Spring, Cave, Dry Lake, and Delamar Valleys Renewable Energy Viability Report

PRESENTATION TO THE OFFICE OF THE NEVADA STATE ENGINEER

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Prepared by

Aspen Environmental Group

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Spring, Cave, Dry Lake, and Delamar Valleys Renewable Energy Viability Report

Submitted to:
Jason King, P.E., State Engineer
State of Nevada
Department of Conservation & Natural Resources
Division of Water Resources
901 S. Stewart Street, Suite 2002
Carson City, Nevada 89701

Pertaining to:
Groundwater Applications 54003 through 54021 in
Spring Valley
and
Groundwater Applications 53987 through 53992 in
Cave, Dry Lake, and Delamar Valleys

June 2011

Prepared by:
Aspen Environmental Group
8801 Folsom Blvd., Suite 290
Sacramento, CA 95826-3250

Carl B. Linvill, Director of Integrated Energy Analysis and Planning Division — 6/20/11 Date

John E. Candelaria, Sr. Associate — 6-21-11 Date

CONTENTS

CONTENTS (CONTINUED)

FIGURES

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TABLES

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ACRONYMS

AB	Assembly Bill
ACS	American Chemical Society
BLM	Bureau of Land Management
CAISO	California Independent System Operator
CPUC	California Public Utilities Commission
CREZ	Competitive Renewable Energy Zone
CSP	concentrating solar power
DOE	U.S. Department of Energy
GBT	Great Basin Transmission Company
GDP	Groundwater Development Project
GTM	Generation and Transmission Model
HA	hydrographic area
IPA	Intermountain Power Agency
ITC	Investment Tax Credit
LCOE	Levelized Cost of Energy
LCPD	Lincoln County Power District
MWPI	Mt. Wheeler Power Inc.
NPC	Nevada Power Company
NREL	National Renewable Energy Lab
NVE	Nevada Energy
PEIS	Programmatic Environmental Impact Statement
PPA	Power Purchase Agreement
PTC	Production Tax Credit
PUCN	Public Utilities Commission of Nevada
PV	photovoltaic
QRA	Qualified Resource Areas
REC	Renewable Energy Credit
RETI	Renewable Energy Transmission Initiative
ROW	right-of-way
RPS	Renewable Portfolio Standard
SB	Senate Bill
SNIP	Southern Nevada Intertie Project
SNWA	Southern Nevada Water Authority
SOI	Statement of Intent
SPPC	Sierra Pacific Power Company

ACRONYMS (CONTINUED)

SWIP	Southwest Intertie Project
TREC	Tradable Renewable Energy Credit (or Certificate)
WECC	Western Electricity Coordinating Council
WREZ	Western Renewable Energy Zone

ABBREVIATIONS

AC	alternating current
afy	acre-feet per year
DC	direct current
gal	gallon
GWh	giga-watt-hour
km	kilometer
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
m^2	square meter
mi	mile
MMBtu	one thousand thousand British Thermal Units
MW	megawatt
MWh	megawatt hour
TWh	terrawatt hour
yr	year

EXECUTIVE SUMMARY

The purpose of this analysis is to evaluate the economic viability of renewable energy development in Spring, Cave, Dry Lake, and Delamar Valleys ("Valleys of Interest"). The analysis demonstrates that large scale solar projects in the Valleys of Interest will not be competitive for the foreseeable future. The cost of producing and delivering solar electricity from the Valleys of Interest to potential markets is simply too high for these projects to be competitive given the potential size of the market for this energy between the present and 2030. Beyond 2030, predicting the size of the market for remote, large scale solar development is a speculative exercise. However, even if the market turns out to be larger than expected beyond 2030, water needs will be very low. Indeed, Photovoltaic (PV) systems with self-cleaning capabilities and minimal water use are already under development. These technologies will become the large scale technology of choice in desert climates and the water requirements for this technology will be very small.

Section 1.0 shows that Nevada and the West are blessed with abundant renewable resources. The areas with the best wind, geothermal and solar resources are identified, and the quantity of high quality resources is quantified. Section 1.0 also presents a relative ranking of resources within Nevada and in the western interconnection. The resource ranking for the West shows that solar projects in Eastern Nevada are ranked behind 382,000 GWh of other projects. The Western Electricity Coordinating Council (WECC) forecasts demand for new renewable resources in the West to be about 110,000 GWh by 2020.[1] Thus, Eastern Nevada solar clearly is not close to being competitive within that time frame in the West. Compared to other solar development areas in Southern Nevada, projects in the Valleys of Interest face the competitive disadvantages of being further from markets and having more expensive transmission access options. In addition, within Nevada, geothermal projects are a better overall resource than solar resources because they cost far less and have characteristics that are more desirable to utilities and load serving entities.

Section 2.0 explains that renewable energy development of solar energy resources in the Valleys of Interest would require construction of new transmission facilities to reach the market. Section 2.0 also shows that the cost of transmission and market access are key factors for determining the competitiveness of renewable energy resources in Nevada and the West. The analysis concludes that higher transmission access costs and more onerous market access requirements will place solar resource developers in the Valleys of Interest at a competitive disadvantage to developers in other solar development areas.

Section 3.0 evaluates the development interest expressed to date in the Valleys of Interest. An indication that projects in the Valleys of Interest will not be competitive is the relative lack of activity by developers in pursuing projects and the lack of success to date in competing in renewable resource

1. The WECC Base Case for 2020 shows renewable demand in the West to be about 172,000 GWh and there is currently about 63,000 GWh of renewable energy either operating or under construction, therefore, the incremental renewable energy demand projected by WECC for 2020 is about 110,000 GWh.

solicitations. While many renewable energy developers have sought interconnection agreements with the Nevada utilities and many have sought to secure public lands in Nevada, very few of these potential projects have sought interconnection or permits to develop in the Valleys of Interest. Likewise, NV Energy (NVE) has entered into contracts with many project developers in Nevada but, to date, no solar resources in the Valleys of Interest have successfully competed in a solicitation.

The remaining four sections evaluate the competitiveness of large scale solar in the Valleys of Interest for the four potential markets for renewable resources: NVEs Renewable Portfolio Standard (RPS) market, the regional market for delivered renewable energy, regional renewable energy credit (REC) markets and the Nevada and regional long term procurement markets for delivered energy (renewable, fossil or otherwise).[2] In each potential market, the competitiveness of a renewable energy project depends on:

- whether the resource qualifies to compete in a given solicitation;
- the relative performance of the renewable energy technology compared with other qualifying technologies;
- the relative performance of the renewable energy resource (e.g., the intensity of the solar radiation at a given site compared with other sites); and
- the transmission cost and deliverability requirements of the solicitation.

Section 4.0 combines the information provided in Sections 1.0, 2.0, and 3.0 and evaluates the likelihood that resources in the Valleys of Interest could compete to serve Nevada's RPS by 2025. Since the solar set aside portion of the RPS will be fully subscribed out to 2025 with other resources, resources in the Valleys of Interest are not needed to serve the RPS market given current statutory requirements. In the event the Nevada RPS or the Nevada solar set aside is expanded, prospects for resources in the Valleys of Interest continue to be bleak in Nevada because 10,000 GWh of extremely high value solar resources have better, lower cost access to the Nevada market.

Section 5.0 combines the information provided in Sections 1.0, 2.0, and 3.0 and evaluates the likelihood that resources in the Valleys of Interest could compete to serve regional renewable energy markets. As noted above, WECC projects that demand for renewables in the West out to 2020 will total about 110,000 GWh based on current RPS statutes, and normal load growth only pushes this need from 110,000 GWh to 125,000 GWh in 2030 if RPS percentages remain constant and demand growth continues at pre-2020 rates out to 2030. Furthermore, most states in the West plan to meet their RPS requirements with in-state resources, so California is the only potential export market of notable size. Black and Veatch ranked 560,000 GWh of renewable resources in the West and the renewable resources located in eastern Nevada are ranked behind 382,000 GWh of these resources in

2. All markets except the REC market require "firm transmission rights" to deliver energy to the delivery point required by the market, but the REC market requires sale of the REC associated with a project and delivery of the energy to any market. Transmission access and cost is an important element in determining competitiveness of resources.

terms of cost competitiveness of serving the California market (Black and Veatch, 2010).[3] As a result, solar resources in the Valleys of Interest are not close to being competitive in serving the WECC projected demand in 2020.

Section 6.0 shows projects developed in the Valleys of Interest are unlikely to be competitive in REC markets in Nevada and California. Demand for RECs will be driven by California's RPS which currently allows RECs to be used to meet 25 percent of California's RPS. However, recently passed legislation in California, SBX1 2, not only changes the restrictions on the use of out-of-state renewable energy resources but requires the percentage of RECs that can be used to meet RPS requirements to decrease to 10 percent by 2016 (California Legislation, p. 27) making the market for RECS even smaller and the competition for REC sales even more intense. Furthermore, since the Valleys of Interest are in remote areas and currently don't have transmission access to a load center or the electric grid, there is no local load to absorb the energy from resources in these valleys, and developers would need to connect to and deliver the energy from their resources into NVE's electric system in order to participate in the California REC market. The revenue from facilitating energy sales to NVE[4] plus the revenue from REC sales to the California REC market appears inadequate to support investment in renewable energy resources in the Valleys of Interest based upon participation in a REC market.

Section 7.0 combines the information provided in Sections 1.0, 2.0, and 3.0 to provide an overall evaluation of the likelihood that resources in the Valleys of Interest could compete out to 2030 and beyond in the long term energy procurement markets in the west. Prediction in 2030 and beyond is speculative due to the many uncertainties affecting electricity supply and demand, but the analysis of Section 7.0 shows that even in the unlikely event that the many uncertainties are resolved in a way that makes resources in the Valleys of Interest competitive, any such development can be expected to be PV and it can be expected have essentially no need for water.

The first part of Section 7.0 shows that the relative cost competitiveness of solar should improve relative to gas fired resources. The second part of Section 7.0 shows that a confluence of forces may combine to increase renewable demand considerably beyond 2030. If one considers a scenario where this confluence of forces comes together to: (1) increase demand due to limited effectiveness of energy efficiency, distributed generation and smart grid development efforts; (2) increase large scale solar cost effectiveness relative to fossil resources dramatically; (3) cause very large coal retirements; and, (4) ensure no new nuclear power is built in the West, then demand for renewable resources could be great enough to create a potential opportunity for the best solar resources in the Valleys of Interest by about 2030. The third part of Section 7.0 demonstrates that water does not need to be reserved even for this "confluence of forces" scenario because the same confluence of forces implies that all

3. It is worth noting that while Black and Veatch only ranked 560,000 GWh resources in "Qualified Resource Areas," renewable resource potential in the West exceeds 1,000,000 GWh. For example, in Nevada Black and Veatch indicated that about 50,000 GWh of renewable resources are in QRA's but they further note that 200,000 GWh of renewable resource potential did not merit a ranking because it was located outside of the QRA's. Therefore, the actual size of the renewable energy market against which Valleys of Interest projects must compete is larger than the 560,000 GWhs discussed here.
4. It may be possible to offer dynamically scheduled resources from the Valleys of Interest to a California balancing area with just an interconnection to the NV Energy grid but the absence of a direct connection to a California balancing area from other utility transmission systems in the transmission path between the Valleys of Interest and California, make such dynamic transfers complicated and unlikely. Further, any projects within the Valleys of Interest would still be competing against all of the resources in the west identified in Section 5.0 and thus successful competition is highly unlikely.

development would likely be PV and water use for the PV can be expected to be de minimus given the value of water and the emergence of non-water based cleaning technologies.

Solar energy development in the Valleys of Interest is unlikely to occur before 2030 because the resources are expensive to access and the large quantity of superior resources with better access to markets will make obtaining financing and winning contract solicitations extremely difficult. In 2030 and beyond, development of the resources is still unlikely because the quantity of demand for renewables would have to triple beyond projected 2030 levels. However, a scenario where a confluence of forces come together and expand demand dramatically could be envisioned. By the time such a scenario might come to pass, PV technology will be directly cost competitive or more cost competitive than dry cooled solar thermal technology and thus any development occurring in the Valleys of Interest could be expected to be PV-based with de minimus water needs.

1.0 RENEWABLE ENERGY COST AND RESOURCE POTENTIAL IN NEVADA AND THE WEST

1.1 Renewable Energy Net Cost

The competitiveness of renewable energy resources depends upon the cost and value of delivered energy on a per kilo watt hour basis. Black and Veatch developed a net cost methodology for valuing renewable resources that takes into account the cost and value of a given resource. This methodology has been applied for the purpose of identifying likely western transmission line development corridors in the California Renewable Energy Transmission Initiative (RETI) project and was also used to evaluate the value of western resources for the western renewable energy zone (WREZ) project.[1] The RETI and WREZ processes each took pains to involve a wide range of stakeholder to ensure that the recommendations resulting from the processes would have credibility. For example, the RETI process was a California initiative that was created to identify, quantify and assess the quality of renewable resources in California and adjacent states that can cost-effectively meet California's RPS requirements in an environmentally sensitive manner. Assumptions used in the process were well vetted and broadly circulated to maximize the credibility of the results. Stakeholders in the RETI process represented a broad range of interests including utilities, generation developers, renewable energy advocates, regulatory agencies, public interest and environmental advocacy groups.

The cost components of the net cost calculations include generation cost, transmission cost and integration cost. The primary factors for the generation cost per kilowatt hour calculation for renewable resources include capital cost, fixed and variable operations and maintenance cost, generation interconnection cost, incentives, available tax treatment cost reductions, net plant output and capacity factor. The quality of a renewable resource affects both the plant output which represents the total number of kilowatt hours available for sale in a given year and the capacity factor which represents the percentage of time that the facility operates in a given year. A higher quality solar resource, for example will generate more output and thus will have a higher capacity factor. The transmission cost includes the cost to use the transmission capacity on each electric system that is transversed to deliver the energy from a resource to a load center. If new transmission needs to be built, the cost would include the cost of helping to pay for the required transmission. The integration cost includes the cost charged by the Transmission Providers to ensure that the electric system reliability is maintained. For example, if a generation facility is unpredictable then there may be a cost of compensating for unpredictability by having extra resources in reserve. Those extra resources

1. For a description of the methodology, see the RETI Phase 1A Report which can be viewed at: http://www.energy.ca.gov/reti/documents/index.html. To view the most recent results produced with the methodology, see the RETI Phase 2B Report and see the WREZ Peer Analysis Tool and the associated documentation at: http://www.westgov.org/component/content/article/102-initiatives/220-wrez-transmission-model-page.

could be called a cost of integration. There is not a general agreement on the components of the cost of integration among stakeholders.

The value (or benefit) components of the net cost calculation include the capacity value and the energy value. The capacity value is based on the proportion of time that a generation resource provides energy during peak times when energy is most needed to maintain reliability. The market value of resources varies with the value being higher in high demand periods and lower in low demand periods. The higher the proportion of time that the resource can be counted on to be available at key times, the greater the capacity value of that resource. The energy value is the market value of the energy produced from a resource. The sum of the capacity value and the energy value is the total value.

The net cost per kilowatt hour is the total cost less the total value divided by the total number of kilowatt hours produced. The levelized cost for a given generation facility is the average net cost per kilowatt hour for a generation facility over the life of that facility.[2] The net costs produced by Black and Veatch to compare the costs of generation resources are levelized costs.

1.2 Renewable Energy Resource Quality In The West

Renewable energy generation cost and levelized cost is significantly affected by the quality of renewable energy resources. The quality of the resource is one of the most important factors in determining where renewable energy facilities are developed. Nevada is fortunate to have very high quality geothermal and solar resources as well as some good wind resources. However, renewable resources in various locations within Nevada compete against each other to serve the Nevada market and Nevada renewable resources compete against renewable resources elsewhere in the West. As a result, the prospects for development for any given location in Nevada will depend on the competitiveness of that location relative to other locations in Nevada as well as the competitiveness of the location relative to other resources in the West.

To get a feel for the quality of renewable resources in Nevada, it is helpful to view a series of resource maps produced by the National Renewable Energy Lab (NREL). Figure 1-1 shows wind power potential in the U.S. with class 1 wind power potential being “poor” and class 7 being “superb”(Roberts, 2008a). When we evaluate the relative cost of resources later in this section it will be evident that wind that is class 4 or better competes very favorably against solar on a cost per kilowatt hour (kWh) basis. The best wind potential in the western interconnection is located in Wyoming, Montana, and eastern New Mexico where there exist large regions of class 5 and above wind resources. The northwest and southern California have pockets of very good resources as well.

As part of the WREZ initiative, Black and Veatch identified cost competitive renewable resource potentials for a large number of Qualified Resource Areas (QRAs) in the West. QRAs are defined as areas of high quality and dense renewable energy resources with enough capacity to potentially justify the construction of a high voltage transmission line for interstate transmission of renewable energy (Pletka and Finn, 2009, p. 1-1). Figure 1-2, (p. 1-4) shows the best QRA’s for the western

2. The levelized cost is the net present value of all energy generated from a facility over the life of that facility divided by the total number of kilowatt hours of output produced by that generation facility over its life.

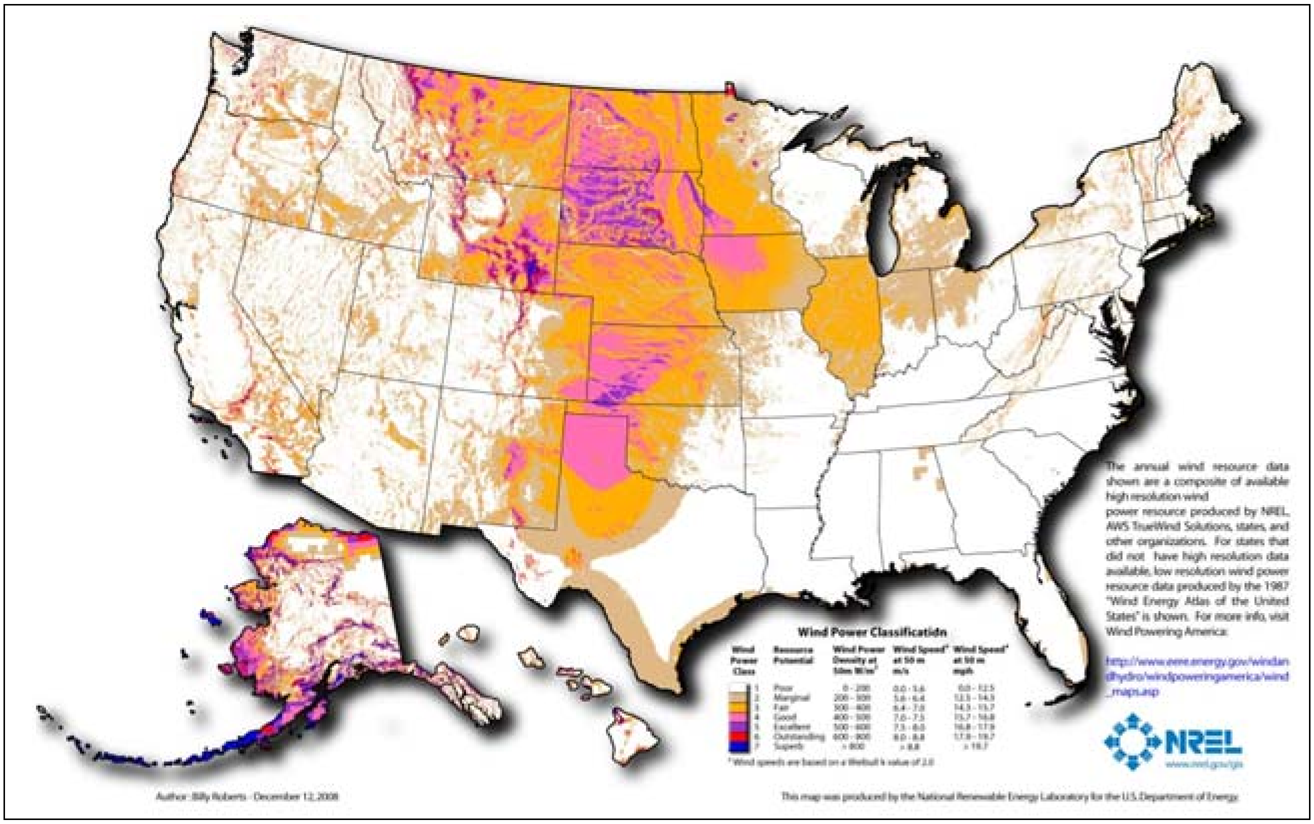


Figure 1-1
U.S. Wind Resources

United States as circles (Pletka and Finn, 2009, p. 5-5). The total amount of wind energy that is class 4 or better is 183,000 GWh/yr (Pletka and Finn, 2009, p. B-9). Current total annual demand for electricity in the West is about 900,000 GWh, so this wind potential represents more than 20 percent of that total. The amount of wind potential identified as class 4 or better in Nevada is only 60 MW, and the 60 MW of capacity is capable of producing about 175 GWh/yr (Pletka and Finn, 2009, p. B-6). Nevada's total annual demand is about 32,000 GWh/yr so the high quality wind potential is relatively small.

In contrast, high quality geothermal resource potential is significantly higher in Nevada. Figure 1-3, (p. 1-5) shows that Nevada is among the best areas for geothermal development in the U.S. (Roberts, 2008b). The high quality remaining geothermal resource potential exceeds 1,400 MW (Pletka and Finn, 2009, p. B-6). Capacity factors for Nevada geothermal resources are 80 percent or better, so the annual geothermal energy production potential is about 10,000 GWh/yr, or about one-third of Nevada's current annual demand (Pletka and Finn, 2009, p. B-9).

Nevada also has very good solar resources. The Southwestern U.S. is home to the highest solar insolation levels (kWh/m^2/Day) in the nation, making it a prime location for both solar photovoltaic (PV) and concentrating solar power (CSP) resources. PV technologies convert sunlight directly into electricity. CSP technologies concentrate sunlight using mirrors and focusing devices and then use the heat generated by the focused light to heat a liquid. The heat from this liquid is extracted and used to create steam which provides the mechanical energy required to spin an electric turbine generator.

