

**NEVADA
ENERGY MARKETS AND
PLANNING REPORT**

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Executive Summary

The Nevada Governor's Office of Energy (GOE)¹ partnered with the National Association of State Energy Officials and the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability on completion of the Energy Markets and Planning (E-MAP) project. This road mapping project was undertaken to provide a comprehensive overview of goals and achievements across Nevada's electric system, including evaluations of the specific advances in distribute energy resources, renewable energy, and energy efficiency with the aim of fostering market innovation and ensuring a reliable, affordable, and environmentally sustainable electric system for the State.

Nevada's energy markets provide a vast array of services that people rely on every day, including electricity for lighting, air conditioning, and manufacturing; natural gas for residential uses and industrial processes; and transportation fuels for cars, public transportation, and freight. These services provide the foundations of the State's economy but also contain some concerns for the environment and economic future unless regularly evaluated and updated. While Nevada contains a rich mix of natural and renewable energy resources, the State does not include local sources of fossil fuels which have historically dominated energy generation and consumption in Nevada. Technology and policy changes have favored more domestic energy production and provide opportunities for the State to increase energy resilience, develop a larger energy generation market, and lead renewable energy production and innovation.

Nevada's policies and statutes are generally reviewed on a biennial cycle which functions around the Legislative and election calendar in the State. The Nevada Legislature meets for 120 calendar days on odd-numbered years. State agencies utilize the interim between legislative sessions for implementation and review of policies. Initiatives and referendums allow Nevada voters to utilize a petition circulation process to impact policies by proposing new legislation, amending the Nevada Constitution or existing statutes, or approving or disapproving existing laws.

Energy policy in Nevada cycles through the following three stages of review, adoption, and implementation which are carried out by several agencies and organizations:

- 1) Formal stakeholder and public meetings to review regulatory and policy implementation, developing additional recommendations to update policies;
 - Interim Legislative Committee on Energy;
 - Public Utilities Commission of Nevada investigatory dockets; and

¹ 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 GOE implements the laws of the State as defined in Nevada Revised Statutes Chapters 701 and 701A; manages energy-related programs; facilitates cooperation between key stakeholders; advises the Governor on energy policy; and collaborates with local, regional, and federal partners to ensure a reliable and sustainable energy system. The energy programs administered by the GOE align to the agency mission as well as the policy and energy goals set by the state legislature.

- Additional ad hoc committees established by the Legislature or executive order.²
- 2) Adoption of policy and regulatory recommendations;
 - Voter approval of initiatives and referendums; and
 - Adoption of legislation and approval by Governor.
 - 3) Regulatory and policy implementation.
 - Rulemakings;
 - Monitoring and regulatory oversight; and
 - Administrative agency implementation.

As Nevada works to transform its electricity sector, it must do so in a changing industry. Market developments, technological innovations, and policy actions have helped put into motion a shift in the operations of investor-owned utilities in the State.

² The E-MAP project solicitation was released while the State was in the process of implementing statutory (Nevada Revised Statute (NRS)) and regulatory (Nevada Administrative Code (NAC)) changes governing residential net metering systems. Concerns with implications of existing net metering policies prompted Governor Brian Sandoval to issue an executive order in February 2016, reconvening the New Energy Industry Task Force and charging it with providing recommendations on the best energy policies for Nevada's future. The goals of the E-MAP project corresponded with the planning goals for the Task Force and provided an opportunity for the GOE to combine the two processes. The Director of the GOE served as the chair of the Task Force, which also included members of industry, utilities, environmental interest groups, Nevada Legislature, as well as other stakeholders.

The E-MAP project was initiated in Nevada shortly after the Task Force was created with the intention of utilizing existing policy processes to complete the evaluation of Nevada's energy markets and policies. The strategy of combining the processes was to avoid re-creating a new stakeholder process for E-MAP and utilize existing stakeholder conversations that were seeking similar outcomes. The Task Force held public stakeholder meetings between March and September 2016 and formed three Technical Advisor Committees (TACs) to assist in the development of recommendations on the best energy policies for Nevada's future and to specifically address policies that achieve the following:

- Encourage the development of clean energy sources and integrate renewable energy technologies into Nevada's energy sector;
- Foster the creation of a modern, resilient, and cost-effective energy grid; and
- Support distributed generation and storage, with a specific focus on rooftop solar and net metering.

Throughout the Task Force and TAC meetings, presentations were given by experts representing the renewable energy industry, utilities, environmental advocates, consumers, businesses, residents, and federal and state regulators on a variety of issues related to the assigned policy focus areas. In total, the Task Force and TACs held 23 public meetings to examine the issues and received extensive public and industry participation. The Task Force concluded with 20 recommendations which required legislative changes and seven (7) recommendations which required agency regulation changes. These recommendations were reported to the Governor and Nevada Legislature. Most Task Force recommendations requiring legislation made it whole or partially into bill draft requests for the 2017 Legislature, including two bill draft requests by the Governor.

The GOE utilized the Task Force stakeholder conversations for the development of the baseline assessment and to support the development of accomplishments, strategies, and goals identified in the E-MAP roadmap. The roadmap was further supported through policies established during the 2017 legislative session which featured energy policy as a central topic of debate and discussion. The completion of 15 energy-related bills that were passed by the Legislature and signed by Governor Sandoval highlighted the focus on energy policy. The energy policies established in 2017 and in previous legislative sessions have formed the core strategies and goals for sectors moving forward.

The Nevada Energy Markets and Planning Report has been organized into three interconnected sectors driving energy markets in the State identified as: 1) Distributed Energy Resources; 2) Renewable Energy; and 3) Energy Efficiency. These three sectors provide an overview of the major State policy drivers shaping energy markets in Nevada for the foreseeable future.³ As these three sectors are reviewed, it is important to understand that many aspects and strategies impact each other and have connected actions.

