RENEWABLE ENERGY IN NEVADA

The following information is largely excerpted from the Nevada Renewable Energy and Energy Conservation Task Force's 2003 Report to the Nevada State Legislature

PUBLIC POLICY

Nevada Renewable Energy and Energy Conservation Task Force

The Nevada Renewable Energy and Energy Conservation Task Force was created by the 2001 Nevada State Legislature to act as an advocate for the renewable energy community and to provide them with a forum for moving the state's renewable energy agenda forward. The Task Force is composed of business executives, members of government and the University of Nevada, and non-profit and utility executives. Members were appointed by the Governor of Nevada, the Senate Majority Leader, the Assembly Speaker, Senate Minority Leader, the Assembly Minority Leader and the Attorney General's Bureau of Consumer Protection.

The Task Force's mandate includes coordinating programs and activities with the Nevada State Office of Energy, the utilities, the Attorney General's Bureau of Consumer Protection, the Public Utilities Commission of Nevada, renewable energy stakeholders and other state and federal offices to help identify barriers, develop consensus, and identify solutions.

During its initial year of operation the Task Force heard presentations and reports from federal and state officials and from Nevada's renewable energy community and renewable energy stakeholders. Base on the presentations, findings and recommendations were considered and adopted and the Task Forced developed a strategy for addressing its mandates. The findings and recommendations were set forth in the "Nevada Renewable Energy and Energy Conservation Task Force January 30, 2003 Report to the 2003 Nevada State Legislature and to the Governor of the State of Nevada." Copies of the document can be found of the Nevada State Office of Energy's web site at http://energy.state.nv.us/taskforce/default.htm

LEGISLATION AND REGULATION

Senate Bill 372 Renewable Portfolio Standard

The 2001 Nevada State Legislature enacted Senate Bill 372 to encourage the development and use of renewable resources. The legislation requires Nevada Power Company and Sierra Pacific Power Company to comply with portfolio standards for renewable energy. The portfolio standard provides that beginning in calendar years 2003 and 2004 Nevada Power Company and Sierra Pacific Power Company must generate or acquire electricity in an amount that is not less than 5% of the total amount sold by the utilities to its retail customers. The portfolio standard increases biannually until calendar year 2013, at which time the percentage is established at not less than 15$. Not less than 5% of the energy generated or acquired from renewable energy systems must come from solar renewable energy systems.

Senate Bill 372 stated the Public Utilities Commission of Nevada may adopt regulations establishing a renewable energy credit trading program and set the standards for renewable energy contracts entered into by the utilities. The Commission must approve all renewable contracts entered into by the utilities. If a utility fails to comply with its portfolio standard for any given calendar year the Commission may include any enforcement mechanisms which are necessary to ensure that each utility complies with its portfolio standard. An enforcement mechanism may include the imposition of administrative fines.

Since passage of Senate Bill 372 the Public Utilities Commission of Nevada has adopted regulations which establish: 1) the terms and conditions required for approval of a renewable energy contract; 2) the provisions for administrative fines for non-compliance; and 3) a renewable energy credit trading system. See Chapter 704 of the Nevada Administrative Code. See http://www.leg.state.nv.us/71st/bills/SB/SB372_EN.pdf

Assembly Bill 661 – Exiting the Utility System and Net Metering Changes, etc.
AB 661 was enacted by the 2001 Nevada State Legislature. AB 661: 1) authorized certain eligible customers to purchase electric energy from providers of new electric resources; 2) established the universal energy charge to fund low-income energy assistance; 3) made various changes to net metering; 4) authorized the director of the department of business development to issue industrial development bonds for certain renewable energy projects; 5) created the task force for renewable energy and energy conservation; 6) created the Trust Fund for Renewable Energy and Energy Conservation; 7) created the Office of Energy within the Office of the Governor; and 8) transferred control of the State Energy Office from the Director of the Department of Business and Industry to the office of energy within the Office of the Governor.

The PUCN has adopted regulations implementing the universal energy charge. See Nevada Administrative Code Chapter 702. The Public Utilities Commission of Nevada has also adopted regulations setting forth application requirements for eligible customers that wish to receive energy from a new resource provider. See Nevada Administrative Code Chapter 704. Those eligible customers that receive electric energy from a new resource provider must comply with the Renewable Portfolio Standard.