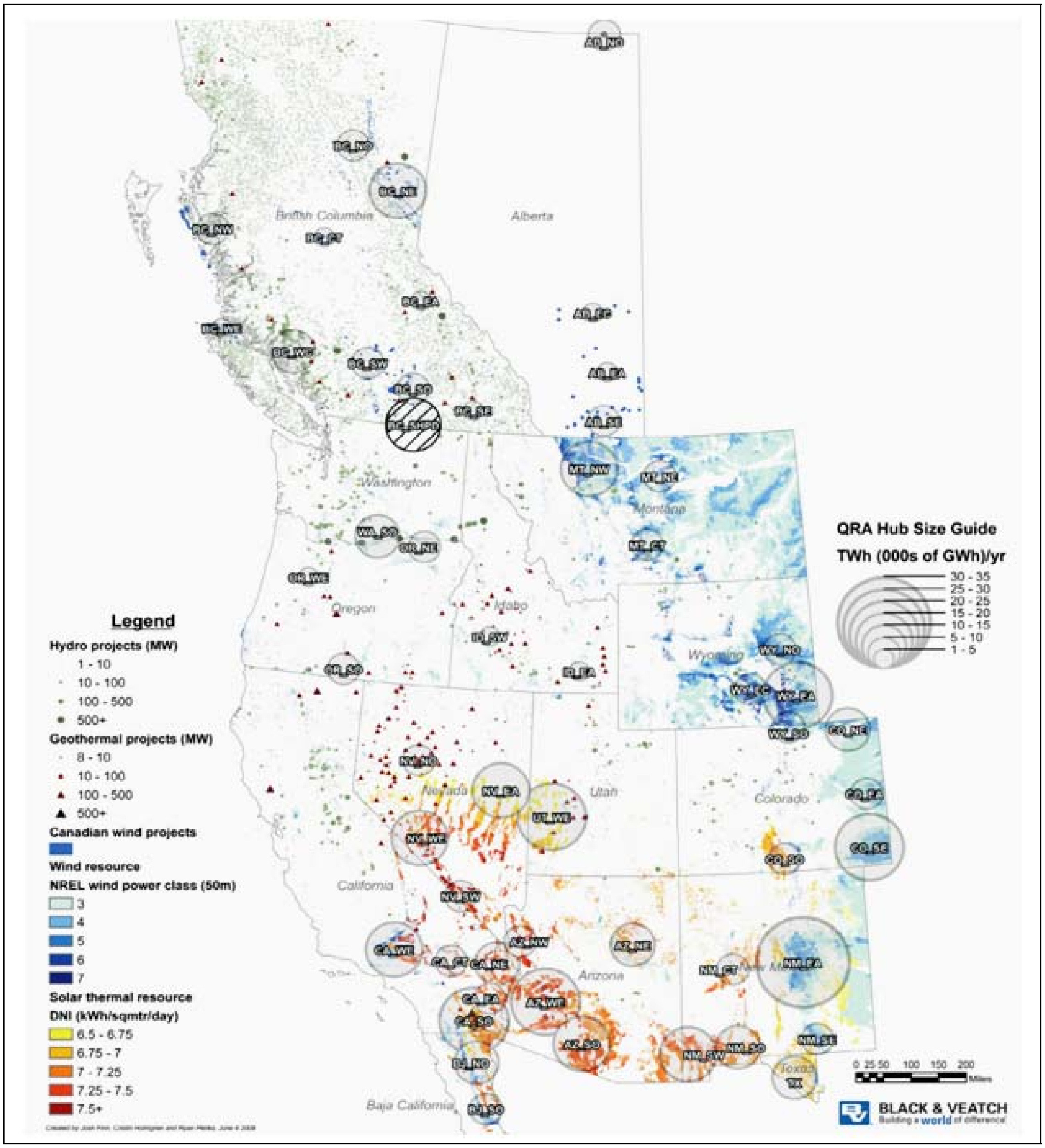


Figure 1-2
Prime Western Qualified Resource Areas

Figures 1-4 and 1-5 depict the annual average solar insolation levels for PV and CSP resources, respectively, throughout the United States. The Mojave Desert region and southwestern portion of Nevada, in particular, show high levels of solar resources availability, with insolation levels of 7 and above. Solar insolation levels drop off dramatically in the northern portion of the state, which explains why all of the state's existing and pending solar resources are located in the southern regions. Figures 1-4 and 1-5 show the best areas for CSP and PV Solar Power (Roberts, 2008c and d).

The solar resources included in the Black and Veatch WREZ QRA potentials shown in Figure 1-2 were limited to areas with a slope of less than 2 percent and the minimum insolation level for CSP to

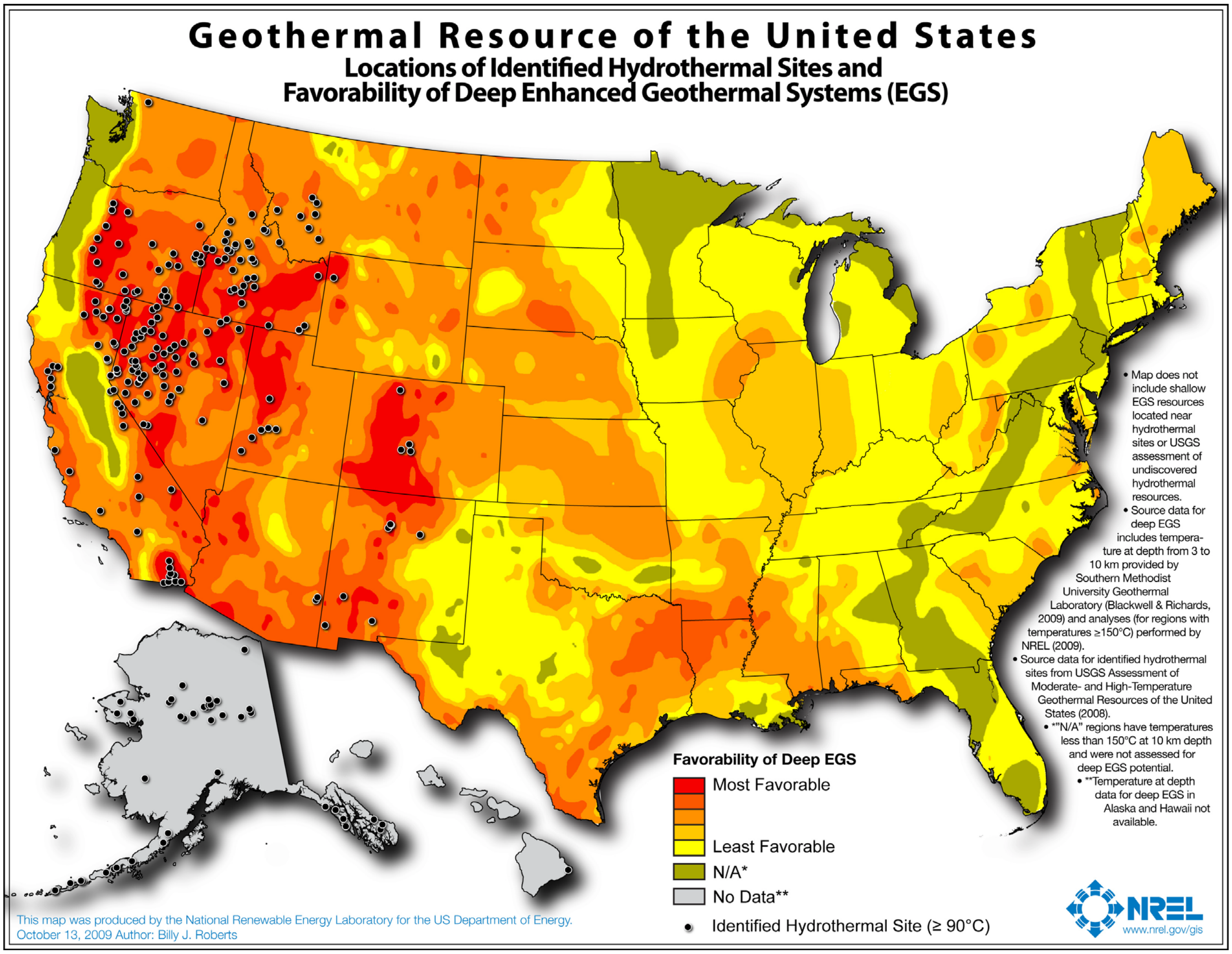
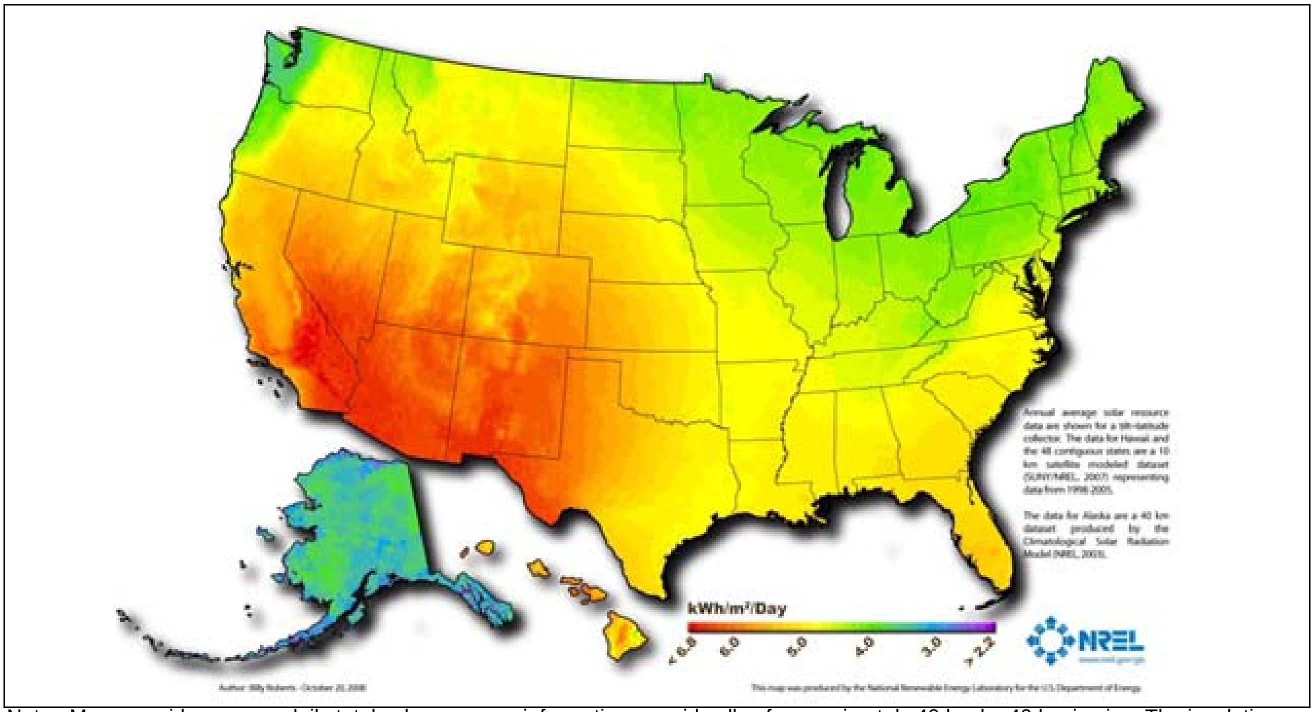


Figure 1-3
U.S. Geothermal Resources

be cost-effectively developed on a utility scale was set at 6.5 to 7 for the entire region.[3] The quantity of Nevada's solar resources with insolation levels in excess of 7 is 18,000 MW of capacity (Pletka and Finn, 2009, p. B-6). The capacity factor for these resources is about 25 percent, so these 18,000 MW of capacity represent about 39,000 GWh of annual energy production (Pletka and Finn, 2009, p. B-9). For the West as a whole, high quality solar resource potential is about 175,000 GWh.

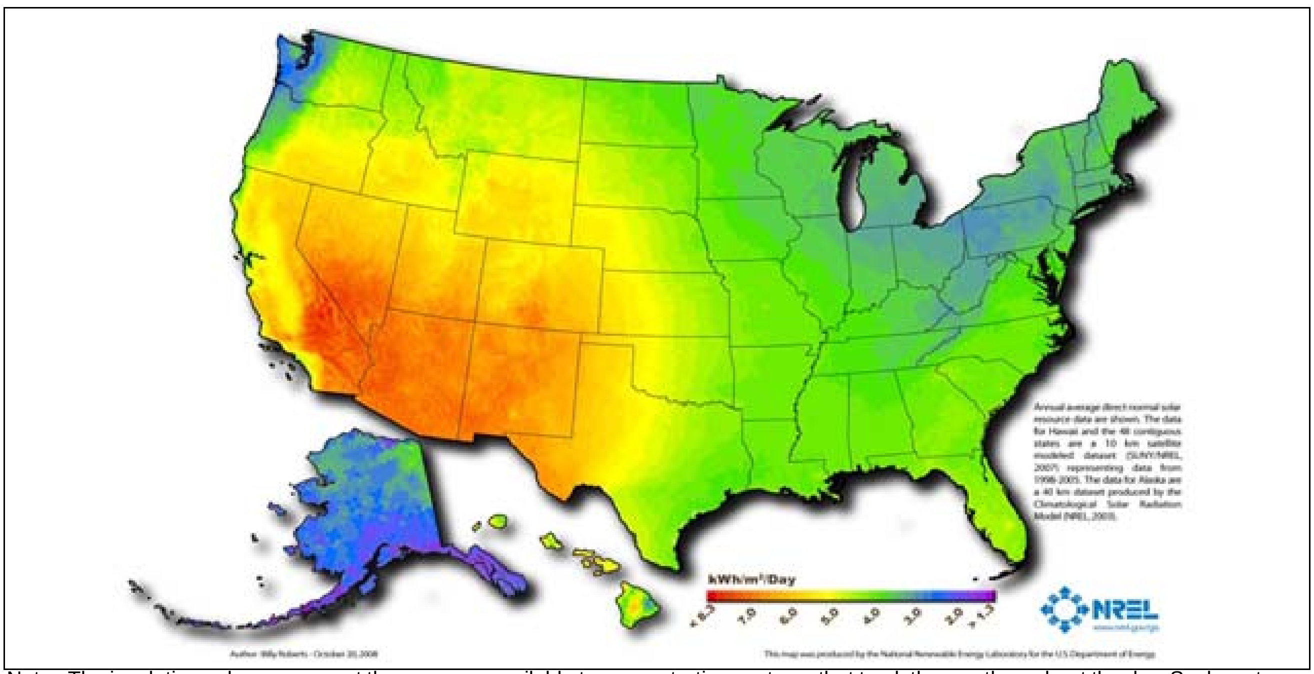
Figure 1-6 indicates that some high quality resources exist in the Delamar Valley zone, but the highest quality resources are not evident in the other Valleys of Interest. However, Delamar Valley is remote and thus, it does not appear that Black and Veatch and the WREZ included these resources in the QRA. Since Delamar Valley is remote from other high quality resources and relatively small (the acres of high value resources in Delamar is only about 7,500 acres), Delamar Valley was left out. The other resources of similar (red) or superior (dark red) quality in southern Nevada comprise about

3. The insolation level used to determine QRA potential was increased to 7 for Nevada due to the large quantities of high quality potential solar resources in the state.



Note: Maps provide average daily total solar resource information on grid cells of approximately 40 km by 40 km in size. The insolation values represent the resource available to a flat plate collector, such as a PV panel, oriented due south at an angle from horizontal equal to the latitude of the collector location. This is typical practice for PV system installation, although other orientations are also used (NREL, 2010).

Figure 1-4
Solar PV Resources



Note: The insolation values represent the resource available to concentrating systems that track the sun throughout the day. Such systems include CSP stations such as trough collectors or dishes (NREL, 2010).

Figure 1-5
CSP Resources

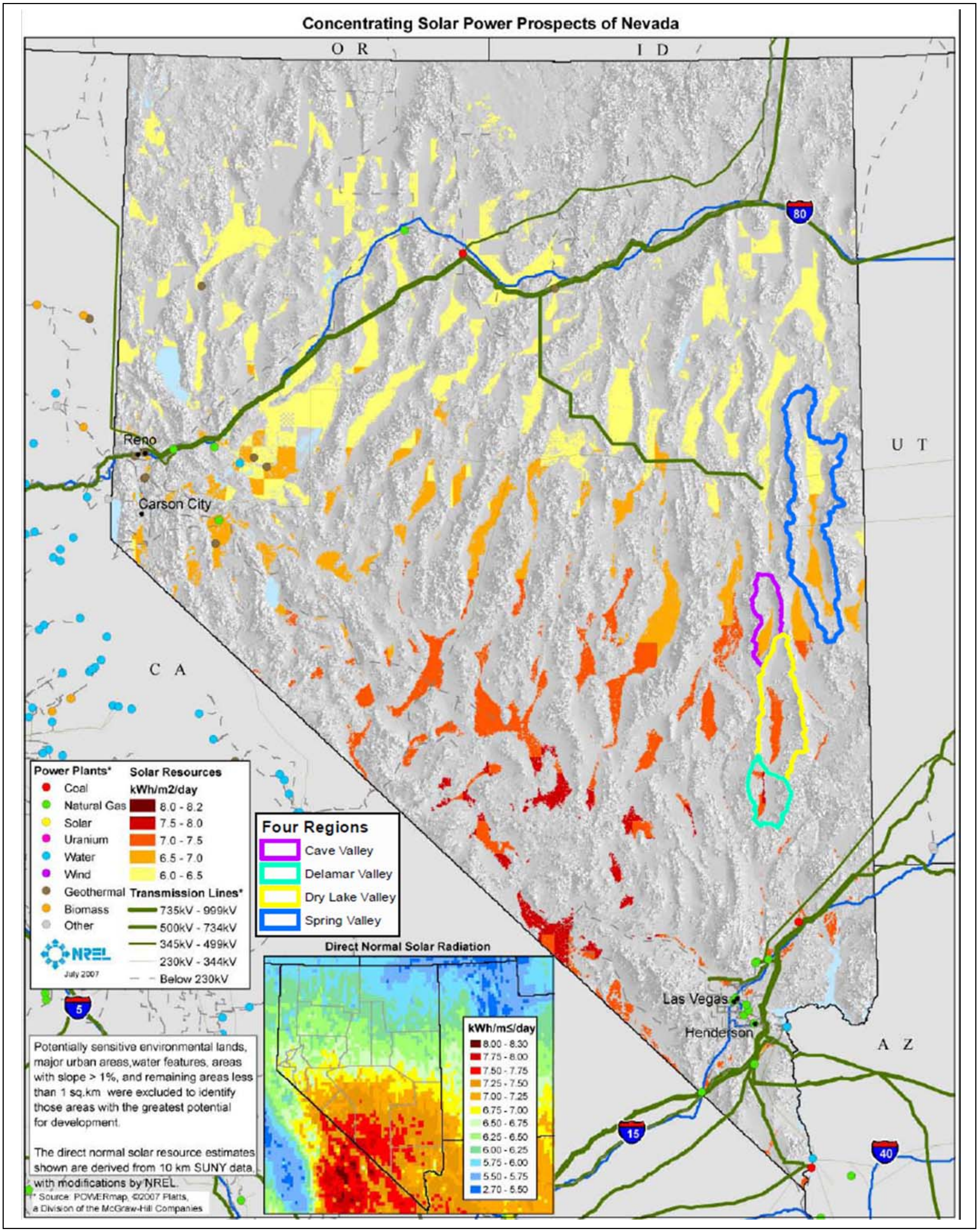


Figure 1-6
Cost Competitiveness of Nevada's Solar Resources

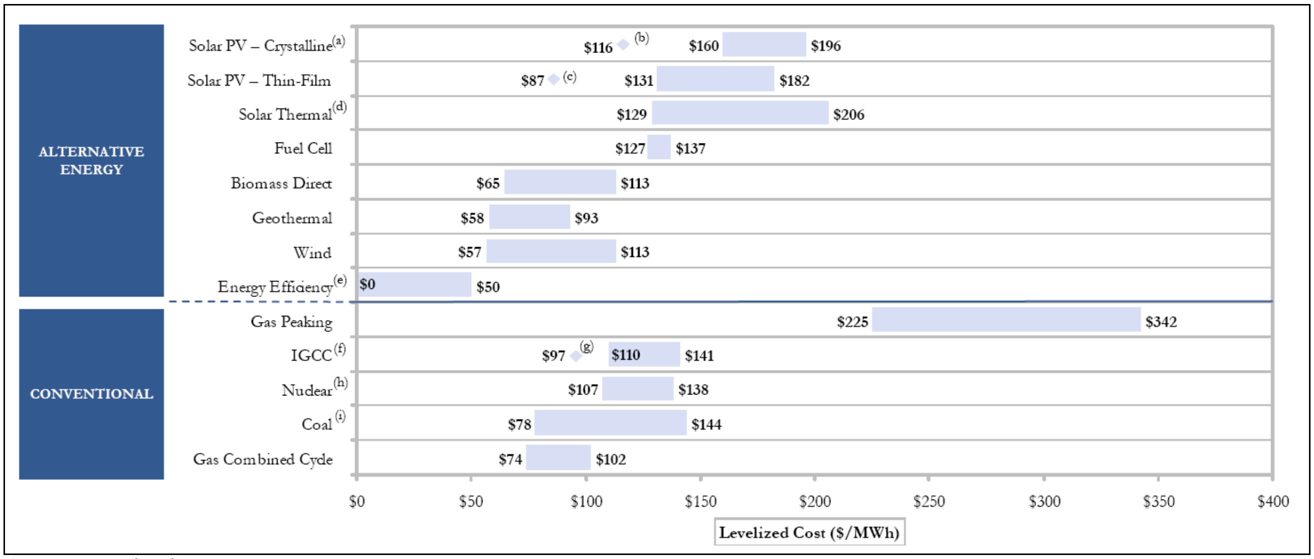
400,000 acres, or approximately 50 times the size of the Delamar Valley resource, and many of these resources are closer to California, implying lower transmission costs.

Taken together, the annual wind, solar and geothermal resources included in the Nevada QRA's is more than 50,000 GWh and the annual renewable potential outside of QRA's in Nevada exceed 200,000 GWh (Pletka and Finn, 2009, p. 5-7 and p. 5-10). Projects in the Valleys of Interest face the daunting task of competing against 10,000 GWh of highly competitive geothermal and more than 10,000 GWh of very high quality solar, equal to or better than the best solar in Delamar Valley. To place the intensity of competition in context, note that annual energy consumption in Nevada as projected by Nevada Power Company (NPC) and Sierra Pacific Power Company (SPPC) (NPC, 2010, p. 15; and SPPC, 2010b, p. 18) is 36,618 GWh in 2025 and the portion of Nevada's energy that is mandated to satisfy the Renewable Energy Standard by 2025 is 25 percent or about 9,155 GWh.[4] Thus, the Valleys of Interest are competing against 50,000 GWh in Nevada QRA's and 200,000 GWh in non-QRA Nevada areas to serve a market demand of about 9,000 GWh. We will see that the competition among solar resources is even more intense, but we will hold that discussion until Section 4.0.

On a west wide basis,[5] we will show in Section 5.0 that the total demand for new renewable resources between the present and 2020 is about 110,000 GWh. The total resource potential tallied by Black and Veatch in these high quality QRA zones is about 560,000 GWh/yr (Pletka and Finn, 2009, p. B-10). So the Valley of Interest projects will be engaged in a competition for a market of 110,000 GWh against rivals that bring 560,000 GWh into play. Furthermore, since the WREZ assessment was completed, additional information has come to light on Oregon's high quality coastal wind resource that is not reflected in the 560,000 GWh sum. Also the quantity of high quality resources is much greater than 560,000 GWh, but the WREZ work restricted its attention to highly concentrated areas that could be cost effectively reached by transmission.

This section assesses the relative costs of renewable technologies and the relative cost of resources in the Valleys of Interest. Cost estimates for Concentrated Solar Power vary greatly. Lazard created a range of cost estimates for different sources of energy (Lazard, 2009). Figure 1-7 depicts the ranges of levelized cost of energy (2008$/MWh) developed by Lazard. Recall that levelized cost represents the average present value cost per unit of electricity output over the life of a facility. All estimates shown in Figure 1-7 include the very favorable production tax credits (PTC) and investment tax credits (ITC) made available for renewable technologies over the last few years. The levelized costs of energy for solar thermal and solar PV are at the higher end of the range among all technologies, renewable and conventional. For example, solar thermal costs range $129-$206. PV costs with current technologies range from $131-$196. Examples of possible PV technology induced cost reduction are also shown as additional data points on Figure 1-7. Solar cost is currently higher than other renewable technologies due to higher capital costs. Solar has significantly higher levelized costs than gas fired power sources, with the exception of gas peaking facilities.