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³ It should be noted that the Energy Choice Initiative (ECI) is currently pending before Nevada’s voters. The ECI would eliminate electric monopolies in the State, opening the way for a competitive electric market. In 2016, the ECI received 72.36% of the general election vote to amend the Nevada Constitution and automatically qualified for the 2018 ballot. If passed by a majority of voters in November 2018, the State Constitution will be amended, requiring policy makers and regulators implement an open and competitive retail market for energy and generation by 2023. The impact on distributed energy resource, renewable energy, and energy efficiency measures and programs is unknown if ECI is approved by voters again in November 2018.

I. Distributed Energy Resources⁴

The first of the core energy sectors to be addressed in this Report is distributed energy resources. There is some cross-over between this sector and others but many technologies and services fit into this category due to the benefits which they provide and the incentive structure of the State. Nevada has adopted many policies supporting distributed energy resources which have provided quantified customer benefits, advances in technology, and lower costs. Distributed energy resources can require updates to traditional ratemaking and utility models that are evaluated throughout regulatory oversight and stakeholder review processes. Statewide initiatives and incentives are required to have statutory authority and are implemented through executive branch agencies and the regulatory process. The most successful distributed energy resources projects reduce operational costs, improve system resiliency, and provide greater system flexibility.

A. Essential Strategies and Goals for Distributed Energy Resources

Strategically focus resources and policies to implement cost effective distributed energy resource initiatives throughout Nevada.

Strategies	Implementation Actions
1) Deployment of advanced metering infrastructure and integration of distribution automation	<ul style="list-style-type: none"> • Deployment of smart meters throughout the State • Improve demand response management of the grid
2) Strengthen the regulatory and policy framework for net metering deployment	<ul style="list-style-type: none"> • Establish net metering rates and regulations • Direct incentives for development of net metered systems • Initiate pilot programs for underserved communities
3) Increase energy storage deployment	<ul style="list-style-type: none"> • Energy storage deployment within the transmission and distribution system

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⁴ A DER is any resource on the distribution system that produces electricity and is not part of the interconnected bulk power system. A DER includes, but is not limited to, behind-the-meter generation and energy storage devices.

B. Accomplishments and Strategy Status for Distributed Energy Resources

1. Deployment of Advanced Metering Infrastructure and Integration of Distribution Automation

Integrating distribution automation and advanced metering infrastructure are key components to maximizing distributed energy resource savings. Advanced metering infrastructure systems are comprised of state-of-the-art metering hardware and software to utilize interval data measurement remotely. These systems enable the collection and transmittal of time-based information. Although not as dynamic and advantageous as advanced metering infrastructure, automatic meter reading allows for faster collection of consumption and billing information to improve utility operational effectiveness.

Distribution automation utilizes digital sensors and switches with advanced control and communication technologies to remotely monitor and control basis switches, capacitors, relays, reclosers, and other devices that control a large and complex array of power lines, substations, and other components of the system. Investments in distribution automation help improve fault locations, isolation, and service restoration capabilities that result in fewer and shorter outages, lower outage costs, reduced equipment failure, and fewer inconveniences for customers. More effective equipment monitoring and preventative maintenance can reduce operating costs and lead to more efficient use of repair crews and enable faster service restoration. Distribution automation also reinforces other distributed energy resource investments by improving grid integration of newer technologies.

Deployment of Smart Meters Throughout the State

Improving metering infrastructure has been a priority for electric providers and regulators, pushed by cost savings that the improved infrastructure provides. From 2010-2015, over 1.4 million electric and gas meters were exchanged for smart meters in NV Energy's service territories.⁵ This updated technology was prompted by a \$139 million grant from the U.S. Department of Energy. Essential communication networks were implemented to collect and manage the metering information. This project created the utility's Meter Data Management System which substantially reduced operating costs while improving meter data and billing quality. It also supports operational improvement as it relates to outage detection and restoration. It provides a technology platform that automates and optimizes enhanced customer communications and demand management solutions. The implementation also provides estimated cost reductions of \$20 million annually. In addition to the benefits provided to the utility and rates provided by the smart meters, they provide increased customer access and awareness of energy usage. The customer data portal, MyAccount, provides two-year usage data, net metering production graphs, and time of use and demand information for customers to take advantage of.

⁵ Nevada Power Company d/b/a NV Energy in southern Nevada and Sierra Pacific Power Company d/b/a NV Energy in Northern Nevada collectively serve 90% of the population in Nevada.

In addition to NV Energy's system, smaller electricity service territories have made progress in planning and deployment of improved metering systems. As an example, in 2009 Mt. Wheeler Power completed full deployment of an automatic meter reading system, reducing the staff time spent to download user data by over 80%.

Improve Demand Response Management of the Grid

NV Energy, through regulatory approval, has implemented several programs that allow NV Energy to control customers' loads to assist in meeting electric peak load without adding generation. Customer energy management solutions integrate energy efficiency and demand response options to provide enhanced services beyond traditional rebate programs. These efforts have leveraged smart grid infrastructure to allow customers to take advantage of new data driven solutions for enhanced energy management, benefiting participating customers and lowering costs for all ratepayers. Data analysis can be applied to both sides of the meter to optimize how customers use major energy systems and allows the utility to actively manage its peak demand via peak shaving technology. NV Energy also maintains a demand response management system that allows the utility to forecast and optimize the "dispatch" of customer loads to reduce and shape the electric peak load. New approaches minimize customer impact and allow flexible and locational dispatch to support both system-wide and distribution level demand management. NV Energy's demand response program manages over 240 megawatts (MWs) of load control, helping the system avoid the need to construct costly new generation to serve peak load. NV Energy's monitoring and diagnostic center tracks over 100,000 data points at its power plants to predict failure in advance, so outages can be avoided or properly planned for. These systems provide for optimal dispatch and scheduling of resources based on performance data.

2. Strengthen Regulatory and Policy Frameworks for Net Metering⁶ Deployment

Establish Net Metering Rates and Regulations

Net metering policy for small scale projects has been one of the most visible energy issues in Nevada over recent years. Net metering was first enacted in 1997, authorizing a maximum of 100 customers to participate, and has grown significantly since that time. Initial net metering policy in Nevada required that net metered energy be measured in a 1-1 ratio, permitting customer generators to receive 100% of the retail value of the energy they produced and did not directly consume at the time of production. Over subsequent legislative sessions, the cap was gradually increased to allow 235 MWs of installed capacity by 2015.