Assembly Bill 296 Multiplier for Photovoltaic Distributed Generation
Assembly Bill 296 was passed by the 2003 Legislature to provide additional incentives for the installation of photovoltaic systems and to provide credits for renewable energy systems fueled by tires. It states that for every 1.0 kilowatt-hour of actual electricity generated or acquired by photovoltaic systems the system will receive credit for 2.4 kilowatt-hours of electricity. The bill also provided that systems utilizing a reverse polymerization process (typically a tire-based system) would receive 0.7 kilowatt-hours of electricity credits for each 1.0 kilowatt-hours of electricity generated. See http://www.leg.state.nv.us/72nd/bills/AB/AB296_EN.pdf

Assembly Bill 429 Net Metering
Net Metering is when surplus energy generated on site is exported to the electrical grid. Assembly Bill 429 allows meters to turn in both directions based on whether a site is importing or exporting energy. This eliminates the need to store on-site power before sending it to the grid. This greatly simplifies and reduces the cost of on-site electricity production. It also requires the utility to purchases power at the customer's retail rate (only to a net-zero power bill for each account), eliminated the cap on the number of systems that can be net metered, and increased the size of allowable net metered systems from 10 kilowatt systems to 30 kilowatt systems. The bill also provided the Nevada State Office of Energy with $250,000 in funding for distributed generation projects. See http://www.leg.state.nv.us/72nd/bills/AB/AB429_EN.pdf

Assembly Bill 32 and Assembly Bill 431 Solar Demonstration Projects
Assembly Bill 32 and Assembly Bill 42 were passed by the 2003 Nevada State Legislature. They require the Public Utilities Commission of Nevada to adopt a system of renewable energy credits and provide for the establishment of the Solar Energy Systems Demonstration program which encourages the development of Photovoltaic projects for small businesses, schools and public buildings. To qualify for the Solar Energy Systems Demonstration program projects must use contractors with C-2 Contractors Licenses and provide for the public display of the systems. It also provides for guaranteed applicability of time of use tariffs in the event such tariffs exist for net

metered customers. See http://ww.leg.state.nv.us/72nd/bills/AB/AB431_EN.pd and http://www.leg.state.nv.us/72nd/bills/AB/AB32_EN.pd

Assembly Bill 398 Performance Contracting
This bill was passed by the 2003 Legislature. It relates to purchasing; establishing an alternative procedure for certain performance contracts for the installation or purchase of cost-savings energy measures in buildings occupied by state and local governmental entities. It allows agencies to enter into sole source agreements with companies that successfully respond to public Statement of Qualifications (SOQ). This is because for small projects, especially where the contracting agency has no existing expertise, the normal Request for Proposal can be very expensive and excessively burdensome. Cost savings can include renewable energy measures. See http://www.leg.state.nv.us/72nd/bills/AB/AB398_EN.pdf

GENERAL INFORMATION ON NEVADA RENEWABLE ENERGY

Nevada's Annual Energy Bill

Nevada generates only about half the energy it consumes at high usage times[1]. To cover the shortfall, every year Nevadans send over $2.5 billion to other states to purchase the energy we need[2].

Nevada Renewable Energy Resources

Nevada is rich in renewable energy. Wind, geothermal, solar and biomass resources all have the potential to meet Nevada's energy needs and, more importantly, to become a major new industry for the State.

Nevada's energy consumption is approximately 26 million megawatt-hours per year[3]. The total potential for renewable energy is not well known, but estimates based on preliminary data indicate are that Nevada could potentially produce 169 million megawatt-hours per year just from wind, geothermal, solar and biomass. These estimates do not account for land use and transmission barriers that must be overcome to if Nevada is to reach its potential. But the estimates are based on old data and technology. We expect new estimates would be higher because new technology allows for the economical extraction of energy at lower wind speeds and from lower temperature geothermal fields etc. If the demand for this green energy is created nationally, Nevada could easily produce much more than what it uses and become a net exporter of energy, with great economic benefits to the State.