4. Since energy efficiency can fill some of the standard, and since some solar PV qualifies for a multiplier, the actual number of GWh of renewable energy generation required to meet the RES is at most 9,155.
5. West wide in this context means the region encompassing the footprint of the Western Electricity Coordinating Council. This region is shown in Figure 1-2.



Source: Lazard Estimates

Note: Reflects production tax credit (PTC), investment tax credit (ITC) and accelerated asset depreciation, as applicable. Assumes 2008 dollars, 20-year economic life, 40% tax rate and 5-20 year tax life. Assumes 30% debt at 8.0% interest rate and 40% equity at 12% cost for conventional generation technologies. Assumes a coal price of $2.50 per MMBtu and a natural gas price of $8.00 per MMBtu.

(a) Low end represents single-axis tracking crystalline. High end represents fixed installation.
(b) Represents estimated implied LCOE in 2012, assuming a total system cost of $3.50 per watt for single-axis tracking crystalline.
(c) Represents a leading thin-film company's targeted implied LCOE in 20102, assuming a total system cost of $2.00 per watt.
(d) Low end represent solar tower. High end represents solar trough.
(e) Estimates per National Action Plan for Energy Efficiency; actual cost for various initiatives varies widely.
(f) High end incorporates 90% carbon capture and compression.
(g) Represents estimated implied LCOE for Southern Company's proposed IGCC facility in Mississippi that is expected to be in service in 2013, assuming a total system cost of $3.00 per watt and 50% carbon capture per Southern Company public comments.
(h) Does not reflect decommissioning costs or potential economic impact of federal loan guarantees or other subsidies.
(i) Based on advanced supercritical pulverized coal. High end incorporates 9-% carbon capture and compression.

Figure 1-7
Levelized Cost of Energy Comparison

The relevant technology to compare renewable energy generation against for meeting future resources needs not covered by RPS requirements are natural gas fired technologies because coal and nuclear are not likely to be selected by utilities for the foreseeable future. The coal costs shown do not include the costs of all proposed air control technologies and thus are understated. Further, the coal costs do not quantify the full cost of sequestration because no large scale sequestration project has been successfully completed to date and the costs are likely to be quite high thus likely competition between renewable energy and clean coal is unlikely. The nuclear costs do not include the costs of decommissioning and completion of any new nuclear power plant is highly speculative due to recent nuclear accidents. The WECC does not project increases in coal or nuclear generation for the next ten years due to these factors. Therefore in comparing renewable energy costs with conventional technologies, it is most appropriate to compare renewable technologies against gas fired generation sources. Of course, solar thermal and PV technologies, like wind and geothermal energy, have very low operating costs because they do not consume fuel, and so the high capital costs are partially offset by lower operating costs. Renewable resource cost competitiveness thus could improve relative to what is shown in Figure 1-7 if natural gas prices become high.

Though location is a large factor in solar costs, storage levels, method of cooling, and taxes can all affect CSP costs. Wet cooling plants are not always feasible due to the large amounts of water required. Depending on the design of the system, Table 1-1 shows that wet cooling plants consume

Table 1-1
Water Use Comparisons for Several Solar Technologies

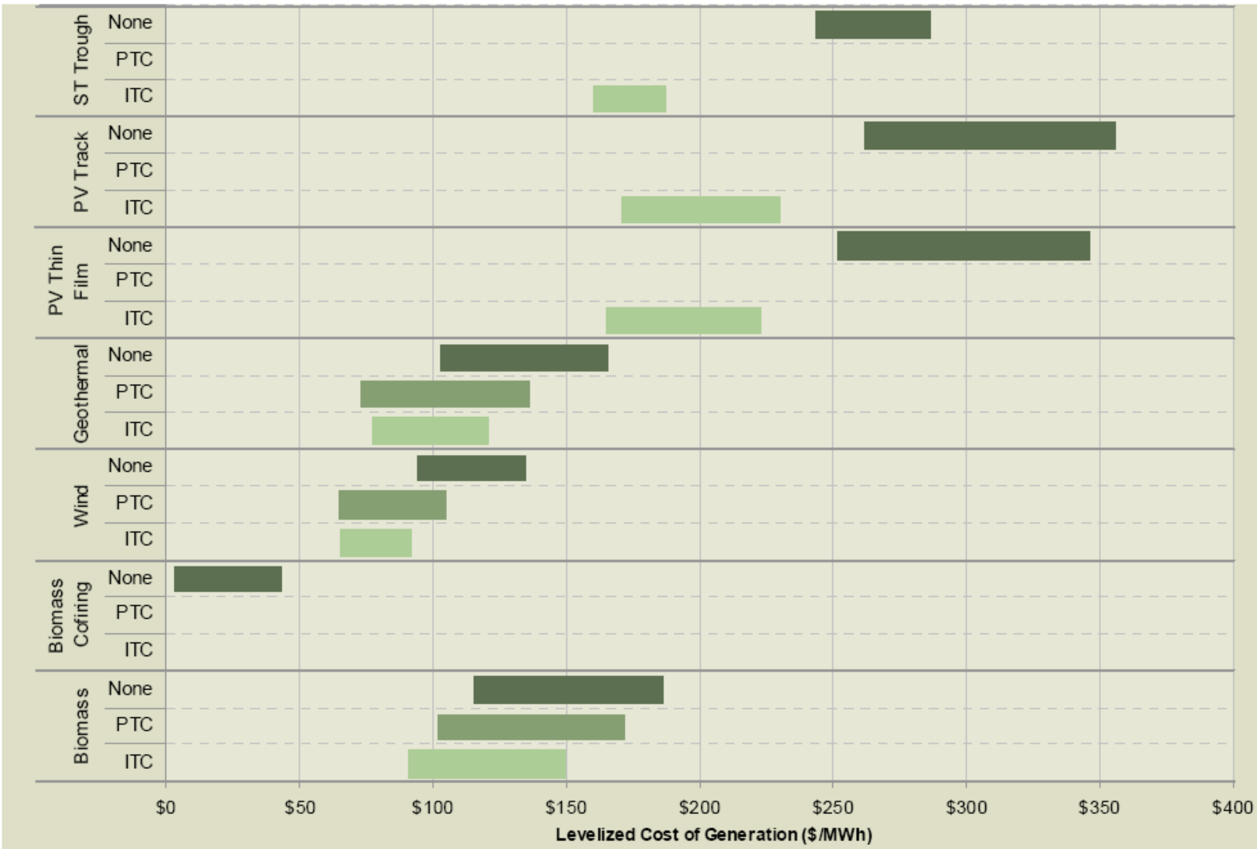
Solar Technology	BLM Solar PEIS-Overview (Table 3.1-1) Converted from afy/MW[a]	DOE (2009)[b] (gal/MWh)	Western Resource Advocates (2010)[c] (gal/MWh)	BLM Solar PEIS-Amargosa Valley SEZ (Table 11.1.9.2-2) Converted from afy for facilities of given MW capacity
Parabolic trough (wet)	298-1,817 gal/MWh [30%-60% operation + washing]	800	760	298-1,817 gal/MWh [30%-60% operation + washing]
Parabolic trough (dry)	31-143 gal/MWh [30%-60% operation + washing]	78	78	31-143 gal/MWh [30%-60% operation + washing]
Power tower (wet)	298-1,817 gals/MWh [30%-60% operation + washing]	500-750	760	298-1,817 gal/MWh [30%-60% operation + washing]
Power tower (dry)	31-143 gal/MWh [30%-60% operation + washing]	90	78	31-143 gal/MWh [30%-60% operation + washing]
Dish Stirling engine	19 gal/MWh [washing only]	20	78	19 gal/MWh [washing only]
Photovoltaic (utility)	1.9 gal/MWh [washing only]	---	0 virtually none	1.9 gal/MWh [washing only]

[a]The Bureau of Land Management (BLM) provided a range for 30%-60% operation of annual hours for parabolic trough and power tower technologies. For all technologies, BLM considered mirror/panel washing with a conservative 100% assumption on operational time.
[b]In a report to Congress, the U.S. Department of Energy (DOE) compared the performance of wet- and dry-cooled plants in California and found that the dry-air-cooled plant provided roughly 5% less electric energy on an annual basis than the water cooled plant (DOE, 2009). Similarly, a presentation by the DOE reports that switching from wet-cooled to dry-cooled results in a performance loss of less than 7% (DOE, 2010).
[c]Tellinghuisen and Milford (2010).

from 298 to 1,817 gal per/MWh (BLM and DOE, 2010; Clean Air Task Force, 2003; Kelly, 2006; Stoddard et al., 2006; DOE, 2009; Tellinghuisen and Milford, 2010). This water consumption is similar to the water required by a conventional fossil fuel steam plant. Dry cooling requires much less water (31 to 143 gal/MWh). However, compared to wet cooling systems, dry cooling systems cost more and are not as efficient. Consequently, CSP resources with dry cooling will have a LCOE that is slightly higher that CSP with wet cooling.

A second levelized cost comparison among renewable technologies is shown on Figure 1-8 (Black and Veatch, 2010, p. 3-5). The levelized cost of solar thermal trough technology (a CSP Technology) is compared with other renewable technologies in Figure 1-8. The technologies against which CSP is compared include: PV technology with a tracking mechanism, thin film solar PV without tracking, geothermal technology, wind technology and biomass technology. RETI 1B estimates and compares the performance and cost of dry-cooled CSP systems with and without storage. The CSP costs shown on Figure 1-8 assumes that no storage is installed. When storage is added, costs increase but the value of the energy also increases because energy continues to be produced for some time after the sun goes down. Without storage, the capacity factor of a CSP resource is estimated to be between 20 and 28 percent with total project costs of 5,350 to 5,550 $/kW. Storage increases the capacity factor to 29 to 39 percent but increases costs to 7,650 to 7,850 $/kW (Black and Veatch, 2010, p. 4-6).

For each technology, Figure 1-8 shows the range of levelized costs with and without tax credits where “None” represents no available tax credits, “PTC” represents Production Tax Credit available only, and “ITC” represents Investment Tax Credit available only. The government has recently chosen to reduce the cost of renewables through tax credits. Currently, there is a 30 percent income tax credit on both solar PV and solar thermal that does not expire until 2016. Whether or not this is accounted for can significantly alter cost estimates. Figure 1-8 clearly shows that the current tax credits make



Key

PTC: production tax credit
ITC: investment tax credit
PV Track: single-axis tracking crystalline photovoltaic technology
PV Thin Film: fixed-tilt thin film photovoltaic technology
ST Trough: solar thermal parabolic trough technology
Wind: wind turbines
Biomass Cofiring: combustion of biomass along with coal in a thermal power plant
Biomass: organic materials that can be burned and used as a source of fuel
Levelized Cost of Generation: average net cost per megawatt hour for a generation facility over the life of that facility

Note: In February 2009, the American Recovery and Reinvestment Act of 2009 (ARRA) was signed into law. The ARRA allows for biomass, geothermal, and wind projects to now take advantage of the 30 percent ITC or equivalent grant. Previously these technologies were only eligible for the PTC. The cost of generation model evaluates each resource under various incentive assumptions and picks the lowest cost (Black and Veatch, 2010). Currently, the PTC for wind and geothermal is $21/year and $10/year for closed-loop biomass and qualified hydro. There is uncertainty about when the tax credits will expire.
The levelized costs shown are based on cost factors only.

Figure 1-8
Composite Levelized Cost Ranges of Technologies with and without PTC and ITC

solar more competitive on a levelized cost basis. The cost of solar PV is reduced by roughly a third with the tax credit. Solar thermal costs are also reduced though not as dramatically.

The range of costs without tax credits shows the solar technologies are more than twice as expensive on a levelized cost basis relative to every other technology. When the ITC is introduced, the cost of solar becomes more competitive but it is still more expensive.

The RETI Phase 2B report also presents relative net cost estimates of western resources in serving California markets. Table 1-2 below shows the megawatts (MW) of renewable capacity, the GWh of potential, the cumulative GWh of potential and the relative cost of renewable energy zones (Black and Veatch, 2010, p. 7-3). The renewable zones highlighted in yellow are zones outside California. As discussed at the beginning of this section, the net cost score represents the net cost of resources from a given zone where generation, transmission and integration cost are net of the capacity and energy value relative to the current market. A negative number means that a given resource generates more energy and capacity value than the cost it imposes. A positive number means that there is a positive cost in excess of the capacity and energy values associated with adding the resource to the system. The Nevada QRA's are represented by NV_NO (a Northern Nevada zone that is predominantly geothermal), NV_SW (a Southwestern Nevada zone that includes the best solar resources in Nevada), NV_WE (a Western Nevada zone that includes the Tonopah and Amargosa Valley resources) and NV_EA (an Eastern Nevada zone that includes mostly wind and solar resources in Eastern Nevada). The cost score of these resources range from 30 to 73, where a lower number represents a lower net cost. Note that the cost of the Nevada resources, from lowest to highest is NV_NO (30), NV_SW (49), NV_WE (61) and NV_EA (73). Also note that Table 1-2 shows that 382,678 GWh of resources are better than the NV_EA resources from a California consumer's perspective.

Table 1-2
Weighted Average Rank Costs–All CREZ and Resource Areas
(Page 1 of 2)

CREZ Name	Net Capacity (MW)	Annual Energy (GWh/yr)[a]	Cumulative Energy (GWh/yr)[a]	Weighted Average Rank (Cost ($/MWh)
Solano	894	2.721	2.721	-21
Palm Springs	333	1,047	3,768	-18
Round Mountain-A	384	2,557	6,325	-6
Imperial North-A	1,370	10,095	16,419	4
Santa Barbara	433	1,121	17,540	4
Fairmont	2,200	6,015	23,555	7
San Diego South	678	1,829	25,385	9
Tehachapi	8,626	21,411	46,795	11
San Diego North Central	200	502	47,297	15
Lassen South	410	1,051	48,348	18
Victorville	1,336	3,196	51,545	18
Round Mountain-B	132	339	51,883	19
Barstow	1,986	4,706	56,589	19
UT_WE	2,144	7,595	64,184	20
San Bernardino - Lucerne	1,845	4,829	69,013	21
Lassen North	1,467	3,595	72,608	24
Kramer	4,866	11,092	83,700	25
OR_SO	669	2,443	86,143	25
Inyokern	1,896	4,315	90,459	29
OR_WE	970	5,393	95,851	29
NV_NO	1,248	8,389	104,240	30
Mountain Pass	763	1,741	105,982	32
Twentynine Palms	1,354	3,012	108,993	33
Pisgah	1,650	3,680	112,673	34
Cuyama	300	638	113,311	35
OR_NE	2,089	5,719	119,031	35
Carrizo South	2,250	4,721	123,751	38
San Bernardino-Baker	2,513	5,540	129,291	38
Carrizo North	1,200	2,501	131,792	38
Imperial East	1,199	2,708	134,500	41
Riverside East	7,913	17,504	152,004	41
Westlands	3,750	7,467	159,472	42
ID_SW	1,158	3,906	163,378	45
WY_EC	2,595	8,236	171,614	45
AZ_NE	4,063	11,694	183,308	46
NV_SW	5,042	12,501	195,809	49
WA_SO	3,752	11,942	207,751	51
Imperial North-B	1,380	3,190	210,941	53
Imperial South	2,823	6,714	217,655	54
ID_EA	1,178	4,934	222,589	54
Owens Valley	3,750	8,194	230,782	56
BJ_NO	5,655	16,635	247,417	56
WY_SO	1,940	5,813	253,230	57

Table 1-2
Weighted Average Rank Costs–All CREZ and Resource Areas
(Page 2 of 2)

CREZ Name	Net Capacity (MW)	Annual Energy (GWh/yr)[a]	Cumulative Energy (GWh/yr)[a]	Weighted Average Rank (Cost ($/MWh)
AZ_NW	3,758	9,168	262,397	58
NM_EA	11,292	31,626	294,023	58
AZ_WE	9,373	23,130	317,153	58
WY_NO	3,061	9,217	326,369	58
NV_WE	7,836	20,109	346,479	61
WY_EA	7,257	22,690	369,169	62
Iron Mountain	3,662	8,133	377,302	64
NM_SE	1,894	5,376	382,678	65
BJ_SO	2,650	7,973	390,651	73
NV_EA	7,974	19,332	409,984	73
AZ_SO	6,631	16,265	426,249	76
BC_WC	307	2,121	428,370	95
BC_EA	66	429	428,799	130
BC_SE	230	829	429,627	140
BC_WE	1,370	3,194	432,821	142
BC_NE	4,206	10,638	443,459	148
BC_SW	1,922	4,424	447,883	155
BC_SO	2,441	5,208	453,092	157
BC_NO	2,254	5,486	458,577	161
BC_CT	1,024	2,497	461,074	176
BC_NW	1,402	3,442	464,516	185

Source: RETI Phase 2B report (Black and Veatch, 2010)
CREZ = Competitive Renewable Energy Zone
[a]Includes transmission losses.

2.0 TRANSMISSION ACCESS OPTIONS FOR SOLAR RESOURCES LOCATED IN THE VALLEYS OF INTEREST

2.1 Summary

Development of solar energy resources in the Valleys of Interest is not possible without transmission access from these valleys to relevant load centers or energy markets. Market access requirements and the cost of transmission are key factors for determining the competitiveness of renewable energy resources. The Valleys of Interest are located in remote areas and the closest existing transmission systems do not have available capacity to support delivery of the energy from a single utility scale project[1] to a relevant load center. Transmission access to the Valleys of Interest will require construction of new transmission facilities and these facilities will cost more than facilities constructed to access other solar development areas in Nevada. Further, because of the location of the Valleys of Interest, market access requirements will be more onerous for developers in the valleys than for developers in other solar resource development areas. Both of these factors place solar resource developers in the Valleys of Interest at a competitive disadvantage to developers in other solar development areas in Nevada and other western states.

2.2 Existing Transmission Facilities in or Near the Valleys of Interest

The existing transmission facilities in or near the Valleys of Interest are owned by Lincoln County Power District (LCPD), Mt. Wheeler Power Inc. (MWPI), NVE and the Intermountain Power Agency (IPA). The map in Figure 2-1 (Office of the Governor, 2009, p. 120) shows an overlay of the Valleys of Interest on the service territories of the Nevada utilities. NVE and IPA have existing transmission facilities located north of Ely that run through the Spring Valley, the northernmost valley. These transmission facilities, shown in Figure 2-2, (p. 2-3), are approximately 120 mi north of the Delamar Valley, the location of the best solar resources in any of the Valleys of Interest. NVE also has transmission facilities located in the South, also shown on Figure 2-2, that are approximately 100 mi from the Delamar Valley, the southernmost valley. Solar developers in the Valleys of Interest would have to construct transmission lines from their resources to these existing facilities in order to use any available transmission capacity on them.

An assessment of the ability of the existing transmission facilities in or near the Valleys of Interest to support solar resource development in these valleys is provided below. Key factors used in the assessment include the amount of available capacity on existing transmission facilities, the relative cost for solar developers to construct transmission tie lines that interconnect to these facilities

1. Note that available transmission capacity can be compared to the typical capacity levels of utility scale solar projects to determine whether the available capacity is significant. Utility scale solar projects are typically greater than 10 MW for PV projects and greater than 75 MW for solar thermal projects.

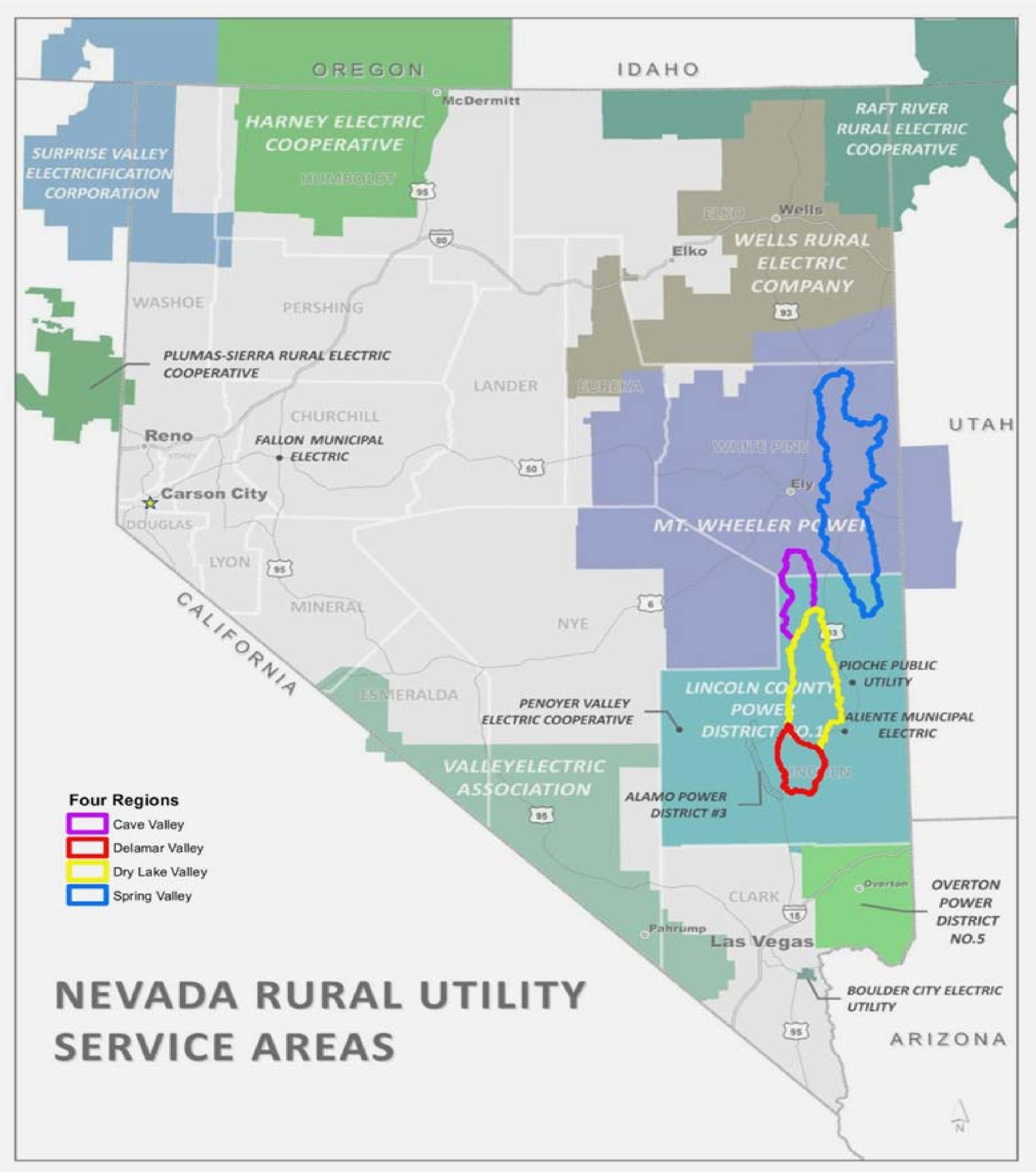


Figure 2-1
Valleys of Interest on the Service Territories of the Nevada Utilities