The ability for customers to finance and install net metered systems has become easier as

⁶ Net metering measures the difference between the electricity supplied by a utility and the electricity generated by a customer-generator which is fed back to the utility's system over an applicable billing period. There is crossover between the distributed energy resources sector and the renewable energy sector but net metering is included with distributed energy resources due to the values it provides and the incentives used to support the industry. Net metered systems are deployed throughout the distribution network, providing widespread benefits to the distribution system.

the market has matured and penetration has increased in the State. Average residential solar installation costs have declined by over 60% since 2010, providing a shorter payback period for net metering investments.

The 2015 Legislature passed several changes to net metering policy, requiring the Public Utilities Commission of Nevada to establish cost-based rates for net metering customers to ensure there were no unreasonable cost shifts between customer generators and other customers. However, quantifying the full scope of the costs/benefits of net metered systems proved difficult to achieve in Nevada, especially considering that many of the costs/benefits provided have not traditionally been a part of establishing energy rates. Given the clash between the meteoric rate of net metering installations and the slow pace of regulatory rate making, the industry experienced a slowdown in 2016. The stakeholder concern over implementation of the new net metering laws resulted in Governor Sandoval reconvening the New Energy Industry Task Force and in-depth stakeholder review of the policies.

The 2017 Legislature created a compromise on net metering policy with the passage of Assembly Bill 405 which established consumer protections and a “Bill of Rights” for distributed generation customers along with revising provisions governing net metering rates. The net metering reimbursement rate structure created through the new legislation is tiered below the retail rate and set to decrease over time as the amount of electricity produced by net metering systems reaches 80 MW benchmarks. Net metering customers also remain in the same customer class as non-net metering customers and are entitled to the reimbursement rates at the time a system is installed for a period of 20 years. This legislation impacts systems sized at 25 kilowatts (kW) or less and nets electricity off monthly consumption and generation. The passage of this legislation provided increased stability to the net metering market in Nevada and creates greater certainty for distributed generation investments.

Direct Incentives for Development of Net Metered Systems

The Renewable Generations Systems Incentive Program was created by NV Energy to provide education, outreach, and incentives to residential, governmental, and commercial customers who wished to install net metered, private generation systems. The specific objectives have been updated over subsequent legislative sessions, particularly when the 2013 Legislature setting a goal of incentivizing 250 MWs of distributed solar capacity. Plans are proposed by NV Energy annually to the Public Utilities Commission of Nevada, reviewed by interested stakeholders, and carried out by the utility. Systems with a total capacity of up to 500 kW are eligible to receive incentives. Small systems, 25 kW and smaller, receive a direct payment at the completion of construction and larger systems which qualify receive incentives based on actual performance. The renewable energy credits generated by incentivized systems are assigned to the utility to apply toward compliance with the renewable portfolio standard. Over 20,000 customers have taken advantage of the program, incentivizing over 195 MWs of distributed energy resources through February 2018. The 2017 Legislature, through Senate Bill 145, expanded eligible technologies into electric vehicle infrastructure and energy storage.

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Initiate Pilot Programs for Underserved Communities

The Low Income Solar Energy Pilot Program was authorized by the 2013 Legislature to implement solar energy systems to support low-income residents in both northern and southern Nevada. The program was created with the objective of installing 2,000 kW of solar capacity to benefit low-income customers, established by the Public Utilities Commission of Nevada through regulation. Phase I of the program developed 125 kW systems at eight schools serving lower income areas around the State. Phase II has followed-up that action with installing solar systems at non-profit organizations serving low-income residents that were selected through a stakeholder process that involved regulators, State agencies, solar installers and community activists. The GOE provided a grant for Phase II projects to fund the inclusion of microinverter technology to lower maintenance costs of the systems over service lifetimes.

With completion of the Phase I and II of the Low Income Solar Energy Pilot Program objectives, the 2017 Legislature established a more permanent program, through Senate Bill 145, by allocating \$1 million per year for five years to incentivize additional solar and distributed generation systems that benefit low-income customers.

3. Increase Energy Storage Deployment

Energy storage systems can be utilized to add stability, control, and reliability to the electric grid. Storage technologies have not been historically used on a wide-scale due to the lack of the cost-competitiveness with cheaper sources of power. Recent declines in costs and improved technology have opened up storage as a potentially viable option to increase efficiencies in the transmission and distribution system and behind the meter demand control. The growing use of intermittent renewable sources of generation have also increased the value that storage brings in maintaining a stable grid.

Energy storage deployment in Nevada has seen several projects and limited applications but will go through greater analysis and potential project identification. At the utility scale, the State has seen energy storage projects in NV Energy's service territory and outside it. The Crescent Dunes solar facility uses molten salt as a thermal storage medium to provide 1,100 MW hour of energy storage in addition to the solar thermal electric generation the facility produces. The ARES project, located within Valley Electric Association's (VEA) service territory, is an energy storage system that was permitted to utilize electric locomotives to store and discharge electricity. The project is expected to provide 50 MW grid-scale ancillary services and will be interconnected into the California Independent System Operator (CAISO) via VEA's transmission infrastructure. A variety of behind-the-meter and distribution energy storage system deployments have also been evaluated, tested, and deployed in the State but a comprehensive incentive and regulatory approach was not established until the 2017 Legislature. The passage of Senate Bill 204 requires the Public Utilities Commission of Nevada to investigate and consider targets for the utility to procure energy storage systems if found to be cost-effective. The passage of Senate Bill 145 also requires \$5 million to be dedicated to support small systems installed by residential or small commercial customers of the utility and \$5 million to support larger systems sized from 100 to 1,000 kW.

C. Measuring Success and Adjusting Strategies Over Time

Distributed energy resources have largely been driven by the cost-effectiveness of implemented programs and the impact of those savings on ratepayers. As the cost-effectiveness has been evaluated, the integration of distributed energy resources have presented new challenges in determining the costs/benefits attributed to these systems and the assignment of those values across various groups of ratepayers. As these deployments are evaluated in the future, the adoption of new technologies and incentives will continue to be driven by their cost-effectiveness for ratepayers and the overall economics of the whole energy system.

