, CityLab, When is a Dedicated Bus Lane Not a Dedicated Bus Lane (May 31, 2018), https://www.citylab.com/transportation/2018/05/ dedicated-bus-lanes-without-the-extra-lane/561509/.

Asit K. Biswas and Cecilia Tortajada, The Conversation, Electric vehicles are changing the world. And they're only just getting started (Feb. 28, 2018, 8:48 am EST), https://theconversation.com/electric-vehicles-are-changing-the-world-and-theyre-only-just-getting-started-90402.

Tony Canova, Chargepoint, Charging the Future: Our Blog, The Contractor's Guide to EV Ready Building Codes (Aug. 31, 2017), https://www.chargepoint.com/blog/contractors-guide-ev-ready-building-codes/.

Chispa, Nevada Clean Buses Fact Sheet, http://www.cleanride4kids.org/ blog/resource/nevada-state-fact-sheet/ (last visited Dec. 2, 2018).

Paul Ciampoli, American Public Power Association, Cities seek information from automakers on plans to meet large EV order (Jan. 23, 2017), https://www.publicpower. org/periodical/article/cities-seek-information-automakers-plans-meet-large-ev-order.

Alex Davies, Wired, General Motors Is Going All Electric (Oct. 2, 2017, 12:01 pm), https://www.wired.com/story/general-motors-electric-cars-plan-gm/.

Carl Davis, Institute on Taxation and Economic Policy, Just Taxes Blog, An Unhappy Anniversary: Federal Gas Tax Reaches 25 Years of Stagnation (Sept. 25, 2018), https:// itep.org/an-unhappy-anniversary-federal-gas-tax-reaches-25-years-of-stagnation/.

Hussein Dia, The Conversation, Jobs, tax and politics: three ways electric vehicles will change our world (Oct. 5, 2017, 3:04 pm EDT), https://theconversation.com/jobs-tax-and-politics-three-ways-electric-vehicles-will-change-our-world-84910.

Electrification Coalition, EC Launches Climate Mayors Electric Vehicle Purchasing Collaborative, https://www.electrificationcoalition.org/electrification-coalition/.

Peter Fox-Penner, et al., The Conversation, Spread of self-driving cars could cause more pollution – unless the electric grid transforms radically (Oct. 25, 2018, 6:48 am EDT), https://theconversation.com/spread-of-self-driving-cars-could-cause-more-pollution-unless-the-electric-grid-transforms-radically-101508.

Justin Gerdes, GreenTech Media, School Districts Rolling Out Electric Buses as Economics Improve: 'It's Time to Switch' (Nov. 15, 2018), https://www.greentechmedia. com/articles/read/school-districts-rolling-out-electric-buses#gs.mV2BP8Q.

Global Climate Action Summit, Nine-State Coalition Releases New Zero Emission Vehicle Action Plan (June 20, 2018), https://www.globalclimateactionsummit. org/nine-state-coalition-releases-new-zero-emission-vehicle-action-plan/#.

Patrick Hertzke, Nicolai Müller, Stephanie Schenk, and Ting Wu, McKinsey & Company, The global electric-vehicle market is amped up and on the rise (May 2018), https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-global-electric-vehicle-market-is-amped-up-and-on-the-rise.

Lyft, Electric Autonomous Vehicles: Our Plan to Reduce U.S. Carbon Emissions (July 7, 2017), https://blog.lyft.com/posts/our-plan-to-reduce-us-carbon-emissions.

Art Marroquin, Las Vegas Review-Journal, Sandoval reveals transportation goals for final year in office (Jan. 14, 2018), https://www.reviewjournal.com/news/news-columns/road-warrior/sandoval-reveals-transportation-goals-for-final-year-in-office/.

Thomas McMahon, School Bus Fleet, Top 100 School District Fleets of 2017, 24 (Oct. 2017).

Meeting of the Minds, Uber's Mobility Dream Might Be a Consumer Nightmare (Nov. 7, 2018), https://meetingoftheminds.org (expand menu item "Blog," choose Focus Area "Mobility," click tile with blog post title).

Mileage Based User Fee Alliance, Why Mileage Based User Fees?, http://www.mbufa.org/why.html (last visited Dec. 2, 2018).

Proterra, Press Release, Proterra Catalyst<sup>®</sup> E2 Max Sets World Record and Drives 1,101.2 Miles on a Single Charge (Sept. 19, 2017), https://www.proterra.com/press-release/ proterra-catalyst-e2-max-sets-world-record-and-drives-1101-2-miles-on-a-single-charge/.

Proterra, Press Release, Emphasizing Safe, Intelligent Transportation, Proterra Begins First Autonomous Bus Program in the United States (May 2, 2017), https:// www.proterra.com/press-release/emphasizing-safe-intelligent-transportationproterra-begins-first-autonomous-bus-program-in-the-united-states/.

Julia Pyper, GreenTech Media, PG&E Proposes Ditching Demand Charges for Commercial EV Charging (Nov. 7, 2018), https://www.greentechmedia.com/articles/ read/pge-ditch-demand-charges-for-commercial-ev-charging#gs.4Hs\_8EY.

Sean Slone, The Council of State Governments, The Current State, Nevada Drives Transportation Policy into the Future (Nov. 2017), https:// www.csg.org/pubs/capitolideas/enews/cs129\_3.aspx

Strong Towns, https://www.strongtowns.org/ (last visited Dec. 2, 2018).

Christer Tryggestad, Namit Sharma, Jasper van de Staaij and Arjan Keizer, McKinsey & Company Energy Insights, New reality: electric trucks and their implications on energy demand (Sept. 2017), https://www.mckinseyenergyinsights.com/insights/ new-reality-electric-trucks-and-their-implications-on-energy-demand/.

Volvo, Press Release, Pioneering Automation: Volvo Demonstrates Autonomous Bus (Jun. 18, 2018), https://www.volvobuses.com/en-en/news/2018/jun/ pioneering-automation-volvo-demonstrates-autonomous-bus.html.

Jarrett Walker, Human Transit, Microtransit: What I Think We Know (Feb. 23, 2018), https://humantransit.org/2018/02/microtransit-what-i-think-we-know.html.

Brett Williams, Mashable, Here's how every major automaker plans to go electric (Oct. 3, 2017), https://mashable.com/2017/10/03/ electric-car-development-plans-ford-gm/#v9XKCaXekiqI.

#### <u>Other</u>

Siemens, E-Car Operations Center Data Sheet (2015), available at https://w3.siemens.com/smartgrid/global/en/products-systems-solutions/smart-metering/emeter/Documents/E-car\_Datasheet.pdf.

Nevada 79th (2017) Legislature, SB 145, available at https://www.leg. state.nv.us/App/NELIS/REL/79th2017/Bill/4981/Overview.