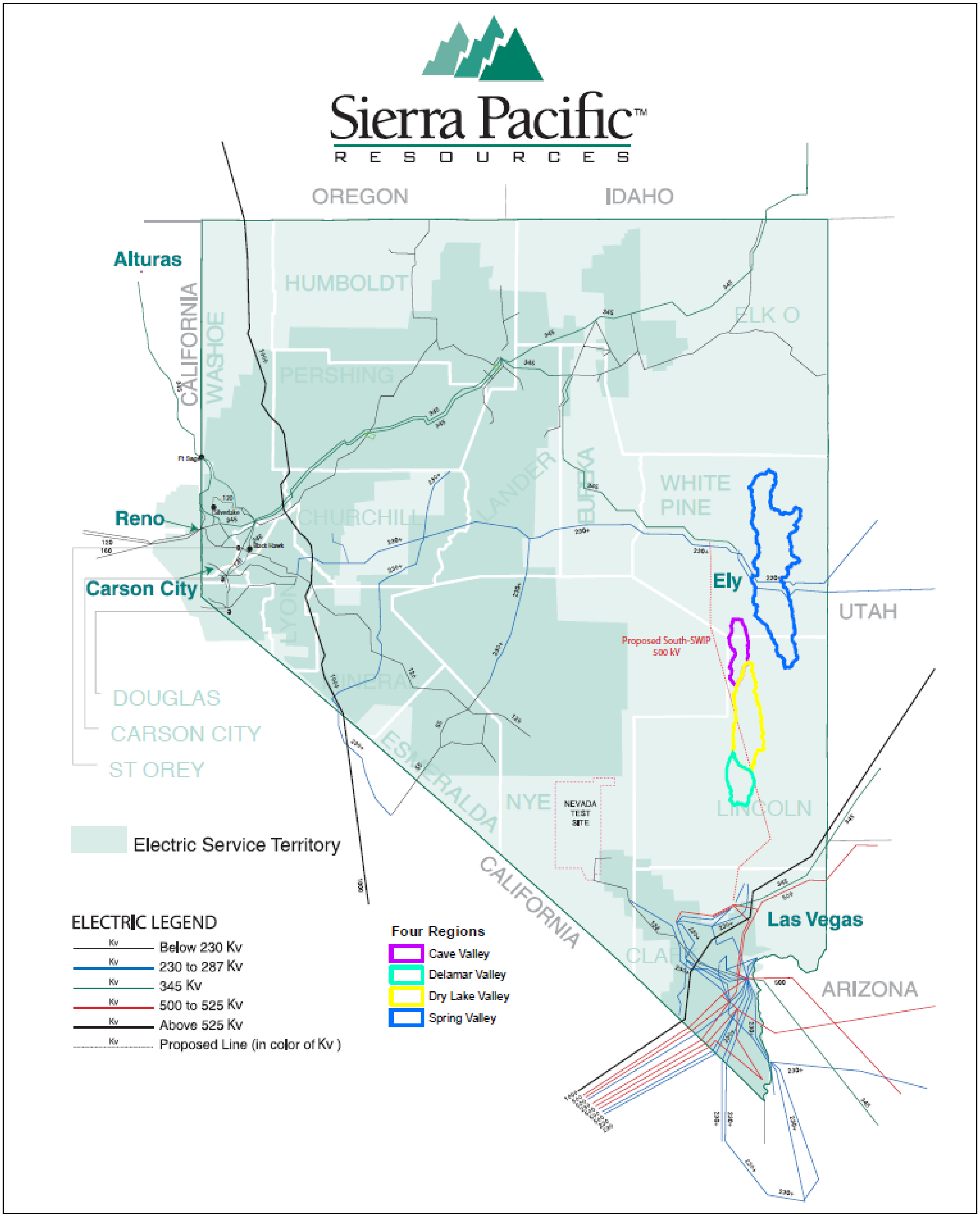


Figure 2-2
NVE and IPA Transmission Facilities Running through Spring Valley

compared to solar developers in other locations, and whether interconnection to the existing facilities provides access to relevant load centers.

Lincoln County Power District's service territory encompasses the Cave, Dry Lake, Delamar Valleys and part of Spring Valley. LCPD's electric system had a peak load of 18 MW in 2009 (Office of the Governor, 2009, p.130). LCPD does not own any generation and purchases the power it needs for its customers. As it exists right now, the LCPD electric system can be characterized as very small. It has limited capacity available to support development of a significant level of renewable energy in any of the Valleys of Interest. In addition, the LCPD electric system likely would not support utility scale solar PV or solar thermal projects and has a limited ability to provide transmission access to a relevant load center.

MWPI's service territory encompasses most of the Spring Valley. In 2009, MWPI had a peak demand of 74 MW (Office of the Governor, 2009, p. 122). MWPI does not own any generation and purchases the power it needs for its customers. The MWPI electric system can be characterized as small with limited available transmission capacity. It likely could not support utility scale solar PV and solar thermal projects and has a limited ability to provide transmission access to a relevant load center.

NVE and IPA have transmission facilities that are routed through the Spring Valley and terminate at the Gonder substation which is located north of Ely Nevada. These facilities are located approximately 120 mi north of the best solar resource areas in the Valleys of Interest. NVE also has transmission facilities located in Southern Nevada, north of Las Vegas, that are approximately 100 mi from the best solar resource areas in the Valleys of Interest. The transmission facilities north of Ely have limited available transmission capacity, provide limited access to relevant energy markets and would likely not support development of significant level of renewable resources in Spring Valley. NVE's transmission facilities in Southern Nevada currently have approximately 500 MW of available transmission capacity (Villar Rebuttal Testimony, p. 21) and could access load centers in Nevada and California. Developers in the Valleys of Interest could construct transmission tie lines to access these existing facilities. However, the cost for these tie lines would be high compared to tie line costs for solar and geothermal resources in other locations within Nevada and would negatively affect the competitiveness of resources in the Valleys of Interest (this issue is more fully discussed later in this section).

2.3 Proposed Transmission Facilities

New transmission service to the Valleys of Interest could potentially be provided by MWPI, LCPD, NVE, IPA, Western Area Power Administration and independent transmission developers. While no transmission projects have been proposed specifically to access the solar resources within the Valleys of Interest, a number of transmission projects have been proposed by local utilities and independent transmission developers that would pass through or near the Valleys of Interest and potentially provide a transmission access option for developers in these valleys. A summary of the transmission access opportunities for solar developers in the Valleys of Interest on these proposed transmission lines and transmission access cost information is provided in this section.

A number of transmission developers have proposed major transmission projects that would be routed through or in the vicinity of the Valleys of Interest. These projects include: The Zephyr, Chinook, TransWest Express, and SWIP[2] projects. With the exception of NVE's share of the capacity of the SWIP-South line, which is discussed below, these projects can be characterized as high capacity (2,000 MW to 3,000 MW) Alternating Current (AC) or Direct Current (DC) lines that are being developed primarily to move renewable energy from low cost renewable resource areas in the northeast region of WECC to California. These lines are speculative and their development is contingent upon the amount of energy from out-of-state renewable resources that California policy makers allow to contribute towards meeting California's RPS requirements. If any of these lines are constructed, solar developers in the Valleys of Interest will face significant cost and competitive challenges trying to secure capacity on these lines. Two of the lines, Zephyr and Chinook, are DC lines. DC interconnection facilities are extremely expensive and it is unlikely that the solar resource in the Valleys of Interest would be competitive with solar resources developers in other locations if the cost of a DC interconnection is included in the price of the energy from their resources. If the AC lines (SWIP and TransWest Express) are constructed, the solar developers in the Valleys of Interest would have to build transmission facilities to interconnect to these lines. Then they would have to compete with other renewable energy developers in Nevada and other Western states for the capacity on these lines. With respect to the ability of resources in the Valleys of Interest to compete with resources in other Western states, it is important to remember that the proposed lines are being considered because the resources they access are significantly less expensive to develop than resources in other areas including those in the Valleys of Interest. With respect to resources in Nevada, resources in the Valleys of Interest are unlikely to be competitive with other types of renewable energy resources in Nevada including geothermal resources and better quality solar resources south of the valleys. Furthermore, as indicated above, the renewable energy market in Nevada–which is driven by Nevada's RPS statutes–will not support a significant level of solar resources.

NVE and Great Basin Transmission are developing the SWIP-South segment of the SWIP transmission project. NVE calls this project the "ON Line" project but, because it is a component of the SWIP project, it will be referred to as SWIP – South in the remainder of this document. The SWIP-South project is shown on Figure 2-2, (p. 2-3). The end points of SWIP-South are located at an electric substation named Robinson Summit near Ely, Nevada in the North and a substation named Harry Allen which is located in the northeast corner of the Las Vegas Valley in the South. The voltage of this line will be 500 kV and its length will be approximately 235 mi. It is scheduled to be in operation by the end of 2012. The line will be routed through Lincoln County and along or in the Cave Lake, Dry Lake, and Delamar Valleys. It will have an initial capacity of about 600 MW. This initial capacity is committed to NVE retail customers and will not be available on a firm basis to accommodate power transfers from other transmission customers. This means that solar developers in the Valleys of Interest will not have firm access to the transmission capacity on this line, which is a requirement for project financing.

2. A high voltage transmission line connecting the Midpoint Substation in southern Idaho to southern Nevada has been on transmission planning maps for over 20 years. This line has been referred to as the Southwest Intertie Project or SWIP during this period. In this document the SWIP project consists of three transmission segments: SWIP-North, SWIP-South and Southern Nevada Intertie Project (SNIP). SNIP is the 500 kV transmission line segment that connects the Harry Allen Substation to the Mead Substation in the El Dorado Valley.

The Great Basin Transmission Company (GBT) plans to develop the two remaining segments of the SWIP project. The first segment, SWIP-North is a 500 kV transmission project that would connect to the Robinson Summit Substation at its southernmost point and the Midpoint Substation in Idaho at its northernmost point. This SWIP-North segment is shown on the map in Figure 2-2, (p. 2-3). The final segment of SWIP, the SNIP, is also a 500 kV transmission project. It will terminate at the Harry Allen Substation at its northernmost point and the Mead Substation in the El Dorado Valley at its southernmost point. If the SWIP-North and SNIP projects are developed, the transmission capacity of the entire SWIP line will increase to over 2,000 MW and NVE's share of this capacity would increase to about 750 MW. Most of GBT's capacity, which would be about 1,200 MW, would likely not be available to renewable developers in Nevada, including those in the Valleys of Interest, as SWIP-North will only be constructed if commitments for capacity are secured from transmission customers located upstream of the SWIP Line. In other words, GBT's transmission capacity on SWIP is intended to serve transmission customers moving renewable resources from Idaho, Wyoming and Montana to the Southwest energy markets, primarily California.

As indicated above, the initial capacity of the SWIP-South project is limited to 600 MW. This limit is due to the nature of the existing electric system. However, the thermal capacity rating of SWIP-South is consistent with the capacity rating of the entire SWIP line, around 2,000 MW. Consequently, with changes to the existing electrical system, such as the addition of new generation resources at the northern end of SWIP-South, it may be possible to increase the capacity limit on SWIP-South without constructing either SWIP-North or SNIP. If this is the case, renewable developers in Nevada would have access to this additional capacity. At this time, it is not known what options are available for increasing the capacity on SWIP-South if the SWIP-North or SNIP projects are not completed. And, it is not known what options are available for increasing the capacity level on SWIP-South if just the SNIP project is completed. However, if SWIP-North is not completed and SNIP is completed, only transmission customers (i.e., renewable developers, etc.) in Nevada would have access to any additional capacity made available on the SWIP-South transmission line. In this case, the competition for available capacity on SWIP–South would be limited to Northern Nevada transmission customers. Renewable developers in Northern Nevada and in the Valleys of Interest would be competing for a share of the Nevada and California renewable energy markets. Solar resource developers in the Valleys of Interest would likely not fare well in this competition, as geothermal resources in Nevada are more competitive than solar resources and, as indicated elsewhere in this document, it is not believed that developers in the Valleys of Interest can compete in markets in Nevada or in other Western states as there are better quality resources with less expensive transmission access options available.

The Southern Nevada Water Authority (SNWA) is expected to install transmission facilities to supply power to the pumping stations for the Groundwater Development Project (GDP). These proposed facilities will be routed through the Valleys of Interest. At this time, only conceptual plans are available for the facilities proposed by SNWA and therefore it is not possible to provide any definitive information regarding what capacity may or may not be available on these facilities to support renewable energy development in the Valleys of Interest. In addition, the operating schedules for the pumping stations that will be served by these facilities have not been developed. Therefore, it is not known whether there will be periods when the transmission facilities may be idle and available to accommodate some level of power transfers from renewable resources located in the Valleys of

Interest. Table 2-1 (SNWA, 2010, p. 2-32) shows the transmission facilities that are currently proposed to support the GDP.

Table 2-1
GWD Project Power Lines

Power Line Conductor Voltages	Total Miles
230 kV power line	100
69 kV power line	20.8
25 kV power line	24.1
230 kV power line with 69 kV and 25 kV under hang	45.5
230 kV power line with 69 kV under hang	97
69 kV power line with 25 kV under hang	35.6
Total	**323**

Table 2-2 shows transmission capacity levels for various voltage classes based upon the length of the transmission line. This table is provided to give an understanding of the capacity level of the proposed SNWA transmission facilities. The primary transmission voltage for the GDP transmission facilities is 230 kV and these facilities are expected to be over 200 mi in length. Based upon the information in the table, the overall capacity of the GDP will likely be around 200 MW. If most of this capacity is needed for pumping operations, there will be little capacity available for other purposes.

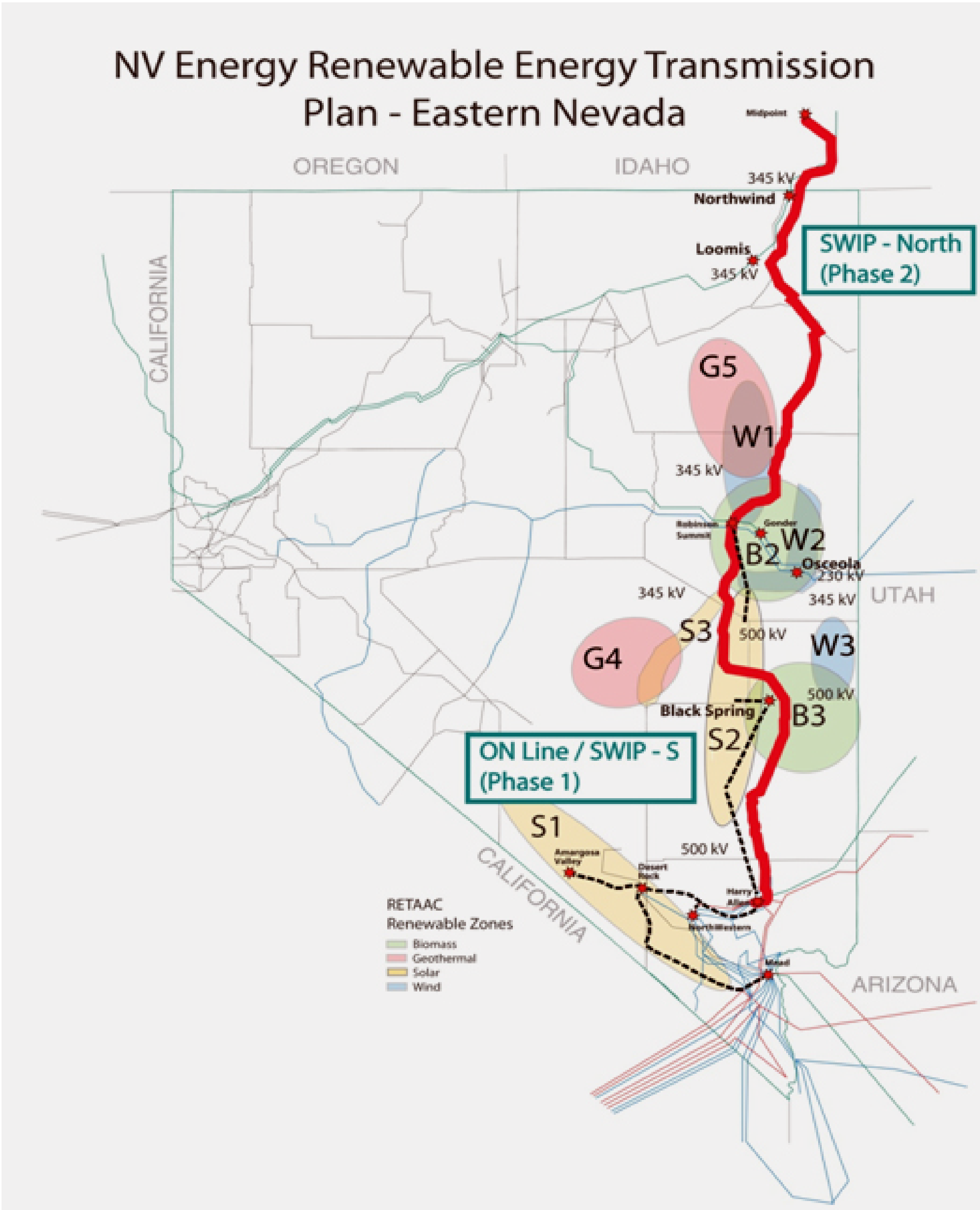
Table 2-2
Capacity of Transmission Lines by Voltage and Length

Line Voltage	Length 12 + miles	Length 80 + miles	100 Miles
500 kV	N/A	N/A	2000 + MW
345 kV	N/A	750 MW	600 MW
230 kV	N/A	250 MW	200 MW
138 kV	180 MW	100 MW	80 MW
69 kV	100 MW	30 MW	20 MW
35 kV	35 MW	N/A	N/A

This data was taken from WREZ Generation and Transmission Model (GTM) model and various presentations made by NVE (NV Energy Presentation, 2008) and Patterson (2007).

2.4 Cost Estimates to Develop Transmission Facilities to Cave, Dry Lake, and Delamar Valleys

The cost of transmission to access a solar resource area is a key factor for determining the competitiveness of solar resources within that area. In Nevada, a number of high concentration solar resource areas have been identified. Legislation passed in Nevada's 2009 legislative session (AB 387) authorized the Public Utilities Commission of Nevada to designate renewable energy zones identified throughout Nevada (SPPC, 2010a). Three solar renewable energy zones have been designated. These zones are identified as S1 (Amargosa Valley), S2 (Cave, Dry Lake, and Delamar Valleys) and S3 (Railroad Valley). These zones are shown on the map listed in Figure 2-3. The renewable energy zones in Nevada were so designated because they include high concentration areas of renewable resources, are in remote areas and have no transmission available to deliver the energy



Note: Aspen modified NVE's RECTP-Eastern Nevada map (SPPC, 2010a, Volume 13, TRAN 1, p.14) to show dashed lines for options for providing transmission access to renewable energy zones in Eastern Nevada. Map provided by SPPC.

Figure 2-3
NVE Renewable Energy Transmission Plan–Eastern Nevada

from these zones to load centers. Approximately one-fifth of land in Nevada falls into one of these zones. In addition to these three designated zones, there are seven "Nevada Solar Energy Study Areas." These study areas are being evaluated as part of the BLM/DOE Programmatic Solar EIS. Five of the solar study areas are located closer to the Las Vegas load center (implying lower transmission access costs) than the Cave, Dry Lake, and Delamar Valleys. One site, "Dry Lake-Apex," is just north of Las Vegas and has readily available transmission access. These Study Areas are shown on the map in Figure 2-3 (Solar DPEIS, p. ES-33).

In order to determine how solar developers in each of the solar resource areas in Nevada would compete from a transmission access cost perspective, one could compare the cost to provide transmission access to each zone and area. Some publicly available transmission access cost information is available for the zones and study areas. This information will be provided below to compare transmission access cost estimates for zones S1 and S2 and provide a measure of how resources in zone S2 (Cave, Dry Lake, and Delamar Valleys) might compete against resources in zone S1 (Amargosa Valley)[3].

As shown in Section 4.0, Table 4-2, Nevada utilities do not need additional solar resources to comply with the state mandated renewable portfolio standards. Therefore, the Nevada renewable energy market is not a target market for large scale solar developers. Accordingly, transmission access costs to deliver energy from high concentration solar areas in Nevada to load centers (most likely located in California) include three cost components: (1) the transmission cost to connect the solar developer's generation facility to the Nevada electric system (typically called the interconnection cost); (2) the transmission cost to delivery energy through a Nevada electric system to a California electric system (this is the cost that a Nevada Transmission Provider like NVE would charge the developer to use its transmission system, and (3) the cost to deliver energy from the point where it is delivered to the California electric system to a load center in California (this is the cost that a California Transmission Provider would charge the renewable energy developer to use its transmission system). Since most large scale solar developers in Nevada will be targeting California via the El Dorado Valley, the cost of the third component is likely the same for all solar zones in Nevada. Therefore, a comparison of the cost of just the first two cost components provides a sufficient measure of how developers in each solar resource area competes, from a transmission cost perspective, against the other solar resource areas in Nevada.

Listed below are cost estimates that NVE provided to install a collector line to the center of zone S1 from the Northwest Substation and the center of zone S2 from the Harry Allen Substation. These substations are shown on Figure 2-4. As can be seen from Table 2-3 the cost to access S2 is significantly greater than the cost to access S1.

The transmission infrastructure listed about only provides access to NVE's electric system. It does not provide access to a California transmission system. At present, there is limited transmission capacity available on NVE's existing transmission system to allow a significant level of exports from Nevada to California. As indicated at the beginning of this section, the relevant transmission cost

3. The legislation in AB 387 resulted in regulations that require Nevada's investor owned utilities to develop conceptual transmission plans that include cost estimates for providing transmission access to each of the designated renewable energy zones. Cost estimates for transmission infrastructure to access zones S1 and S2 have been provided by Nevada Power Company and Sierra Pacific Power Company in their last two integrated resource plans (SPPC, 2010a, IRP; NPC, 2010, IRP).