1. Deployment of Advanced Metering Infrastructure and Integration of Distribution Automation

Most of the major investments in advanced metering infrastructure in NV Energy's service territory have been completed and are positively impacting system efficiency. Despite the improvements in advanced metering infrastructure over the most concentrated customer bases, continued gaps in infrastructure persist in rural areas and non-NV Energy service territory. In addition to closing the remaining gaps in advanced metering infrastructure, increased customer communication, outreach, and training is necessary to fully optimize the benefits of AMI infrastructure. Utilizing existing and new infrastructure to encourage customer behaviors which benefit the system will need to be continued.

Continuing and expanding the use of distribution automation infrastructure is imperative as the electric system is integrated with rising levels of net metered customers, battery storage deployment, electrical vehicle usage, and expanding renewable energy production. Integration of these new technologies will require automated management to maintain a more flexible electric grid.

2. Strengthen Regulatory and Policy Frameworks Supporting Net Metering Deployment

The increased adoption of net metered systems will be monitored on a continuing basis. The rate structure for net metered systems under 25 kW was modified to gradually decrease the reimbursement of net metered energy as more systems are installed. This will require review and updates on the values provided from the installed systems and monitoring that reimbursement rates meet customer and constituent expectations.

Funding sources for direct incentives will need to be updated during upcoming legislative sessions to continue funding existing programs and identify any new program areas to fund in the future. The Renewable Energy Program Rate has provided a source of funding to directly incentivize net metering systems but it has a monetary cap limiting the total funding which can be collected through the rate. This cap has been raised in several legislative sessions and must be raised in subsequent sessions in order to increase the number of systems funded through this rate.

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3. Increase Energy Storage Deployment

Traditional resource planning approaches do not always provide visibility into all benefits provided by energy storage systems. Resource plans focus on evaluating the costs and risks of various resource portfolios in meeting forecasted load profiles with appropriate planning margins. The purpose of resource planning is primarily adequacy, with a limited scope of the benefits energy storage systems can provide within the utility regulatory framework. Maximizing the value of energy storage requires optimal siting, sizing, control, and design of the energy storage system. Near term goals to implement Senate Bill 204 will require comprehensive evaluation of cost effective targets for energy storage. If targets are established, these will need to be implemented and evaluated for effectiveness.

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II. Renewable Energy

The renewable energy sector has seen dramatic changes in the State over the last decade. Goals and strategies will be laid out to help highlight the evolving nature of Nevada’s generation portfolio as we look into the future. Critical strategies have been developed through extensive collaboration through stakeholder groups, the Legislature, and executive agencies.

Nevada has been a leading state in the adoption of a renewable portfolio standard, establishing aggressive up-front targets for renewable production, and encouraging the exportation of domestically produced renewable energy. Nevada has maintained a robust geothermal development market for decades but has been able to integrate large-scale solar projects over the last decade, going from having zero large-scale solar developments 15 years ago to being ranked first in the nation for installed solar capacity per capita. Nevada established the objective of becoming the leading producer and consumer of renewable energy in the State’s strategic planning framework, “*Generations to Come*” 2016-2020.

As the State moves forward to achieve its renewable portfolio standard targets and retires older fossil fuel generation assets, the base structure that the electricity sector has operated in for decades is fundamentally changing. Energy planning in Nevada has been largely centralized and the potential for a competitive market will present many challenges for policy makers and regulators.

A. Essential Strategies and Goals

Strategically focus resources to become the nation’s leading producer and consumer of clean and renewable energy.

Strategies	Implementation Actions
1) Utilize in-state drivers for new renewable energy development	<ul style="list-style-type: none">• Renewable portfolio standard• Integrated resource planning• Retirement of fossil fuel generation• Consumer-driven renewable energy development• Clean energy financing mechanisms
2) Utilize out-of-state drivers for new renewable energy development	<ul style="list-style-type: none">• Renewable portfolio standards• Participation in out-of-state energy markets

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| 3) Accelerate the siting and access for new renewable energy development and transmission infrastructure | <ul style="list-style-type: none"> • Improve access to federal lands in Nevada • Siting for new transmission development |
| 4) Invest in key infrastructure at scale through State incentives | <ul style="list-style-type: none"> • Direct tax incentives for qualifying renewable energy projects • Invest in new technologies |

B. Representative Accomplishments and Strategy Status

1. Utilize In-State Drivers for New Renewable Energy Development

Cost reductions in renewable energy production, particularly solar, have helped spur market growth for renewable energy development in Nevada. The State’s investments in renewable energy over the past decade have seen large improvements in cost effectiveness, technology, and expertise in managing a modern energy system.

Renewable Portfolio Standard

A major policy driver in the electricity sector is the State’s renewable portfolio standard, codified in NRS 704.7801, which was first adopted by the Nevada Legislature in 1997 and has been modified in nearly every legislative session since then. The renewable portfolio standard establishes the percentage of electricity sold by an electric utility to retail customers that must come from renewable sources. More specifically, electric utilities are required to generate, acquire, or save with portfolio energy systems or energy efficiency measures, a certain percentage of electricity annually. The renewable portfolio standard in Nevada is calculated with qualifying portfolio energy credits, with targets based on retail electricity sales. The current renewable portfolio standard target for Nevada will meet a 25% standard by 2025.

Changes made in the 2015 legislative session moved the accounting closer to an energy standard rather than a portfolio energy credit standard. Credits generated from energy efficiency measures are phased out by 2025, enhanced credits (with multipliers) were eliminated after 2015, and credits from parasitic load were eliminated after 2015 except for certain energy used for geothermal systems. Currently, 20 percent of the renewable portfolio standard is achievable through credits from energy efficiency projects. This will decrease to 10 percent in 2020 and be completely phased out by 2025. While early carve-outs and multipliers with energy credits served as a good way to encourage newer technologies and efficiency investments, they are no longer a primary goal for renewable portfolio standard policies. There remains a minimum carve-out for solar energy production that has been exceeded. The requirement for renewable energy production increases when both the target is raised and efficiency improvements and multipliers are phased out.