Nevada 79th (2017) Legislature, SB 149, available at https://www.leg. state.nv.us/App/NELIS/REL/79th2017/Bill/4985/Overview.

Nevada 79th (2017) Legislature, SB 554, available at https://www.leg. state.nv.us/App/NELIS/REL/79th2017/Bill/5853/Overview.

Nevada 79th (2017) Legislature, AB 69, available at

https://www.leg.state.nv.us/App/NELIS/REL/79th2017/Bill/4750/Overview.

Nevada 79th (2017) Legislature, AB 399, available at https://www.leg. state.nv.us/App/NELIS/REL/79th2017/Bill/5477/Overview.

Nevada 78th (2015) Legislature, AB 175, available at https://www.leg. state.nv.us/App/NELIS/REL/78th2015/Bill/1544/Overview.

Nevada 78th (2015) Legislature, AB 176, available at https://www.leg. state.nv.us/App/NELIS/REL/78th2015/Bill/1545/Overview.

Nevada 77th (2013) Legislature, SB 313, available at https://www.leg. state.nv.us/Session/77th2013/Reports/history.cfm?ID=759.

Nevada 76th (2011) Legislature, AB 511, available at https://www.leg. state.nv.us/Session/76th2011/Reports/history.cfm?ID=1011.



## APPENDIX A



## Entities Interviewed for This Report

NEVADA STATE & LOCAL GOVERNMENT	INDUSTRY ORGANIZATIONS	FEDERAL GOVERNMENT
Governor's Office of Energy Public Utilities Commission of Nevada Nevada Department of Transportation Nevada Department of Motor Vehicles Nevada Transportation Authority Nevada Division of Environmental Protection Nevada Department of Education Nevada Center for Applied Research at University of Nevada, Reno City of Henderson City of Las Vegas City of Reno Clark County Washoe County Regional Transportation Commission Southern Nevada Regional Transportation Commission Washoe County Tahoe Regional Planning Agency Clark County Department of Air Quality Washoe County Health District Air Quality Management Division	Advanced Energy EconomyElectric Power Research InstituteIntelligent Transportation Society of AmericaSmart Electric Power AllianceMileage Based User Fee AssociationLas Vegas Global Economic AllianceSouthern Nevada Home Builders AssociationChargepoint, Inc.Electrify AmericaFilamentFleetcarma, a GEOTAB CompanyKeolis North AmericaNational Strategies, Inc.NV EnergyProterra, Inc.Siemens CorporationTesla, Inc.Chispa NevadaNevada Conservation LeagueSierra Club Southern Nevada GroupSouthwest Energy Efficiency ProjectWestern Resource Advocates	Department of Energy - Energy Efficiency and Renewable Energy Vehicle Technologies Office - Energy Efficient Mobility Systems Program Department of Energy - Energy Efficiency and Renewable Energy - Vehicle Technologies Office - National Clean Cities Coalitions Program Department of Transportation - Federal Highway Administration Office of Planning, Environment, and Realty Department of Transportation - Office of the Asst. Secretary for Research and Technology – Intelligent Transportation Systems Joint Program Office Federal Energy Regulatory Commission



## APPENDIX B



## Nevada Laws and Codes Supporting **Transportation Electrification**

GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION	
Clark and Washoe Counties	🖵 읙 🖡	Policy, Planning	Shall have a regional planning body that creates a regional plan and coordinates other plans within the region; plans shall address, among other things, mixed use development, transit-oriented development, and transportation	NRS 278.02514, 02528, 0262, 0274	Amend planning directive to require creation and application of performance-based metrics for transportation goals	
Clark and Washoe Counties	<b>\$</b>	Planning, Funding	Regional Planning Commission shall study, develop, and provide incentives for mixed use development, transit- oriented development, large commercial development which provides employee parking at a site other than the commercial development	NRS 278.02535, 02632	Auhority to create and find funds for incentives that support and award activity based on performance and outcomes as measured against plan	
Clark County	<u> </u>	Regulation	May establish a program for the control of air pollution that includes requirements for the creation, receipt and exchange for consideration of credits to reduce and control air contaminants	NRS 445.500	Authority to extend credits and trading regime to mobile emissions sources	
Clark County	<i>F</i>	Regulation	Requires a license fee for generators, with exemptions based on size and connection with the grid	Clark County Code 7.60 Amend to extend exemption from license requirement to sto including nonstationary		
Clark County		Regulation	Ariport ground transportation licensing and fees	Clark County Code 20.09	Amend regulations to extend some benefit to ground services that are electric or autonomous	
Clark County	🖵 4	Regulation	Building Code	Clark County Code Title 22	Amend to include requirements that multi-unit dwellings include charging stations or charging readiness	
Clark County		Regulation	Taxi cab regulation in Clark County	Clark County Code 15.04	Amend to create permitting or licensing benefit for taxis that are electric or autonomous	
Clark County		Regulation	Development Code	NRS 371.043, 045 Clark County Code Title 30	Adapt as necessary to maintan consistency with Complete Streets guidance and faciliation of multimodal transportation connectivity and options	
Counties		Funding	May impose a supplemental governmental services tax and shall use the proceeds of the tax to pay the cost of projects related to the construction and maintenance of sidewalks, streets, avenues, boulevards, highways and other public rights-of-way used primarily for vehicular traffic, including, without limitation, overpass projects, street projects or underpass projects	NRS 371.043, 045	Source of funding for Complete Street projects that build or retrofit to accommodate advanced and electrified transportation solutions	
Counties		Funding	May, upon approval by popular vote, impose a tax on new development to be used for projects related to the construction and maintenance of sidewalks, streets, avenues, boulevards, highways and other public rights-of-way used primarily for vehicular traffic, including, without limitation, overpass projects, street projects and underpass projects, or the payment of bonds to fund the project or both	NRS 278.710	Potential source of funds to retrofit arterials to accommodate designated lanes for public and rapid transit	
Counties		Funding	May, upon approval by majority vote, enact a special purpose tax for a public transit system; construction, maintenance, and repair of public roads; improvement of air quality; or any combination of these	NRS 377A.020, 070	Authority to create funding source for electrified public transportation solutions and roads and street retrofits to accommodate them	