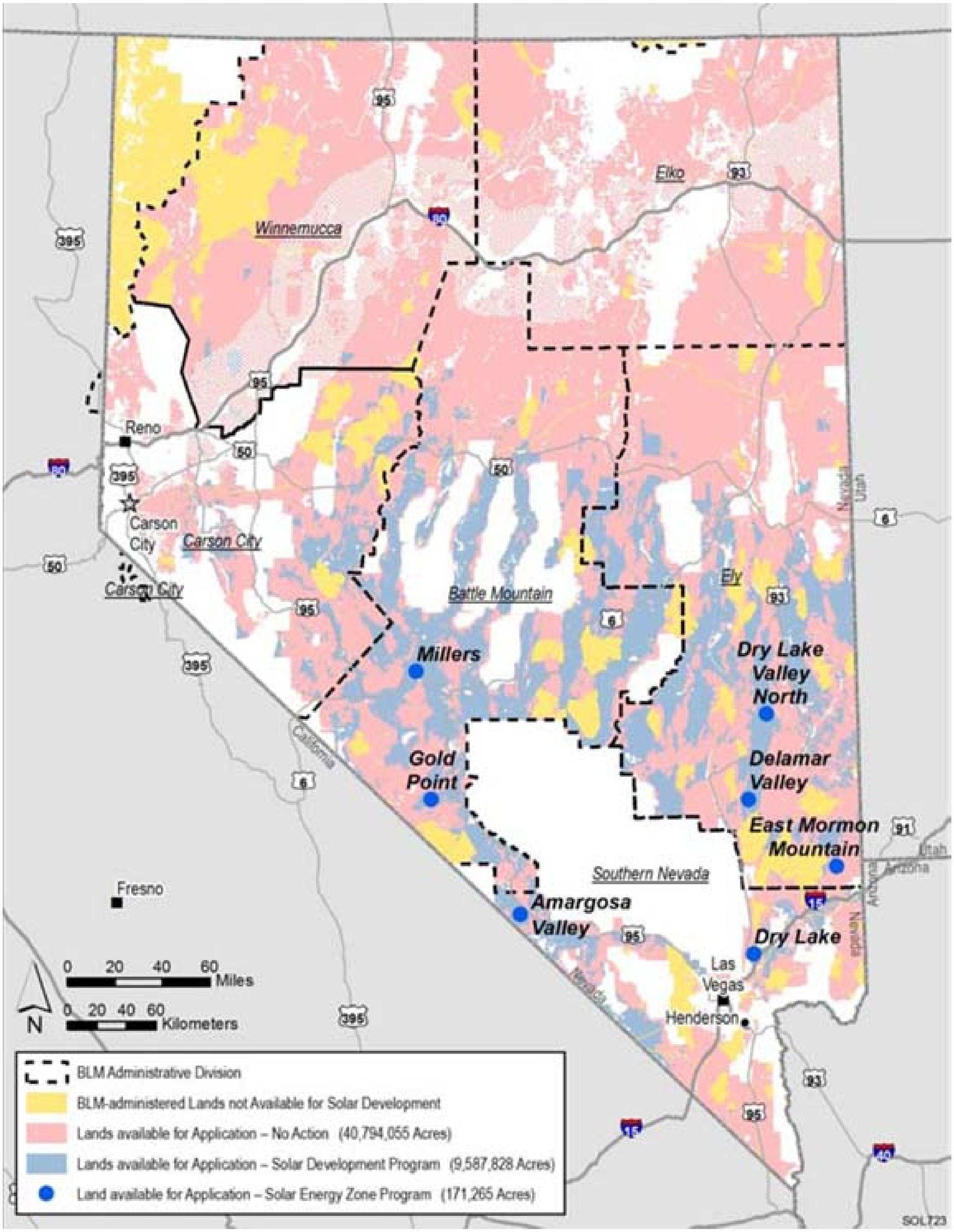


Figure 2-4
Nevada Solar Energy Study Areas

Table 2-3
Cost Estimate for Collector Line to Access Zone S1 and S2 from NVE's Transmission System

Transmission Infrastructure	Access to Zone S1 (Millions)	Access to Zone S2 (Millions)
Collector Line	146.4	220.2
Substation	29.8	23.5
Feeder Lines	-	-
Total	**176.2**	**243.7**

estimates to access high concentration solar areas in Nevada should include the cost of transmission infrastructure to access the California market and not just the cost of infrastructure to access NVE's electric system.

Cost estimates to allow access from zones S1 and S2 to the California Energy markets are listed on Table 2-4. The cost estimates listed will allow solar renewable energy developers in zones S1 and S2 to deliver energy to the Eldorado Valley. The Eldorado Valley is a major energy trading hub that provides access to California and other Southwest load centers. Transmission cost estimates to access the El Dorado Valley were included in NVE's proposed SOI project[4].

Table 2-4
Transmission Cost Estimate to Access Eldorado Valley from Zones S1 and S2

Transmission Infrastructure	Access to Zone S1 - Option 1 ($Millions)	Access to Zone S1 - Option 2 ($Millions)	Access to Zone S2 ($Millions)
Collector Transmission Facilities	146.4	0	220.20
Network Upgrades	-	-	-
Substation	29.8	29.8	23.5
	-	-	-
Access to Eldorado			
SOI Project (Phase I)			
Harry Allen to Eldorado	134.4		134.4
Northwest to Harry Allen	65.4		
SOI Project (Phase II)		214	
Total	**376.0**	**269.8**	**445.3**

As can be seen from Table 2-4, the most costly transmission access to California is from Zone S2 (Valleys of Interest). A map showing the Phase I and II route alternatives for the SOI project is listed in Figure 2-5, (p. 2-12) (NV Energy, Statement of Interest, 2009, p. 5).

4. The SOI project was submitted by NVE to the Western Area Power Administration in response to its Request for Interest for participation in the Transmission Infrastructure Program which was created as a result of the American Recovery and Reinvestment Act. Information regarding the Transmission Infrastructure Program can be found at: http://www.wapa.gov/recovery/programs.htm.

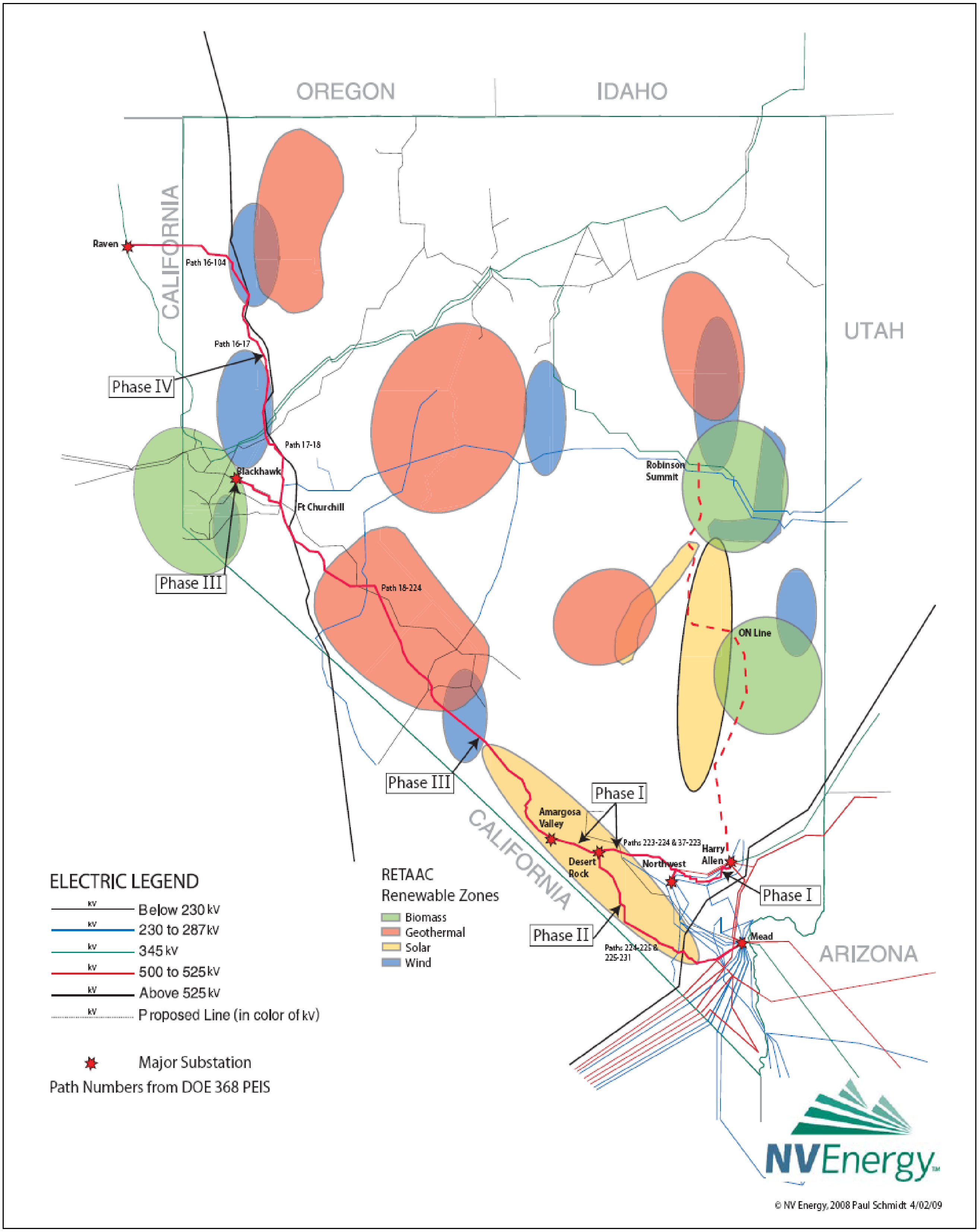


Figure 2-5
Potential Project Phases and RETAAC Renewable Energy Zones

Table 2-5
Out-of-State Transmission Costs

RETI Stakeholder Steering Committee
RETI Phase 2B

6.0 Out-of-state Additions and Improvements

Table 6-5. Out-of-state Transmission Costs, Delivered to Gateway CREZ.

Out-of-state Area	Transmission Capital Cost ($Million)	Transmission Cost Adder ($/MWh)
Arizona - Northeast	747	$19.81
Arizona - Northwest	285	$7.56
Arizona - South	728	$19.31
Arizona - West	241	$6.38
Baja – North*	226	$7.07
Baja – South*	511	16.18
British Columbia - Central	2,608	$57.64
British Columbia - East	1,699	$37.55
British Columbia - Northeast	2,911	$64.35
British Columbia - North	2,712	$59.95
British Columbia - Northwest	3,110	$68.76
British Columbia - Southeast	1,699	$37.55
British Columbia - Shaped	1,698	$28.77
British Columbia - South	1,885	$41.68
British Columbia - Southwest	1,899	$41.98
British Columbia - West/Central	1,818	$40.19
British Columbia - West	2,096	$46.33
Idaho - East	1,440	$31.83
Idaho – Southwest	1,052	$23.25
New Mexico - East	1,641	$43.54
New Mexico - Southeast	1,956	$51.90
Nevada - East	719	$19.07
Nevada – North	546	$8.52
Nevada – Southwest**	411	$10.91
Nevada - West	713	$18.92
Oregon - Northeast	1,009	$22.31
Oregon - South	236	$5.23
Oregon - West	790	$17.47
Utah - West	559	$14.83
Washington - South	1,065	$23.55
Wyoming - East	2,248	$59.63
Wyoming - East/Central	1,693	$44.92
Wyoming - North	1,977	$52.45
Wyoming - South	1,980	$52.51

* Costs were calculated for individual projects rather than the region. These numbers represent an average of projects in the region

** Costs for wind resources in Southwestern Nevada that can directly interconnect to the CAISO were calculated separately and had an out-of-state cost of $4.01.

The information in Table 2-4 is consistent with data prepared for California's RETI's Phase 2B report. In that report, the estimated transmission cost adder for delivering energy from resources in the vicinity of the Valleys of Interest to California load centers is $19/ MWh compared to $11/MWh for resources located in the Amargosa Valley. This information is provided in Table 2-5, (p. 2-13) (see values for NV East; NV Southwest). In addition, the cost to get from the Valleys of Interest to a California electrical substation (called a "Gateway CREZ" in the report) is also considerably higher than for other solar development areas (Black and Veatch, 2010, p. 6-10). In Figure 2-6, the bubbles on the figure list the cost, in $/MWh, for delivering energy from each renewable energy zone to a substation in California (Black and Veatch, 2010, p. 6-28). As can be seen from the figure, less expensive delivery paths exist in Southern Nevada, Arizona and Mexico than for those in the Valleys of Interest.

2.5 Market Access Issues of Significance

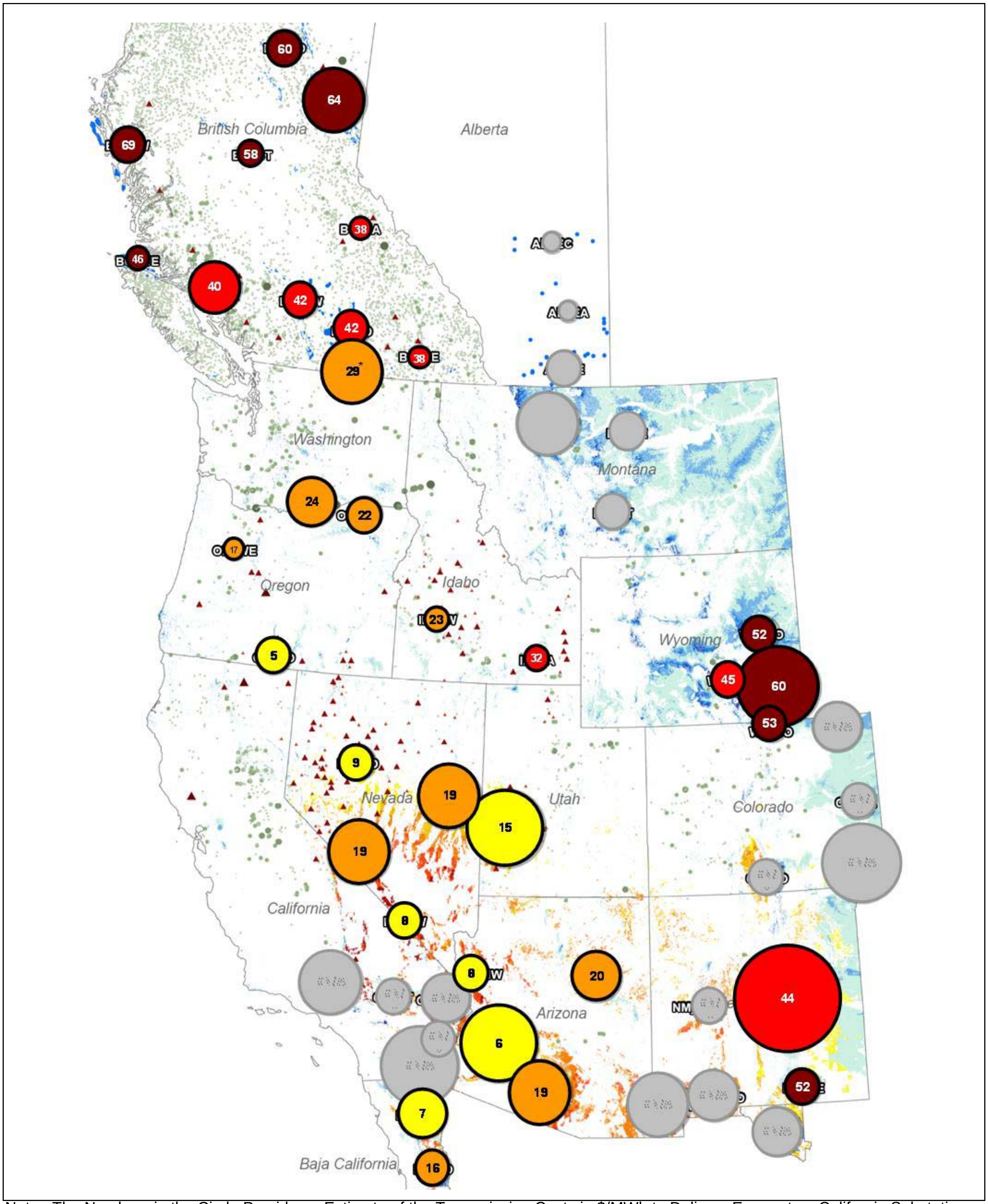
2.5.1 Introduction

There are a number of market access issues that are relevant to the development of renewable resources in the Valleys of Interest. These market access issues affect the competitiveness and ability of resource developers to participate in renewable energy markets. These issues include: (1) the location of the renewable resource with respect to the load that it will serve; (2) the availability of transmission capacity to deliver the energy from the resource to the load – this includes transmission capacity in the Nevada electric system as well as any adjacent transmission systems; and (3) the availability of services called ancillary services that are required to support renewable energy generation.

2.5.2 Location of the Resource

The location of a renewable resource with respect to the load it will serve is an important factor for determining the competitiveness of the resource. Factors affecting competitiveness that are related to location include distance from the load, length of transmission facilities required to connect the resource to the local electric system, and the cost of transmission to deliver the energy to the load center. An explanation of these location related factors and how they affect the competitiveness of resources in the Valleys of Interest follow.

The distance between a resource and a load is significant because it affects the amount of energy that is lost transmitting the energy from the resource to the load center. Generally speaking, the further a resource is from the load, the greater the line losses. Table 2-6 shows the line loss data for transmission lines at various voltage levels. Note that a 100 mi 230 kV transmission line would have 3.33 percent line losses and 200 mi 230 kV line would have 6.66 percent line losses. So, a renewable developer 100 mi away from a load center that had a 100 MW project could sell only 96.67 MW to the load. And, a renewable developer that was 200 mi away and had a 100 MW project would only be able to sell 93.33 MWs to load. Figure 2-5, (p. 2-12) shows the location of the Nevada Solar Energy Study Areas. It is clear that three of these study areas are closer to load centers in Nevada and California than the study areas located in the Valleys of Interest. Therefore, the line losses will be



Note: The Numbers in the Circle Provide an Estimate of the Transmission Costs in $/MWh to Delivery Energy to a California Substation (AKA Gateway CREZ).

Figure 2-6
Cost for Delivering Energy from each REZ to a Substation in California

greater for developers in the Valleys of Interest as compared to these other areas and they would be at a competitive disadvantage to resources in these other study areas.

Table 2-6
Line Loss Data from WREZ GTM Model

Voltage	Losses at 60% Utilization (% per 100 Miles)	Length (miles)	Losses (%)
230 kV AC	3.33	100	3.33
345 kV AC	2.15	100	2.15
500 kV AC	0.71	100	0.71
765 kV AC	0.45	100	0.45
800 kV DC	0.34	100	0.34

Source: Black and Veatch (2010)

The location of the resource also determines the distance from the resource to where it will interconnect with the grid and the corresponding cost for this interconnection. As shown above, the distance to interconnection for the Valleys of Interest is greater than the distance to interconnection for the other solar resource development areas in Southern Nevada and therefore the cost for providing an interconnection will be higher. This increased cost will place solar developers in the Valleys of Interest at a competitive disadvantage to other solar developers in Southern Nevada.

In general, the location of the resource determines the transmission systems that must be used to deliver the energy from the resource to the load. For example, assuming the target market for the solar developers in the Valleys of Interest is California, the likely transmission systems that they will need to use to deliver their energy to California load centers include NVE's transmission system and a transmission system of a California utility or municipality. Transmission charges are assessed by each transmission system in the path from the resource to the load. So, for the example above, a solar developer in the Valleys of Interest would be assessed a transmission charge by NVE and a transmission charge by the California utility or municipality. This piling up of transmission charges is called rate pan-caking. This is an important consideration for developers in the Valleys of Interest as each additional rate that is added to the overall cost of their resources affects the competitiveness of their resources.

Solar developers in other solar development areas in Southern Nevada have options to avoid rate pan-caking. For example, solar development areas in the Amargosa Valley have transmission options that allow them to connect directly to a California balancing area. In fact, there is a 500 kV transmission project that is being proposed in Nye County, the Solar Express Project that will allow solar developers in the Amargosa Valley to directly connect to a California balancing area and thus avoid paying transmission charges to NVE. Consequently, solar developers in the Amargosa Valley will have a competitive advantage over other developers in Nevada that cannot connect directly to a California utility or municipality's electric system.

2.6 Transmission Availability

Generally speaking, the transmission grid in the West was not designed to move large quantities of energy from one region of the grid to another. Instead, it was designed to meet local reliability needs and foster some level of resource sharing between adjacent transmission systems or balancing areas. Consequently, the ability to deliver energy from one transmission system to another really depends on whether or not there is any available transmission capacity to facilitate the delivery. If there is insufficient transmission capacity then new transmission facilities will have to be constructed. All of the large scale developers in solar development areas in Nevada will encounter transmission availability limitations, or constraints, on one or more transmission systems. Some of these constraints are more difficult to overcome than others.

With respect to transmission constraints facing developers in solar development areas in Nevada, the worst transmission constraint or bottleneck is located in the Las Vegas Valley. There is currently limited transmission capacity to move energy through NVE's transmission system from north to south to the liquid energy market in the El Dorado Valley. The constraint exists because of the difficulty to secure right-of-ways for new transmission projects that cross the Las Vegas Valley. In fact, every route alternative through the Las Vegas Valley encounters severe environmental or land use impediments. With the exception of the Amargosa Valley, where there are transmission options to go around this constraint, most of the developers in solar development areas in Southern and Eastern Nevada will need to secure transmission capacity through this constraint if they intend to deliver energy to California or the Southwest energy markets.

Unfortunately, developers in Southern Nevada, including those in the Valleys of Interest, will encounter intense competition for the right to use capacity across this constraint. As indicated above, there are a number of transmission developers that want to move power through this constraint. Their projects include: TransWest Express, Gateway South, SWIP, NVE's Transmission Corridor Project, Zephyr and Chinook. These developers intend to provide transmission for low cost renewable resources located in Western states that are north of Nevada. The developers of these resources will compete directly with solar resource developers located in Nevada. Furthermore, since there are limited options for getting through this constraint, there will be competition among renewable developers for the available transmission capacity. The winners of this competition are expected to be those that provide the most economic renewable energy options.

In summary, the solar developers in the Valleys of Interest will face competition for any transmission capacity that is developed across the transmission constraint in the Las Vegas Valley. They will compete with other renewable energy developers north of Nevada that likely produce energy at lower costs. They will have a competitive disadvantage to some solar developers in Nevada, such as those in the Amargosa Valley, that have options to avoid this constraint.

2.7 Ancillary Services

As indicated earlier, the target market for renewable resources developed in the Valleys of Interest will likely be California. Accordingly, renewable developers in the Valleys of Interest will have to make arrangements to sell their energy to a California utility, secure the rights to use transmission systems in Nevada and California, and secure agreements for ancillary services. Ancillary services are basic services required to support generation, energy supply, and power delivery. These services include scheduling and dispatch of resources, provision of generating and operating reserves, load following, reliability, energy imbalance service, voltage control for generation and transmission, etc.

Developers in the Valleys of Interest have several options for securing ancillary services. They could request ancillary services from NVE to the extent that they are available, provide their own ancillary services (which are cost prohibitive) or secure ancillary services from another balancing area. Developers that secure ancillary services from a California balancing area will have more market opportunities than those that can't (explained in Section 6.1), as direct connection allows greater participation in the California RPS market. The options, practicality and rules for securing ancillary services from an adjacent balancing area are currently being worked out and are expected to be used by the California balancing area authorities to support imports of renewable resources from other states. It should be noted that agreements to provide ancillary services become more complicated and more difficult to execute as the number of balancing areas and transmission providers increase. Consequently, renewable developers that can connect directly to a California balancing area have an advantage over those than cannot.

It is unlikely that a transmission project will be constructed from the Valleys of Interest directly to a California balancing area because of the configuration of the existing electric system–NVE's transmission system is between the Valleys of Interest and the California energy market. Furthermore, there are solar development areas in Nevada that can be connected directly to a California balancing area. Therefore, developers in these areas would have an advantage over developers in the Valleys of Interest. Solar resource development areas in Nevada that appear to have options for direct connection to a California balancing area include the Amargosa Valley and any resource areas south or west of the Las Vegas Valley.

3.0 IS THERE A DEMONSTRATED INTEREST IN SOLAR DEVELOPMENT IN SPRING, CAVE, DRY LAKE, AND DELAMAR VALLEYS?

There are a number of sources of information that can provide an indication of the interest level in solar energy development in the Valleys of Interest. These sources include: transmission service requests made by generation developers that are considering projects in these valleys,[1] BLM ROW applications and lease requests, public disclosure of projects that have bid into utility request for proposals, public information related to potential development of a particular site, and other demonstrations of support for specific projects.