The following chart represents potential electricity production form renewable sources in Nevada.[4] (ref. Renewable Energy Atlas of the West, A Project of the Hewlett Foundation and The Energy Foundation, 2003, www.energyatlas.org)

Wind Potential	Solar Potential	Biomass Potential	Geothermal Potential	Current (1999) Electricity

[1] Nevada State Office of Energy
[2] Nevada State Office of energy
[3] Renewable Energy Atlas of the West www.energyatlas.org, , A Project of the Hewlett Foundation and The Energy Foundation, 2003
[4] Renewable Energy Atlas of the West, A Project of the Hewlett Foundation and The Energy Foundation, 2003, www.energyatlas.org)

				Consumption
55 Million MWh/yr	93 Million MWh/yr	1 Million MWh/yr	20 Million MWh/yr	26 Million MWh/yr

These estimates do not account for land use and transmission barriers that must be overcome to if Nevada is to reach its potential.

At the moment, Nevada is a leader in renewable energy development and is striving to conserve and use energy more efficiently. If the state continues – in a thoughtful, measured yet expedient manner – to encourage the development of its renewable resources, and encourages and supports energy conservation and energy efficiency, Nevada can become energy independent. It can also continue to lead the country in the development of a cleaner, more secure energy supply.

Nevada Renewable Energy Supply

We know Nevada is rich in renewable resources. However, the estimates of the resource are out of date and incomplete. In the case of geothermal energy, the last assessment of the resource was completed by the USGS in the late 1970's. Since that time our understanding of geology has advanced significantly. Further, lower temperature fields can be economically developed using more advanced energy extraction technology. These fields were ignored in the past assessment.

Similarly, although five states in the West have had detailed wind surveys Nevada is not one of them. We need such a detailed assessment to facilitate development. The new methods for surveying wind allow a very detailed picture of windy areas to emerge. The details provide a much clearer image of actual land parcels that could be economically developed for wind power. Similar to geothermal, the technology of wind energy has advanced and lower wind speeds can be economically developed.

Although some of Nevada has been assessed for biomass potential, the vast majority of the State has no assessment what-so-ever. What has been assessed, mainly the northern most part of Nevada and the southern tip is relatively low in potential relative to the forested Eastern and Northwestern states.

The estimate of solar potential is theoretically huge but the achievable potential hinges on technology to reduce costs and the application. For example, thermal solar is much more economical and competitive than electricity production.

The potential of all of these technologies will be limited by policy choices and land-use limitations.

Some of the entities involved in determining the extent of Nevada's renewable resources include the University of Nevada, Las Vegas, the University of Nevada, Reno, the Desert Research Institute, and the Nevada Test Development Corporation among others. Recently, Governor Kenny Guinn and United States Senator Reid announced $3.22 million in awards for renewable energy research and development. A portion of those awards will be spent continuing a statewide survey of Nevada's renewable energy resources. These projects are critical and a very good start on assessing Nevada's renewable potential. However, there is no current commitment to a complete assessment of this important resource.

Nevada Renewable Energy Demand

Mechanisms that increase the demand for renewable energy include renewable portfolio standards, green tags, green tariffs, federal production tax credits and other tax and credit incentives. Federal production tax credits and other tax and credit incentives encourage the development of renewable energy resources. Green tags, green tariffs and other programs encourage consumers to pay a premium to purchase renewable energy as opposed to traditional energy thereby increasing the demand for renewable energy.

Increasing the demand for renewable energy via a renewable energy portfolio has multiple benefits - it provides the state with a cleaner portfolio of energy and it contributes to economic development.

The impact on Nevada renewable energy demand of a federal renewable energy portfolio has been analyzed by the Union of Concerned Scientists (http://www.ucsusa.org) an advocacy group that has focused on energy issues. They concluded that between 2002 and 2020 a 20% national standard would produce $2.8 billion in new capital investment in Nevada, $213 million in new property tax revenues for local communities, $18 million in lease payments to farmers, ranchers and rural landowners from wind power and $3.6 billion in additional revenues from the export of renewable energy credits.

They also found that under a 20% federal renewable portfolio standard Nevada could produce the equivalent of 48% of its electricity use from renewable energy (not including hydro) in 2010 and 71% in 2020. By 2020, renewable generation in Nevada would be more than 3.5 times the national standard. If electricity generation grows at the same rate as electricity use in Nevada, renewable energy would provide 56% of Nevada's electricity generation in 2002.

