Laying a Foundation for Nevada's Electricity Future:

Generation Facility Uncertainties and the Need for a Flexible Infrastructure

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Dr. McCann specializes in environmental and energy resource economics and policy. He has completed numerous project benefit assessments and impact analyses and has testified before the Federal Energy Regulatory Commission, California Public Utilities Commission, California Energy Commission, Air Resources Board, State Water Resources Control Board, and other regulatory agencies. Currently, Dr. McCann is working with the California Energy Commission to estimate the costs for new alternative generating technologies. Dr. McCann holds a Ph.D. in Agricultural & Resource Economics from the University of California, Berkeley.

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Executive Summary

Sierra Pacific Power Company (SPPC) and Nevada Power Company (NPC) recently announced a delay in the operation of the first 750 megawatt (MW) coal unit of the Ely Energy Center (EEC).[1] The Utilities have further suggested that uncertainties may lead to further delays or cancellation of the coal power plants.[2] While all new sources of generation face uncertainties that can affect the timing and ultimate cost of those facilities, the delay or cancellation of the coal units demonstrates the risk to reliability and rates associated with a strategy that is dependent upon the timely completion of large centralized generation. The potential absence of the 1500 MW EEC coal plants highlights the need for a contingency plan to meet a resource shortfall. This report frames the issues that need to be addressed by such a plan. The intention of this study is to initiate a discussion among the Nevada Utilities and policy makers that will expedite the construction of an infrastructure that accesses distributed and centralized resources from the state and the region. To their credit, Nevada Utilities and Nevada's policy makers have already proposed significant infrastructure additions. The proposal in this report differs from existing proposals because it emphasizes the importance of getting infrastructure in place in advance of the proposed coal plants and it proposes more substantial access to distributed and demand side resources. Building an infrastructure foundation now that leverages and extends existing proposals will provide Nevada Utilities and policy makers with a flexible array of options.

The first cornerstone of a flexible infrastructure foundation for Nevada is a north-south transmission inter-tie. Several north-south interconnections have been proposed, including the Utilities' Eastern Nevada Transmission Inter-tie (EN-ti) proposal.[3] The Renewable Energy Transmission Access Advisory Committee (RETAAC) recently expressed its support for a north-south inter-tie in Nevada and RETAAC highlighted the importance of such an inter-tie to facilitate development of renewable energy in Nevada.[4] Interconnecting SPPC and NPC facilitates reserve sharing, captures system coordination benefits, facilitates development of renewable energy resources in northern Nevada, and provides NPC with access to electricity reserves in the Northwest, Basin and Rocky Mountain regions of the western grid. It fulfills a key promise from the Utilities' merger. Completing a north-south interconnection by 2011 contributes significantly to meeting:

- Nevada's near term needs by providing NPC with access to SPPC excess capacity and regional reserves, and
- Nevada's longer term needs by providing NPC with access to northern Nevada and regional renewable energy projects.

The second cornerstone of building a flexible infrastructure in Nevada is ensuring access to cost effective energy efficiency, demand response and distributed generation resources. The Utilities, Nevada policy makers, and the federal government have all contributed to energy conservation in the state. However, the announced delay in the EEC requires that proposed utility and non-utility

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1 2007. Reuters. "RPT-Nevada Power Delays Ely Coal Power Plant." December 1. Retrieved December 5, 2007 from http://www.reuters.com/article/bondsNews/idUSN3033040220071201

2 2007. "Nevada Utilities Want to Kill Bill Amendment that May Stifle Coal." California Energy Markets. December 7, p. 15.

3 NPC. *Integrated Resource Plan 2007-2026. Vol. 6, Supply Side Plan , Transmission Plan and Financial Plan*, pp. 87 – 93.

4 RETAAC. *Phase 1 Report*. December 2007, p. 6.

efficiency enhancing projects are implemented aggressively and that existing proposals are complemented with additional distribution level measures. Existing demand side management (DSM) and demand response (DR) programs should be accelerated and improved, and combined heat and power (CHP) partnerships between large commercial entities, such as casinos, and the Utilities should be pursued. Completely accounting for all of the energy and demand savings associated with existing utility and non-utility programs in the Utilities' demand forecasts will be just as important as implementing the programs well because documenting reduced consumption contributes directly to meeting resource adequacy requirements.

The third cornerstone is beginning pre-permitting, permitting and construction of renewable energy transmission collector systems on an expedited basis and aggressive pursuit of renewable energy projects that benefit from the selected collector systems. Nevada is poised to be at the national forefront for solar and geothermal resources, and Nevada can begin adding wind power.[5] A review of western planning reports finds that these resources are expected to be cost competitive with traditional gas and coal-fired generation. Nevada is evaluating the alternatives, but in comparison with other western utility planning reports, the Nevada evaluation could be more systematic and comprehensive. SPPC identified routing studies that could facilitate more rapid development of renewable energy resources in northern Nevada in its most recent Integrated Resource Plan (IRP).[6] Yet the Utilities' "Preferred Portfolios" continue to focus on gas and coal resources and downplay the potential for these resources to meet its needs.[7] To its credit, RETAAC identified and is refining plans for transmission collector systems statewide that could facilitate the development of renewable energy zones in Nevada.[8] Improving access to resource alternatives as technology, resource discoveries and availability of capital equipment evolve is an essential cornerstone to laying a flexible infrastructure foundation. Utility and RETAAC efforts are encouraging but delays in the EEC justify expedited development of the most promising collector systems and initiating specific request for proposals (RFPs) that can attract a set of projects to fill possible collector system zones prior to 2013.

The fourth cornerstone complements the first three and includes building flexible gas generation capabilities. NPC has announced that it will ask for approval of an additional 500 MW unit at the Harry Allen site. The utility is to be congratulated for having a pre-permitted site that can be accessed quickly, however, the generation built should be considered relative to its efficiency and thus CHP applications should be considered alongside any new proposed gas plants.[9] In addition, the generation considered should also be evaluated based on its ability to support a Nevada generation fleet that will have more intermittent generation and more distributed and demand side generation in the near future. Finally, construction of gas storage facilities should be considered alongside the consideration of new gas generation so that flexible gas contracting can increase the Utilities' flexibility in how it dispatches its existing and planned gas generation fleet.

Nevada's long term resource needs will require an infrastructure foundation that allows NPC and SPPC to access local, state and regional resources. Federal and state policies, regulations and tariffs that

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5 NPC. "Renewable Energy," http://www.nevadapower.com/company/renewables/, retrieved January 30, 2008.

6 SPPC. *2007 Integrated Resource Plan 2008-2027.* Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan, p. 98.

7 Op. cit., pp. 60-61.

8 RETAAC. *Phase 1 Report*. December 2007, p. 9.

9 Business Wire. "Nevada Power Announces Plan to Build Natural Gas Facility." November 28, 2007. Retrieved November 28, 2007 from http://www.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20071128006106&newsLang=en.

facilitate the construction of and access to Nevada's flexible infrastructure can be developed and implemented. The first delay in the EEC has created a need for additional resources by 2011. Additional uncertainties surrounding the future development of the EEC cited by Sierra Pacific Resources (SPR) in its 10-Q include possible changes in environmental regulations, emissions limits, climate change legislation and the possibility of increasing plant construction costs.[10] Given these uncertainties, delaying the deployment of the flexible infrastructure needed to access diverse resources would be a serious mistake. Nevada has the opportunity to lay the foundation of a flexible infrastructure now, which will address the near term needs created by this first delay and allow it to flexibly respond to longer term needs as in-state and regional resources are developed.

10 SPR. *Form 10-Q, Quarterly Report, Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations*. November 2007. Retrieved on November 4, 2007 from http://biz.yahoo.com/e/071102/srp10-q.html.

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List of Acronyms

ACEEE................American Council for an Energy Efficient Economy
ACLM................Air Conditioner Load Management
ADS................Automatic Dispatch Signal
AGC................Automatic Generator Control
APS................Arizona Public Service
ATC................Available Transmission Capacity
B&V................Black & Veatch
Bcf................billion cubic feet
BLM................Bureau of Land Management
CAISO................California Independent System Operator
CCGT................Combined Cycle Gas Turbine
CDEAC................Clean and Diversified Energy Advisory Committee
CEC................California Energy Commission
CHP................Combined Heat and Power
CO2................Carbon Dioxide
CPP................Critical-Peak-Pricing
CPUC................California Public Utilities Commission
CREZ................Texas Competitive Renewable Energy Zone
CSP................Concentrating Solar Power
DG................Distributed Generation
DOE................Department of Energy
DR................Demand Response
DSM................Demand Side Management
E3.................Energy and Environmental Economics, Inc.
EEC................Ely Energy Center
EIA................Energy Information Administration
EN-ti................Eastern Nevada Transmission Inter-tie
EPAct................Energy Policy Act
FERC................Federal Energy Regulatory Commission
GHG................Greenhouse gas
GPE................Great Plains Energy
GTN................Gas Transmission Northwest
GWh................Gigawatt-hour
HED................Home Energy Display
IEPR................Integrated Energy Policy Report
IERA................Idaho Energy Resources Authority
IRP................Integrated Resource Plan
kV.................Kilovolt
kWh................Kilowatt-hour
LBNL................Lawrence Berkeley National Laboratory
LBNL................Lawrence Berkeley National Laboratory
LNG................Liquefied Natural Gas
LSE................Load-Serving Entity
MMcf................million cubic feet
MW................Megawatt
MWh................Megawatt-hour
NCARE................Nevadans for Clean Affordable Reliable Energy
NERC................North American Reliability Corporation
NIETC................National Interest Electric Transmission Corridors
NOPR................Notice of Proposed Rulemaking
NPC................Nevada Power Company
NPCC................Northwest Power and Conservation Council
NREL................National Renewable Energy Laboratory