3.1 Transmission Service Requests

There are three utilities that could have received requests for transmission service from solar renewable energy developers in the Valleys of Interest. These utilities include NVE, Mt Wheeler Power Inc., and LCPD.

NVE has not received any transmission service or interconnection requests from developers of solar renewable energy projects whose projects are located in the Valleys of Interest. The map in Figure 3-1 below shows the general location of the interconnection point of each interconnection request received by NVE (SPPC, 2010a, IRP). The yellow dots on the map denote active interconnection requests made by a solar energy developer.[2] As can be seen from the map, no interconnection requests for solar resources that originate in the Valleys of Interest have been made. NVE's OASIS site maintains a current list of active interconnection requests (NV Energy, 2010a). The list that was current as of March 9, 2011 is provided in Table 3-1. It also reflects that no interconnection requests for solar resources that originate in the Valleys of Interest have been made.

LCPD was contacted and its representative indicated that it has received only one serious inquiry for transmission service from a renewable energy developer which was for a project requiring the transmission service for a waste to bio-fuel plant (Luttrell, pers. comm., January, 2011). Mt. Wheeler Power Inc. was also contacted and its representative indicated that it has not received any requests for transmission service from any renewable energy developers (Murdock, pers. comm., January, 2011).

1. Transmission service requests and Interconnection Service Requests can be found in the transmission request queues of the local utilities or obtained by contacting the local utilities directly, if an online queue is not maintained.
2. NVE must process interconnection requests in accordance with its FERC approved Open Access Transmission Tariff. Developers submitting interconnection request must meet obligations listed in the tariff or their status in the interconnection queue will be lost and their request will be removed.

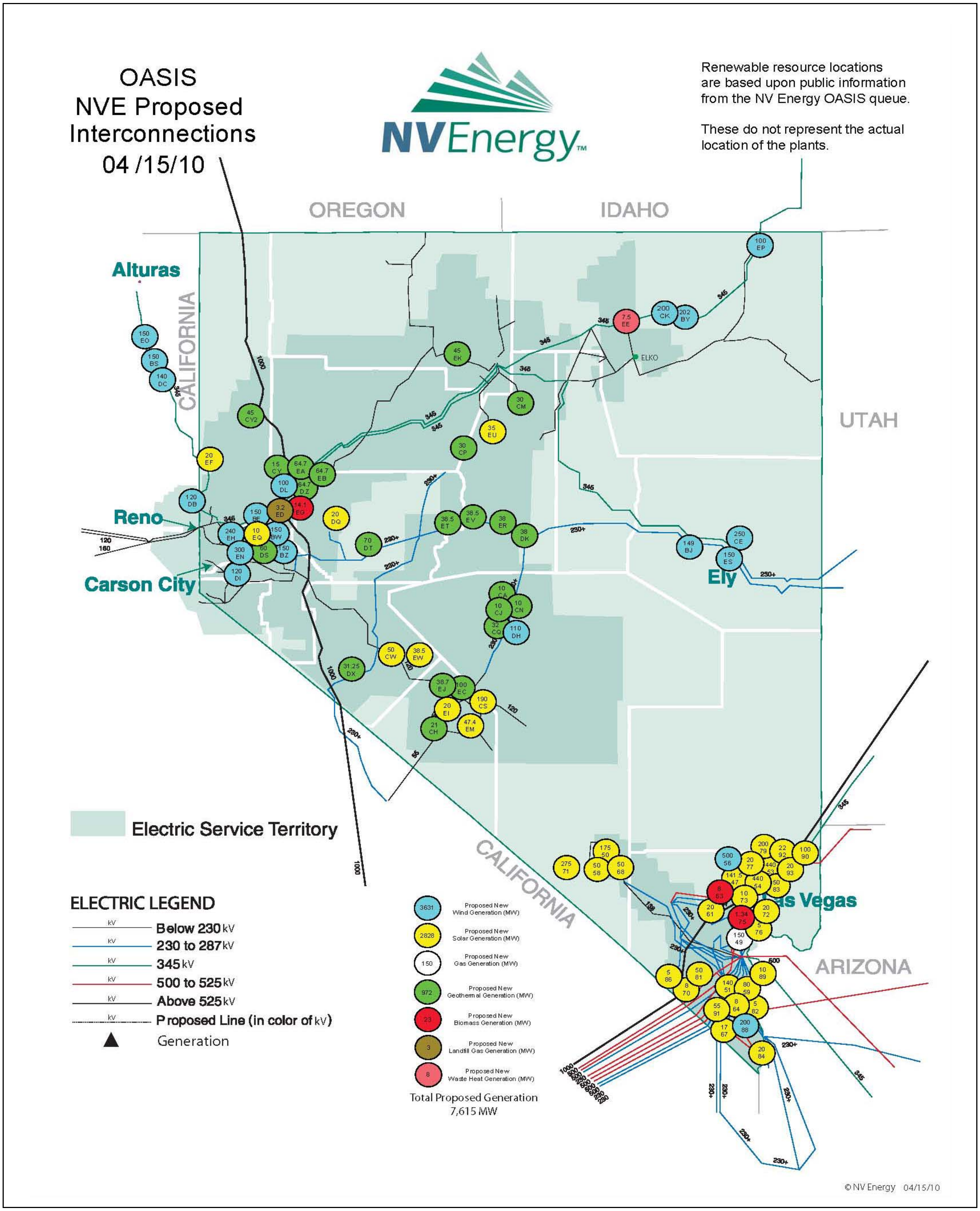


Figure 3-1
NVE Proposed Interconnections

Table 3-1
IPP OATT Applications for Interconnection (as of March 9, 2011)
(Page 1 of 2)

Nevada Power Company Interconnection Requests								
Company 47	11/26/2007	141.5 MW	Clark/NV	HA 230 kV Sub	12/01/2010	NR	No	Solar
Company 49	6/13/2008	150 MW	Clark/NV	Saguaro 138 kV line	5/01/2011	NR	Yes	Gas
Company 51	7/23/2008	140 MW	Clark/NV	Merchant 230 kV Sub	9/30/2009	ER	No	Solar
Company 53	10/3/2008	440 MW	Clark/NV	Reid Gardner Sub	1/1/2013	ER/NR	No	Solar
Company 54	10/3/2008	440 MW	Clark/NV	Crystal Sub	1/1/2013	ER/NR	No	Solar
Company 56	10/31/2008	500 MW	Clark/NV	On Line	7/1/2012	NR	No	Wind
Company 58	11/4/2008	47 MW	Clark/NV	Mercury-Radar 138 kV line	12/1/2011	NR	Yes	Solar
Company 59	11/7/2008	80 MW	Clark/NV	Nevada Solar One Sub	9/1/2012	ER/NR	Yes	Solar
Company 61	11/10/2008	20 MW	Clark/NV	Gypsum Substation	11/30/2011	NR	No	Solar
Company 64	12/5/2008	8 MW	Clark/NV	Nevada Solar One Sub	9/1/2012	ER/NR	Yes	Solar
Company 72	5/13/2009	20 MW	Clark/NV	Pabco Sub	2/15/2011	ER/NR	No	Solar
Company 76	7/28/2009	5 MW	Clark/NV	Winterwood Sub	12/31/2010	ER/NR	No	Solar
Company 79	8/20/2009	101 MW	Clark/NV	HA 500 kV Sub	12/1/2013	ER/NR	Yes	Solar
Company 81	9/23/2009	50 MW	Clark/NV	Bighorn Sub	5/1/2011	NR	Yes	Solar
Company 82	9/28/2008	4 MW	Clark/NV	Nevada Solar One Sub	9/1/2012	ER/NR	Yes	Solar
Company 84	10/2/2009	20 MW	Clark/NV	Laughlin-Needles 69 kV	2/15/2013	ER/NR	No	Solar
Company 86	2/8/2010	5 MW	Clark/NV	Bighorn Sub	5/1/2011	NR	Yes	Solar
Company 88	2/18/2010	200 MW	Clark/NV	Nevada Solar One Sub	9/1/2012	ER/NR	Yes	Wind
Company 89	3/9/2010	10 MW	Clark/NV	Pabco Sub	2/15/2011	ER/NR	Yes	Solar
Company 90	3/23/2010	100 MW	Lincoln/ NV	Red Butte-HA 345	10/31/2012	NR	Yes	Solar
Company 91	4/6/2010	55 MW	Clark/NV	Nevada Solar One Sub	09/01/2011	NR	Yes	Solar
Company 93	04/14/2010	20MW	Clark/NV	Harry Allen-Pecos 230 kV	1/1/2012	ER/NR	No	Solar
Company 95	04/20/2010	20MW	Clark/NV	Gypsum Substation	12/15/2011	ER/NR	Yes	Solar
Company 96	09/9/2010	350MW	Clark/NV	Crystal Sub	6/1/2012	ER	Yes	Solar
Company 97	10/22/2010	50 MW	Clark/NV	Reid Gardner	12/1/2012	ER/NR	Yes	Solar
Company 98	12/03/2010	50 MW	Clark/NV	Reid Gardner	12/31/2012	ER/NR	Yes	Solar
Company 99	12/20/2010	20 MW	Clark/NV	Sheep Mtn 69 kV	2/28/2012	ER/NR	Yes	Solar
Company 100	1/20/2011	20 MW	Clark/NV	Sheep Mtn 69 kV	2/28/2012	ER/NR	Yes	Solar
Company 101	1/20/2011	20 MW	Clark/NV	Sheep Mtn 69 kV	2/28/2012	ER/NR	Yes	Solar
Company 102	1/25/2011	100 MW	Clark/NV	On Line	6/1/2014	ER/NR	Yes	Solar
Company 103	1/27/2011	20MW	Clark/NV	Sheep Mtn 69 kV	1/1/2012	ER/NR	Yes	Solar

HA = hydrographic area

Aspen Environmental Group

Table 3-1
IPP OATT Applications for Interconnection (as of March 9, 2011)
(Page 2 of 2)

Sierra Pacific Power Company Interconnection Requests								
Company BE	8/29/2005	150 MW	Washoe/NV	E. Tracy Sub	12/31/2011	NR	No	Wind
Company BS	9/27/2006	150 MW	Lassen/CA	Alturas 345kV	11/1/2009	ER/NR	Yes	Wind
Company BY	4/16/2007	202 MW	Elko/NV	Mdpt-Vmy 345kV	12/31/2011	ER/NR	Yes	Wind
Company BZ	3/29/2007	150 MW	Lyon/NV	#113 Line	12/31/2012	ER/NR	No	Wind
Company CE	7/10/2007	250 MW	White Pine/NV	Gonder Sub	9/1/2010	ER/NR	Yes	Wind
Company CQ	12/7/2007	32 MW	Nye/NV	Round Mtn Sub	12/1/2010	NR	No	Geothermal
Company CW	6/23/2008	50 MW	Mineral/NV	Table Mtn Sub	6/1/2010	ER	No	Solar
Company CY2	7/17/2008	45 MW	Washoe/NV	Eagle Sub	10/1/2011	ER/NR	No	Geothermal
Company DB	9/11/2008	120 MW	Lassen/CA	Bordertown Sub	1/15/2012	ER/NR	Yes	Wind
Company DC	9/11/2008	140 MW	Lassen/CA	Alturas 345kV	1/15/2012	ER/NR	Yes	Wind
Company DH	10/16/2008	110 MW	Nye/NV	Rnd Mtn Sub	12/1/2010	ER/NR	No	Wind
Company DI	11/7/2008	120 MW	Washoe/NV	Brunswick Sub	12/31/2011	ER/NR	No	Wind
Company DK	11/7/2008	38 MW	Lander/NV	Frontier Sub	12/31/2012	ER/NR	No	Geothermal
Company DL	11/10/2008	100 MW	Wa.& Chur/NV	Valmy/Tracy 345kV	12/31/2011	ER/NR	Yes	Wind
Company DQ	11/10/2008	20 MW	Churchill/NV	Crook Rd Sub	10/01/2010	NR	Yes	Solar
Company DS	2/6/2009	72 MW	Lyon/NV	Eagle Sub	4/1/2012	ER	No	Geothermal
Company DT	2/23/2009	70 MW	Churchill/NV	Bunejug Switching Station	4/1/2012	ER/NR	No	Geothermal
Company DX	6/17/2009	31.25 MW	Mineral/NV	55 kV near Sweetwater	12/31/2014	ER/NR	Yes	Geothermal
Company DZ	8/5/2009	64.7 MW	Churchill/NV	Valmy-Tracy 345kV	3/1/2013	NR	No	Geothermal
Company EB	8/5/2009	64.7 MW	Churchill/NV	Valmy-Tracy 345kV	7/1/2013	NR	No	Geothermal
Company EH	10/2/2009	120 MW	Washoe/NV	Tracy 345 kV Sub	9/1/2012	ER/NR	No	Wind
Company EI	10/9/2009	20 MW	Esmeralda/NV	55kV Stone Cabin-W. Tonopah	5/1/2011	NR	No	Solar
Company EJ	10/13/2009	77.4 MW	Nye/NV	Millers Sub	6/30/2014	NR	Yes	Geothermal
Company EK	10/13/2009	45 MW	Humboldt/NV	Kramer Hill Sub	11/1/2012	NR	Yes	Geothermal
Company EN	2/18/2010	201 MW	Washoe/NV	Tracy 345kV Sub	9/1/2015	ER/NR	No	Wind
Company EO	2/19/2010	150 MW	Lassen/CA	Proposed Raven Sub	12/31/2012	ER/NR	Yes	Wind
Company EP	2/19/2010	100 MW	Elko/NV	Midpoint-Humbolt line	10/1/2013	ER/NR	Yes	Wind
Company ER	4/2/2010	38 MW	Lander/NV	Austin-Frontier Line	12/31/2011	NR	Yes	Geothermal
Company ES	04/9/2010	150MW	White Pine/NV	Gonder-Pavant 230kv	2/4/2013	ER/NR	Yes	Wind
Company ET	4/14/2010	38.5 MW	Churchill/NV	Ft. Churchill-Gonder 230 kV	12/31/2011	ER	Yes	Geothermal
Company EU	4/14/2010	35 MW	Lander/NV	Bannock Switching Station	12/31/2011	ER	Yes	Solar
Company EV	4/14/2010	38.5 MW	Churchill/NV	Bannock Switching Station	12/31/2011	ER	Yes	Geothermal
Company EW	4/14/2010	38.5 MW	Mineral/NV	Paradise Peak 120 kV	12/31/2011	ER	No	Geothermal
Company EX	04/19/2010	300 MW	White Pine/NV	Gonder Sub	2/4/2014	ER/NR	Yes	Wind
Company EY	04/21/2010	200 MW	Lassen/CA	Proposed Raven Sub	12/31/2013	ER/NR	Yes	Wind
Company FA	9/10/2010	72 MW	Lyon/NV	Eagle Sub	4/1/2013	ER	Yes	Geothermal
Company FB	10/26/2010	30MW	Nye/NV	120kV Tonopah Airport	8/1/2013	ER	Yes	Solar
Company FC	10/27/2010	20 MW	Washoe/NV	Tracy Clark	10/1/2011	ER	Yes	Solar
Company FD	1/18/2011	19.8 MW	Nye/NV	Rnd Mtn Sub	8/30/2012	ER/NR	Yes	Geothermal
Company FE	1/26/2011	129.4 MW	Churchill/NV	Valmy-Tracy 345kV	5/1/2013	ER/NR	Yes	Geothermal
Company FF	3/2/2011	38.5 MW	Churchill/NV	120kV line #165	12/31/2011	ER	No	Geothermal

3.2 BLM Renewable Leases/ROW Applications:

The map in Figure 3-2 below (Bureau of Land Management, geocommunicator website) shows renewable leases and ROW applications submitted for renewable resources throughout the state of Nevada. The map reflects that a number of ROW applications have been submitted for locations in the Dry Lake and the Delamar Valleys but no applications have been submitted for locations in the Cave or Spring Valleys. It should be noted that there is currently little or no transmission access in the Cave, Dry Lake and Delamar Valleys.

3.3 Public Information Suggesting Development at a Particular Site:

The American Solar Energy Pilot Leasing Act of 2010 would establish a pilot solar-leasing program in Lincoln County, Nevada. The legislation would designate two “solar leasing zones” that would be used for commercial development of solar resources. These zones would be located in Delamar and Dry Lake Valleys (Solar Home and Business Journal, 2010). It is unclear why these sites have been selected since there is no transmission infrastructure planned to access these areas. Aspen staff have checked on the status of this bill and found that it has not made any progress to date in this congressional session.

3.4 Evidence of an Executed Power Purchase Agreement

There has been no public disclosure of any solar projects from the Spring, Cave, Dry Lake, or Delamar Valleys that have secured a Power Purchase Agreement (PPA) with a Nevada or out of state utility. However, the process for selecting renewable resources in Nevada is confidential. Information regarding PPA’s with winning bidders is made public when NVE energy submits the contracts between it and the winning bidders to the PUCN for approval. It should be noted that the process for selecting renewable resources in other states is similar. There has been no public disclosure of a PPA between a solar developer in the Valleys of Interest and an out of state interest.

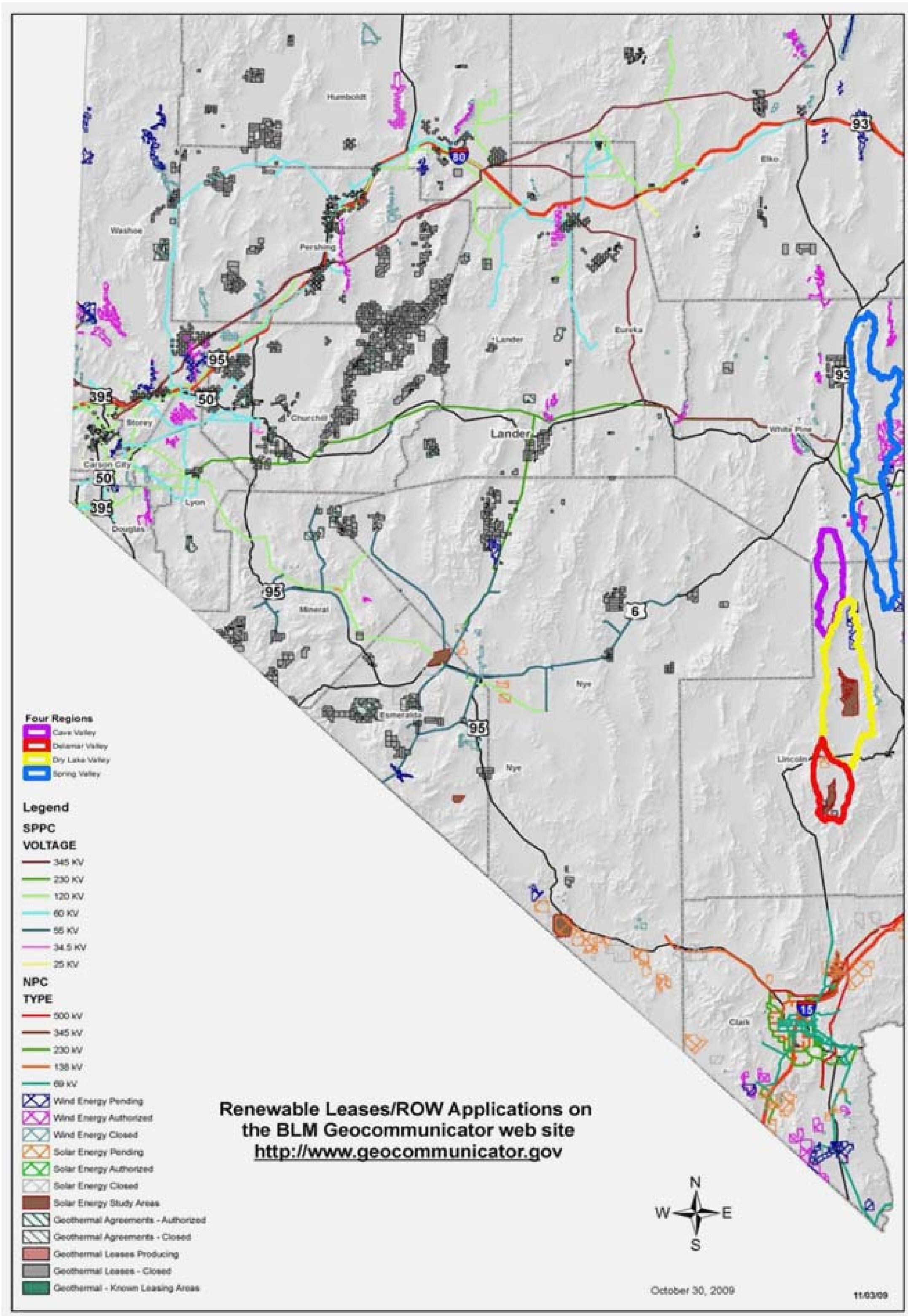


Figure 3-2
Renewable Leases and ROW Applications Submitted for Renewable Resources in Nevada

4.0 VALLEYS OF INTEREST PROJECTS ARE NOT LIKELY TO COMPETE SUCCESSFULLY IN NEVADA'S CURRENT AND FUTURE MARKET FOR RENEWABLE ENERGY

Altogether Nevada currently generates 2,033 GWh of renewable energy annually. In 2008, solar power accounted for 156 GWh (or 7.7%) of renewable energy. Most renewable energy development in Nevada has been a result of the Nevada Portfolio Standard, with geothermal energy typically bidding in at the most competitive electricity rates and solar bidding in to assist the utilities in complying with the solar energy set aside. In other words, solar energy development to date in Nevada has been driven by the solar energy set aside requirement. According to "The 2008 Status of Energy in Nevada" report issued by the Nevada Office of the Governor, Nevada is ranked #1 in use of solar energy as measured in watts per person and percent of retail sales (kWh), but geothermal energy is by far the largest renewable energy source in Nevada on a GWh of production basis (Office of the Governor, 2008).

Figure 4-1 depicts Nevada's renewable energy resources in service and under development by type and location. Table 4-1 shows the capacity and type of each renewable energy resource in Nevada. It is readily apparent that essentially all development to date has been proximate to Reno and Las Vegas. It is also apparent that no solar resources have been developed to date in Eastern Nevada.

4.1 Potential Market for Solar Projects in Nevada: Nevada's Renewable Portfolio Requirements

The 2009 Nevada legislature passed Assembly Bill 387 which, among other things, revised Nevada's Renewable Portfolio Standard (RPS). The 2009 legislation not only increased the amount of energy required from renewable resources, but also increased the amount of energy required to be obtained from solar energy resources. The table below reflects Nevada's RPS by year through 2025 and beyond and also shows the level of solar energy that is required to be obtained for the same period. The percentage of RPS energy that is required to be obtained from solar resources is 5 percent through 2015 and 6 percent thereafter. Table 4-2 below shows that, based on the solar resources that have been approved by the PUCN through 2010, NVE does not need to acquire new solar resources to stay in compliance with the solar requirements of the Nevada's RPS through at least 2029 (NPC, 2010 IRP; SPPC, 2010b, IRP; NV Energy, 2010b, Portfolio).