Integrated Resource Planning

Controlling energy costs and managing energy consumption is most effectively influenced in Nevada through thoughtful energy planning. The IRP process was established in 1983 to develop a plan to serve customers' annual peak electrical demand and energy requirements, plus an adequate planning reserve margin, through a combination of demand-side and supply-side resources.

In the 2017 Nevada Legislature, Senate Bill 65 was passed to enable greater public participation in the integrated resource plan pre-filing meetings between the Public Utilities Commission of Nevada and the utility. The legislation also ensures that during the integrated resource planning process, preference will be given by the Public Utilities Commission of Nevada to resources that provide the greatest economic and environmental benefits. This change helps enable the greatest opportunity for the creation of new jobs in the State, diversify energy portfolios, reduce fuel and carbon-price risk, and help to position Nevada to lead the nation as a producer and consumer of clean and renewable energy consistent with established State policy.

As renewable energy production has increased development in Nevada, many technologies have gained price competitiveness with fossil fuels. Ten years ago, utility-scale solar cost more than \$0.15 per kilowatt-hour, the market cost of wholesale solar energy in Nevada is now less than one third of that price.

Retirement of Fossil Fuel Generation

In June 2013, the Nevada Legislature passed Senate Bill 123, which included the complete retirement of coal generation plants in southern Nevada and replacing the capacity with renewable and other lower carbon generating facilities. Since 2013, this legislation has prompted the retirement of over 800 MWs of coal-fueled generation and the procurement and construction of over 300 MWs of solar capacity in the State. Coal-fueled generation was once a dominant source of energy in Nevada, but now supplies less than 10% of NV Energy's electricity. By 2025, NV Energy will not own any coal-fueled generation.

Consumer-Driven Renewable Energy Development

Direction from Nevada ratepayers and voters has been a significant factor in the expansion of renewable energy development. Consumer-driven development has occurred in both the large and small scale, seeing renewable priorities developed by rural electric cooperatives, NV Energy, major industrial and commercial customers, and governments. In addition to net-metered systems developed directly on private properties, sourcing more renewable generation has become a regular practice for multiple categories of ratepayers. In particular, in December 2016 the City of Las Vegas became one of the first major municipalities in the U.S. to be served exclusively with renewable energy for municipal facilities and buildings.

In NV Energy's service territory, the Green Energy Rider program provides a means for customers to source all or a portion of their load from renewable energy sources. Authorized by NRS 704.738, customers may enter into a special contract under which the customer agrees to

assume all of the costs of securing renewable energy resources up to a specified amount, not to exceed the customer's total energy consumption. This has provided the opportunity for customers to source renewable energy beyond the RPS. This program offers long-term renewable energy at fixed prices with no additional administration costs. Utilities can aggregate customer load to get economies of scale and by 2017, Nevada had the largest percentage of commercial and industrial load under a green tariff.

Clean Energy Financing Mechanisms

Nevada has worked to ensure that clean energy projects can utilize new funding streams to finance clean energy projects. In addition to conventional financing, several alternative financing mechanisms have been created by the State to specifically encourage renewable energy and energy efficiency investments.

The GOE manages the revolving loan program for renewable energy, energy efficiency, and energy conservation. Nearly \$13 million was funded under the federal American Recovery and Reinvestment Act of 2009 to provide short-term, low-cost loans to developers of renewable energy projects, renewable component manufacturers, energy efficiency, and energy conservation projects in Nevada. These loans serve as a bridge financing option to provide funding for various startup costs associated with these projects.

The 2017 Legislature featured several initiatives for clean energy financing and approved Assembly Bill 5, enabling legislation for Property Assessed Clean Energy, and Senate Bill 407, creating the Nevada Clean Energy Fund. The Property Assessed Clean Energy legislation provides for the creation of local improvement districts that include an energy efficiency improvement project or a renewable energy project. The Nevada Clean Energy Fund will work to provide financing opportunities for more renewable energy and energy efficiency projects on commercial properties.

2. Utilize Out-of-State Drivers for New Renewable Energy Development

Increasing regional grid connectivity and resource sharing improves Nevada's energy resiliency and opens up markets for energy produced in the State. Trading with partners across a larger footprint allows for purchases and sales between renewable power plants with differing seasonal and daily operating profiles.

Renewable Portfolio Standards

Renewable portfolio standards have been the major driver of renewable energy development in the United States over recent decades. More than 50% of all non-hydro renewable power built since 2000 was to meet RPS requirements. The U.S. has added an average of 6 gigawatts of new renewable capacity annually to meet RPS needs over the past decade and existing renewable portfolio standard requirements will still require roughly a 50% increase in U.S. renewable generation by 2030. The 2030 renewable portfolio standard goal in California alone is expected to require an additional 7,000 MWs to 31,000 MWs of additional renewable energy capacity. Nevada has seen significant development of renewable resources with power

purchase agreements for end users who are out-of-state. Renewable projects in Nevada with out-of-state purchase power agreements total 1,291 MWs capacity, which accounts for 43 percent of the renewable production within the State, excluding hydro power produced at Hoover Dam.

Participation in Out-of-State Energy Markets

NV Energy received approval from the Public Utilities Commission of Nevada to participate in the Energy Imbalance Market (EIM) in December 2015. The EIM currently serves consumers in Arizona, California, Idaho, Nevada, Oregon, Utah, Washington, and Wyoming. The EIM allows CAISO operators to draw on least-cost power to serve consumer demand. Additional benefits are produced by more efficiently using renewable energy, including excess energy, across a wide geographic region. EIM also reduces costly energy reserves utilities are required to secure to ensure reliability. Members can avoid having to build new resources to follow imbalance in generation and load due to the fact that existing resources can be shared between balancing areas. Participation increases the cost effectiveness of intermittent renewable resources such as wind and solar because any excess generation can be delivered and used over a large area.