are
,
to
on





GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION		
Counties		Funding	Shall create a fund in the county treasury for the Complete Streets Program	NRS 403.573	Covers direct funding to build and retrofit streets for multimodality that include advanced and electrified transportation options		
Counties, Cities	F	Funding	May create a "district" subject to a special tax assessment to finance an energy efficiency improvement project or renewable energy project	NRS 271.6312-6325	Funding source for locally-placed solar to provide power to public transit		
Counties, Cities		Implementation, Regulation	May adopt an ordinance to all low emission and energy-efficient vehicles to travel in a designated lane on streets within a community	NRS 484A.467	May be activated as purchase incentive for electric vehicles		
Counties, Cities	<b>교</b> 음	Policy, Planning	Shall create a Master Plan which may include a transportation element and a land use element, which must address mixed use and transit-oriented development	NRS 278.150, 160	Amend planning directive to require creation and application of performance based metrics for transportation goals		
Counties, Cities, or Towns		Implementation	Acquire, improve, equip, operate and maintain, within or without the municipality, or both within and without the municipality an off-street parking project; •"Off-street parking project" means parking facilities for the parking of motor vehicles off the public streets, including graded, regraded, graveled, oiled, surfaced, macadamized, paved, curbed, guttered, drained and side-walked sites therefor, driveways, ramps, structures, buildings, elevators, traffic control equipment, and all appurtenances and incidentals necessary, useful or desirable for off-street parking facilities (or any combination thereof), including real and other property therefor	NRS 271.265, 150	Covers local government authority to site and develop parking proje that encourage multimodality and use of advanced and electrified transportation solutions		
Counties, Cities, or Towns		Implementation	Acquire, improve, equip, operate and maintain, within or without the municipality, or both within and without the municipality a transportation project; "Transportation project" means a project to provide local transportation for public use, and includes works, systems and facilities for transporting persons, rolling stock, equipment, terminals, stations, platforms and other facilities necessary, useful or desirable for such a project, and all property, easements, rights-of-way and other rights or interest incidental to the project	NRS 271.265, 237	Covers local government authority to develop transportation faciliites to support advanced and electrified transportation solutions		
Deparment of Conservation and Natural Resources	ि 📮 号	Regulation, Implementation	May develop and carry out a program to provide incentives to encourage those persons who do not have a fleet subject to the regulations pursuant to NRS 486A to acquire clean vehicles and motor vehicles that use alternative fuels	NRS 486A.200	Authority to create incentives for non-government fleets to adopt alternative fuels		
Department of Administration State Public Works Division State Public Works Board	F	Regulation	Shall adopt building design and construction regulations that set standards for, among other things, the efficient use of energy, including, without limitation, the use of sources of renewable energy and set performance guidelines for retrofit projects, including, without limitation, guidelines for energy consumption	NRS 341.091	Amend to include setting standards for building microgrids and EV charging stations, including retrofits		
Department of Environmental Protection	<u> </u>	Implementation	Issue ever four years a statewide inventory of greenhouse gases released in this State	NRS 445B.380	Baseline for setting a mobile sources emissions reduction target for the State		
Department of Motor Vehicles		Funding	A basic tax for governmental services is hereby imposed for the privilege of operating any vehicle upon the public highways of this State. Such tax is imposed in lieu of all taxes based on value and levied for state or local purpose on such vehicles.	NRS 371.030	Tax collected on vehicle may be used for local public transportation facilities or abated as purchase incentive for electric vehicles		
Department of Motor Vehicles		Regulation, Funding	Shall administer and enforce the collection of fuel tax and distribution to the State Treasurer for the State Highway Fund and to the counties according to their proportionate share	NRS 365.100, 531-565	Regulations for collection of transportation funding, to be adapted to a road usage fee charge if and when applicable		
Department of Motor Vehicles		Funding	Shall develop the regulations for and collect tax on the use of a digital network or software application service of a transportation network company to connect a passenger to a driver for the purpose of providing transportation services [and deposit the collections] with the State Treasurer; "Transportation network company" has the meaning ascribed to it in NRS 706A.050	NRS 372B.110, 140, 080	Regulations for collection of transportation funding, to be adapted to align revenues and distributions with TNC costs and benefits		





GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION
Department of Motor Vehicles		Funding	Shall collect and submit to the State Treasurer a tax on the use of a dispatch center, software application, or other digital means by an autonomous vehicle network company to connect a passenger to a fully autonomous vehicle for the purpose of providing transportation service; "Fully autonomous vehicle" means a vehicle equipped with an automated driving system which is designed to function at a level of driving automation of level 4 or 5 pursuant to SAE J3016	NRS 372B.145, 482A.036	Regulations for collection of transportation funding, to be adapted to align revenues and distributions with TNC costs and benefits
Department of Motor Vehicles		Regulation	May adopt regulations relating to the operation and testing of autonomous vehicles on highways within the State of Nevada which are consistent with this chapter and do not impose additional requirements upon the operation and testing of autonomous vehicles; only the Department may adopt regulations or impose any requirement relating to the technology of an automated driving system or autonomous vehicle, and any such regulations adopted, ordinance enacted or requirement imposed by another governmental entity or local government is void, nor shall a local government impose any tax or fee or impose any other requirement on an automated driving system or autonomous vehicle or on a person who operates an autonomous vehicle	NRS 482A.100, 110	Creates a single regulatory regime for bringing autonomous transportation technologies to market; may be amended to extend to regulations on commercialization
Department of Motor Vehicles		Regulation	"Automated driving system" has the meaning ascribed to it in SAE J3016; "Autonomous vehicle" means a motor vehicle that is equipped with an automated driving system which is designed to function at a level of driving automation of level 3, 4 or 5 pursuant to SAE J3016. The term includes a fully autonomous vehicle; "Fully autonomous vehicle" means a vehicle equipped with an automated driving system which is designed to function at a level of driving automation of level 4 or 5 pursuant to SAE J3016; "SAE J3016" means the document published by SAE International on September 30, 2016, as "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles" or a document determined by the Department to be a subsequent version which is approved by the Department by regulation	NRS 482A.025, 030, 036, 048	Ties regulations regarding autonomous vehicle technologies to evolving standards and definitions at the national level
Department of Motor Vehicles	🖵 号	Implementation, Regulation	In a county whose population is 100,000 or more, conduct a test of the emissions from a motor vehicle which is being operated on a highway in that county to determine whether the vehicle complies with the provisions of NRS 445B.700 to 445B.845, inclusive, and the regulations adopted pursuant thereto	NRS 445B.798	Test could be modified and eased, as appropriate, for vehicles that are partially electrified or all-electric
Department of Transportation		Implementation, Regulation	May approve a request to develop, construct, improve, maintain or operate a transportation facility, which project may be submitted unsolicited and if the Department determines it serves a public purpose, may be opened for competing proposals; "transportation facility" means a road, railroad, bridge, tunnel, overpass, conduit or other infrastructure for conveying telecommunications cable, line, fiber or wire, airport, mass transit facility, parking facility for vehicles or similar commercial facility used for the support of or the transportation of persons, information or goods, including, without limitation, any other property that is needed to operate the facility. The term does not include a toll bridge or toll road	NRS 408.5471-549; NRS338.161	Extends authority over transportation projects to approval of public private partnerships or other commercial entity involvement in providing advanced transportation solutions; amend to include intelligent transportation systems and systems for transportation data management and exchange
Department of Transportation		Policy, Planning	Shall, as a matter of primary responsibilities, plan, assist planning, coordinate, develop procedures for, conduct research, etc. to achieve balanced transportation planning and services across the state	NRS 408.223	Enables state planning for and allocation of transportation dollars to keep up with trends and technology
Department of Transportation		Implementation, Regulation, Funding	House and administer the Nevada State Infrastructure Bank to fund the development and improvement of transportation facilities (including those using autonomous technology), effective upon funding	NRS 408.55048-55088	Could provide loans for infrastructure to support networked and autonomous vehicles that are electric
Department of Transportation		Implementation, Funding	Rural elderly and disabled transit services	Federal Transit Administration section 5310 grant	Funding may be applied to advanced and electric transportation solutions for paratransit services in rural areas
Department of Transportation		Implementation, Funding	Rural and small urban transit	Federal Transit Administration section 5311 grant	Funding may be applied to advanced and electric transportation solutions for local mobility in rural areas





GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION			
Department of Transportation		Implementation, Funding	Rural bus and bus facilities	Federal Transit Administration section 5339 grant	Funding may be applied to advanced and electric transportation solutions for bus service in rural and urban areas			
Department of Transportation		Funding	Shall administer State Highway Fund for maintenance and improvements of highways	NRS 408.235	Provides authority to fund projects that improve highway efficiency and safety beyond road construction and repair			
Department of Transportation		Implementation, Regulation	May adopt regulations establishing a program to allow a vehicle that is certified by the Administrator of the United States Environmental Protection Agency as a low emission and energy-efficient vehicle to be operated in a lane that is designated for the use of high-occupancy vehicles	NRS 484A.463	May be activated as purchase incentive for electric vehicles			
Governor's Office of Energy	<b>F</b>	Implementation, Funding	Develop a program to distribute grants, incentives, or rebates to persons to acquire, install or improve net metering systems	NRS 701.240	Amend to extend to vehicle-to-grid integration if legislation and PUC create a feed-in tariff for vehicle batteries			
Governor's Office of Energy	<b>F</b>	Implementation	Coordinate activities with the Consumer's Advocate and the Public Utilities Commission of Nevada, and with other federal, state and local officers and agencies that promote, fund, administer or operate activities and programs related to the use of renewable energy and the use of measures which conserve or reduce the demand for energy or which result in more efficient use of energy	NRS 701.180, .380	Authority to coordinate activities within the energy-transportation nexus as lead on management, joint programming, and issue resolution			
Governor's Office of Energy	<b>F</b>	Planning, Implementation, Funding	Solicit and serve as the point of contact for grants and other money from the Federal Government	NRS 701.180	Authority to identify and pursue funding from US DOE and DOT for grid modernization needed for electrified transportation			
Governor's Office of Energy	4	Policy, Planning	Prepare a comprehensive state energy plan that promotes economic development, use of renewable energy, and energy conservation	NRS 701.190	Authority to plan for renwable resource development to serve transportation sector			
Governor's Office of Energy	<b>F</b>	Implementation, Funding	The Director of the Office of Energy may by regulations establish other uses of the money in the Renewable Energy Account	NRS 701A.450(6)(a)	Authority to support transportation electrification studies, for example, use of fleet batteries for load shaping as a means of balancing DERs and other renewables			
Governor's Office of Energy	<b>F</b>	Implementation	Educate public about and encourage projects involving renewable resources and energy efficiency through various facilitiation and support mechanisms	NRS 701.390	Authority to educate public on benefits of electrified transport and using electric public transit as a means of promoting grid-connected renewables development and generally reducing reliance on gas plants and gasoline-powered internal combustion engine vehicles			
Governor's Office of Energy	<b>F</b>	Regulation	Participate in any program established by the Federal Government relating to sources of energy and adopt regulations to carry out such a program	NRS 701.400	Authority to identify and pursue funding from US DOE and DOT for grid modernization needed for electrified transportation			
Governor's Office of Energy	<b>F</b>	Implementation, Funding	Create and administer the Account for Renewable Energy, Energy Efficiency and Energy Conservation Loans to make loans at a rate of not more than 3% for energy conservation, energy efficiency, or renewable energy system projects or the manufacture of components for renewable energy systems	NRS 701.575, .590	Authority is subject to a pending request to repurpose this account for grants in lieu of loans. Grants under this authority could extend to fund solar-plus-storage projects to support EV charging, including charging depots for commercial or public transit fleets			
Governor's Office of Science, Innovation, and Technology	<b>\$</b>	Implementation	Advise on matters relating to science, innovation and technology and work in coordination with the Office of Economic Development to establish criteria and goals for economic development and diversification in this State in the areas of science, innovation and technology	NRS 223.610(1,2)	2) Authority to work with GOED on transportation technologies that could be doing business in the state and infrastructure needed to support them			
Governor's Office of Science, Innovation, and Technology		Implementation	Identify, recommend and carry out policies related to science, innovation and technology	NRS 223.610(3)	Authority to develop policies that promote advanced transportation technologies			