Nevada has abundant geothermal renewable energy resources. These resources make up the bulk of NVE RPS portfolio. These resources have more favorable operating characteristics (higher capacity factor) and have traditionally been more economic than other renewable resources (including solar). Therefore, it is likely that NVE will continue to add these resources to its portfolio. Recall that the NV_NO resource area is significantly more cost competitive with a levelized net cost at $30 than the

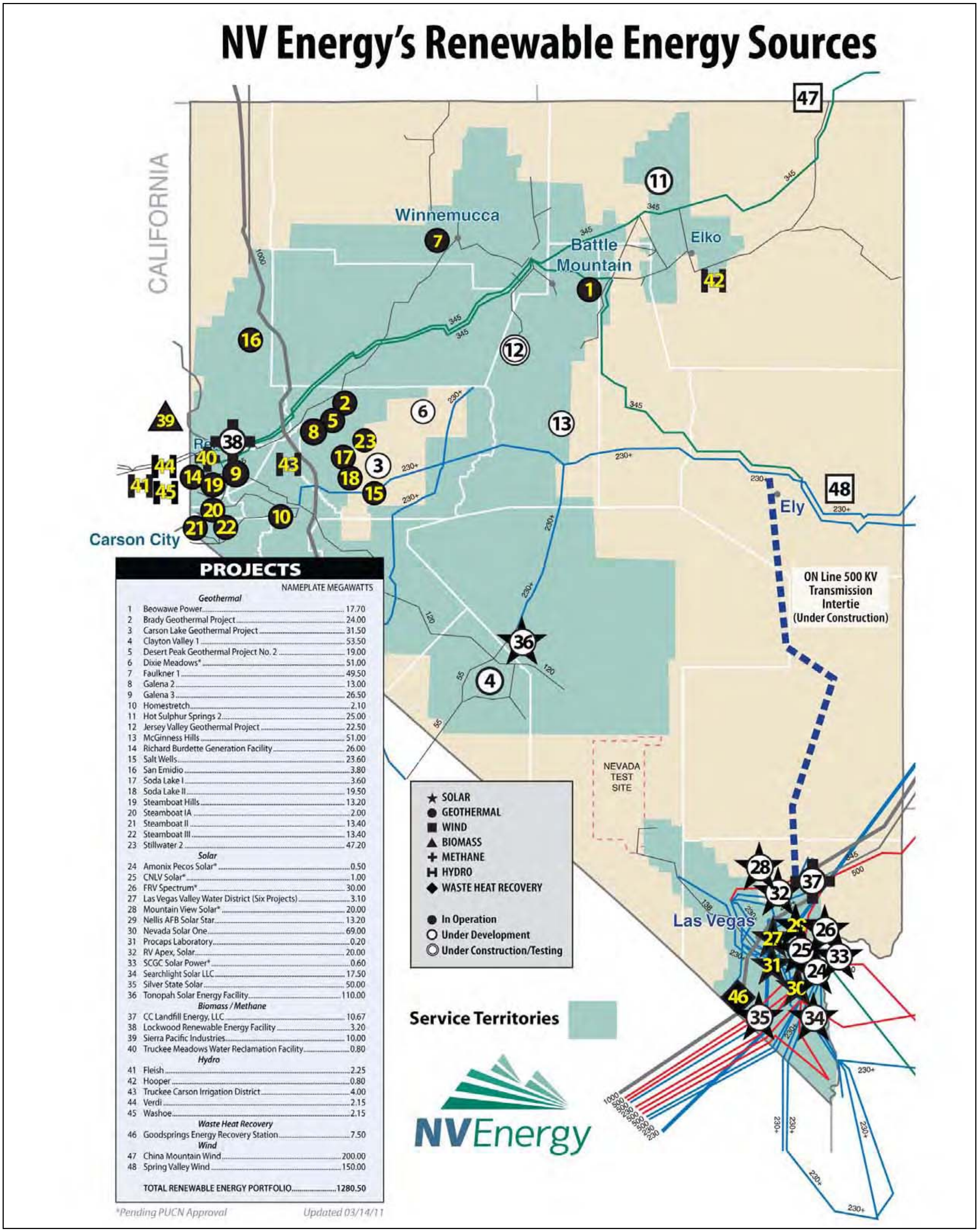


Figure 4-1
NVE's Renewable Energy Resources

Table 4-1
NVE Portfolio Standard Annual Report, Renewable Projects

NV Energy
Portfolio Standard Annual Report, Compliance Year 2009
Table 3 Renewable Projects

Map Reference		MW	Increase vs. 2008	Status
	Geothermal			
1	Beowawe	17.7		In Service
2	Brady Geothermal Project	21.5		In Service
3	Carson Lake Basin	62.0		In Development
4	Carson Lake Geothermal Project	31.5		In Development
5	Clayton Valley*	53.5	53.5	In Development
6	Desert Peak Geothermal Project no. 2	19.0		In Service
7	Faulkner 1	49.5		In Service
8	Galena 2	13.0		In Service
9	Galena 3	26.5		In Service
10	Homestretch	2.1		In Service
11	McGinness Hills*	51.0	51	In Development
12	Hot Sulpher Springs 2*	25.0	25	In Development
13	Jersey Valley Geothermal Project	31.5		In Development
14	Richard Burdette Generation Facility	26.0		In Service
15	Salt Wells	23.6		In Service
16	San Emidio	3.8		In Service
17	Soda Lake I	3.6		In Service
18	Soda Lake II	19.5		In Service
19	Steamboat Hills	13.2		In Service
20	Steamboat IA	2.0		In Service
21	Steamboat II	13.4		In Service
22	Steamboat III	13.4		In Service
23	Stillwater 2	47.2		In Service
	Subtotal Geothermal	569.5	129.5	
	Solar			
24	American Capital Energy-Searchlight Solar LLC	17.5	17.5	In Development
25	Fotowatio	20.5	20.5	In Development
26	Las Vegas Valey Water District (six projects)	3.1		In Service
27	Nelis AFB	12.0		In Service
28	Nevada Solar One	64.0		In Service
29	Next Light/Silver State*	50.0	50.0	In Development
30	Procaps Laboratory	0.2		In Service
31	SolarReserve Tonopah Solar Energy Facility*	110.0	110.0	In Development
	Subtotal Solar	277.3	198.0	
	Biomass/Methane			
32	CC Landfill LLC	10.7	10.7	In Development
33	Renewable Energy Ctr @ N NV Corr. Ctr.	1.0		In Service
34	Sierry Pacific Industries	10.0		In Service
35	Truckee Meadows Water Reclamation Facility	1.4		In Service
36	Waste Management Renewable Energy*	3.2	3.2	In Development
	Subtotal Biomass/Methane	26.3	13.9	
37	Fleish	2.3		In Service
38	Hooper	0.8		In Service
39	Truckee Carson Irrigation District	4.0		In Service
40	Verdi	2.2		In Service
41	Washoe	2.2		In Service
	Subtotal Hydro	11.5		
	Waste Heat Recovery			
42	Goodsprings	5.8		In Development
	Wind			
	China Mountain	200.0		In Development
	Spring Valley*	150.0	150.0	In Development
42	Subtotal Wind	350.0	150.0	
	Total Renewables	**1,240.1**	**491.37**	

Table 4-2
NVE Solar Energy Requirements Through 2029

Year	Retail Sales Forecast (GWh)	NVE RPS Requirement	Solar % RPS	Renewable Energy Requirement (GWh)	NVE Solar Energy Requirement (GWh)	Solar Energy Available from PUCN Approved Resources (GWh)
2010	28,882	12%	5%	3,466	173	221
2011	29,198	15%	5%	4,380	219	354
2012	29,694	15%	5%	4,454	223	489
2013	30,252	18%	5%	5,445	272	489
2014	30,813	18%	5%	5,546	277	757
2015	31,344	20%	5%	6,269	313	1,017[a]
2016	31,955	20%	6%	6,391	383	1,017[a]
2017	32,413	20%	6%	6,483	389	1,017[a]
2018	32,942	20%	6%	6,588	395	1,017[a]
2019	33,481	20%	6%	6,696	402	1,017[a]
2020	34,036	22%	6%	7,488	449	1,017[a]
2021	34,504	22%	6%	7,591	455	1,017[a]
2022	35,013	22%	6%	7,703	462	1,017[a]
2023	35,545	22%	6%	7,820	469	1,017[a]
2024	36,116	22%	6%	7,946	477	1,017[a]
2025	36,618	25%	6%	9,155	549	1,017[a]
2026	36,951	25%	6%	9,238	554	1,017[a]
2027	37,467	25%	6%	9,367	562	1,017[a]
2028	38,020	25%	6%	9,505	570	1,017[a]
2029	38,485	25%	6%	9,621	577	1,017[a]

[a]Solar Energy Available from Solar Resources Approved by PUCN through 2010.

NV_EA resources which come in at $73 as shown on Table 1-2, (p. 1-13). Further recall that NV_SW, which is composed of solar resources, is significantly less costly at $49 than the NV_EA resources. Solar resource development for sale within Nevada will therefore likely be limited in Nevada RPS requirements due to higher economic cost than other available resources. Furthermore, to the extent additional headroom is created for solar resources, resources in NV_SW and NV_WE would be accessed before NV_EA would be sought.

5.0 VALLEYS OF INTEREST PROJECTS ARE NOT LIKELY TO COMPETE SUCCESSFULLY IN WESTERN RENEWABLE ENERGY MARKETS FOR THE FORESEEABLE FUTURE

5.1 Demand Assessment for Renewable Resources from Adjacent States

The State and Provincial Steering Committee in cooperation with the Western Governors Association and the Western Electricity Coordinating Council is currently developing electricity demand and western state Renewable Portfolio Standard requirements for the western interconnection in 2020. Table 5-1 shows results provided by state, last year. The results indicate that total renewable energy demand by 2020 will be about 140,000 GWh. The table is included to demonstrate where, on a state by state basis, the demand for renewables will come from. It is clear from the table that California is the largest market by far in the West.

The WECC recently updated the western project for renewable resource demand by 2020 and they have revised the number up to 172,000 GWh. Of this 172,000 GWh, about 63,000 GWh is in operation. Therefore, of the 172,000 GWh projected, about 110,000 GWh is incremental renewable energy that is not yet in operation. Consistent with the proportions shown in Table 5-1, most of the demand will come from California.

Table 5-1
WECC/SPSC Load Forecast

	State-Adjusted 2020 Loads and RPS Requirements in WECC Region (Draft 08-17-10)							
State/ Province	2020 Load Forecast (GWh) by Balancing Areas	RPS% for IOUs in 2020[a]	RPS% for Other Entities in 2020[b]	Total RPS Energy (GWh) in 2020	Existing RPS Energy (GWh) 2010	Incremental RPS Energy (GWh) 2010-2020	State % of Total RPS Energy (GWh) in 2020	State % of Incremental RPS Energy (GWh) 2010-2020
AB	108,555				4,839			
AZ	92,283	10.0%	10.0%	5,238	900	4,338	3.7%	4.8%
BC	63.241				1,694			
CA	307,183	33.0%	33.0%	89,055	29,796	59,259	63.5%	66.1%
CO	68,639	30.0%	10.0%	11,632	3,043	8,589	8.3%	9.6%
ID	27,250				1,142			
MEX	17,484				4,666			
MT	13,527	15.0%		995	456	539	0.7%	0.6%
NV	39,426	22.0%		5,359	2,033	3,326	3.8%	3.7%
NM	18,871	20.0%	10.0%	2,777	620	2,157	2.0%	2.4%
OR	56,717	20.0%	6.7%	8,368	5,585	2,783	6.0%	3.1%
TX	8,104	5.0%		405			0.3%	0.0%
UT	37,415	13.3%	13.3%	4,668	2,140	2,528	3.3%	2.8%
WA	99,539	15.0%		11,789	5,665	6,124	8.4%	6.8%
WY	23,387							
Total	**981,620**			**140,288**	**62,579**	**89,644**	**100.0%**	**100.0%**

[a]IOU RPS% reflects path of RPS% for investor owned utilities smoother across years for discrete jumps.
[b]Municipals, publics, cooperatives, or smaller utilities

Recall that Table 1-2, (p. 1-13) identified 382,000 GWh of new resources as being more cost competitive than the NV_NE resources in meeting California demand. With western demand increasing to 110,000 GWh by 2020, Eastern Nevada resources are clearly not competitive with these most cost effective 110,000 GWh. The NV_NO geothermal resources are in the competition for this 110,000 GWh of demand with a net cost of $30/MWh, but NV_EA comes in at a net cost of $73/MWh which is more than twice the cost of competitive resources.

To make things worse, the demand from other States in the West for renewable resources from Nevada is not expected to be significant. The state most often mentioned as a source of demand for Nevada renewable energy is California. Unfortunately, there has been much uncertainty regarding California's desire to allow a significant level of renewable resources to be obtained from out-of-state resources. In fact, the first two attempts to pass legislation implementing a 33 percent RPS in California were hampered by disagreement over limitations placed on deliveries of renewable resources from out-of-state resources. On April 12, 2011, new California Governor, Jerry Brown, signed Senate Bill 2 into law implementing a 33 percent Renewable Portfolio Standard in California. As explained in Section 6.0, the new law appears to place limitation on renewable resources that cannot be directly connected to or dynamically scheduled from a California balancing area (Lathan & Watkins, LLP, Governor Brown Signs Landmark Bill Raising California's Renewables Portfolio Standard to 33 percent by 2020, April 25, 2011). Resources in the Valleys of Interest would be negatively affected by this limitation.

However, California is still investigating the development of numerous instate and out-of-state renewable energy zones to meet existing or proposed RPS requirements. California's "Out of State" Case pursued recently by RETI assumes that 34,000 GWh of California's need would be met by energy routed to California from or through Nevada by 2020 (Aspen & E3, 2010). If this heavy import scenario were to come to pass, then Nevada could compete to fill the need. However, as noted previously, there are more than 234,000 GWh of renewable energy available to California that are more cost effective than Eastern Nevada resources.

In addition, the California Public Utilities Commission's (CPUC) issuances in 2010 of its Tradable Renewable Energy Credit (TREC)[1] regulations have caused even more uncertainty for out-of-state renewable energy developers and transmission developers. These regulations as originally proposed limited the level of renewable resources that could be obtained from out of state sources. These regulations were challenged by the California utilities, were modified, and have been reissued on a temporary basis (CPUC, 2010). It should be noted that the Legislation in SB 722 addressed the TREC issue and the TREC issues will be discussed further in Section 6.0.

A brief summary of the prospects of selling Eastern Nevada resources to other Western states follows.

Arizona

- Arizona's RPS requires investor owned utilities to secure 15 percent of their projected retail energy sales from renewable resources by 2025. Thirty percent must come from distributed

1. Tradable Renewable Energy Credits (1 TREC is equivalent to 1 MWh of renewable energy) allow for purchase of the REC without taking delivery of the renewable energy itself.

generation resources. Salt River Project has voluntarily set goals to comply with the RPS requirements that are consistent with those of the investor owned utilities.

- The potential for imports of energy from out of state renewable resources is estimated to be about 4.9 TWh.[2] This equates to about 1,900 MW of capacity from wind or Solar CSP resources assuming a 30 percent capacity factor.

Idaho

Idaho does not currently have an RPS. Four-fifths of Idaho's energy is produced by hydroelectric facilities. Further, Idaho is known to have significant wind, geothermal, and solar renewable resource potential and is likely to be a renewable energy exporter.

Demand by Idaho for renewable energy generated in Nevada is likely to be very limited.

Utah

- In March 2008, the Utah governor signed SB 202, which provides that 20 percent of an electrical corporation's or municipal electric utility's adjusted retail electric sales beginning in the year 2025 must come from qualifying renewable resources, if cost effective.

- For determining renewable energy requirements, retail electric sales are adjusted to exclude zero-carbon sources of energy such as nuclear resources and clean coal. Cost-effectiveness is determined by the municipality's legislative body. The Utah law is considered a "goal" rather than a mandate as there are no penalty provisions. In addition, the limits on annual renewable energy increases are small.

- There is existing transmission capacity in Nevada that can be used to deliver energy from renewable resources in Nevada to Utah (Harry Allen Red Butte 345 kV, Gonder –IPP 230 kV and Gonder to Sigurd 230 kV); however, Utah demand for renewable energy generated in Nevada is uncertain.

Oregon

- Oregon RPS requires utilities to supply 25 percent of retail energy sales by 2025 with renewable resources. Five percent must be secured by 2011, 15 percent by 2015, 20 percent by 2020, and 25 percent by 2025.

- Oregon utilities can acquire "bundled" or "unbundled" RECs from out-of-state sources. Unbundled RECs can be secured from anywhere in the WECC footprint. Bundled RECs must come from resources located in WECC regions within the US borders.

- There is existing transmission capacity in Nevada that can be used to deliver energy from renewable resources in Northwestern Nevada to Oregon (Alturas 345 kV to Malin).

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2. Estimates developed by applying AZ RPS requirements to 2020 retail sales projections for Salt River Project, Arizona Power Service and Tucson Electric Power. Estimate does not include offset due to existing renewable resources.

- There is potential demand from Oregon for bundled and unbundled RECs and a means to deliver bundled RECs.

Dr. David Hurlbut, Senior Analyst with the NREL, has been investigating how renewable requirements are likely to be met in the Western states. In an interim summary of his work in May 2010, Dr. Hurlbut indicated that he believes that most states (Colorado, New Mexico, Arizona, Nevada) will meet its State's RPS requirements with in-state resources and sell excess prime resources to out-of-state markets (Hurlbut, David, 2010). Thus, Nevada's opportunity to sell beyond its borders may be even bleaker than it appears on the surface.

Finally, it is worth considering whether Nevada should commit any of its scarce water resources to produce power for export. Nevada has generally implemented a "dry cooling" policy with respect to new power plants to conserve Nevada's precious water resources. Since any solar project developed in Eastern Nevada will not be needed to satisfy Nevada renewable energy requirements, any project would only be developed if there was a demand for exports. Wet cooled CSP units have significant water requirements similar to requirements of fossil steam generation facilities, about 739 gal/MWh. Dry cooled solar thermal facilities developed in Eastern Nevada use 31-143 gal/MWh and PV use 1.9 gal/MWh. Fortunately, new electrostatic technology promises an alternative to water cleaning of PV.

6.0 VALLEYS OF INTEREST PROJECTS ARE NOT LIKELY TO COMPETE SUCCESSFULLY IN REC MARKETS

6.1 Tradable Renewable Energy Certificates

In order to foster a higher level of renewable resource development, a trading system for renewable energy that does not require the delivery of the energy itself was created. A tradable renewable energy certificate,[1] which is the unit of trade for this system, provides verification that one megawatt hour[2] of energy has been generated from a qualified renewable energy resource. States throughout the West allow RECs to be used to meet the energy requirements of their respective RPSs. TRECs can be sold separately from, or bundled with, the energy from the qualified renewable energy resource.[3] Tracking systems have been established to ensure credibility that the energy was in fact generated by a qualified renewable energy resource.

There are a number of factors that determine whether generation developers in a specific location can benefit from a TREC market. These factors include: (1) the level of demand for TRECs in a local or distant market; (2) the expected revenues from energy and TREC sales; and (3) the ability of the local market in which the renewable generation developers will be located to absorb the energy from the generation resources. These factors will be explored below and a general opinion regarding whether generation development in the Valleys of Interest can be sustained by a TREC market will be provided.

6.2 Demand for TRECs in Local and Distant Markets and Expected Revenues from Energy and TREC Sales

The market for TRECs in Nevada is currently limited by Nevada's RPS. As stated previously, Nevada's RPS requirements are relatively small and REC sales to Nevada utilities will not be large enough to support development of utility scale renewable resources. Since the renewable energy requirements in most Western states besides California are also relatively small and will likely be met with local resources, the likely driver for a TREC market is the California market.

Regarding the California TREC market, the CPUC issued its final decision on January 13, 2011 regarding the use of TRECs to help comply with California's RPS requirements (CPUC, 2011a). The decision affects only the current RPS requirements, 20 percent by 2020, is temporary, and can be changed if a larger RPS standard is adopted (California adopted a 33 percent RPS in April of 2011). Pertinent provisions of the TREC decision include: (1) the three large California utilities may use

1. Tradable renewable energy certificates are also called RECs, green tags and portfolio credits.
2. The increment of energy used varies by state. In California, the increment of energy is the megawatt-hour (1 million watts), in Nevada the increment is kilowatt-hour (1000 watts).
3. A TREC that is bundled with energy is called a bundled transaction.

TRECs to meet no more than 25 percent of their annual RPS procurement obligations; (2) that a price cap of $50/REC would be placed on REC only contracts; and (3) these limits would expire on December 31, 2013. These temporary provisions of the TREC decision would likely not support development of the resources in the Valleys of Interest for a number of reasons. First, the percentage of TRECs allowed to be used to comply with the RPS is likely too low to support development of resources in the Valleys of Interest as these resources will not be competitive enough to gain a share of the TREC market. Second, the price cap on RECs plus revenues from energy sales to the local market would likely not provide sufficient compensation to renewable developers for their investment and ongoing expenses; Third, the provisions are temporary and developers likely won't make decisions to develop projects given the uncertainty surrounding the decision. In fact, the TREC decision will have to be revised because of the recent change to California's RPS statutes.

6.3 Ability of the Local Market to Absorb Energy from Renewable Resources

As indicated above, renewable energy developers can benefit from a TREC trading system because it allows them to produce renewable energy and sell TRECs to a distant market but does not require them to deliver the energy to the distant market. This eliminates the need to develop transmission facilities to transport the energy beyond the local market. However, before a renewable developer can participate in a TREC market, it must find a local load that can absorb the energy that it generates from its resource. Accordingly, developers that want to participate in a TREC market must make arrangements to sell the energy from their resource to a local market and then also make arrangements to sell the RECs into the TREC market. A developer's ability to sell RECs is limited by the ability of the local market to absorb the energy from the developer's resource.[4] Developers in the Valleys of Interest would need to interconnect with NVE's electric system if they wish to participate in the California TREC market. This interconnection is required because the Valleys of Interest are in a remote area and there is no local market in the vicinity to absorb the energy produced by resources in these valleys. Developers in the Valleys of Interest would also have to execute contracts with NVE or others to sell energy from their resources.

Since a renewable developer generates revenue from its project by sales of energy and RECs, the ability to obtain a good price for sale of energy is an important factor for successful resource development. Since NVE is the closest major load center, energy sales from solar developers in the Valleys of Interest could be made to NVE at a price no more than its avoided cost of energy. NVE's avoided cost of energy is a price that is typically based on the cost of energy from a natural gas fired combined cycle resource. Energy prices based on a combined cycle resource are currently much less than energy from any type of solar resource. This price combined with expected revenues from TREC sales would likely not be high enough to support development of solar resources in the Valleys of Interest.

4. In Nevada, this approach has been used for years to overcome transmission limitations. Namely, renewable energy in Northern Nevada could not be delivered to southern Nevada because there are no transmission facilities to deliver the energy. Consequently, the Nevada utilities developed contracting mechanisms to overcome the transmission limitations. Nevada Power Company arranged to sell the energy from the renewable resources to SPPC and then also arranged to purchase the RECs directly from the renewable energy developer. SPPC paid its avoided cost for the energy and absorbed the energy produced by the renewable developer. NPC and SPPC have indicated that eventually the energy level produced by renewable developers will reach a level that will negatively affect the economic operation of SPPC's electric system.