NV Energy's participation was originally estimated to save Nevada ratepayers \$6 million to \$10 million per year by enhancing the ability to analyze supply and demand by dispatching the lowest cost resource and integrating more renewable resources. Actual savings for Nevada ratepayers have significantly exceeded the original estimate since participation began. According to the CAISO, NV Energy's participation improved transmission access throughout Nevada and exportation opportunities to other states.

3. Accelerate the Siting and Access for New Renewable Energy Development and Transmission Infrastructure

Preserving the ability to site and develop renewable energy generation and transmission infrastructure in Nevada will be critical to meet State and regional renewable goals. The federal government is a necessary partner for nearly every large-scale renewable energy project through siting of generation facilities themselves or transmission connections for new projects. About 84 percent of the land in the State is managed by the federal government, making avoidance of a federal nexus in large-scale development nearly impossible.

Improve Access to Federal Lands in Nevada

As renewable resources are developed in Nevada, preserving access to utilize federally managed lands are a critical component of growing this industry. Increased pressures of managing for threatened and endangered species, urban growth, and historic land uses put renewable projects at risk throughout the permitting process. The GOE regularly serves as a cooperating agency on federal land use planning processes in the State and can serve as an influential voice to articulate needs of the renewable development sector.

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Siting for New Transmission Development

Increased transmission line infrastructure development is a necessary compliment to developing large scale renewable energy facilities. The retirement of coal generation increases the need for transmission resilience as current “must run” energy facilities are taken offline. Recent years have seen the permitting of several key transmission lines to connect renewable energy sources to urban markets. The One Nevada transmission line (ON Line) was a significant infrastructure investment—installing a 235-mile 500 kilovolt (kV) power line connecting southern Nevada to northern Nevada resources through the Robinson Summit Substation. Additional major transmission projects that have been permitted but are waiting on construction include the Southwest Intertie Project and the Harry Allen-Eldorado Transmission Line; these 500 kV transmission lines will connect the ON Line project 275 miles north to Idaho and 60 miles south to Southern California Edison’s Eldorado substation, respectively.

4. Invest in Key Infrastructure at Scale Through State Incentives

The vast majority of renewable energy production and potential in Nevada requires large-scale production and the economies of scale to reduce prices. Most large-scale renewable production has occurred on publicly managed lands, with the Bureau of Land Management serving as the major federal land management agency permitting renewable energy projects. Not only do renewable energy projects generate large short-term investments during the construction phase, they provide long-term value to local communities and counties. Counties are unable to collect property tax on federally managed lands but private developments on public land provide a tax value for counties where previously there was little direct return to the local economy.

Direct Tax Incentives for Qualifying Renewable Energy Projects

The Renewable Energy Tax Abatement Program came under the GOE’s jurisdiction in 2009 and awards partial sales and use tax and partial property tax abatements to eligible renewable energy facilities. To be eligible, projects must have a nameplate capacity of 10 MW or more, employ at least 50% Nevada workers, pay 175% of Nevada’s average wage during construction, and offer healthcare benefits to workers and their dependents. The GOE reviews applications, conducts public hearings to determine eligibility, and reviews annual compliance reports after abatements are granted. An approved qualified renewable project is entitled to receive a 55 percent abatement on the real and personal property taxes for 20 fiscal years and a partial abatement on local sales and use taxes for 3 years. The partial abatement on local sales and use taxes is intended to provide support during the initial construction period; however, the abatement does not include relief from the Local School Support Tax, which is collected and distributed to the school district where the project is located. The Renewable Energy Tax Abatement Program supports a sustainable economy by offering tax incentives to eligible renewable energy development projects that create jobs and stimulate rural economies.

Since the Program’s inception, Nevada’s investment of \$749 million in tax incentives has attracted nearly \$7 billion in capital investments, payroll, and taxes paid. The projects that have received an abatement from the GOE created over 4,600 jobs that paid an average wage of over \$37 an hour. A total of 30 renewable power plants and one transmission project in Nevada have

been granted partial tax abatements, representing over 2,180 MWs of renewable energy capacity as of 2017.

Invest in New Technologies

Investing in new technologies to develop additional resources for large-scale renewable energy facilities within the State should remain a priority. The Frontier Observatory Research Geothermal Energy (FORGE) project represents a good example of opportunities to partner with research institutions, the federal government, and private industry. The FORGE project was developed by the DOE to create a unique research facility that will develop methods and technologies needed to enable widespread enhanced geothermal systems. The DOE primarily funds the project at a site in Fallon; NV has been selected as one of the two finalist locations for the development. The GOE contributed roughly \$1 million to the project and the state's partners in the project are committed to long-term success of the Nevada site.

C. Measuring Success and Adjusting Strategies over Time

As the State moves forward to implement the renewable portfolio standard and more renewable energy systems come online, more work is needed to maximize the benefits of renewable generation and maintaining system reliability. Tax abatements and investments in technology innovations will be necessary to continue the robust growth in the renewable energy sector. Reviewing these strategies and updating implementation actions will be necessary to ensure Nevada's continued leadership in renewable energy policy.

1. Utilize In-State Drivers for New Renewable Energy Development

Nevada's renewable portfolio standard has been the primary policy driver for large-scale renewable energy development within the State to serve local load. As the State approaches meeting the target date and the installed cost of utility-scale solar photovoltaic and wind drops below other resources, the renewable portfolio standard will continue to be evaluated to determine if it should be raised, modified, or eliminated in response to the changing energy markets. Increasing the production of renewable generation in the State will require thorough planning through the integrated resource planning process along with the appropriate tools to finance and incentivize renewable energy investments.

2. Utilize Out-of-State Drivers for New Renewable Energy Development

The goal for Nevada to be the leading producer of renewable energy requires that renewable development serve more than just the domestic population. Developing large-scale projects to serve RPS targets in neighboring states is a necessary objective to achieve the goal. Regional integration, increased participation across State lines, and improved infrastructure will foster the ability for Nevada to continue to lead development of renewable energy.