Delivering Renewable Energy

Unlike fossil fuel plants which utilize transportable fuel sources and can therefore be conveniently located near the transmission grid, renewable energy plants utilize resources that cannot be moved. To develop a renewable energy resource, the power plant must be build wherever the resource is located. Developing Nevada's rich renewable resources means improving and expanding the state's transmission grid to reach each resource center.

The exception to this is distributed generation. Distributed generation systems create and use energy locally. As a result they are not affected by transmission interruptions in the states which import energy to Nevada – this contributes to both regional and national security.

Renewable resources can play a significant role in the development of distributed generation systems. Since distributed generation systems do not use the transmission grid, the development of distributed generation systems will contribute the easing of current transmission constraints which now exist in Nevada.

One of the major transmission issues for Nevada is that the Northern and Southern parts of the State are not connected in the transmission grid. This means that it is not possible for the South to get renewable energy generated in the North for example. A major benefit to the renewable energy industry would be achieved by connecting the North and South. Such a transmission addition is being considered from Ely to Las Vegas for example.

Another transmission issue is the ability to market our renewable energy to other states, particularly California. The DC intertie project is a study being conducted by the California Energy Commission to look at the possibility of tapping into the Pacific high voltage direct current intertie, or PDCI. The PDCI begins in Oregon and ends in Los Angeles and is currently under utilized. The construction of a tap into this DC line would be expensive, but would allow independent renewable energy producers to sell their energy to California.

RENEWABLE ENERGY AND ENERGY EFFICIENCY

The definition of renewable energy varies from state to state. The 2001 Nevada Legislature defined renewable energy as biomass, geothermal, solar and wind energy. Some states also include small hydro projects in the definition of renewable energy. The following renewable resources are use to fuel commercial power plants.

Energy Efficiency

Wind

Wind is generally assessed on a scale from one (least energetic) to seven (most energetic), seven being the best class at over 800 W/m^2. (W/m^2 is Watts per square meter of the blade swept area). Wind is generally thought to be economical at class four and above, i.e. 400 W/m^2. Technology advances mean that small scale wind projects have been economically installed in regions classified as low as two.

There are two main ways to harness the wind:
Horizontal Axis Turbines:

- These are two or three-blade turbines with variable speed capabilities so they can operate at higher efficiencies over a wider range of wind speeds ranging from 6 mph to 60 miles per hour. Newer technologies are being developed that can tap winds under 6 miles per hour.

Vertical Axis Turbines:

- Darrieus type looks like an eggbeater.
- Savonius type has slow rotational speed.

The main advantage of wind power is it is it's currently the most economical form of renewable electricity production. As a result, wind power is the fastest growing form of renewable energy in the world today.

Energy from wind plants costs an average of $35-45 per megawatt hour to produce. Wind generated power is also a non-firm source of energy. The utilities are studying the impact of non-firm energy sources on grid and are also examining the attending regulation, load following, and resource scheduling issues - initial indications are that the operating impact costs may be less than $.005 per kilowatt hour. There are no wind power plants online in Nevada. Nevada's utilities have just signed two new wind power plant contracts for a combined 130 megawatts.

Geothermal

Geothermal energy taps the heat in the earth's crust. The total amount of heat in the earth's crust significantly exceeds the amount of energy that can be derived from gas and oil. Like solar, geothermal energy can be used directly (direct use) to provide heat. Alternatively, the heat can be used to drive turbines which produce electricity. The direct use of geothermal energy is available almost anywhere through the use of geothermal heat pumps. However, finding enough heat and fluid to drive power production is more limited. Geothermal reservoirs capable of producing electricity must have both heat and either water or steam to carry that heat to the surface.

There are three kinds of geothermal power plants, dry, flash and binary. They type of plant depends on the temperatures and pressures of the geothermal reservoir.

A dry steam reservoir produces steam but very little water. The steam is piped directly into a dry steam power plant to provide the force to spin the turbine generator.

A geothermal reservoir that produces mostly hot vapor in the form of steam can be utilized by a flash steam system. Water ranging in temperature from 300 - 700 degrees Fahrenheit is brought up to the surface through the production well - upon being released from the pressure of the deep reservoir, some of the water flashes into steam in a separator. The steam then powers the turbines. This type of plant represents a small percentage of the potential development in Nevada.