				1			
GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION		
Governor's Office of Science, Innovation, and Technology	<b>\$</b>	Implementation	Coordinate activities in this State relating to the planning, mapping and procurement of broadband service in a competitively neutral and nondiscriminatory manner	NRS 223.610(5)	Amend to include goal of extending communications to support transportation needs in rural areas		
Governor's Office of Science, Innovation, and Technology	<b>\$</b>	Implementation	Provide support to the Advisory Council on Science, Technology, Engineering and Mathematics and direct the implementation in this State of plans developed by the Council concerning, without limitation, workforce development, college preparedness and economic development	NRS 223.610(6)	Authority to develop and promote plans to create training for a workforce to support advanced transportation technologies		
Henderson City Council	<b>F</b>	Regulation	Building Code	Henderson Code of Ordinances Title 15	Amend to include requirements that multi-unit dwellings include charging stations or charging readiness		
Henderson City Council		Regulation	Development Code (Zoning)	Henderson Code of Ordinances Title 19	Adapt as necessary to maintan consistency with Complete Streets guidance and faciliation of multimodal transportation connectivity and options		
Henderson Traffic Engineer		Implementation	The city traffic engineer shall place and maintain or cause to be placed or maintained, traffic control signs, signals and devices when and as required under the traffic ordinance of this city to make effective the provisions of said ordinances, and may place and maintain such additional traffic control devices as he may deem necessary to regulate traffic under the traffic ordinances of this city or under state law or to guide or warn traffic	Henderson Code of Ordinances 10.20.010	Traffic Engineer has the authority to pilot and install various ITS devices and equipment		
Las Vegas City Council	<b>F</b>	Regulation	Building Code	Las Vegas Code of Ordinances Title 16	Amend to include requirements that multi-unit dwellings include charging stations or charging readiness		
Las Vegas City Council		Regulation	Development Code (Zoning)	Las Vegas Code of Ordinances Title 19	Adapt as necessary to maintan consistency with Complete Streets guidance and faciliation of multimodal transportation connectivity and options		
Las Vegas Traffic and Parking Commission		Regulation	The Commission shall have the duty and authority to request the preparation and publication of traffic reports, to consider requests having to do with traffic and parking regulations, and to analyze and provide recommendations to the City Council with respect to proposed changes in traffic and parking regulations	Las Vegas Code of Ordinances 2.48.060	Authority to create non-monetary incentives for advanced and electrified transportation solutions		
Las Vegas Traffic Engineer		Implementation	General duties shall include determining the installation and proper timing and maintenance of traffic-control devices; conducting engineering analysis of traffic accidents and to devise remedial measures; conducting engineering investigations of traffic conditions; planning the operation of traffic on the streets and highways; cooperating with city officials on ways and means to improve traffic conditions	Las Vegas Code of Ordinances 11.04.020	Traffic Engineer has the authority to pilot and install various ITS devices and equipment		
Las Vegas Traffic Engineer		Implementation	The City Traffic Engineer is authorized to place markers, buttons, or signs within or adjacent to intersections indicating the course to be traveled by vehicles turning at such intersections, and such course to be traveled as so indicated may conform to or be other than as prescribed by law or ordinance	Las Vegas Code of Ordinances 11.12.010	Traffic Engineer may direct traffic flow in a manner to accommodate public or other transit offerings, including electrified		
Las Vegas Traffic Engineer		Implementation	The City Traffic Engineer shall place and maintain traffic-control signs, signals, and devices when and as required under the traffic ordinances of the City to make effective the provisions of said ordinances, and may place and maintain such additional traffic-control devices as he may deem necessary to regulate traffic under the traffic ordinances of this City or under State law or to guide and warn traffic	Las Vegas Code of Ordinances 11.32.010	Traffic Engineer has the authority to pilot and install various ITS devices and equipment		
Las Vegas Traffic Engineer		Implementation	The City Traffic Engineer is authorized and required to establish: bus stops, bus stands, taxicab stands and stands for other passenger common carrier motor vehicles; and points for the origin and destination of the routes of transit buses on such public streets or public property, in such places and in such number, and he may designate the length of time that a bus may stand or park at each, as he shall determine to be of the greatest benefit and convenience to the public, and every such bus stop, bus stand, taxicab stand, other stand or origin or destination point shall be designated by appropriate signs	Las Vegas Code of Ordinances 11.60.010	Traffic Engineer has the authority to designate fixed points of connection between multimodal transportation options		







				1	
GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION
Legislature		Policy	State Legislature finds that planning for energy conservation and future energy requirements should include consideration of state, regional and local plans for land use, urban expansion, transportation systems, environmental protection and economic development; the State has a responsibility to encourage the maintenance of a reliable and economical supply of energy at a level which is consistent with the protection of environmental quality; the State has a responsibility to encourage the utilization of a wide range of measures which reduce wasteful uses of energy resources; while government and private enterprise are seeking to accelerate research and development of sources of renewable energy, they must also prepare for and respond to the advent of competition within the electrical energy industry and are, therefore, encouraged to maximize the use of indigenous energy resources to the extent competitively and economically feasible; it is the policy of this State to encourage participation with all levels of government and private enterprise in cooperative state, regional and national programs to assure adequate supplies of energy resources and markets for such energy resources	NRS 701.010	Express governmental support of the growth of renewable energy within the state and a market to support it, including transportation load
Local Government		Regulation	May not impose any tax, fee, or license requirement on a transportation network company autonomous vehicle network company other than a local business license as applicable to all businesse	NRS 706A.310, 706B.290	Simplifies doing business in Nevada as a networked transportation company
Public Utilities Commission	<b>F</b>	Regulation	"Public utility" or "utility" does not include persons who own, control, operate or manage a facility that supplies electricity only for use to charge electric vehicles	NRS 704.021	Exempts charging stations selling electricity from regulatory burdens placed on public utilities selling electricity
Public Utilities Commission	<b>F</b>	Regulation	Any generator of electricity that is portable and capable of being connected temporarily to an electrical system that is normally furnished electricity by a public utility may be connected only after the main switch of the system has been opened to isolate that electrical system from the public utility's system for distribution of electricity; capable of being permanently connected to an electrical system, except for a generator of electricity designed to run in parallel with a public utility's system for distribution of electricity, must be connected by means of a double-throw switch that isolates that electrical system from the public utility's system	NRS 459A.020	Amend as necessary to accommodate bidirectional, nonstationary storage connections
Public Utilities Commission	<b>F</b>	Regulation	Any person has the right to generate, consume, and export renewable energy and reduce his or her use of electricity that is obtained from the grid and/or use technology to store energy at his or her residence; shall be allowed to connect his system with the electric utility meter provided to him in a timely manner, receive fair credit for energy exports, receive priority as an energy resource when utility plans for grid, and remain in the same rate class	NRS 701.540	Allows for tariff to address bidirectional, non-stationary storage
Public Utilities Commission	<b>F</b>	Regulation	Adopt regulations for Electric Vehicle Infrastructure Demonstration Program to get utility to submit a plan with measures to promote or incentivize the deployment of electric vehicle infrastructure	NRS 701B.670	Authorizes pilots and regulations that address evolving mechanisms for vehicle to grid integration
Public Utilities Commission	<b>F</b>	Regulation	Oversee utility net metering program	NRS 704.766-777	Amend to extend to vehicle-to-grid integration if legislation and PUC create a feed-in tariff for vehicle batteries
Public Utilities Commission	<b>F</b>	Regulation	Establish and enforce a Renewable Portfolio Standard for each provider of electric service and may adopt regulations related to calculating credits	NRS 704.7821, 7828, 78215	Amend to include credits for storage and non-stationary storage that may be tied to storing or balancing renewable sources of energy
Public Utilities Commission	<b>F</b>	Regulation	Adopt regulations for procurement of energy storage if procurement targets in public interest	NRS 704.791-797	Regulations could include targets for nonstationary storage
Regional Planning Body		Regulation, Implementation, Funding	Shall study, develop, and provide incentives for mixed use development, transit-oriented development, and commercial developments that provide employees parking at a site other than commercial development	NRS 278.02535, 02632	Authority to craft and administer monetary and non-monetary incentives that tie transportation projects to active land use development
Regional Planning Coalition (Clark)		Planning, Implementation	May designate regional transportation commission to administer regional plan	NRS 278.02528	Allows for better coordination between master regional plan and evolving transportation priorities





GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION		
Regional Planning Coalition (Clark)	🖵	Funding	The regional planning coalition may, within the limits of legislative appropriations and other available money, provide grants to a city or county if all the plans that the city or county is required to submit are in substantial conformance with the comprehensive regional policy plan. Grants provided to a city or county pursuant to this subsection must be expended by the city or county only to pay the costs of establishing, maintaining and carrying out programs related to land use planning	NRS 278.02577	Authority to craft and administer monetary and non-monetary incentives that tie transportation projects to active land use development		
Regional Planning Coalition (Clark)	🖵 ⋛	Planning	Shall cooperate and consult with the local air pollution control board and the regional transportation commission, and if the program for control of air pollution established and administered by the local air pollution control board includes measures for the control of traffic or transportation, the regional planning coalition shall consider recommending the use of alternative land use designations, densities and design standards to meet local and regional needs with respect to transportation	NRS 278.02584	Authority to adopt positions on land use development as a means to support transportation efficiency and emissions reduction		
Regional Transportation Commission, County, City		Implementation	Establish or operate a public transit system consisting of regular routes and fixed schedules to serve the public, nonemergency medical transportation of persons to facilitate their participation in jobs and day training services, available upon request and without regard to regular routes or fixed schedules, non-medical transportation of persons with disabilities without regard to regular routes or fixed schedules, or non-medical transportation of persons by reservation and without regard to regular routes or fixed schedules; enter into contacts with private operators to provide such services	NRS 277A.280	Authority to develop non-fixed transportation options for paratransit and in rural areas, including advanced and electrific transportation solutions		
Regional Transportation Commission		Policy, Funding	Prepare and approve budgets for regional street and highway funds, public transit funds, and other money received	NRS 277A.210	Enables state planning for and allocation of transportation dollars to keep up with trends and technology		
Regional Transportation Commission		Policy, Planning	Conduct studies, develop plans and conduct public hearings to establish and approve short-range and regional plans for transportation	NRS 277A.210	Authority to pilot advanced and electric transportation solutions		
Regional Transportation Commission		Policy, Planning	Interact with federal agencies regarding federal funding, project applications, and agreements, and required public hearings	NRS 277A.230	Authority to identify and pursue funding from US DOE and DOT for advanced and electrified transportation projects		
Regional Transportation Commission		Funding	Establish a fund to execute projects for Complete Streets	NRS 277A.240	Authority to direct funding to build and retrofit streets for multimodality that included advanced and electrified transportation options		
Regional Transportation Commission		Policy, Planning, Implementation	Adopt a policy for and plan and carry out projects within a Complete Streets Program (i.e., retrofitting streets or highways to provide access to all users, including operating public transit but not purchasing vehicles of hardware for it)	NRS 277A.285	Authority to direct projects to build and retrofit streets for multimodality that included advanced and electrified transportation options		
Regional Transportation Commission		Policy, Implementation	May grant money to conduct research for and otherwise develop and implement transportation projects that promote innovative transportation and transit technology, including, without limitation, automated driving systems	NRS 277A.430	Authority to pilot advanced and electric transportation solutions		
Regional Transportation Commission		Implementation	May provide programs to reduce or manage motor vehicle traffic	NRS 377A.140	Authority to further intelligent transportation systems and related infrastructure		
Regional Transportation Commission		Implementation	Enter into agreements for the joint use of facilities, installations and properties and the joint exercise of statutory powers	NRS 277A.270	Authorizes collaboration and co-investment with local governments to create multimodal infrastructure that connects regional with local streets		
Regional Transportation Commission		Implementation	Construct, operate, develop, maintain a high capacity transit system, or enter into a public-private patnership to do so; "High-capacity transit" means a public transit system that may provide a higher level of passenger capacity by increasing, without limitation, the number of vehicles utilized by the system, the size of the vehicles, the frequency of vehicle rides, travel speed or any combination thereof, and that operates in conjunction with public transit stations. The term includes, without limitation, bus rapid transit, fixed guideway, light rail transit, commuter rail, streetcar and heavy rail	NRS 277A.430, .420, .400	Authorizes development of a purely electric high capacity transit system		





GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION
Regional Transportation Commission		Implementation, Funding	Acquire, own, dispose of interests in both real and personal property, exercise eminent domain for real property if relevant jurisdiction approves, and regulate and finance activities for operation of systems or services provided by the commission	NRS 277A.250	Authority to acquire property as needed for street retrofits and dedicated lanes to accommodate public and mass transit
Regional Transportation Commission		Funding	Appropriate the funds from a special purpose tax for a public transit system; construction, maintenance, and repair of public roads; improvement of air quality; payment of bonds that fund any such project; or any combination of these	NRS 377A.080, 090	Funding for electrified public transportation solutions and roads and street retrofits to accommodate them
Regional Transportation Commission		Implementation	Construct, modify, operate and maintain electrical and communication systems, including, without limitation, traffic signalization or messaging systems, and related infrastructure that are necessary to carry out the commission's duties set forth in this chapter within any public easement or right-of-way, including, without limitation, a public easement or right-of-way dedicated or restricted for use by any utility	NRS 277A.300	Covers use of rights of way by RTCs for intelligent transportation systems infrastructure and equipment
Regional Transportation Commission		Implementation	Construct, convert, improve, equip and maintain parking facilities or parking spaces for use by the general public and public employees	NRS 277A.290	Cover RTCs authority to design parking solutions that encouarge multimodality and use of advanced and electric transportation solutions
Regional Transportation Commmission of Southern Nevada		Implementation	Construct, operate, develop or maintain a high-capacity transit system, or enter into a public-private partnership to do so; "High-capacity transit" means a public transit system that may provide a higher level of passenger capacity by increasing, without limitation, the number of vehicles utilized by the system, the size of the vehicles, the frequency of vehicle rides, travel speed or any combination thereof, and that operates in conjunction with public transit stations. The term includes, without limitation, bus rapid transit, fixed guideway, light rail transit, commuter rail, streetcar and heavy rail	NRS 277A.400, .420, .430	Covers authority to develop electrified mass transit system
Reno City Council		Regulation, Implementation	Qualified alternative fuel vehicles parking program	Reno Code of Ordinances 6.06.240	Provides free city parking incentive to electric vehicles
Reno City Council		Regulation, Implementation	Annexation and Land Development Code	Reno Code of Ordinances Title 18	Adapt as necessary to maintan consistency with Complete Streets guidance and faciliation of multimodal transportation connectivity and options
Reno City Council	<b>\$</b>	Regulation	Building Code	Reno Code of Ordinances Title 14	Amend to include requirements that multi-unit dwellings include charging stations or charging readiness
Reno Traffic Engineer		Implementation	The city traffic engineer is authorized to place markers, buttons, or signs within or adjacent to intersections indicating the course to be traveled by vehicles turning at such intersections, and such course to be traveled as so indicated may conform to or be other than as prescribed by law or ordinance	Reno Code of Ordinances 6.06.130	Traffic Engineer may direct traffic flow in a manner to accommodate public or other transit offerings
Reno Traffic Engineer		Implementation	The city traffic engineer shall place and maintain traffic-control signs, signals, markings and devices when and as required under the traffic ordinances of this city to make effective the provisions of such ordinances, and may place and maintain such additional traffic-control devices and markings as they may deem necessary to regulate traffic under the traffic ordinances of this city or under state law or to guide or warn traffic	Reno Code of Ordinances 6.06.040	Traffic Engineer has the authority to pilot and install various ITS devices and equipment
State Environmental Commission	<u> </u>	Regulation	May adopt regulations to prevent, abate and control air pollution; establish standards for air quality; require access to records relating to emissions which cause or contribute to air pollution; cooperate with other governmental agencies, including other states and the Federal Government; and establish such requirements for the control of emissions as may be necessary to prevent, abate or control air pollution	NRS 445B.210	Regulations could extend to targeted emissions levels
State Environmental Commission	📮 号	Regulation	Establish fuel standards for both stationary and mobile sources of air contaminants	NRS 445B.210	Regulations cover mandatory alternative fuels program and compliance
State Environmental Commission	<b>਼ਿ</b> ਵੇ	Regulation	Require elimination of devices or practices which cannot be reasonably allowed without generation of undue amounts of air contaminants	NRS 445B.210	Authority to establish or target emissions levels for vehicles