3. Accelerate the Siting and Access for New Renewable Energy Development and Transmission Infrastructure

A robust transmission infrastructure is necessary for the incorporation of new renewable generation and the success of competitive wholesale and retail markets. Stakeholders and State agencies must remain engaged in federal land planning processes to ensure that undeveloped renewable energy assets remain accessible and additional transmission corridors are planned. Federal agencies can restrict development through military or conservation land withdrawals, critical species management, and other conflicting uses.

4. Invest in Key Infrastructure at Scale Through State Incentives

The continued use of the Renewable Energy Tax Abatement does not require additional or ongoing authorizations by the Legislature but the goals and outcomes require continued evaluation. Currently, the majority of projects which have received abatements under this program have been for projects for energy supply outside of Nevada. Policy makers and stakeholders should remain engaged so that these abatements continue to be effective towards reaching the current State goal of being the leading producer and consumer of renewable energy.

IV. Energy Efficiency

The final core energy sector in this roadmap is end-use efficiency, targeting a reduction in the use of electricity and energy by end users, including homes, businesses, government, and industrial development. Improvements focused on end-use efficiency will have spill-over effects into other sectors of Nevada’s energy system. By increasing efficiencies at the end of the delivery network, the process of balancing the demand from the grid against increasing variability in generation will have consequences on demand management practices and influence distributed energy resource investments in the future. Achieving advances in efficiency also allow utilities to ramp down more expensive generation units by replacing them with cheaper efficiency savings.

A. Essential Strategies and Goals

Strategically focus resources to incentivize, educate, and encourage energy conservation in the public, residential, and commercial sectors.

Strategies	Implementation Actions
1) Align regulatory and policy efficiency incentives with clean energy goals	<ul style="list-style-type: none"> • Energy efficiency planning
2) Retrofit existing residential and commercial buildings	<ul style="list-style-type: none"> • State incentive programs • Energy efficiency financing
3) Strengthen new construction policies and building codes	<ul style="list-style-type: none"> • International Energy Conservation Code • Green Building Tax Abatement Program
4) Reduce energy consumption in public buildings	<ul style="list-style-type: none"> • Performance contract audit assistance program • State-owned building efficiency improvements

B. Representative Accomplishments and Strategy Status

1. Align Regulatory and Policy Efficiency Incentives with Clean Energy Goals

The strategies for end-use efficiency are based on the fundamentals of the energy efficiency market, acknowledging that significant differences exist between efficiency measures

available to new and existing buildings, residential and commercial buildings, the public sector, and non-building energy users. Efficiency programs also rely on much of the regulatory system that governs the generation, transmission, and distribution sectors, as reductions in energy use are very much a part of the overall electricity system overseen by the electric utilities and the Public Utilities Commission of Nevada.

Energy Efficiency Planning

Energy efficiency planning in Nevada has historically been completed as part of the integrated resource planning process, generating energy savings credits to comply with the renewable portfolio standard. Initially, an electric utility was authorized to use energy efficiency savings to comply with up to 25 percent of its annual renewable portfolio standard target. This has been tiered down to 20 percent currently, and will continue to decline to zero as energy efficiency credits are phased out of renewable portfolio standard compliance by 2025. Energy efficiency programs have been authorized by the Public Utilities Commission of Nevada for NV Energy to target efficiencies specific to customer uses, upgrades to appliances, and improvements in infrastructure. During the 2017 Legislature, several pieces of energy legislation were focused on achieving efficiencies, including Senate Bill 150, which requires the Public Utilities Commission of Nevada to establish an energy efficiency resource goal which will increase over time.

2. Retrofit Existing Residential and Commercial Buildings

Energy consumed by the residential, commercial, and industrial sectors accounts for over 65 percent of the State's total energy consumption. A reduction of energy use for existing structures is an important objective for efficiency measures to have a substantive impact on energy consumption.

State Incentive Programs

Non-utility efficiency incentives offered by public agencies and utility efficiency programs authorized by the Public Utilities Commission of Nevada are generally targeted actions, which focus on a specific group of individuals to serve or customer behavior to encourage. Non-utility residential efficiency incentives have historically been based on financial need and age qualifications for applicants to receive assistance. The Weatherization Assistance Program (WAP) is administered by the Nevada Housing Division to reduce residential energy costs for low-income families, particularly for the elderly, people with disabilities, and children. The WAP has been funded with State dollars since 2001 to augment the federal funding received from the U.S. Department of Energy. The GOE adds funding through the Home Energy Retrofit Opportunities for Seniors (HEROS) program which extends the efficiency improvements which can be provided to low-income seniors.

Many utility efficiency programs administered by NV Energy are funded through an on-bill energy efficiency charge which was established by the Legislature to allow utilities to recover energy efficiency and conservation program costs. To extend energy efficiency project benefits for low-income residents, the 2017 Legislature passed Assembly Bill 223, requiring that

energy utilities provide no less than five percent of demand side management spending in energy efficiency plans to help low-income residents. This legislation continues the priority of focusing some efficiency programs on reducing the energy burden of low-income residents.

Energy Efficiency Financing

The 2017 Legislature featured several initiatives for financing energy efficiency projects and approved Assembly Bill 5, enabling legislation for commercial Property Assessed Clean Energy programs, and Senate Bill 407, creating the Nevada Clean Energy Fund. The enabling commercial Property Assessed Clean Energy legislation originated as a recommendation from the 2016 New Energy Industry Task Force and provides for the creation of local improvement districts that include an energy efficiency improvement project or a renewable energy development. Through this legislation, local governments are able to create Property Assessed Clean Energy districts that rely on the existing framework of property taxes by allowing commercial property owners to repay the entire loan for a project through a special tax assessment made on the property. Energy efficiency projects for commercial properties will be able to utilize Property Assessed Clean Energy financing with limited upfront capital.

3. Strengthen New Construction Policies and Building Codes

Robust efficiency standards for new construction policies and building codes help minimize the negative impacts of bringing new load requirements on the system and provide flexibility to the existing grid.

International Energy Conservation Code

The International Energy Conservation Code (IECC) is a model for the establishment of minimum design and construction requirements for energy efficiency. The GOE adopted the 2012 IECC in 2015 and in June of 2017, the GOE began the adoption process for the most recent version of the IECC. Nevada has committed, by statute, to adopting the most current IECC codes every three years. Adopting such building codes represents an inexpensive way to achieve energy efficiency outcomes.