A reservoir that is liquid dominated and produces geothermal liquids at temperatures between 250 and 370 degrees Fahrenheit can be utilized by a binary geothermal facility. In a binary system the geothermal water is passed through a heat exchanger, where its heat is transferred into a second (binary) liquid, such as isopentane, that boils at a lower temperature than water. When heated, the binary liquid flashes to vapor, which, like steam, expands across and spins the turbine blades. The vapor is then recondensed to a liquid and is reused repeatedly. In this closed loop cycle, there are no emissions to the air.

A reservoir that is liquid dominated and produces geothermal liquids at temperatures below 250 degrees Fahrenheit but above 100 Fahrenheit may be utilized in direct use applications such as aquaculture, horticulture, hydroponics and dehydration of organic products. The energy provided by the geothermal resources would displace natural gas and electricity that would be required at these facilities if geothermal liquids were not available. Therefore, they can be provided as electricity equivalent energy savings. Direct use geothermal applications have the advantages of geothermal are that it is a clean form of energy which can add to the production capacity of a generation portfolio. That is, once the potential to provide significant job creation and tax base to Nevada.

The advantage of geothermal is it has many of plant is constructed, the attributes of traditional power plants in that it is available on demand. The resource is available on a production can be more-or-less constant basis compared to wind and solar. Direct use geothermal is both ubiquitous and capable of stable production.

Energy from geothermal plants costs an average of $50-$70[5] per megawatt hour to produce and provides reliable, high capacity energy to the electric grid. There are eleven binary plants with a combined installed capacity of 63.14 megawatts and three single flash plants with an installed capacity of 48.33 megawatts operating in Nevada. Nevada's utilities have just signed four new geothermal plant contracts for 97 megawatts of new capacity.

Solar

There are many ways to harness solar energy solar is generated either through photovoltaic or solar thermal resources:

- Photovoltaic (solar cell) systems produce electricity directly from sunlight.
- Concentrating (solar thermal) systems to use the sun's heat to produce electricity.
- Passive solar heating and day lighting use solar energy to heat and light buildings.
- Solar hot water heats water with solar energy.
- Solar process heat and space heating and cooling are industrial and commercial uses of the sun's heat.

The advantages of solar energy are that it is an abundant form of energy that could be tapped in every building by utilizing passive solar design, solar heating and hot water, and photovoltaics.

[5] Based on contracts in Nevada. Sierra Pacific Power

Energy from solar power plants cost an average of $200-250 per megawatt hour to produce. Solar energy is a non-firm energy source – firm energy is energy that is available whenever a customer needs it – solar energy (unless stored) is only available when the sun is shinning (although even under sudden cloud cover solar will still supply some power.) Non-firm energy sources require additional operational flexibility on the part of the utility to provide ancillary services to firm-up the power. Nevada has two dish/engine systems providing 50 kilowatts to the grid and one 110 kilowatt direct use system.

In Dec. 2002, Sierra Pacific Resources announced that its two Nevada-based utility subsidiaries have signed long-term contracts with Duke Solar Energy LLC to supply 50 megawatts of electricity generated by solar thermal power from a plant to be located in Eldorado Valley, near Boulder City, Nev. Nevada Power contracted for approximately two-thirds of the power and Sierra Pacific Power Company contracted for approximately one-third.

Biomass

Biomass is any organic matter available on a renewable basis, including, without limitation:

- Agricultural crops and agricultural wastes and residues;
- Wood and wood wastes and residues;
- Animal wastes;
- Municipal wastes; and
- Aquatic plants

Biomass energy uses these organic materials to produce electricity or heat. Biomass materials can also be converted to liquid or gaseous fuels such as methane or ethanol. The advantages of biomass are that it uses materials that would otherwise be incinerated or disposed of in a landfill. In Nevada, there is also interest eradicating invasive species by harvesting them for energy and in using forest wastes. **]**

Energy from biomass power plants cost an average of $60-80 per megawatt hour to produce[6] and provides reliable energy to the electric grid. There is one biomass plant connected to Sierra Pacific Power Company's transmission grid. It has an installed capacity of 10 megawatts.