NSOE ... Nevada State Office of Energy
OATT ... Open Access Transmission Tariff
PEIS ... Programmatic Environmental Impact Statement
PG&E ... Pacific Gas & Electric
PGE ... Portland General Electric
PIER ... Public Interest Energy Research
PS ... Portfolio Standard
PUCN ... Public Utilities Commission of Nevada
PV ... Photovoltaic
QF ... Qualifying Facility
RDM ... Robust Decision Making
RETA ... New Mexico Renewable Energy Transmission Authority
RETAAC ... Renewable Energy and Transmission Advisory Committee
RFP ... Request for Proposals
SEER ... Seasonal Energy Efficiency Ratio
SPPC ... Sierra Pacific Power Company
SPR ... Sierra Pacific Resources
SWEEP ... Southwest Energy Efficiency Project
TOU ... Time-of-Use
WECC ... Western Electricity Coordinating Council
WGA ... Western Governors' Association

Introduction

Capacity Requirements in Nevada and the Ely Energy Center

Nevada's investor owned Utilities expect summer peak electricity demand to increase by more than 16% or 1400 megawatts (MW) between 2008 and 2014. The Utilities have proposed the Ely Energy Center (EEC), a large, discrete amount of coal-fired energy, as the center piece of their strategy to meet the need. However, the Nevada Power Company (NPC) recently acknowledged that an on-time operational date (late 2011) for Phase1 of EEC is improbable given the current permitting timeline.[11] A delay in one unit of the EEC creates an apparent 750 MW need starting in 2011. A delay in the second unit of the EEC creates an apparent 750 MW of additional need starting in 2013. Nevada is fortunate to have a wide array of resource options available to respond to the absence of the EEC. The first delay can be compensated for with energy efficiency and the completion of a north-south inter-tie by 2011. Additional gas generation could further increase reliability and could help to lay a flexible infrastructure foundation for Nevada if the plant is carefully chosen to complement the other resources identified in this report.

The large, complex EEC project is likely to be confronted with additional delays as numerous uncertainties impinge on the project's construction schedule. Uncertainties surrounding EEC cited by Sierra Pacific Resources (SPR) include possible changes in environmental regulations, emissions limits, climate change legislation and the possibility of increasing plant construction costs.[12] Utility representatives have stated they would drop existing plans for the 1500 MW coal plant if more stringent air-quality standards are enacted and applied to EEC.[13] Additional sources of uncertainty that could affect the timing and cost of the plants have been identified by others.[14]

Given the announcement of a first delay and the real potential of additional delays or cancellation, ensuring that adequate resources are available to meet energy needs in the absence of the coal plants is critical. At the same time, the measures chosen to address these near term needs will have longer term implications. Resource solutions evaluated to meet near term needs should therefore be evaluated relative to their capacity to contribute to longer term electricity needs and mitigate future uncertainties. This research recommends that the resource solution selected should help lay the foundation of an infrastructure that supports further diversification and helps mitigate environmental, technological, cost and regulatory uncertainties.

Sierra Pacific Power Company (SPPC) and NPC have begun to lay the foundation of the infrastructure of the future by increasing demand side programs, expanding renewable resource contracting and construction, and expanding their transmission pre-permitting, permitting and construction activities.

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11 2007. Reuters. "RPT-Nevada Power Delays Ely Coal Power Plant." December 1. Retrieved December 5, 2007 from http://www.reuters.com/article/bondsNews/idUSN3033040220071201.

12 SPR. *Form 10-Q, Quarterly Report, Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations*. November 2007. Retrieved on November 6, 2007 from http://biz.yahoo.com/e/071102/srp10-q.html.

13 2007. "Nevada Utilities Want to Kill Bill Amendment that May Stifle Coal." California Energy Markets. December 7.

14 Econorthwest. *Economic Analysis of Nevada's Future Electricity-Generating Alternatives*. November 2007, p.2.

Traditional utility planning and financing favors large, centralized generation solutions, and so SPPC and NPC should be congratulated for the initial steps they have taken toward proposing infrastructure improvements that can facilitate the development of more decentralized energy sources while pursuing their more traditional goals. With the prospect of significant delays in coal development, the wisdom of these initial steps toward diversification is evident. Taking additional steps toward laying the flexible, adaptive infrastructure of the future is paramount now because focusing on any one resource given the significant uncertainties that impinge upon the timing, performance and cost of a wide range of resource alternatives would expose Nevadans to unacceptable risk. The infrastructure that should be built now must be able to accommodate resources that are needed in the near term to fill any gaps left by further delays in the EEC as well as flexible enough to aggressively pursue the resources that become the most desirable as uncertainties are resolved.

The Renewable Energy Transmission Access Advisory Committee (RETAAC) recommended in its December 31, 2007 report that a north south inter-tie and more localized renewable energy collector systems are necessary to access Nevada's vast renewable potential.[15] The infrastructure identified by RETAAC is an important part of the flexible, adaptive infrastructure that will be needed to meet the energy needs of Nevada. However, with the possibility of significant delays in the coal plant, construction of a north-south inter-tie before 2011 and in advance of the coal plants, construction of the highest priority renewable energy collector systems should be expedited to be completed prior to 2013. In addition, any new gas plant should be chosen based on its ability to maximize the capacity value of resources delivered over the transmission infrastructure. Finally, the infrastructure identified by RETAAC needs to be complemented with more aggressive energy efficiency implementation and the expedited development of a distribution system level infrastructure that facilitates more comprehensive access to demand side and distributed generation resources (DG).

Laying an Infrastructure Foundation for Addressing EEC Delays and Future Risks

Construction of a north-south interconnection, expanding and counting all efficiency efforts and construction of some new gas generation more than addresses the need in 2011. However, the foundational infrastructure that should be built now should be an infrastructure that can meet Nevada's needs in 2013 and facilitate meeting needs beyond 2013. Resources that are known and available by 2013 to address EEC coal plant delays are identified in Table I-1. The basis for the estimated contribution of each resource is included in the citations to the table. The resources identified and cited include:

- the ability to share reserve capacity in SPPC's control area given the non-coincidence of control area peaks,[16]
- diversification benefits for NPC from being able to access the Northwest, Basin and Rocky Mountain reserves,[17]
- geothermal resources in northern Nevada,[18]

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15 RETAAC. *Phase 1 Report*. December 2007.

16 Avista. *2007 Electric Integrated Resource Plan*. August, 2007, pp. 6-14. Northern and southern Nevada summer peak loads are uncorrelated in Avista's analysis indicating significant opportunity for capacity sharing.

17 Western Electricity Coordinating Council (WECC). *2007 Power Supply Assessment*. December 2007.

- wind resources in northern Nevada,[19,20,21]
- concentrating solar power (CSP),[22,23,24]
- photovoltaic (PV) power,[25]
- combined heat and power (CHP),[26]
- a pre-permitted, flexible gas plant in southern Nevada, and
- energy efficiency resources throughout Nevada.[27,28,29]

The collection of infrastructure projects that can provide flexible access to this diversified portfolio of high probability resources is the infrastructure that should be built now.

The first cornerstone of a flexible infrastructure for Nevada is a north-south electricity transmission line between the SPPC control area and the NPC control area. The inter-tie provides the opportunity for the two control areas to cooperate to meet their respective needs; provides southern Nevada with access to the relatively larger reserve margins in northern Nevada; provides access to power pools in the Basin, Northwest and Rocky Mountain regions; and provides the opportunity to expedite renewable energy development in northern Nevada. Table I-1 includes a very conservative estimate of 200 to 300 MW that can be accessed in northern Nevada to help NPC meet its reliability requirements if the Eastern Nevada Transmission Inter-tie (EN-ti) is built in advance of the coal plants. The assumed availability of this capacity is based on the Avista study cited above which demonstrates non-coincidence between northern and southern Nevada peak loads, as well as the relatively high capacity reserves that come with the operation of the new Tracy plant. This capacity does not include the substantial benefit that could arise from gaining access to contracting opportunities in the Northwest, Basin and Rocky Mountain regions of the Western Electric Coordinating Council (WECC) where peaking is non-coincident with southern Nevada peaks. The potential contribution of regional resources to meeting NPC needs conservatively could be an additional 200 to 300 MW, and the potential could grow substantially as congestion constraints outside of Nevada are addressed.

While interconnecting Nevada would immediately improve reliability in southern Nevada, additional infrastructure is needed to access renewable energy resources. Renewable energy collector systems are needed to address the energy gap created by a significant delay in the EEC. SPPC noted in its 2007

18 GeothermEx, Inc. *New Geothermal Site Identification and Qualification*. Prepared for Public Interest Energy Research (PIER) Program. California Energy Commission. April 2004.

19 SPPC. *2007 Integrated Resource Plan*. Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan.

20 Industrial Wind Action Group. "No Military Objection to Nevada Wind Farm." November, 2007.

21 RETAAC. *Phase 1 Report, Figure 1: RenewableEnergy Zones and Interconnects Map*. December 2007.

22 RETAAC. *Phase 1 Report, Figure 1: RenewableEnergy Zones and Interconnects Map*. December 2007.

23 Ausra Inc. News Releases. December 13, 2007.

24 Black and Veatch (B&V). *Arizona Renewable Energy Assessment*. Prepared for Arizona Public Service Company, Salt River Project and Tucson Electric Power Corporation. September, 2007.

25 Op. cit.

26 Energy and Environmental Analysis, Inc. *Hotel and Casino CHP Market Assessment*. December 2005.

27 Southwest Energy Efficiency Project (SWEEP). *High Performance Homes in the Southwest: Savings Potential, Cost Effectiveness and Policy Options*. November 2007.