Green Building Tax Abatement Program

The Green Building Tax Abatement Program (GBTA) supports a sustainable economy by attracting businesses to build sustainably by offering tax abatements for new commercial and multi-family green buildings, and existing buildings which are renovated to meet certain green building standards. The GOE administers the GBTA program based on criteria set forth in the Leadership in Energy and Environmental Design (LEED) or Green Globes rating systems and certification from the U.S. Green Building Council or the Green Building Initiative, respectively. Both the LEED and Green Globes rating systems provide a complete framework for assessing building performance and meeting environmental sustainability goals. These rating systems are used in industry and are recognized standards for designing, operating, and certifying green building projects. The program was instituted in 2007, by statute, as an incentive for business owners to improve the energy efficiency of new and existing buildings.

4. Reduce Energy Consumption in Public Buildings

Public buildings are major consumers of electricity and can serve as community examples of cost-effective energy conservation.

Performance Contract Audit Assistance Program

Performance contracting is an alternative financing mechanism to accelerate investment in cost effective energy conservation measures and accomplish energy savings projects without up-front capital. It is a partnership between a building owner and an energy service company (ESCO) that conducts an energy audit identifying improvements that will save energy. The ESCO guarantees that the improvements will generate cost savings sufficient to pay for the project over the term of the contract. Performance contracting serves as an alternative funding source to make energy efficiency improvements without tapping into the capital budget. The resulting cost savings pay for all project costs over time, normally 10 to 20 years. Benefits are immediate through the acquisition of expertise from ESCOs, installation of new energy efficiency measures and equipment, the improvement to operations and maintenance, and the ability to accomplish projects all at once. The projected savings are guaranteed by the ESCO. This concept is fiscally responsible because there is no increase to the State's bottom line with savings achieved in future years

The Performance Contract Audit Assistance Program was started by the GOE to fund financial grade audits for public entities within the State, which is the first step to determine if a project is worth pursuing. In addition to improving air quality and reducing fossil fuel consumption, these projects improve the comfort, sustainability and efficiency of facilities. Economic benefits from these projects will be significant because the successful contractor will be required to use Nevada businesses to implement the upgrades, providing increased employment opportunities in the construction field. Since the inception of the Performance Contract Audit Assistance Program in 2014, the GOE has awarded \$1.1 million to accelerate performance contracting, resulting in project investments totaling \$65 million, while creating an estimated 479 jobs.

State-Owned Building Efficiency Improvements

In 2005, the Legislature established a target of reducing grid-based energy purchases by 20% by 2015 for the State of Nevada through Assembly Bill 385. The GOE is responsible for benchmarking energy consumption of State buildings every two years and working with State agencies to implement efficiency measures.

C. Measuring Success and Adjusting Strategies over Time

Energy efficiency programs have been able to achieve incremental improvements over recent years by capitalizing on many of the highest yield opportunities; therefore, improvements in the future will likely become more complex and expensive. To compensate for this in the future, greater emphasis should be placed on comprehensive retrofits, integrating new technologies, and attempting to lower cost barriers to generate deeper efficiency improvements.

1. Align Energy Efficiency Regulatory and Policy Incentives with Clean Energy Goals

The basic regulatory framework to allow the incorporation of targeted end use efficiency programs into the utility business model has been utilized for decades in the State. Establishing cost effective targets for efficiency programs in the future will require detailed planning and innovative ways to scale up efficiency efforts.

2. Retrofit Existing Residential and Commercial Buildings

Continued emphasis should be placed on evaluating innovative efficiency business cases and financing best practices into the future. Leveraging private sector capital to make efficiency improvements to the existing building stock remains one of the most critical elements to achieving efficiency goals. Policies to help leverage private capital in innovative manners will always be necessary to ensure that efficiency gets done on the scale necessary to make a substantive impact. These policies and regulatory improvements will be determined as the need for larger efficiency improvements become a reality. Specific attention should be given to the incorporation of next generation technologies into retrofit practices, and quantifying the additional savings resulting from them.

3. Strengthen New Construction Policies and Building Codes

Updating energy conservation codes and incentivizing green building practices serves as one of the best mechanisms to ensure new structures operate at improving efficiency standards. Compliance with standards established by the IECC and green building certification programs will require ongoing support for local governments and the construction industry.

4. Reduce Energy Consumption in Public Buildings

The reduction of energy consumed in public buildings remains a way to reduce operational costs for public agencies. The Performance Contract Audit Assistance Program has helped facilitate significant savings through funding of initial energy audits, leading to significant savings for the State once the identified cost-saving measures have been implemented.

V. Conclusion

Distributed energy resources have largely been driven by the cost-effectiveness of implemented programs and the impact of those savings on ratepayers. As the cost-effectiveness has been evaluated, the integration of distributed energy resources have presented new challenges in determining the costs/benefits attributed to these systems and the assignment of those values across various groups of ratepayers. As these deployments are evaluated in the future, the adoption of new technologies and incentives will continue to be driven by their cost-effectiveness for ratepayers and the overall economics of the whole energy system.

Renewable energy systems continue to come on-line in Nevada. As the State approaches the end of the target percentages for the renewable portfolio standard and the installed cost of utility-scale renewables drops below other resources, the renewable portfolio standard will need to be reevaluated to determine if it should be raised, modified, or eliminated in response to the changing energy markets. Stakeholders and State agencies must remain engaged in federal land planning processes to ensure that undeveloped renewable energy assets remain accessible and additional transmission corridors are planned. Policy makers should also determine whether financial incentives are still necessary to support renewable energy development.

Energy efficiency programs have been able to achieve incremental improvements over recent years by capitalizing on many of the highest yield opportunities; therefore, improvements in the future will likely become more complex and expensive. To compensate for this in the future, greater emphasis should be placed on comprehensive retrofits, integrating new technologies, and attempting to lower cost barriers to generate deeper efficiency improvements.