Net Metering

Businesses and homes also use renewable energy to generate power for on-site use. Power that is not used at the site can be sold back to the utilities. This process is called net metering. Renewable energy technologies currently used in Nevada to net meter energy include:

- **Solar**
  These systems use solar cells made of semi-conducting materials to convert sunlight to electricity. Nevada has 18 solar residential net metering systems totally 44 kilowatts, and one 5 kilowatt commercial net metering system.

- **Combined Solar and Wind**
  These systems combine wind generators with solar systems. Nevada has two residential combined solar and wind net metering systems that net meter a combined 3 kilowatts.

[6] Based on contracts in Nevada. Sierra Pacific Power

ECONOMIC POTENTIAL

Rolling blackouts in California and rising energy prices have spurred renewed interest in renewable energy sources, such as wind, geothermal, biomass, and solar power for electricity production, home heating, and home cooling. Alternatives to nonrenewable energy sources such as coal, nuclear fission, and natural gas have many advantages in terms of reducing global carbon dioxide which leads to global warming, air-quality improvements, and other potential environmental and health benefits. Until recently, the market price of nonrenewable energy was low enough that converting to renewable sources did not have clear economic advantages. However, falling costs of electricity generation from renewable sources and rising energy costs for conventional sources are setting the stage for developing some of our renewable resources.

In 2003, Nevada's electricity consumption is expected to total nearly 36,000 gigawatts hours (gWh). Consumption growth rates are predicted to average 1.3 to 1.5 percent in northern Nevada and approximately 3 percent in southern Nevada. In part due to population growth in excess of energy infrastructure investment, Nevada paid $2.5 billion to out-of-state energy producers in 2002. Governor Guinn's Nevada Energy Protection Program (NEPP) seeks to finds ways to make Nevada a net exporter of electricity. In particular, much of the state's renewable generation capacity remains untapped. If these resources were exploited, it is likely that Nevada could increase electricity generation and export capacity and reduce reliance on other states for its power needs. Further, exploiting these resources could create jobs within the state often in rural areas that are currently experiencing job losses. Thus, developing our solar, wind, biomass, and geothermal resources may prove to be a powerful economic development tool.

An examination of the stock of renewable resources in Nevada proves that the state has the potential to be a leader in renewable electric generation. Solar resources for concentrating collectors range between 7,000 and 7,500 watts hours per square meter (whm^2), making southern Nevada one of the best sources for this type of generation in the world. Flat-plate collectors can provide a similar amount of generation power. Full utilization of Nevada's wind resources could generate 50,589,000 megawatt hours (mWh) of electricity. The abundance of high-temperature sites in Nevada suggests geothermal could be a lucrative electrical generation resource for the state. A swath of geothermal sites covers portions of the western U.S. In Nevada, over 60 percent of the state has sites with high enough temperatures for electricity generation. The geography of the state does not lend itself as readily to biomass production. The Department of Energy (DOE) rates the stock of biomass resources in Nevada as "fair."

Given the abundance of renewable energy potential in Nevada, it is interesting to evaluate the likely economic impacts of converting to electric generation using the state's renewable resources. Toward that end, we estimate the economic impact, in terms of annual employment and gross state product (GSP), of three different scenarios representing different levels of renewable energy generation in the state. We tie the scenarios to the Nevada Renewable Portfolio Standard (RPS). Thus, Scenario 1 examines current usage, where 3.9 percent of total energy consumed in the state is generated using renewable sources. Scenarios 2 and 3 examine 7 and 15 percent of total state consumption, respectively, attributable to renewable generation. We estimate economic impacts for each scenario using a dynamic economic-impact model designed by Regional Economic Models, Inc. (REMI) that is specially calibrated for Nevada. The estimated employment and GSP impacts reflect the differences from the baseline case (the current level of renewable energy generation as 3.9 percent of total consumption) and the second and third scenarios. As such, the second and third scenario outcomes are relative to the current impacts of renewable energy generation.