28 SWEEP. *Nevada Energy Efficiency Strategy*. February 2005.

29 *Nevada Lamp Standards Analysis*. Prepared by H. Geller on December 31, 2007.

integrated resource plan (IRP) that geothermal and wind resources in northern Nevada require the permitting and construction of collector systems that collect renewable energy, spread the cost of developing the energy and speed the development of known, high quality resources in northern Nevada.[30,31] Pre-permitting the aggregator systems and completing construction of the most promising aggregator systems prior to 2013 is a necessary complement to the EN-ti in building a flexible infrastructure that can diversify risk. SPPC has identified pre-permitting collector system opportunities in northern Nevada, the Public Utilities Commission of Nevada (PUCN) has approved pre-permitting for two of the projects and RETAAC has supported the development of collector systems. However, the announced delay of the EEC and the possibility of additional delays provide justification for beginning development of the most promising collector systems now and for pursuing additional pre-permitting opportunities beyond the two approved by the PUCN in its December 2007 Final Order in Docket Number 07-06049.[32]

Geothermal, wind and solar resource potential in Nevada is estimated to be thousands of megawatts. However, the focus of this recommendation is very conservative and attempts to focus on resources that could be accessed with collector system projects that have already been identified by SPPC, NPC and RETAAC. Table I-1 identifies published resource potentials as a point of reference, but more significantly, offers high probability resource development potentials that could be accessed by 2013 with announced infrastructure and identified projects. These estimates take into account the projects that have been included in public versions of resource planning tables that appear in SPPC and NPC documents. These high probability projects include 300 to 500 MW geothermal nameplate capacity, 400 MW wind nameplate capacity and 60 to 120 MW of concentrating solar power nameplate capacity that could be accessed by 2013.

Accessing renewable energy and existing reserves in the north is a necessary but not a sufficient condition for addressing the needs resulting from EEC. Assessing the demand impacts of non-utility efficiency programs, expanding utility and non-utility efficiency programs, and improving access to distributed resources are each critical to ensuring that needs in Nevada will be met. Ensuring that needs are met starts with a forecast of energy and demand. Ensuring that electricity energy and demand forecasts completely reflect the effects of updated building codes and standards in Nevada, 2005 and 2007 Federal Energy Efficiency Appliance and Lamp standards, and the statutory lamp standards that take effect in 2012 is the first step in establishing the need by 2011 and 2013. Further delays in the EEC coal plants may justify additional investment in efficiency including, but not necessarily limited to, expanded utility demand side management (DSM) programs and further improvement in local or state codes and standards. Accessing some DG and demand side capacity resources is possible without investment in new demand side infrastructure, but additional distributed contributions to reliability become possible with investments in a more sophisticated distribution and energy services delivery infrastructure in Nevada. The existing infrastructure can accommodate additional air conditioning load management (ACLM) demand response (DR) and could accommodate a number of 10 MW combined heat and power facilities at new resort properties. More of these resources could become available with accelerations in the deployment of advanced metering, revision of rules and tariffs applicable to real time pricing and distributed generation resources, and new capital

30 SPPC. *2007 Integrated Resource Plan*. Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan, p. 98.

31 Pre-Filed Rebuttal Testimony of Brian J. Whalen, Jr. on behalf of Sierra Pacific Power Company. Public Utilities Commission of Nevada. *Docket 07-06049*. October 29, 2007, pp. 9-10.

32 It is worth noting that NPC's response to the first EEC delay was to expedite the construction of a pre-permitted gas facility. NPC's ability to respond to this first delay was dependent on a construction schedule flexibility that is attributable to pre-permitting.

sharing partnerships between NPC and hotel/casino properties that can host CHP facilities. Table I-1 includes a very conservative estimate of 482 to 767 MW that efficiency, distributed resources and demand side resources could collectively contribute by 2013.

NPC has announced 500 megawatts of new generation in southern Nevada to help meet the need created by the first delay but has not yet asked for PUCN approval of the project.[33] However, the proposed gas generation unit at the Harry Allen site will not meet its potential for mitigating the risk of future energy shortfalls or coal plant delays if it is not selected to complement intermittent and demand side resources. NPC should select a gas generation facility that can optimize the capacity and energy contribution of the combined portfolio of new resources.

A flexible, interconnected system would allow Nevada to utilize its abundant renewable energy resources, enhance its ability to draw on local efficiency and DG resources and increase its capability to import additional low-cost renewable energy sources of electrical power from its northern and Intermountain West neighbors. In view of uncertainty regarding the timing and opening of EEC, Nevada Utilities should build the flexible, adaptive electrical infrastructure that can address the needs in 2011 and 2013 and lay the foundation for meeting future needs. Table I-1 offers a conservative projection of savings and resources available to fill the 1500 MW void left by the coal plants in 2013.

Table I-1 Resources Available for Responding to Significant Ely Energy Center Delays

Infrastructure Need	Reported Potential Capacities	High Probability by 2013	Contribution to Energy by 2013	Contribution to Peak by 2013
North-South Inter-tie				
Resources Accessed:				
North-South Reserve Sharing[34],[35]	1850 MW	200 to 300 MW	Greater than 2,000 GWh	200 to 300 MW
Access to Renewable Resources	see collector system below	see collector system below	see collector system below	see collector system below
Access to the Northwest, Basin & Rocky Mountain Regions[36]	12% Reserve Margin plus Net New Generation	200 to 300 MW		200 to 300 MW
SUB-TOTAL				**400 to 600 MW**
Collector Systems				
Resources Accessed:				
Geothermal[37]	1200 MW	300 to 500 MW	2,234 GWh	210 to 350 MW

33 Business Wire. "Nevada Power Announces Plan to Build Natural Gas Facility." November 28, 2007. Retrieved November 28, 2007 from http://www.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20071128006106&newsLang=en.

34 SPPC. *2007 Integrated Resource Plan 2008-2027.* Vol. 1 Summary, p. 16. If 150 MW of capacity from EEC Phase 1 is not counted as a resource in 2012, then the loads and resources table indicates that SPPC would still maintain a balance of less than 100 MW.

35 Avista. *2007 Electric Integrated Resource Plan*. August, 2007, pp. 6-14. Northern and southern Nevada summer peak loads are uncorrelated and thus there is significant opportunity for capacity sharing.

36 WECC. *2007 Power Supply Assessment*. December, 2007, pg. 14. In 2012, the Northwest and Rocky Mountain regions are expected to have summer peak reserve margins of 3444 and 1682, respectively.

37 GeothermEx, Inc. 2004. *New Geothermal Site Identification and Qualification*. Prepared for California Energy Commission Public Interest Energy Research Program. April 2004, p. 187. This estimate incorporates an

Table I-1 Resources Available for Responding to Significant Ely Energy Center Delays

Infrastructure Need	Reported Potential Capacities	High Probability by 2013	Contribution to Energy by 2013	Contribution to Peak by 2013
Wind[38,39,40]	1900 MW	200 to 600 MW	600 GWh	20 to 60 MW
Concentrating Solar [41,42]	Multiple 1000s	60 to 120 MW	200 GWh	30 to 60 MW
SUB-TOTAL	**More than 4000 MW**			**260 to 470 MW**
CHP & DG				
Resources Accessed:				
Gaming Industry[43]	387 MW	60 to 120 MW	456 GWh	40 to 80 MW
Photovoltaic (PV) deployment[44]	Multiple 1000s	30 to 60 MW	87 GWh	15 to 30 MW
SUB-TOTAL				**55 to 110 MW**
Demand Response				
Resources Accessed:				
ACLM[45,46]	231 MW by 2013	80 to 120 MW	Small	80 to 120 MW
Time of Use and real time pricing[47]	216 MW	40 to 80 MW	Small	65 to 130 MW
SUB-TOTAL				**145 to 250 MW**
Efficiency				
Resources Accessed:				
Commercial Codes and Standards[48]	319 MW in 2010	207 MW	724 GWh	125 to 175 MW

adjustment to account for approximately 300 MW of geothermal power which is currently under development or has been put into operation following the release of the GeothermEx report. See Chapter 3 of this report.

38 SPPC. *2007 Integrated Resource Plan*. Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan, p. 101. 500 MW of wind capacity northwest of Reno is not reported for a specific year; it is referenced in the context of Sierra's Wind Integration Study, which uses 2010 and 2015 as a basis for study.

39 Industrial Wind Action Group. "No Military Objection to Nevada Wind Farm." November, 2007.

40 California Energy Markets. "Sierra Pacific Resources, UK Company Discuss Wind-Power Project." November, 2007.

41 B&V. *Arizona Renewable Energy Assessment*. September, 2007, p. 1-5. Based on the Black and Veatch assessment that 100 MW is feasible by 2011 and 200 MW per year after that, the estimate provided by NV is conservative.

42 The Ely Times. "Sol Searching Underway." October, 2007.

43 Energy and Environmental Analysis, Inc. *Hotel and Casino CHP Market Assessment*. December 2005. See Chapter 3 of this report for further discussion.

44 Projection based on existing deployment of PV. See Chapter 3 of this report for further discussion.

45 NPC. *Measurement & Verification Report, 2006 ACLM Project*. Prepared by Paragon Consulting Services. February 2007, p. 1-2. Demand savings per ACLM unit taken from this report. See Chapter 2 for a discussion of how ACLM savings was computed.

46 NPC. *2006 Integrated Resource Plan 2007-2026*, Vol. 4, Load Forecast and Market Fundamentals, p. 7. Residential Customer Population forecast used in the ACLM savings estimate. See Chapter 2 of this report for a discussion of how ACLM savings was computed.

47 Assumes time-of-use pricing leads to a 1% peak load savings for NPC. See Chapter 2 of this report for further discussion.

Table I-1 Resources Available for Responding to Significant Ely Energy Center Delays

Infrastructure Need	Reported Potential Capacities	High Probability by 2013	Contribution to Energy by 2013	Contribution to Peak by 2013
Residential Codes and Standards[49]	309 MW in 2020	25 MW	159 GWh	10 to 25 MW
NV Lamp Standards 2012[50]	631 MW by 2013	186	1080 GWh	100 to 150 MW
EPAct 2005 and 2008 Appliance Standards[51]	7 MW/yr beginning in 2009			20 to 30 MW
Uncounted Utility Savings[52,53]	27 MW missing from SPPC forecast			27 MW
SUB-TOTAL				**282 to 407 MW**
Natural Gas				
Gas Generation[54]	300 to 500 MW			**300 to 500 MW**
TOTAL				**1442 to 2237 MW**

Overview of the Remaining Chapters

The first chapter summarizes the situation in Nevada with and without the EEC coal plants. The first section identifies the resources that would be available to meet the needs starting in 2011 if a north-south inter-tie is built. The research concludes that an inter-tie is critical to meeting needs in the absence of the EEC and an inter-tie should be built regardless of whether the coal plants are built. The report further indicates that constructing the inter-tie without complementary projects and policies will not be sufficient to meet the needs created by the present and future EEC delays.