GOVERNMENT ENTITY	POLICY AREA	ACTION	AUTHORITY	CITE	APPLICATION		
State Environmental Commission	🖵 😜	Regulation	Shall in cooperation with the Department of Motor Vehicles, adopt regulations which establish procedures for collecting, interpreting and correlating information concerning programs to control emissions from motor vehicles and any benefits which result from an inspection program	NRS 445B.765	Authority to use data regarding vehicle emissions to support setting and meeting emissions control targets		
State Environmental Commission	<b>말</b> 읒	Regulation	May in a county of 100,000 or more and in cooperation with the Department of Motor Vehicles and any local air pollution control agency, adopt regulations to establish a voluntary program of electronic monitoring of emission information, from vehicles equipped with onboard diagnostic equipment that permits such monitoring, for the purposes of compliance with this chapter	NRS 445B.767	Regulations could recognize monitoring exemptions for electrified fleets		
State Environmental Commission	<b>무</b> 응	Regulation	In any county whose population is 100,000 or more, the Commission shall, in cooperation with the Department of Motor Vehicles and any local air pollution control agency, adopt regulations for the control of emissions from motor vehicles in areas of the county designated by the Commission	NRS 445B.770	Authority to establish or target emissions levels for vehicles		
State Environmental Commission	ि <del>।</del> डि	Regulation	A hybrid electric vehicle, as defined in 40 C.F.R. § 86.1702-99, is exempt from the provisions of NRS 445B.770 to 445B.815, inclusive, until the model year of the vehicle is 6 years old	NRS 445B.825	Extend exemption to partially electrified trucks and all-electric vehicles		
State Environmental Commission	ि <del>।</del> इ	Regulation, Implementation	Shall set standards, regulate, enforce, and investigate alternative fuel use by fleets of 50 or more vehicles	NRS 486A.010-180	Authority to encourage adoption by government fleets of the full range of alternative-fuel vehicles, including electric		
State, County, City, Town, School District or any public agency of this State or its political subdivisions sponsoring or financing a public work		Implementation	Enter into a public-private partnership, or authorize a person, to plan, finance, design, construct, improve, maintain, operate or acquire the rights-of-way for, or any combination thereof, a transportation facility; "Transportation facility" in a county of 700,000 or more means any existing, enhanced, upgraded or new facility used or useful for the safe transport of persons, information or goods by one or more modes of transport, including, without limitation, a road, railroad, bridge, tunnel, overpass, mass transit facility, light rail, commuter rail, conduit, ferry, boat, vessel, intermodal or multimodal system, a system using an automated driving system, as defined in NRS 482A.025 and any ancillary facilities and improvements	NRS 338.1587, 1589, 162, 010(16), 1584	Authorizes alternative mechanisms to develop transportation facilities, including automated driving systems for Southern Nevada		
Transportation Authority		Regulation	Shall regulate and permit transportation network companies	NRS 706A.110	Regulatory oversight for networked transportation providers		
Transportation Authority		Regulation	Shall regulate and permit autonomous vehicle network companies	NRS 706B.110	Regulatory oversight for networked transportation providers		
Washoe County		Funding	Public transit and road tax on retailers	Washoe County Code 20.500	Authority to tax retail activity to collect additional funds for public transit operation and projects		
Washoe County		Regulation	Development Code	Washoe County Code Chapter 110	Adapt as necessary to maintan consistency with Complete Streets guidance and faciliation of multimodal transportation connectivity and options		
Washoe County		Regulation	Building Code	Washoe County Code Chapter 100	Amend to include requirements that multi-unit dwellings include charging stations or charging readiness		
Washoe County Manager		Implementation	The county manager is authorized and empowered to allocate and control the use of all parking lots and parking spaces owned or controlled by the county	Washoe County Code 80.600	Authority to create and manage parking spaces offering vehicle charging stations		
Washoe County Public Works Director		Implementation	May determine locations for the placement of official traffic-control devices in order to provide for the safe and expeditious movement of traffic	Washoe County Code 70.220	Public Works director has the authority to pilot and install various ITS devices and equipment		