According to the model results, current economic impacts of renewable energy are large. An estimated 850 Nevada jobs arise either directly or indirectly from renewable energy generation in the state. If the current proportion of energy consumed is generated by renewable sources, the annual impact on GSP averages $124 million annually in nominal dollars through 2035. Adjusted for inflation, the average annual impact is $67 million chain-weighted 1992 dollars[7]. The largest economic effects are observed at the highest level of renewable energy dependence. When 15 percent of electric needs come from renewable energy generated within the state, over 5,000 jobs can be attributed to the renewable energy industry with an average annual GSP effect of $665 million through 2035. Even lower levels of use have significant impact. More than 2,500 jobs result when 7 percent of generation needs arise from renewable sources. GSP under the "low use" 7 percent generation scenario averages $310 million annually through 2035.

Multiplier effects, which measure the indirect and induced economic activity from direct expenditures on renewable energy generation, are significant. On average, the multiplier effect is the highest for the "low" and "high-use" scenarios, both having annual average multiplier gross state product multipliers of 1.72. The average annual multiplier for the current use scenario is slightly lower at 1.67. Nevertheless, the multipliers show that substantial indirect economic activity is generated by switching to in-state renewable energy generation.

The model results show clear economic benefits in terms of GSP and new employment in the state of Nevada. It is important to note that this economic development supports sustainable growth within the state. Renewable energy generation, on average, is associated with less environmental degradation than generation using nonrenewable energy sources. Air-quality impacts are scant or nonexistent. And, save for electric generation using biomass, renewable sources do not contribute to global warming because fossil fuels are not used. Thus, tallying the economic and environmental benefits of electric-energy generation, it is clear that it could be an important contributor to sustainable economic development.

Renewable Energy Glossary

GLOSSARY OF TERMS

Baseload Plant

A power plant which takes all or part of the minimum load of a system, and which runs continuously and produces electricity at a constant rate. These units are operated to maximize system mechanical and thermal efficiency and minimize system operating costs.

Biomass Power

Generating power and/or electricity from materials that are grown or harvested such as farm waste or forest clearings.

[7] Chain-weighted 1992 dollars are inflation-adjusted (or real) dollars in 1992 terms. The chain-weighted adjustment accounts for shifts in consumption so that the inflation adjustment matches changes in household consumption expenditures over time.

Capacity

Capacity is the electricity load (kW or MW) for which a user or manufacturer rates a generating unit, generating station, or other electrical apparatus.

Nameplate Capacity

The design rating of a generator, prime mover or other electrical equipment under specified conditions as designed by the manufacturer. The nameplate rating of the electric generator may not be indicative of the unit maximum or dependable capacity, since some other item or equipment may limit unit output.

Demand

Demand is the total load requirement of a company, electric customer, area or electric system.

Demand Charge

Demand charge is the charge the utility levies for being ready to supply a certain amount of electricity to a customer. It is for the fixed capacity component of a power transaction, i.e. the cost for having capacity available for a power transaction over time, based on the amount of capacity (kW) being sold. This charge is typically expressed as $/kW/Month.

Direct Access

See "Exit the System"

Distribution

The part of the electricity system that brings electricity from the larger transmission grid and distributes it to local customers. Often segregated out for a "distribution charge."

Energy Efficiency

Implementing practices or equipment to reduce energy consumption and costs. Energy efficiency can be a "generation asset" that decreases total generation needs.

Exit Fee

An exit fee is the fee paid by a customer leaving the utility system intended to compensate the utility in whole or in part for loss of income from the departing customer, or for stranded generating capacity.

Exit the System

Where a utility customer no longer purchases electricity from the utility, but instead buys electricity from a third party or generates it themselves. Often the utility will still provide transmission of electricity from the third party.

Firm Energy

An energy supply contract which cannot be interrupted for economic reasons and is intended to remain reliable even under adverse conditions (e.g., the supplier must attempt to buy emergency energy from third parties to maintain deliveries of firm energy service).

Fixed Costs

Fixed costs are costs which are not dependent on the amount of unit operation or energy purchases. Examples of fixed costs are firm gas transportation charges and firm purchase contract demand charges.

Generation

The part of the generation/transmission/distribution rate structure referring to the generation of electricity. There is often a separate charge for generation.

Gigawatt (GW)

One billion watts, or one million kilowatts, or one thousand megawatts.

Gigawatt-Hour (GWh)_

One million kilowatt-hours

Importing Power

Independent Power Producer (IPP)

Wholesale electric producer unaffiliated with the franchised utility in the area in which it is selling power. Now generally known as an Exempt Wholesale Generator (EWG).