The second chapter identifies the near term potential for efficiency resources and distributed resources to help fill the gap left by the EEC. Fully reflecting the demand impact of utility and non-utility programs including but not limited to the lamp standard, building codes and standards and appliance standards plus further improvement in building codes and standards implementation and enforcement, new combined heat and power deployments, expansions in the ACLM and DR programs, and leveraging the residential real estate disclosure can each contribute to filling the gap left by future delays in the EEC.

48 SWEEP. *High Performance Homes in the Southwest: Savings Potential, Cost Effectiveness and Policy Options Fact Sheet*. November 2007. See Chapter 3 of this report for a description of how these savings estimates were applied.

49 SWEEP. *Nevada Energy Efficiency Strategy*. February 2005, pp. 37-38. See Chapter 2 of this report for further discussion.

50 SWEEP. *Nevada Lamp Standards Analysis*. Provided by H. Geller on December 31, 2007. See Chapter 2 of this report for details.

51 ACEEE. *Appliance Energy Efficiency Standards in the 2007 Energy Bill*: Key Facts. December 2007. See Chapter 2 of this report for details.

52 SPPC. *2007 Integrated Resource Plan 2008-2027.* Vol. 1 Summary, p. 7.

53 Direct Testimony of Howard Geller on Behalf of Nevadans for Clean Affordable Reliable Energy (NCARE). *Public Utilities Commission of Nevada. Docket No. 07-06049*. October 17, 2007, Exhibit HG-2.

54 Business Wire. "Nevada Power Announces Plan to Build Natural Gas Facility." November 28, 2007. Retrieved November 28, 2007. This announcement is for a 500 MW combined cycle at the Harry Allen site, so 300 to 500 MW of new gas generation, not necessarily at that site, is deemed reasonable.

The third chapter identifies the near term potential for renewable energy resources to address part of the need created by the absence of the EEC coal plants as well as the longer term potential of renewable energy to serve Nevada's future growth. The chapter identifies specific renewable energy zones and renewable energy potentials that have been well-documented and therefore have a high probability of being developed by 2013 if they are pursued aggressively. The benefits of pursuing a diversified portfolio of renewable energy sources to mitigate risks that could persist or develop prior to 2013 are also discussed. The research demonstrates that conservative estimates of renewable energy development are sufficient to contribute substantially to a diversified solution to future EEC delays.

The fourth chapter discusses complementary gas generation characteristics that can facilitate the construction and operation of a flexible infrastructure, can mitigate risk and spread the costs of infrastructure change.

The fifth chapter suggests federal and state initiatives that could help to facilitate the construction of a flexible transmission and distribution system infrastructure for Nevada.

The report concludes with a summation of the opportunities available to address the coal plant delays or cancellation.

Chapter 1 Nevada Energy Fundamentals and the Benefits of an Inter-tie

A north-south inter-tie is important to meeting reliability and portfolio standard requirements in the absence of the Ely coal units. Nevada continues to experience significant demand growth and growth continues to be concentrated in southern Nevada. Conversely, non-solar generation resource opportunities by 2013 are concentrated in the north. Furthermore, the energization of the Tracy combined cycle plant in 2008 and the development of renewable projects already identified in the SPPC and NPC resource plans will leave SPPC with substantial internal generation resources.[55] Beyond meeting reliability requirements, NPC must meet its portfolio standard requirements and the inter-tie facilitates meeting those requirements as well. While southern Nevada has abundant solar energy and demand side resource potential, geothermal and wind resources are concentrated in northern Nevada. Finally, an inter-tie will reduce NPC's dependence on the southwestern regions of the WECC to supplement its own generation resources. An inter-tie provides NPC with access to contracting and partnership opportunities in the Northwest, Basin and Rocky Mountain regions of the WECC. This chapter elaborates on each of these potential benefits of a north-south inter-tie.

Sharing Nevada's Resources

Nevada's Continuing Growth and Electricity Demand

Compared with the rest of the United States, Nevada's population and energy consumption growth rates are remarkably high. As shown in Figure 1-1, Nevada's population is expected to reach more than 3,415,000 people by 2013, a 20% increase from its current population of 2,850,000.[56] Southern Nevada expects construction of an additional 33,000 hotel rooms by 2010.[57] Correspondingly, Nevada's need for additional energy and infrastructure grows rapidly.

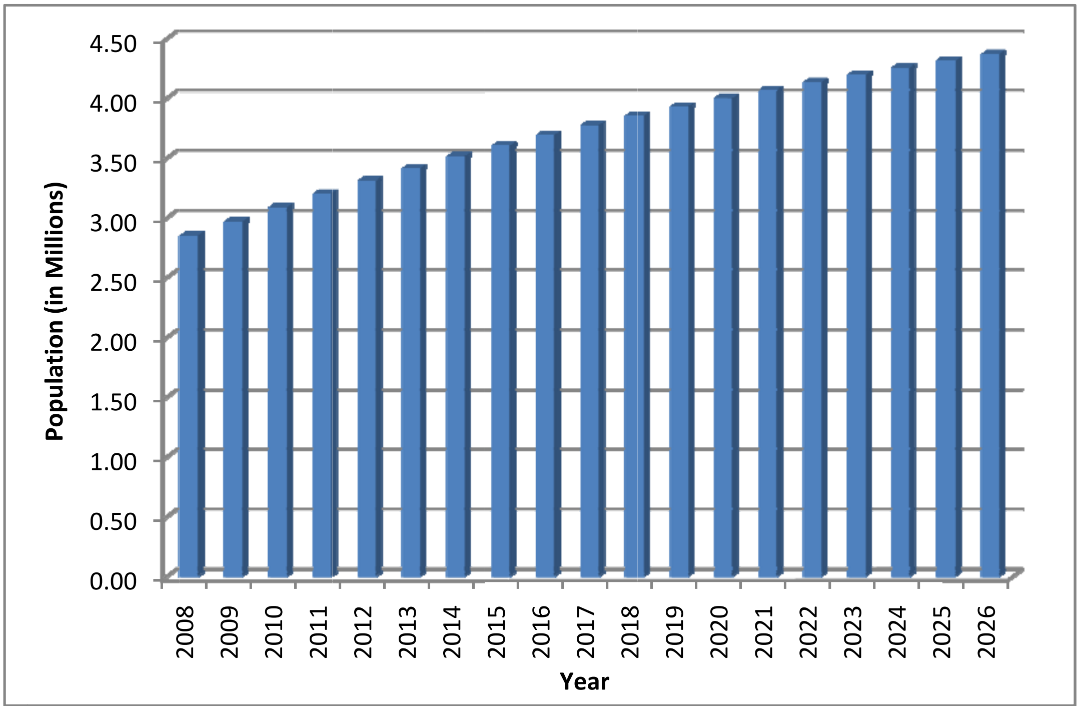
With respect to electricity, northern and southern Nevada are basically isolated from one another. Separated by several hundred miles of arid and mountainous terrain, SPPC and NPC are largely unable to share electricity or natural gas supplies. Indeed, from a regional energy planning perspective, northern and southern Nevada are separated into different sub-regions; the WECC Basin sub-region includes SPPC's service territory while the Desert Southwest sub-region includes NPC's service territory. And for the WECC as a whole, this lack of interconnection has implications for meeting region-wide reliability goals as the Northwest is unable to share excess capacity with the Desert Southwest.

55 The Tracy combined cycle plant is located east of Reno next to the Tracy Generating Station. The 514 MW plant is expected to begin generating electricity for Northern Nevada and the Lake Tahoe area of California in the summer of 2008.

56 Nevada State Demographers Office. 2006. *Nevada County Population Projections 2006 to 2026*. July 2006. Retrieved September 21st, 2007 from http://www.nsbdc.org/what/data_statistics/demographer/pubs/docs/NV_2006_Projections.pdf

57 NPC. *2006 Integrated Resource Plan*. Vol. 3, 4th Amendment to the Action Plan, p. 55.

Figure 1-1 Nevada Population Forecast



Source: Nevada State Demographer's Office, 2006.

Nevada's climatic extremes result in severe peak demands for electricity. Las Vegas experiences extremely hot and dry summers with relatively mild winters. Southern Nevada's summer peak season begins mid-June and extends through mid-September and average peak load during this time is twice as high as during off-peak shoulder months. The summer is also characterized by periods of needle peaks; the highest 1000 MW of NPC's total peak load is estimated to occur for less than 160 hours of the year. NPC's load factor (mean hourly consumption as a percentage of the peak hourly consumption) of 45% is among the lowest in the nation.[58,59] Even within days, demand for energy is very sensitive to fluctuations in temperature. For example, an increase in temperature of just one degree on NPC's peak day can add significant load. Conversely, if clouds move in on a summer day causing a slight temperature drop, Nevada may experience a sharp decline in demand within hours.

The climate throughout the SPPC service territory is characterized by hot but somewhat milder summers than southern Nevada. Northern Nevada experiences notably colder winters than southern Nevada. As such, the SPPC service territory exhibits a dual peak where the summer peak load is only slightly higher than its winter peak load while NPC experiences a pronounced summer peak load much higher than its winter peak load. SPPC and NPC summer peak days are non-coincident and thus a north and south interconnection would provide opportunities to share energy to meet one another's peak load.