APPENDIX C

## Federal Dollars Available for Advanced and Electrified Transportation Projects

FUNDING SOURCE	ТҮРЕ	E DESCRIPTION	TYPE OF PROJECTS ELIGIBLE FOR FUNDING									
National Highway Performance Program (NHPP)	Allocation	Annual average of \$23.3 billion to support the condition and performance of the National Highway System; limited to projects on or, where indicated, in the same corridor and that affect, the National Highway System	x	x	x	x		x	x			
Surface Transportation Block Grant Program (STBG)	Allocation	Annual average of \$11.7 billion of flexible funding for state and local transportation needs (not to be used on local roads or rural collectors)	X	X	X	X	X	X	X	X	X	X
STBG set-aside for Transportation Alternatives (TA)	Competitive grant	Annual average of \$844 million for smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity. Unless a State opts out, it must use a specified portion of its TA funds for recreational trails projects			X							
Highway Safety Improvement Program (HSIP)	Allocation	Annual average of \$2.6 billion for a data-driven, strategic, and performance-focused approach to correct or improve a hazardous feature or address a highway safety problem	X		X			X	X			
Congestion Mitigation and Air Qaulity Improvement Program (CMAQ)	Allocation	Annual average of \$2.4 billion for transportation projects and programs to help meet the requirements of the Clean Air Act by reducing congestion and improving air quality. Programs are for areas within a state that is or was designated as nonattaiment for ozone, carbon monoxide, or particulate matter; states in attainment of federal air quality limits may use their CMAQ funds for any CMAQ- or STBG-eligible project program		X	X	x	X	X	X	X		
National Highway Freight Program (NHFP)	Allocation	Funds for improving the efficient movement of freight on the National Highway Freight Network, which includes projects for freight movement on primary highway freight system and critical urban and rural freight corridors	x			x		X				
Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies (FASTLANE)	Competitive grant	Total of \$4.5 billion over five years to provide financial assistance for freight movement, including highway, rail, port, and intermodal freight and highway projects of national or regional significance	x					X	X			
Transportation Infrastructure Financing and Innovation Act (TIFIA)	Loan	Federal credit assistance to eligible surface transportation projects, including highway, transit, intercity passenger rail, some types of freight rail, intermodal freight transfer facilities, and some modifications inside a port terminal	x	X		x		x	X			
Highway Research and Development (HRD)	Allocation	Annual \$125 million for research and technology transfer activities related to highway safety, infrastructure integrity, planning and environment, highway operations, exploratory advanced research, and operation of the Turner-Fairbank Highway Research Center; funds applicable to research and learning transfer of relevant technology	x	X		x	X	X			x	
Technology Innovation and Deployment Program (TIDP)	Competitive grant	Annual average of \$67.4 million to accelerate implementation and delivery of new innovations and technologies that result from highway research and development, reduce fatalities, and reduce congestion	x	X		x	x	x				







FUNDING SOURCE	ТҮРЕ	DESCRIPTION	TYPE OF PROJECTS ELIGIBLE FOR FUNDING												
Advanced Transportation and Congestion Management Technologies Deployment Program	Competitive grant	Annual \$60 million for large-scale implementation and operation of a diverse set of advanced transportation technologies that reduce costs and improve return on investments, deliver environmental benefits through increased mobility, improve transportation system operations, improve safety, improve collection and dissemination of real-time information, monitor transportation assets, deliver economic benefits, and accelerate deployment of connected/autonomous vehicle technologies	Х	X		X	X	X							
Intelligent Transportation Systems (ITS)	Competitive grant	Annual \$100 million for the ITS Program, which conducts research to advance transportation safety, mobility, and environmental sustainability through electronic and information technology applications, and also enhance the national freight system and support national freight policy goals		x		X	X	X			X				
Better Utilizing Investments to Leverage Development (BUILD)	Competitive grant	Replaces Transportation Investment Generating Economic Recovery (TIGER) grant program for projects that will have a significant local or regional impact; BUILD funding can support roads, bridges, transit, rail, ports or intermodal transportation for safety, economic competitiveness, quality of life, environmental protection, and state of good repair, innovation (e.g. autonomous vehicles infrastructure), broadband service to underserved communities, partnerships between the public and private sectors, and non-Federal revenue for transportation infrastructure investments	X	X	X	X	X	X	X	X					
Surface Transportation Funding Alternatives Program	Competitive grant	Grants to states or groups of states to demonstrate user-based alternative revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund													
Department of Energy Grants and Loans	Competitive grant	The Office of Energy Efficiency and Renewable Energy includes the Vehicle Technologies Office, which supports the Clean Cities Coalitions for alternative fuels and research and also the development, testing, and application of technologies around batteries, charging, electric vehicles, energy efficient mobility systems, alternative fuels, lightweight materials, and technology integration. It also sponsors the Energy Efficient Mobility Systems (EEMS) to conduct early stage R&D for advanced transportation technologies that reduce overall energy consumption or otherwise create energy efficiencies		X		X	X	X	X						
Environmental Protection Agency Diesel Emissions Reduction Act (DERA) Grants	Competitive grant	Funding for projects that reduce diesel emissions from existing engines		x											
Environmental Protection Agency Clean School Bus	Rebate program	Funding for reduction of school bus emissions		X											

Sources for this table include the relevant provisions of Title 23 of the United States Code, governing transportation funding, and the Federal Highway Administration's FAST Act Fact Sheets, https://www.fhwa.dot.gov/fastact/factsheets/.







## APPENDIX D



## Action Items by Agency

OBJECTIVE	STRATEGY	Govern	Leojslat	Governe	Public	Depairin	Debo	Hero	Redi	Hero	Clark	Wash	Gove	Cities att	Deba	Hero	Hero	schu	officeot	AIPOT	Transpor
~	(1) Set an express policy mandate	X	X							X	X	X									
Establish Leadership on Transportation Electrification	(2) Create an authority to lead transportation electrification as a policy objective and outcome	X	X																		
	(3) Address the state funding shortfall for transportation resulting from the diminished fuel tax receipts	Х	x	X		x	x		x												x
N	(4) Electrify public transit buses	Х	X		X				X				Х			X					X
Electrify Regional Connectivity and Mobility	(5) Electrify school bus fleets	Х	X		X										Х			Х			X
	(6) Optimize integration of all EV load into electric grid	Х	X	X	X																X
Electrify Multimodal Transportation for Reduced Congestion and Livable Communities	(7) Use TNC taxes to support electrified micro-/on-demand transit		X			X	X		X					X							X
	(8) Create public charging infrastructure to support all vehicles	Х	X	X	X		X		X				Х	X		X					X
	(9) Support EV uptake as a personal vehicle option	Х	X		X									X							X
	(10) Provide the rights of way and non-monetary support needed to place e-bikes and e-scooters as a local transportation option					x			x					x							x
×	(11) Continue to test and develop ACES technology for local transportation options		X			x		x	x				х	x		x	x		x		x
Support Advanced, Electrified Transportation Technologies Development	(12) Invest in Intelligent Transportation Systems (ITS) infrastructure					X			X				Х	X	Х	X	X		X		X
	(13) Invest in Complete Streets with a view of integrating advanced transportation options and electrified public transit								x					x							x
N	(14) Electrify fleets providing ground services at the airports				X					X										X	x
Electrify Efficient Movement of Goods and Services	(15) Promote electrified long distance freight and commercial operations fleets				x																x
	(16) Assess procurement options for medium and heavy duty vehicles in a fleet			x						x											x







## Estimated Electric Capacity Needed for Light Duty Vehicle and Public Bus Fleets in Nevada



Graph shows estimates of electric capacity needed for average annual charging of light duty vehicles currently registered in Nevada, including higher-than-average demand for estimated number of TNCs. Includes capacity needs for Nevada's public transit and school buses based on 2016 total vehicle miles traveled. Assumes average annual charging of light duty vehicles met by approximately 6 hours of charging by all vehicles simultaneously. Excludes non-bus, government- and commercial-sector medium- and heavy-duty vehicles anticipated to add to demand in the next 5 to 10 years.

## **Electric Load Potential from Transportation Electrification**







702.907.7497 | 702.660.8887 e-centricity.com Nevada, US

# Moving forward thinking Forwardad