Independent System Operator (ISO)

Entity that would control and administer non-discriminatory access to electric transmission in a region or across several systems, independent from the owners of the facilities.

Integrated Resource Planning

Least cost planning that specifically examines supply and demand side options that enhance a utility's performance with regard to a set of regulatory objectives.

Interruptible Load

A load which may be interrupted at any time at the discretion of the utility company.

Kilowatt (kW)

One kilowatt equals 1,000 watts.

Kilowatt-Hour (kWh)

The basic unit of electric energy upon which much billing is based. It is equal to one kilowatt of power supplied to or taken from an electric circuit steadily for one hour. One kilowatt-hour equals 1,000 watt-hours.

Load

Demand or energy requirement.

Load Following

An electric system's ability to regulate its generation to follow near-instantaneous changes in customer demand.

Load Management

Economic reduction of electric energy demand during a utility's peak generating periods. Load management differs from conservation in that load management strategies are designed either to reduce or shift demand from on-peak to off-peak times, while conservation strategies may also reduce usage over then entire 24-hour period.

Megawatt (MW)

One megawatt equals one-million watts or one-thousand kilowatts (kW).

Megawatt-Hour (MWh)

One megawatt-hour equals 1,000,000 watt-hours, or 1,000 kilowatt-hours.

Merchant Power Plant

A power plant built to sell its power on the wholesale market (e.g. utilities and power marketers) to the highest bidder. They are unlike traditional power plants which are built to serve a defined service area. Merchant plants cannot sell retail electricity to businesses or individuals.

Native Load

The demand from customers within a company's franchise areas. It excludes external purchases or sales between neighboring companies.

Non-Firm Energy

Energy supplied or available under an arrangement which does not have the guaranteed continuous availability feature of firm power.

Off-Peak Energy

Energy purchased and/or delivered during hours of lowest demand – usually late evening and night. The WSCC Inadvertent Interchange Energy Accounting definition of off-peak hours is: 8 hours on weekdays and Sunday, plus holidays.

On-Peak Energy

Energy purchased and/or delivered during hours of highest demand – usually daytime. The WSCC Inadvertent Interchange Energy Accounting definition of on-peak hours is: 16 hours on weekdays and Saturday, less holidays.

Operating Reserve

The available reserve electricity supply capacity of the electric system. It is the sum of spinning reserve plus quick-start reserve. It may be greater or less than operating reserve obligation.

Operating Reserve Obligation

The reserve capacity a utility company must provide in order to insure reliable system operation in the event of unit failures or interrupted transactions.

Peak Demand

The maximum load for an electric customer during a specified period to time. Often used to determine the demand charge; i.e. the charge for how much transmission capacity the electricity provider needed to make available.

Peaking Capacity

The capacity of generating equipment used to meet the systems peak demand. Peaking capacity is used less often than baseload capacity that runs more continuously. Normally reserved for operation during the hours of highest daily, weekly, or seasonal loads.

Planned Outage

The removal of a generating unit from service to perform work on specific components that is scheduled well in advance and has a predetermined duration (e.g. annual overhaul, inspections, testing).

PV – Photovoltaics

Another name for solar cells that generate electricity from sunlight.

Qualifying Facility (QF)

A cogeneration or small power production facility that meets certain ownership, operating, and efficiency criteria established by the Federal Energy Regulatory Commission (FERC) pursuant to the Public Utility Regulatory Policies Act (PURPA).

Spinning Reserve

The amount of operating reserve capacity that must be on-line or in an operational mode. Comes from the idea that generators are spinning and ready to deliver power to support the transmission grid on momentary notice.

Solar PV
See PV.

System Load
The total power demand of the electric system.

System Peak Load
The 1-hour maximum demand (in MW) on the utility's electric system.

Transmission
The system of wires delivering electricity from generators to the local distribution grid.

Watt
The electrical unit of real power or rate of doing work equivalent to one ampere flowing against an electrical pressure of one volt. One watt is equivalent to approximately 1/746 horsepower, or one joule per second.

Wheeling
The use of one utility's transmission facilities to transmit power (or gas) to another utility system.

Wind Turbine
Otherwise known as a windmill. A machine with a tower and blades that turns the force of the wind into electricity.