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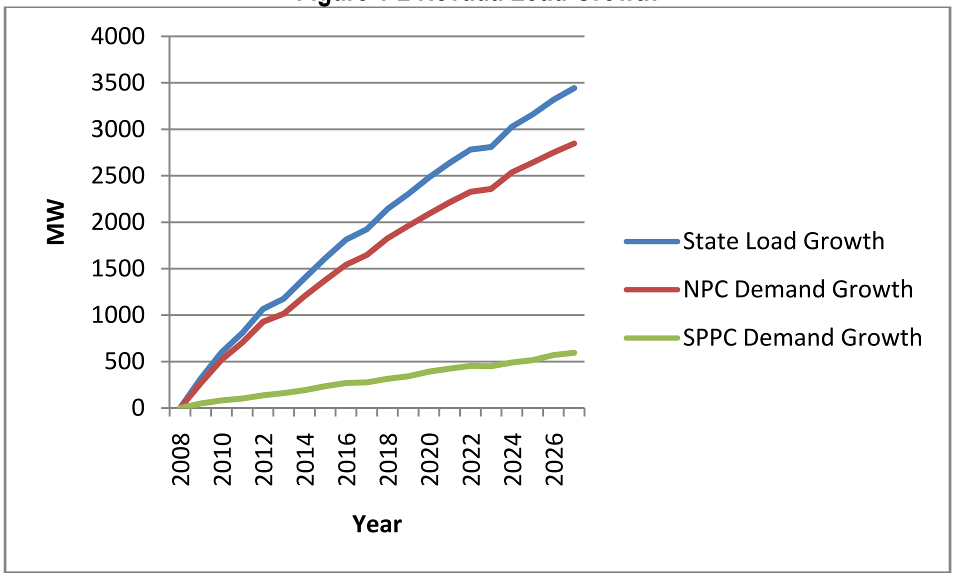
58 NPC. *2006 Integrated Resource Plan 2007 – 2026*. Vol. 3, Energy Supply Plan, p. 20.

59 Balzar, R., H. Geller, and J. Wellinghoff. 2004. "The Rebirth of Utility DSM Programs in Nevada." Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings. Vol 5, p. 5-15, Washington, DC: American Council for an Energy-Efficient Economy.

According to utility estimates, Nevada's demand for electricity is expected to grow from its current level of 8615 MW to 12058 MW in 2027, yielding an average annual load growth of 2.23 %.[60,61] State load growth is primarily driven by the faster growing and significantly larger utility, NPC. As can be seen from Figure 1-2, Nevada's demand for electricity is forecasted by the Utilities to rise steadily over the next 20 years.

Figure 1-2 Nevada Load Growth



Sources: Sierra Pacific Power and Nevada Power Company Resource Plans

Total state energy consumption is expected to grow on an average by 1.57% each year from 2008 to 2027. The annual amount of energy consumption by NPC customers is expected to reach 31,866 gigawatt hours (GWh) by 2026. This represents an increase of 43% from current levels of 22,271 GWh.[62] For SPPC, annual average energy consumption is expected to grow from 9121 GWh in 2008 to 11,763 GWh in 2027 with an average annual growth rate of 1.45%.

NPC anticipates a summer peak load of 6278 MW for summer 2008 (including projected energy savings from energy efficiency programs and a 12% planning reserve margin). According to company forecasts, peak load is expected to reach 8375 MW in 2017, reflecting an average annual load increase of 2.45%.

SPPC forecasts a 2008 summer peak load of 1887 MW (including conservation savings and a 15% planning margin) and expects a peak load of 2164 MW in 2017, representing an average annual load growth of 1.47%.

NPC and SPPC energy and peak load forecasts should reflect the effect of all utility and non-utility energy efficiency and conservation initiatives including all state and federal initiatives. Since reduced forecasts translate into reduced electricity needs and thus reduced need for new generation resources, reflecting all initiatives in the forecast is paramount. The demand forecasts presented here are taken from the 2006 NPC IRP and 2007 SPPC IRP filings. The forecasts reflect the utility DSM program

60 NPC. *2006 Integrated Resource Plan 2008-2027.* Vol. 1, Summary, p. 19. Reported summer peak (MW) from NPC loads and resources table. Demand includes planning reserves and is net of DSM savings.

61 SPPC. *2007 Integrated Resource Plan 2008-2027.* Vol. 1, Summary, p. 16. Reported summer peak (MW) from SPPC loads and resources table. Demand includes planning reserves.

62 NPC. *2006 Integrated Resource Plan 2008-2027.* Vol. 2, 4th Amendment to the Action Plan, p. 56.

effects available at the time the forecasts were performed but do not appear to incorporate updates to those data that have occurred since those filings were prepared. In addition, the forecasts do not appear to explicitly reflect the effect of non-utility programs. Future forecasts should carefully include the effects of these non-utility initiatives. This issue will be discussed more in Chapter 2.

Energy efficiency and conservation programs reduce electricity consumption and reduce peak electrical demand during crucial summer hours. In 2008, Nevada (NPC and SPPC) DSM programs are projected to reduce total summer peak load by 182 MW and total energy consumption by 614 GWh.[63] [64] In addition to savings generated from avoided fuel costs, conservation programs provide an array of non-energy benefits to consumers. There is tremendous potential for significant increases in load reduction in Nevada. Southern Nevada is particularly well suited for DSM due to frequent weather-induced peaking and Nevada has yet to realize much of its load reduction potential. In a 2006 study of energy efficiency in 13 western utility resource plans, SPPC and NPC ranked 11th and 12th, respectively, in terms of DSM program effects as a percentage of total energy requirements.[65] Southwestern Energy Efficiency Project (SWEEP) reports that recent adopted and proposed DSM program expenditures have moved SPPC and NPC to higher rankings relative to other western utilities.[66] However, even with this improvement additional utility and non-utility programs could be implemented and fully reflected in forecasts. Chapter 2 discusses these possibilities in detail.

Existing and Planned Electricity Generation Resources in Nevada

Nevada Utilities currently own interest in generation facilities capable of producing 5674 MW of electricity. The stock of utility generation is comprised of coal, gas, gas/oil and diesel powered facilities. Neither NPC nor SPPC own significant sources of renewable or hydroelectric generation. Instead, they receive geothermal, solar and biomass power from external contracts and qualifying facilities (QF), which use waste heat to produce thermal energy alongside electric energy.

Nevada's utility-owned generation portfolio is characterized by a high proportion of gas relative to other fuel sources; 66% of state utility generation is currently gas-fired, 24% is coal-fired, 9% is gas/oil-fired and just under 1% is diesel-fired. Following large-scale coal procurement in 2012 and 2013, Nevada's utility owned generation mix would consist of 55% gas, 37.5% coal, 7% gas/oil and roughly 0.5% diesel.[67]

Roughly 3922 MW or 70% of the current stock of Nevada utility owned generation is operated by NPC. Of this 3922 MW, 74% or 2910 MW presently comes from gas-fired generation. NPC owns and operates several large gas-fired power plants including the combined-cycle facilities, Lenzie 1 and 2, which have a combined total of 1102 MW. The majority of the power is generated at the five Reid

63 NPC. *2006 Integrated Resource Plan 2008-2027.* Vol. 4, Load Forecast and Market Fundamentals, p. 10.

64 SPPC. *2007 Integrated Resource Plan 2008-2027.* Vol. 1, Summary. p. 7.

65 Hopper, N., Goldman, C., Schlegel, J. *Energy Efficiency in Western Utility Resource Plans: Impacts on Regional Resource Assessment and Support for WGA Policies*. Lawrence Berkeley National Laboratory, August 2006, p. 23.

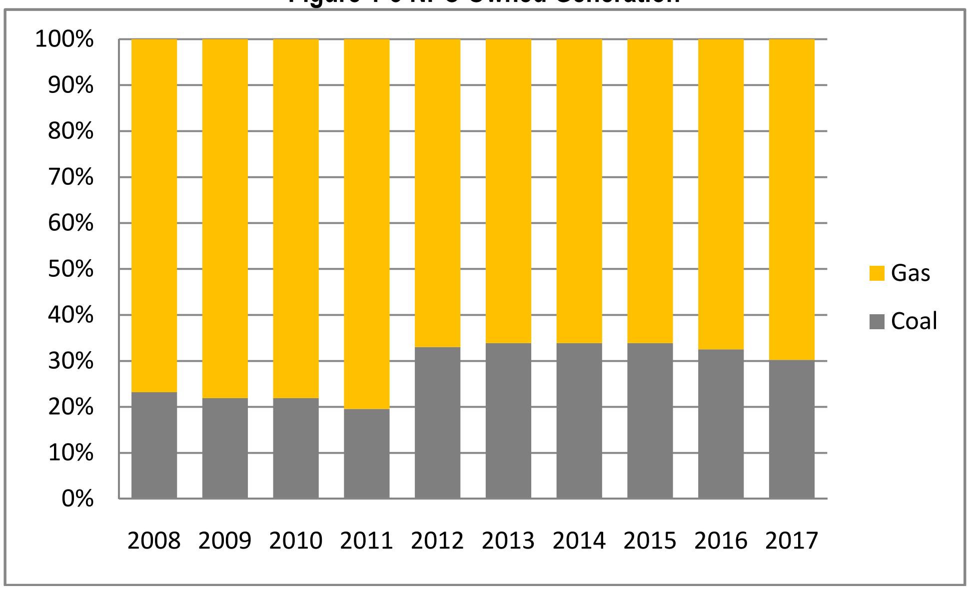
66 H. Geller. SWEEP. *Update on Energy Efficiency Efforts in Western States*. Presentation at the Energy Efficient Buildings Workshop, Denver, CO. July, 17, 2007. Nevada utility DSM program expenditures increased by 157% from 2005 to 2007; total DSM program expenditures for all Utilities in the Southwest region increased by 86% over the same period.

67 This calculation is based on an analysis of SPPC and NPC loads and resources tables provided in company integrated resource plans with one exception: these figures reflect the assumption that 500 MW of gas capacity from the not-yet-approved Harry Allen facility will become available in 2011.

Gardner facilities to the northeast of Las Vegas. NPC will retire three of these facilities (300 MW) in 2012, the same year the Utilities anticipate completion of EEC phase one.[68]

In 2008 NPC owned interest in coal, gas and hydroelectric generation facilities amounting to 3922 MW. If the Ely Energy Center first coal unit were still projected to be completed on time, NPC owned generation would be expected to reach 4907 MW by 2012. As reflected in Figure 1-3, approximately 74% of NPC's current generation is fueled by natural gas, 21% by coal and 5 % by hydroelectric sources. If the announced Harry Allen plant is approved and completed, NPC's internal generation would be comprised of roughly 82% gas and 18% coal.