6.4 Other TREC Related Factors

Another very important element of the CPUC's decision is the definition it created for a bundled transaction. A bundled transaction is a TREC combined with the energy from a qualified resource (i.e., a bundled transaction would consist of one TREC and one MWH of energy). The CPUC decided that a bundled transaction only includes: (1) transactions in which energy is acquired from a generator that has its first point of interconnection with a California balancing authority and (2) transactions in which energy is acquired from a generator and the energy from the transaction is dynamically transferred to a California balancing authority area" (CPUC, 2011b).

The types of transactions that are allowed to be defined as bundled are significant because the definition places limits on the amount of renewable resources that can be imported into California and the development of a REC market. Based on the current definition, a bundled transaction would exclude renewable energy delivered from the Valleys of Interest if these resources cannot be directly connected to the California Independent System Operator (CAISO) balancing area or dynamically scheduled. This decision has the effect of limiting the amount of renewable resources that can be imported into California and consequently the development of resources outside of California. This is true because out-of-state developers with firm transmission that can't connect directly to a California balancing market can only participate in the TREC market which is a much smaller market (25% of California's RPS). Unless this decision is changed so that developers have more favorable delivery options, development of out of state resources for delivery to California will be limited.

In summary, the REC market in Nevada and in California offer limited opportunities for solar developers in the Valleys of Interest. Furthermore, there is not a direct transmission path from the Valleys of Interest to a California balancing area and it is unlikely that such a path will be constructed. Therefore, developers in the Valleys of Interest may only be able to participate in the REC market in California, which is currently and tentatively limited to 25 percent of California's renewable energy market. In addition, the Valleys of Interest are in remote areas and there is no local load to absorb energy from resources in these valleys. Therefore, developers in these valleys will need to connect to and deliver the energy from their resources into NVE's electric system in order to participate in a REC market. The revenue from energy sales to NVE plus the revenue from REC sales to the California REC market would likely not support the investment in renewable energy resources in the Valleys of Interest. Finally, it may be possible to dynamically schedule resources from the Valleys of Interest to a California balancing area, but without a direct connection to a California balancing areas and with other utility transmission systems in the transmission path between the Valleys of Interest and California, such a dynamic schedule will be complicated to set up.

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7.0 VALLEYS OF INTEREST PROJECTS ARE NOT LIKELY TO BE COMPETITIVE IN STATE OR REGIONAL ENERGY MARKETS FOR THE FORESEEABLE FUTURE

The final potential market for solar resources from the Valleys of Interest is long term energy procurement markets in the West. Competing in long term procurement markets in the region places the solar resources in direct competition with conventional resources from gas, coal, nuclear and hydro resources, as well as all other renewable resources. Prediction of the competitiveness of solar in 2030 and beyond is impossible due to the many uncertainties affecting electricity supply and demand, but the analysis of this section shows that even if many uncertainties are resolved in a way that makes resources in the Valleys of Interest competitive, any such development can be expected to be PV, and it can be expected have essentially no need for water.

7.1 Part One: The Competitiveness of Solar Energy should improve Relative to Gas-fired Resources

Gas fired generation resources are currently the resource of choice in long term procurement markets and therefore solar resources will ultimately have to beat out gas resources to fill energy needs in the long term procurement markets in the West. Solar resources are currently more expensive than new gas fired resources but over time the competitive edge of gas fired resources should erode. There are four reasons for this: (1) solar technology is a less mature technology that has not yet benefitted from cost reductions that will come from mass production and economies of scale; (2) improvements in material science and micro electronics will benefit solar technology; (3) the price of natural gas will continue to be volatile and may rise significantly if the environmental consequences of gas fracturing technology limit new resources so that gas supply does not keep up with gas demand; and (4) there may be a cost placed on carbon and that cost would increase the cost of energy from gas fired generation significantly. Therefore, the prospects of solar should improve relative to gas fired generation over time and it is possible that solar will one day compete head on with gas fired resources. Figure 7-1 below shows one recent projection of cost reduction in ground mounted PV that would reduce the cost of PV below 10 cents per kWh (Bony et al., 2010, p.9).

Gas will always have the advantage as a flexible resource that can be dispatched when demand arises, but when solar becomes directly competitive with gas, it is reasonable to expect gas resources to be used less as a base load resource and more exclusively as a resource that is dispatched when nothing else is available. How long it will take solar to reach this position of competitive parity or competitive advantage is subject to a number of uncertainties and is subject to debate.

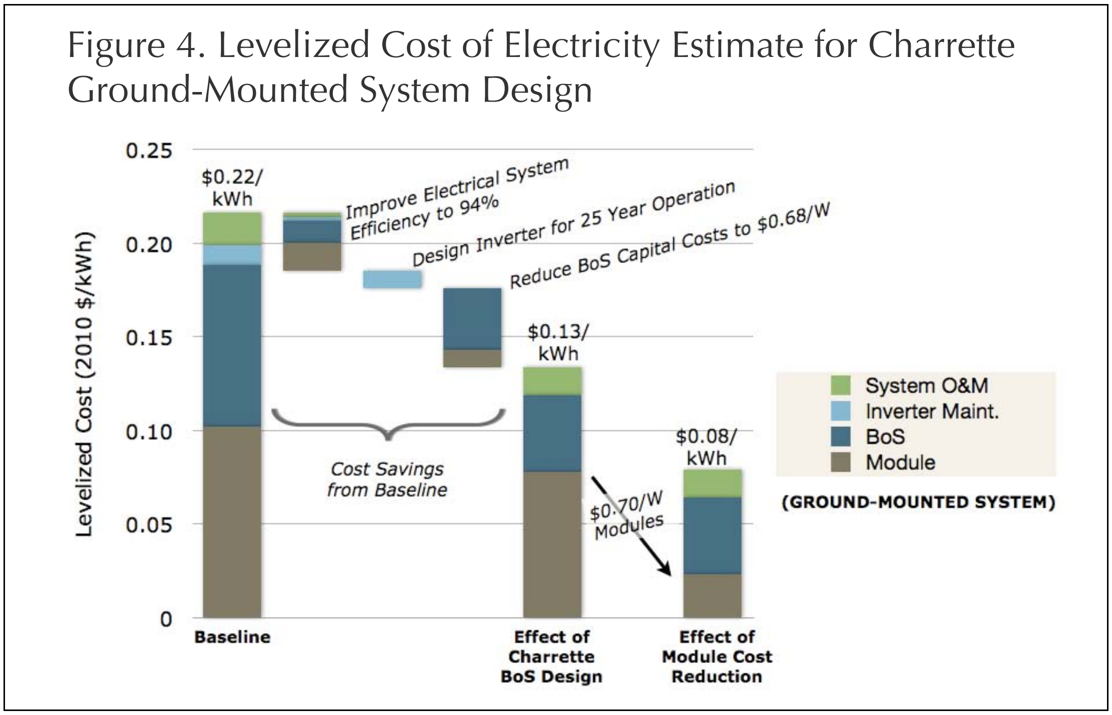

Figure 7-1
Projection of Cost Reduction in Ground Mounted PV

7.2 Part Two: A Confluence of Forces may cause Renewable Energy Demand to Rise Significantly

Reaching cost parity with gas-fired resources is one condition that needs to be satisfied for solar resources to become competitive in regional long term markets. In addition, a number of other changes in the market environment could increase the demand for renewable energy. If one considers a scenario where a confluence of forces comes together to: (1) limit the effectiveness of energy efficiency and smart grid deployment efforts so that demand for electricity is higher; (2) bring about a rapid improvement in solar technologies that increases its cost effectiveness relative to fossil resources dramatically; (3) cause enough concern about climate change that most coal in the West is retired; and (4) build a political consensus that ensures no new nuclear power is built in the West, then, demand for renewable resources could be great enough to create a potential opportunity for the best solar resources in the Valleys of Interest. Recall from Table 1-2, (p. 1-13) in Section 1.0 that Black and Veatch determined that about 382,000 GWh of renewable energy in the west is more cost effective than eastern Nevada resources. Further recall that Black and Veatch found that solar resources, in particular, are even less competitive if one eliminates the ITC that is available until 2016. If these four forces happen simultaneously, then the demand for renewable energy in the West could grow up to the 382,000 GWh threshold and thus Eastern Nevada resources could come into the mix.

7.3 Part Three: Self-cleaning PV will be the Solar Technology of Choice

If the confluence of forces come together to create a much larger demand for renewable energy in the West, there are several reasons why water does not need to be reserved for that potential solar development in the Valleys of Interest. First, PV is already becoming the solar technology of choice in most large scale California projects and it is likely that technological improvements in materials science, microelectronics and nanotechnology will make PV more attractive over time relative to solar thermal technologies. PV technologies can readily be deployed at the point of consumer demand, at the distribution system, or in remote large scale applications. The Black and Veatch study that placed Eastern Nevada behind 382,000 GWh of other resources was focused on identifying Concentrated Resource Areas that could be delivered with transmission to areas with a high level of demand for renewable energy. Since PV can be deployed close to load or in remote locations and delivered by transmission, improvements in PV are likely to bring increased use of distributed PV resources. As a result, some of the demand beyond 382,000 GWh is likely to be met with distributed solar resources that are close to load and the resources in the Valleys of Interest could well be moved farther back in the queue.

Second, the placement of Eastern Nevada resources as being ranked behind 382,000 GWh of other resources was predicated on the availability of the 30 percent ITC that will be available for solar technologies out to 2016. The rank of Eastern Nevada solar resources actually falls relative to other renewable technologies if the ITC expires.

Third, the water requirement of PV is much more favorable than wet or dry cooled solar thermal and recent technological advances are reducing the water requirements of PV even further. The water requirements of solar technologies shown on Table 1-1, (p. 1-10) in Section 1.0 indicate that water requirements for solar PV range from zero to 1.9 gal per MWh. Dry cooled concentrating technologies use between 31 and 143 gal per MWh. The confluence of forces described that leads to high demand for renewable energy included an assumption that climate change concerns cause the retirement of most coal fired power plants in the West. These same climate change concerns would make water even more valuable.

Fortunately, water use may become a non-issue for PV installations. In August 2010, Dr. Malay Mazumder with the Electrical and Computer Engineering Department at Boston University presented research to the American Chemical Society (ACS) that demonstrated the potential application of a water free cleaning technology to solar panel cleaning. In a press release covering the research, ACS reported that Mazumder and colleagues initially developed the self-cleaning solar panel technology for use in lunar and Mars missions while working for NASA. "Mars of course is a dusty and dry environment," Mazumder said, "and solar panels powering rovers and future manned and robotic missions must not succumb to dust deposition. But neither should the solar panels here on Earth." The self-cleaning technology involves deposition of a transparent, electrically sensitive material deposited on glass or a transparent plastic sheet covering the panels. Sensors monitor dust levels on the surface of the panel and energize the material when dust concentration reaches a critical level. The electric charge sends a dust-repelling wave cascading over the surface of the material, lifting away the dust and transporting it off of the screen's edges. Mazumder said that within two minutes, the process removes about 90 percent of the dust deposited on a solar panel and requires only a small amount of the electricity generated by the panel for cleaning operation. "We think our self-cleaning panels used in areas of high dust and particulate pollutant concentrations will highly benefit the systems' solar energy output," study leader Malay K. Mazumder, Ph.D. said. "Our technology can be used in both small- and large-scale PV systems. To our knowledge, this is the only technology for automatic dust cleaning that doesn't require water or mechanical movement" (Bernstein and Woods, 2010).

Scientific American reporter Larry Greenemeier reporting on Dr. Mazumder's discovery reported,

> The electrodynamic transparent screen developed by Mazumder and his colleagues is made by depositing a transparent, electrically sensitive material—indium tin oxide (ITO)—on glass or a clear plastic sheet covering the solar panels. When energized, the electrodes produce a traveling wave of electrostatic and dielectrophoretic forces that lift dust particles from the surface and transport them to the screen's edges. The researchers found that 90 percent of deposited dust can be removed by the transparent screen in fewer than 60 seconds (Greenemeier, 2010).

Mr. Greenemeier and Peter Forbes, also of Scientific American, further report that Dr. Muzumder's technology is one of a number of potential technologies. They report,

> The Boston University research is just the latest attempt at self-cleaning technology. With inspiration from the sacred lotus (*Nelumbo nucifera*), which remains pristine despite growing in muddy waters, a "revolution in self-cleaning surfaces is under way," (Forbes, 2008)
>
> Several other approaches rely on nanotechnology. U.K.-based glass manufacturer Pilkington has since 2001 sold its ActivGlass, which features a nanocoating of transparent titania. And Michael Rubner and Robert Cohen of the Massachusetts Institute of Technology (M.I.T.) are working with industrial partners to commercialize glass surfaces (mirrors and windshields, in particular) coated with nanoparticles that resist fogging (Greenemeier, 2010).

Solar energy development in the Valleys of Interest is unlikely to occur before 2030 because the quantity of truly high quality solar resources in these valleys is relatively small, the resources are expensive to access and the large quantity of superior resources with better access to markets will make obtaining financing and winning contract solicitations extremely difficult. Beyond 2030, development of the resources is still a long shot because the quantity of demand for renewables would have to triple beyond projected 2030 levels. However, a scenario where a confluence of forces come together and expand demand dramatically could be envisioned. By the time such a scenario might come to pass, PV technology will be directly cost competitive or more cost competitive than dry cooled solar thermal technology and thus any development occurring in the Valleys of Interest could be expected to be PV-based with de minimus water needs.

Solar resources are currently more expensive than new gas fired resources and solar resources are unlikely to compete effectively in long term energy markets until they can beat gas fired resources. Over time solar resources will become relatively less expensive than gas fired resources for three reasons: (1) solar technology will improve faster than gas fired generation technology, (2) the price of natural gas may rise significantly if gas supply does not keep up with gas demand; (3) and there may be a cost placed on carbon and that cost would increase the cost of energy from gas fired generation. Beyond 2030, uncertainties associated with climate change impacts, population growth patterns, the public support behind moving to very aggressive levels of renewable energy penetration and relative rates of technological change make prediction impossible. However, if one were to consider a scenario where a confluence of forces came together to increase renewable energy demand dramatically then perhaps demand for renewable resources throughout the west could exceed 382,000 GWh. If such a confluence of forces were to materialize, it is our opinion that PV technology will have become at least as cost effective as solar thermal technology and the fact that PV technology can be deployed effectively locally in distributed generation applications may mean that remote solar development will have become relatively less cost effective.

In the event that technology evolves in a way that makes remote solar locations desirable at that point, then development in the Valleys of Interest could occur. If such development were to occur, it is our opinion that PV technology would be preferred at that point in time and the water consumption would be very small. Recent advances in PV technology are eliminating the need for water to clean PV panels as electro-static cleaning technologies are being proven as this report is being drafted (Brenhouse, 2010). Thus reserving water for this speculative future solar energy development is unnecessary.

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8.0 CONCLUSION

Solar energy development in the Valleys of Interest is unlikely to occur before 2030 because the quantity of truly high quality solar resources in these valleys is relatively small, the resources are expensive to access, and there is a large quantity of superior resources available in other locations with better access to local and out of state energy markets. Furthermore, market access solutions that do not require actual delivery of energy from resources in these valleys, such as the sale of RECs, are not viable because the Valleys of Interest are not located near load centers and there is not a local load that can absorb the energy from resources in these valleys. These circumstances will make obtaining financing and winning contract solicitations extremely difficult. This position is supported by a relative lack of activity by solar developers pursuing projects in these valleys, no evidence of a public announcement that a developer in these valleys has won a purchase power agreement, no transmission interconnection requests originating from these valleys and market access and transmission access analysis supporting a position that solar resources in these valleys would not be competitive with resources in other locations.

Beyond 2030, development of the resources is still highly speculative because the quantity of demand for renewables would have to triple beyond projected 2030 levels. However, a scenario where a confluence of forces come together and expand demand dramatically could be envisioned. By the time such a scenario might come to pass, PV technology will be directly cost competitive or more cost competitive than dry cooled solar thermal technology and thus any development occurring in the Valleys of Interest could be expected to be PV-based with de minimus water needs.

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9.0 GLOSSARY

Ancillary Services – Those services that are necessary to support the transmission of capacity and energy from resources to loads while maintaining reliable operation of the Transmission Service Provider's transmission system in accordance with good utility practice (see NERC Glossary of Terms at http://www.nerc.com/files/Glossary_12Feb08.pdf). Ancillary services include: Scheduling, System Control and Dispatch Service; Reactive Supply and Voltage Control from Generation or Other Sources Service; Regulation and Frequency Response Service: Energy Imbalance Service; Operating Reserve - Spinning Reserve Service; Operating Reserve - Supplemental Reserve Service; Generation Imbalance Service; and Loss Compensation Service.

Avoided Energy Cost – The incremental cost to an electric power producer to generate or purchase a unit of electricity or capacity or both. The long term avoided cost of energy is typically based upon the price paid for energy from a combined cycle resource.

Balancing Areas – A balancing area is by NERC's definition, an area comprising a collection of generation, transmission, and loads within metered boundaries for which a responsible entity integrates resource plans of that area ahead of time, maintains the area's load-resource balance, and supports the area's interconnection frequency in real time. [2]In ISO-NE's case, the term Balancing Authority Area 'is used interchangeably with control area.' (See http://www.iso-ne.com/support/training/glossary/index?p1.html#baa.). This closely follows the NERC definition of a Balancing Authority Area: 'The collection of generation, transmission, and loads within the metered boundaries of the Balancing Authority. The Balancing Authority maintains load resource balance within this area.' (NERC, 2008)

Balancing Area Authority – The functional entity that integrates resource plans ahead of time, maintains generation-load interchange-balance within a Balancing Authority Area, and contributes to Interconnection frequency in real time. Tasks completed by a balancing area include: 1) Operate and control generation, load and confirmed interchange within a Balancing Authority area; 2) Calculate area control error within the reliability area; 3) Review generation commitments, dispatch, and load forecasts; 4) Formulate an operational plan (generation commitment, outages, etc.) for reliability evaluation; 5) Approve Arranged Interchange from ramping ability perspective; 6) Implement Confirmed Interchange; 7) Operate the Balancing Authority area to contribute to Interconnection frequency; 8) Monitor and report control performance and disturbance recovery; 9) Provide balancing and energy accounting (including hourly checkout of Confirmed Interchange, Implemented Interchange and Actual Interchange), and administer inadvertent energy paybacks; 10) Determine needs for reliability-related services; 11) Deploy reliability-related services; and 12) Implement emergency procedures.

Bundled transactions – Termed used to describe energy combined with a renewable energy credit.

Capacity – As used in this document is the limit on the ability to transfer power. A transmission line that has a capacity rating of 200 MW would be able to transfer no more than 200 MW of electricity.

Capacity Factor – The ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period (EIA).

Concentrating Solar Power (CSP) Resources – CSP technologies concentrate sunlight using mirrors and focusing devices and then use the heat generated by the focused light to heat a liquid. The heated liquid then creates steam which is used to spin an electric turbine generator.

Dry Cooling – A cooling system in which heat from the condensers of a power station is dissipated to the atmosphere in a cooling tower solely by convection (Websters).

Dynamic Transfer (Bonneville Power Administration) – A term that refers to methods by which the control response to load or generation is assigned, on a real-time basis from the Balancing Authority to which such load or generation is electrically interconnected (native Balancing Authority) to another Balancing Authority (attaining Balancing Authority) or other controlling entity on a real-time basis. This includes Pseudo-Ties, Dynamic Schedules, and dynamic arrangements within the BPA Balancing Authority Area (Bonneville Power Administration, 2010, p. 3).

El Dorado Valley – The El Dorado Valley is located just south of Las Vegas and contains four major transmission substations. These substations include Mead, El Dorado, Marketplace and McCullough. The El Dorado Valley is considered a major energy trading hub in the southwest.

Energy Value – The market value of the energy produced from a resource.

Giga-Watt-Hour (GWh) – A Giga-watt-hour is 1 billion watt-hours of energy.

Interconnection Service Requests – This a request to interconnect or connect a new transmission line into the existing grid. FERC regulated utilities such as NVE must maintain a publicly available interconnection queue. Cooperatives and Power Districts are not regulated by FERC and are not required to maintain a queue. Information about interconnection requests must be obtained from a Cooperative or Power district.

Insolation Levels (kWh/MS/Day) – The rate of delivery of direct solar radiation per unit of horizontal surface (Merriam-Webster).

KiloVolt (kV) – 1000 Volts

Levelized Costs – The levelized cost for a given generation facility is the average net cost per kilowatt hour for a generation facility over the life of that facility.

Megawatt (MW) – 1,000,000 watts. Bulk power is usually expressed in megawatts.

Net Cost per Kilowatt Hour – The total cost less the total value divided by the total number of kilowatt hours produced.

Overnight Capital Costs – The capital cost of a project if it could be constructed overnight. This cost does not include the interest cost of funds used during construction. More specifically, it refers to the engineering, procurement and construction costs plus owners' costs and excluding financing, escalation due to increased material and labor costs, and inflation. (WNA, 2011).

Power Purchase Agreement – A Solar Power Purchase Agreement (SPPA) is a financial arrangement in which a third-party developer owns, operates, and maintains the photovoltaic (PV) system, and a host customer agrees to site the system on its roof or elsewhere on its property and purchases the system's electric output from the solar services provider for a predetermined period. This financial arrangement allows the host customer to receive stable, and sometimes lower cost electricity, while the solar services provider or another party acquires valuable financial benefits such as tax credits and income generated from the sale of electricity to the host customer (EPA, 2010)

Qualified Resource Areas (QRAs) – Areas of high quality and dense renewable energy resources with enough capacity to potentially justify the construction of a high voltage transmission line for interstate transmission of renewable energy.

Renewable Portfolio Standard (RPS) – Standard requiring that a percentage of a State's energy needs be met with renewable energy resources.

Solar Photovoltaics (PV) – PV technologies convert sunlight directly into electricity.

Solar Thermal Energy – Solar thermal energy technologies use solar energy to create thermal energy or heat.

Tradable Renewable Energy Credit (TREC) – Tradable renewable energy credits represent claim over the compliance value and renewable attributes associated with renewable energy generation. They can be purchased by a utility and traded separately from the underlying energy produced by a renewable generating facility. These energy credits can then be applied, by the utility, toward their renewable energy compliance goals. Importantly, the ability to resell these credits apart from the associated energy provides additional flexibility and liquidity in the renewable market (CPUC, 2011b).

Transmission Service Requests – A transmission service request is a request to secure transmission capacity on a transmission system for use in transmitting power on the system.

Western Electricity Coordinating Council (WECC) – The Western Electricity Coordinating Council (WECC) is the Regional Entity responsible for coordinating and promoting bulk electric system reliability in the Western Interconnection. In addition, WECC assures open and non-discriminatory transmission access among members, provides a forum for resolving transmission access disputes, and provides an environment for coordinating the operating and planning activities of its members (WECC).

Wet Cooling – Wet cooling systems use water to absorb heat via indirect contact with steam in a condenser. The heated water is either discharged to a large surface water body such as a river or lake (once-through cooling) or passed through a cooling tower and recycled back to the condenser (recirculated cooling). In either case, heat absorbed in the condenser is released to the environment through a combination of evaporation and sensible heating of the surroundings (Micheletti and Burns, 2002).

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