Figure 1-3 NPC Owned Generation



Source: Nevada Power Company Resource Plans

As indicated by Figure 1-4, SPPC's generation fleet includes gas, gas/oil, coal, and diesel facilities.[69] Currently, SPPC's generation portfolio encompasses 1247 MW of gas (71%), 464 MW of coal (26%) and 41 MW of diesel (0.02%). With a maximum capacity of 541 MW, the Gas CC unit at the Tracy Station site is the largest single generation facility owned by SPPC.[70]

Over 20% of Nevada's energy supplies come from non-utility sources and the majority of Nevada's non-utility generation serves the southern portion of the state. As a group, Nevada's non-utility energy resources are quite varied; they include an array of cogeneration from QFs, renewable energy contracts, short and long term natural gas contracts, and other generic contracts. Presently, gas contracts account for 44% or 647 MW of state non-utility owned generation and are forecasted to remain the dominant source of non-utility generation until 2012. In 2012, renewable energy will account for more than 40% or 503 MW of non-utility generation, followed by gas contracts (35%), and cogenerating QF (24.5%).[71]

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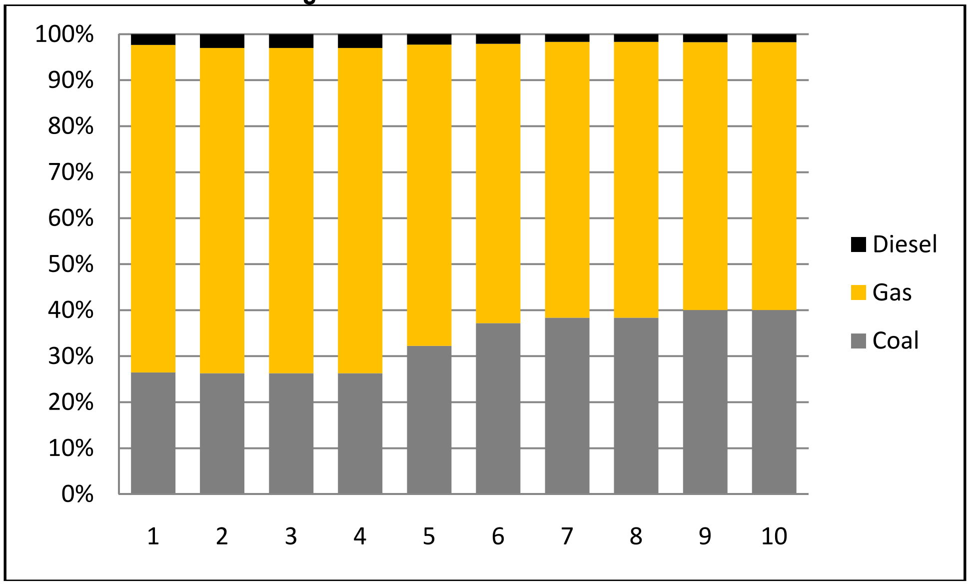
68 NPC. *2006 Integrated Resource Plan 2008-2027.* Vol. 1, Summary, p. 19.

69 Gas/Oil burning facilities have been added to Gas facilities.

70 SPPC. *2007 Integrated Resource Plan 2008-2027.* Vol. 1, Summary, p. 16. Figures were calculated directly from SPPC's loads and resources table.

71 Op. cit.

Figure 1-4 SPPC Owned Generation



Source: Sierra Pacific Power Company Resource Plans

According to NPC and SPPC Integrated Resource Plans, the Utilities expect that an array of geothermal, solar and wind purchases will contribute significantly to resources in 2010 and 2012. The initial increase of renewable purchases in 2010 is anticipated to occur almost exclusively within northern Nevada as a result of geothermal and wind contracts.

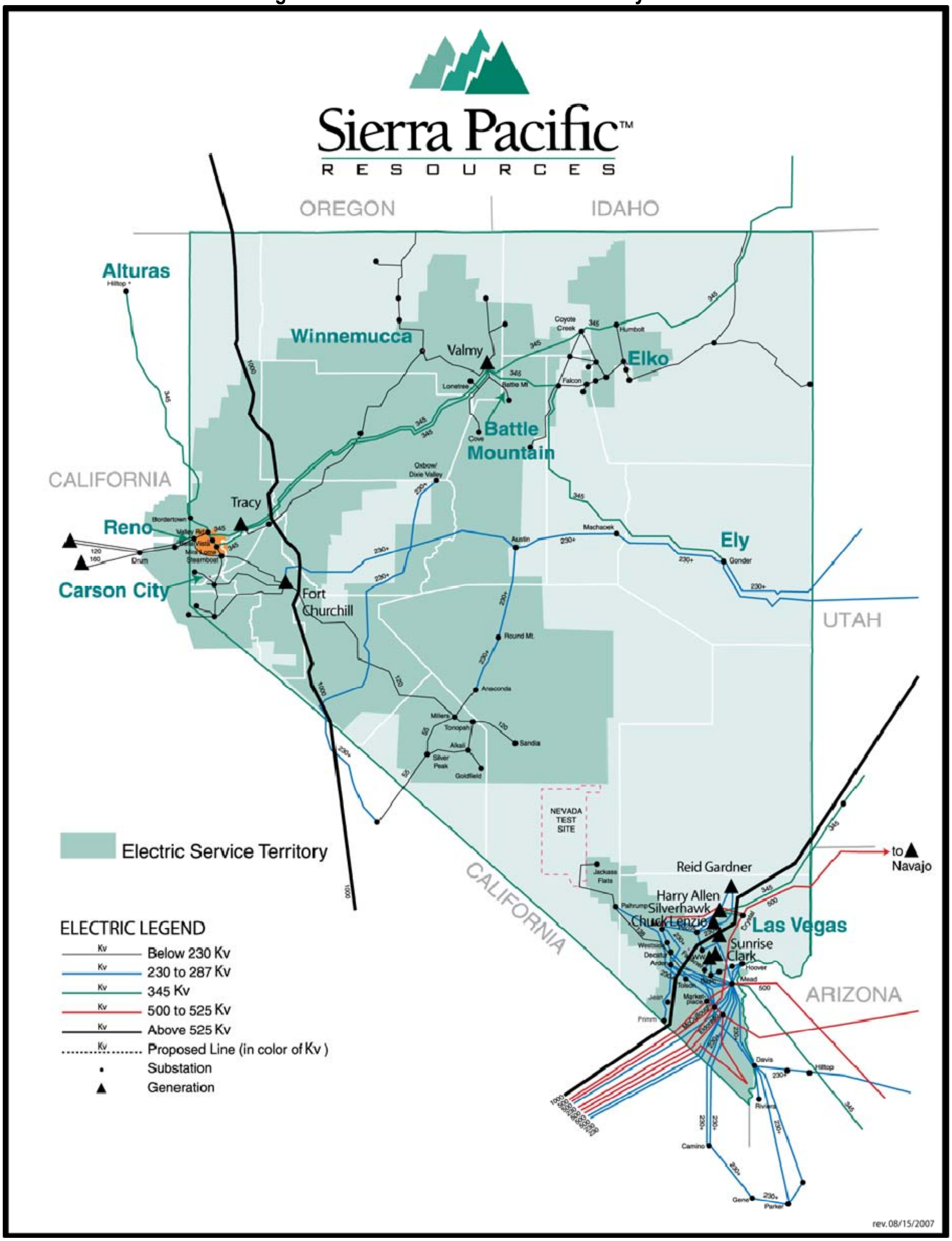
Aside from an unspecified 33 MW solar contract in 2011, NPC supply plans do not explicitly indicate any renewable purchases prior to interconnection with SPPC in 2012. After 2012, NPC plans to access a significant amount of geothermal power from Northern Nevada. As such, the execution of NPC's renewable resource purchases is contingent on system interconnection with SPPC. The renewable additions will be discussed in more detail in Chapter 3.

Nevada's Transmission Systems

The NPC transmission network interconnects with neighboring systems in Arizona, California and Utah at three major inter-ties. NPC plans, builds and operates a transmission system that delivered 22,408,623 MWh of electricity to customers on its transmission system in 2006. The NPC system handled a peak load of 5623 MW in 2006 through 2062 circuit miles of transmission. The Eldorado Valley interconnection is NPC's largest, capable of importing up to 2800 MW of capacity from outside NPC's system. NPC's transmission system features three 500 kV lines extending from Crystal to Harry Allen, Harry Allen to Northwest and Harry Allen to Mead.

Northern Nevada's electrical connection with the western grid is established through Transmission interconnections to California, Idaho and Utah. In the Reno area, a 345 kilovolt (kV) line runs from North Valley Road and Mira Loma to Tracy. Two 345 kV lines extend North from Tracy to Valmy in the north central portion of the state. A 345 kV line connects Valmy to the Gondor substation outside of Ely. Figure 1-5 includes SPPC's major transmission lines, and inter-ties with other systems.

Figure 1-5 NPC and SPPC Transmission System

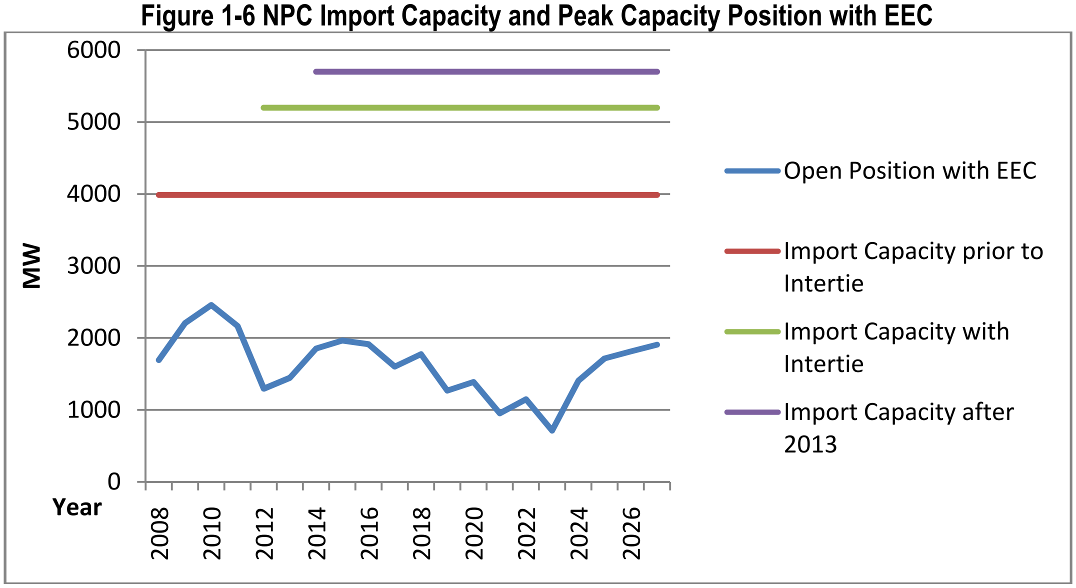


Source: Sierra Pacific Resources, 2007

SPPC and NPC have traditionally relied upon imports to serve a portion of their energy needs. The simultaneous import capacity into southern Nevada of 3988 MW provides access to generation just outside the distribution system and a significant amount of import potential that reaches into the southwestern power pool. The simultaneous import capacity for northern Nevada is 1000 MW, 717 MW of which are available to serve SPPC native load customers.[72] The factors most relevant to assessing the ability of NPC and SPPC to meet their peak loads include the open position prepared by Utilities for their public documents, import capacity into the control areas, available import capacity to serve native loads, non-utility generation within the control area that can be scheduled or counter scheduled to meet needs, and the complete implementation of Federal Energy Regulatory Commission (FERC) order 890. The open position of the respective Utilities and the transmission import capacities are shown on the figures below. The stated open position reflect loads and resources that are identified in the most recently available documents with the one exception that the NPC stated open position shown reflects 500 MW of new contracts or capacity. This additional resource was added because it is assumed that at least 500 MW associated with the Dynegy natural gas tolling contract, the announced Harry Allen combined cycle, or some other contract or resource will become firm by 2011. Of course, if more than one of these events happen then the NPC open position would be substantially smaller than shown. Both the NPC and SPPC open positions can also be dramatically affected by additional efficiency and distributed generation efforts. The amount of transmission available for import is constrained by existing contracts and is also affected by the Available Transmission Capacity (ATC) methodology employed.

The significant import capabilities mean that SPPC and NPC have been able to operate with a considerable open position in the past. Based on utility estimates, the difference between projected state load (plus planning reserves) and resources and thus the need for imported or in-basin purchased power will reach 2285 MW in 2010. The energization of the new Tracy Combined Cycle in SPPC's control area will mean that SPPC will be largely self-sufficient even at peak demand until 2016. As indicated by Figure 1-6, the net open energy position for Nevada's Utilities is entirely due to NPC if the EEC is completed.

Figure 1-6 NPC Import Capacity and Peak Capacity Position with EEC

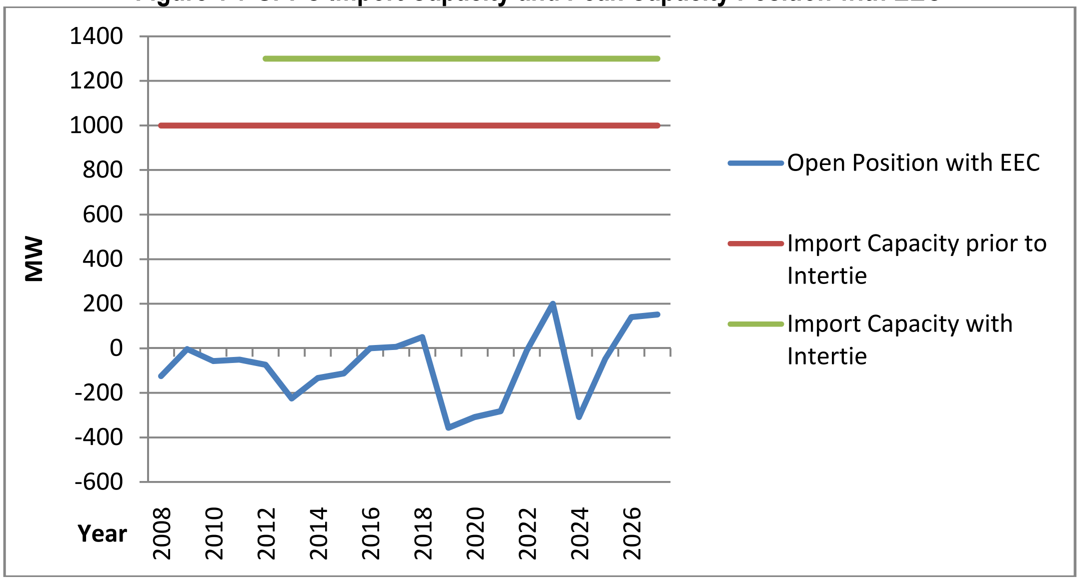


Source: Nevada Power Company Resource Plans

72 Nevada State Office of Energy (NSOE), 2007. *Status of Energy in Nevada: Report to Governor Gibbons and the Legislature*. May 21, pp.31-43.

Examination of Figure 1-6 indicates that NPC is planning to use about 2300 MW of import capacity in 2010 to meet its peak load. Since the net open position reaches about 2300 MW in 2010 and the Utilities indicate no difficulties in meeting load that year, one may presume that a lower limit of available imported and within-control-area-purchased energy in the near term to help meet load will be at least 2300 MW, with or without the EEC.

Figure 1-7 SPPC Import Capacity and Peak Capacity Position with EEC



Source: Sierra Pacific Power Company Resource Plans

However, Figures 1-6 and 1-7 presume that the EEC transmission line and first coal unit is completed in 2011. The absence of 1500 MW of coal-fired generation apparently increases Nevada's open position as indicated by Figures 1-8 and 1-9 below. Assuming EEC is unavailable to serve load, Nevada's open energy position increases by an additional 750 MW in 2012 and 1500 MW in 2013. Based on utility estimates, this would yield an open energy position greater than 2500 MW in 2011 and 3500 MW in 2015.

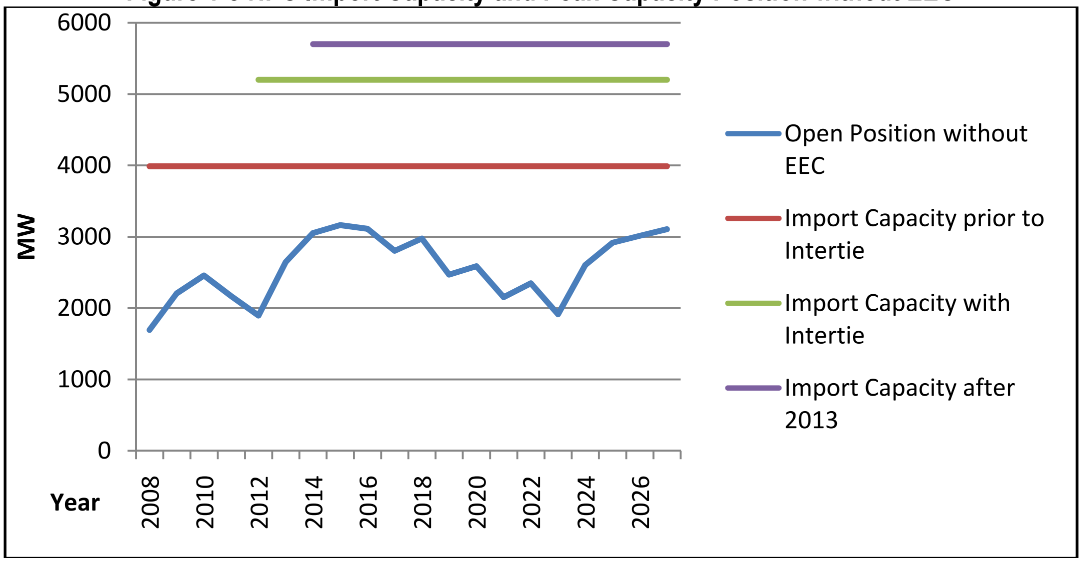
Figure 1-8 below illustrates NPC's open positions from 2008-2017. Given NPC's demonstrated ability to use 2,300 MW of purchased energy to meet its open position in 2010, the net need for new resources in 2011 if the first coal unit is not operational is 2500 MW minus 2300 MW, or about 200 MW. By 2013, the NPC need grows to about 3500 MW minus 2300 MW or about 1200 MW. However these "needs" presume that NPC can only import or purchase 2300 MW. To the extent NPC can import or purchase more than 2300 MW the need will be smaller. To the extent that NPC experiences slower growth rates in demand due to efficiency or distributed generation programs, the need will be smaller.

Unlike some other states in the Intermountain West, Nevada does not have significant fossil fuel reserves and imports natural gas and coal supplies from other states. However, Nevada is fortunate to have significant endowments of geothermal, solar and wind potential. As of 2008, Nevada will lead the nation in terms of solar energy production per capita and geothermal energy use per capita.[73] Furthermore, there is vast additional renewable resource and energy efficiency potential that is only beginning to be developed. For example, in its most recent supply side plan, SPPC outlined a request to undertake transmission routing studies that would integrate 1000 MW of renewable energy in

73 National Priorities Project Database. Retrieved on December 10, 2007 from http://www.nationalpriorities.org/database.html

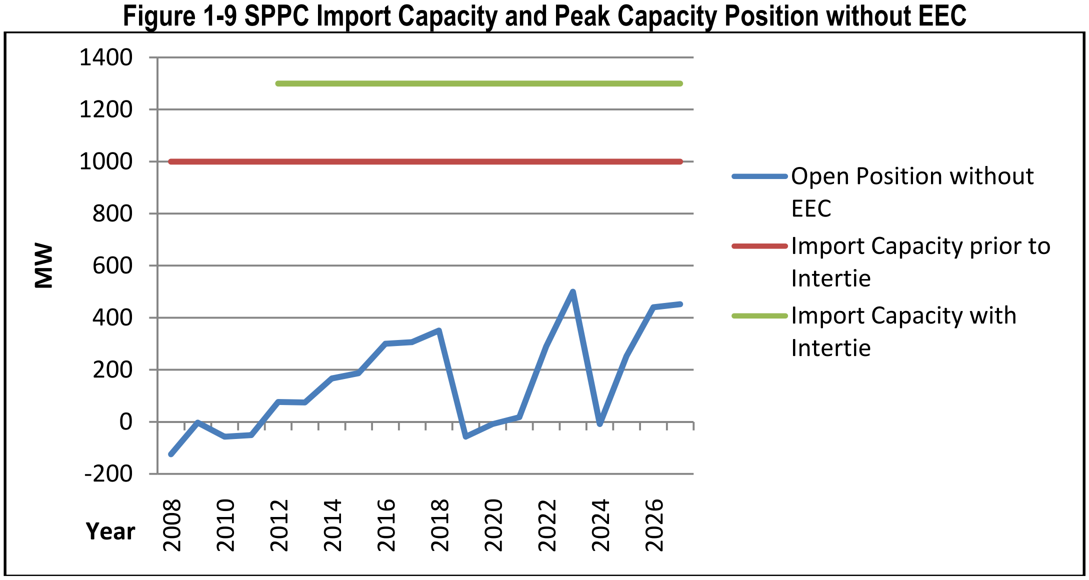
northern Nevada for the benefit of northern and southern Nevada.[74] In one instance, SPPC estimated a potential for an additional 500 MW of wind generation proximate to existing transmission paths.[75]

Figure 1-8 NPC Import Capacity and Peak Capacity Position without EEC



Source: Nevada Power Company Resource Plans

Figure 1-9 SPPC Import Capacity and Peak Capacity Position without EEC



Source: Sierra Pacific Power Company Resource Plans

The value of having the increased transmission import capability that comes with a north-south interconnection is obvious in the above figures. If the inter-tie is not completed by 2011, SPPC reserves and the renewable energy resources planned to be developed between now and 2012 would not be available to serve NPC load. Unfortunately, there is not currently a firm commitment to proceed with a north-south inter-tie if the EEC coal plants are not built. The inter-tie creates the transmission capacity for an additional 1500 MW of capacity from the north to the south and that additional capacity could help to cover southern Nevada's needs for years to come with Nevadan and regional resources.

74 SPPC. *2007 Integrated Resource Plan*. Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan, p. 98.
75 Op. cit, p. 101.

Meeting Nevada's Portfolio Standards

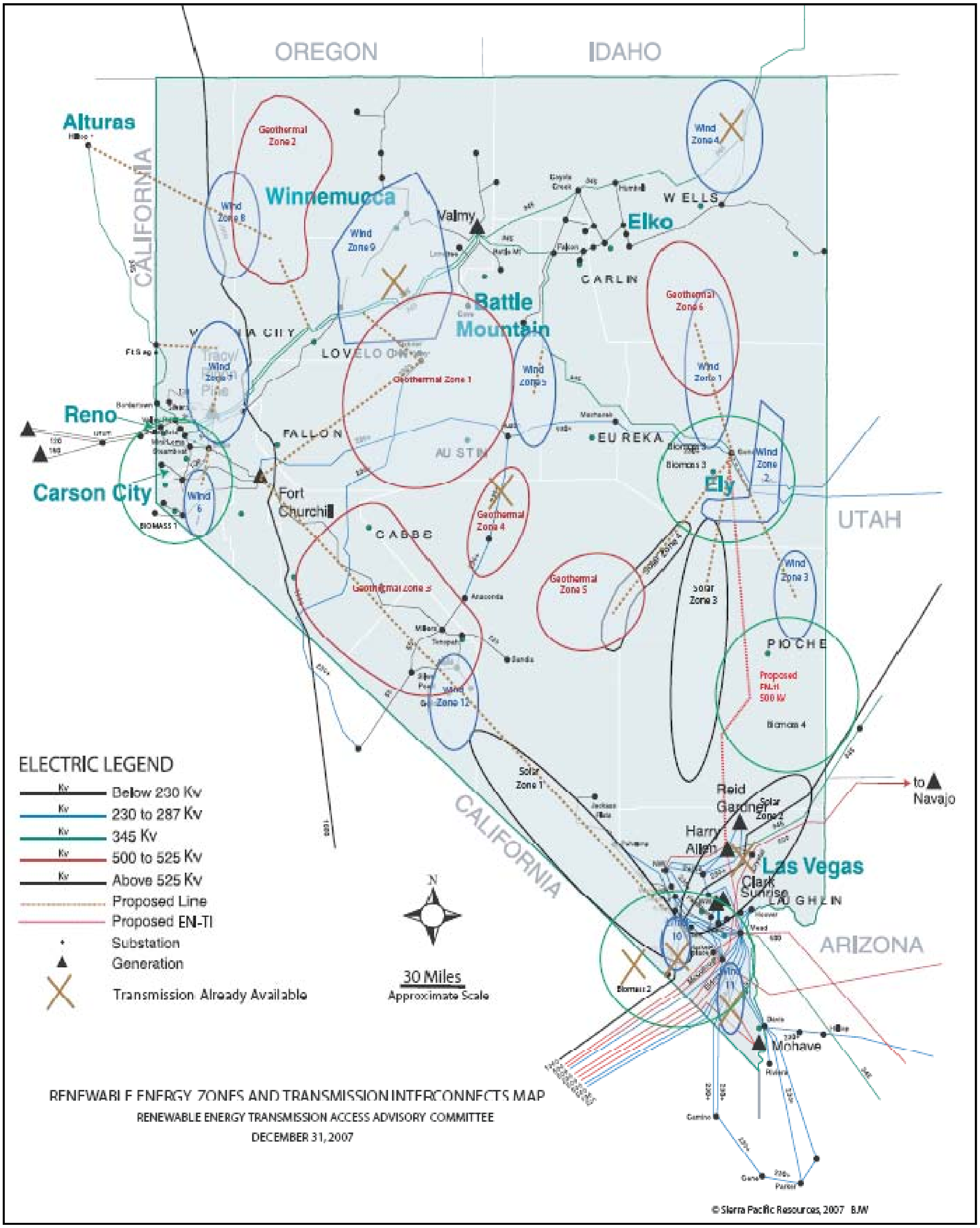
Construction of the Utilities' EN-ti project is expected to begin in early 2008 and is scheduled for completion by summer 2012. Once completed the 250 Mile, 500 kilovolt (kV) EN-ti will connect the NPC and SPPC electrical systems. EN-ti will allow energy resources in northern Nevada to satisfy increasing demand in the South. The interconnection will also increase the relative attractiveness of Nevada's renewable energy resources. Chapter 3 discusses Nevada's renewable energy resource potential in detail but the RETAAC Nevada renewable energy zone map shown below (Figure 1-10) indicates the substantial quantity of geothermal and wind potential in northern Nevada that could complement the substantial solar potential in southern Nevada and fill a significant portion of a north-south inter-tie. Just as significantly, the completion of an inter-tie expands Nevada's capability to accommodate intermittent renewable resources. SPPC reports in its 2007 Integrated Resource Plan that it could accommodate up to 450 MW of intermittent wind resources near ideal conditions and NPC could accommodate up to 700 MW prior to the construction of the EN-ti.[76] After EN-ti, SPPC reports in its IRP that it would have the ability to interconnect between 1850 MW and 1925 MW of intermittent wind generation under ideal conditions.[77]

To their credit, the Utilites have sought approval of several transmission routing studies that would connect some the state's most promising wind and geothermal zones with the SPPC transmission system. The routing studies outlined in SPPC's 2008-2027 IRP would increase SPPC's transfer capacity to NPC and out-of-state uses. According to company estimates, the transmission line options considered in the routing studies could receive a 1000 MW increase in unspecified generation from remote locations across Northern Nevada. The transmission projects are aimed at interconnecting geothermal and wind-powered generation with the SPPC transmission system. A capacity of at least 500 MW of wind generation has been identified along the existing Ft Sage to Raven line route northeast of Reno. The eight 345 kV transmission line routes to be studied by SPPC are listed in Table 1-1.

76 Op. cit, p.86.

77 Op. cit.

Figure 1-10 Renewable Energy Zones and Transmission Interconnects Graph (RETAAC)



Source: RETAAC, 2008.

Table 1-1 Proposed Transmission Routing Studies

Line Project	Length (miles)	Notes
Ft. Sage – Raven Substation	64	500 MW or greater potential along the existing 345 kV line which require improvements in order to accommodate.
Emma – Ft. Churchill	30	
Ft. Churchill – Esmeralda	120	Potential to move electricity between Southern and Northern Nevada
Esmeralda – S. Canyon Substation	180	Includes a 120 kV line route to Millers Substation
Ft. Churchill – Dixie Substation	111	Near Carson Lake and Dixie Valley Geothermal areas.
Oreana – Dixie Substation	45	Shortest line into Dixie Valley generation area
Valmy – Dixie Substation	81	When EN-ti is completed, this line could provide a direct route to move power from the Dixie Valley.
Falcon – Humboldt Substation	51	Increases export capability of Humboldt to Midpoint Intersection.

Source: Sierra Pacific Power Company Resource Plans.

Regional Resource Margins

Planning Nevada's resource additions in the context of surrounding states in the WECC is important because it broadens the opportunities for identifying both potential low-cost, attractive resources, and partners who may want to participate in transmission projects to move those resources to their service areas as well. The place to start this assessment is the WECC's *2007 Power Supply Assessment*. The WECC report identifies transmission "bubbles" in which it is more difficult to move electricity in, and/or, out of the system during peak load periods, and the expected resource "balance" between generation and demand within those bubbles and regional aggregation of those bubbles.

Table 1-2 summarizes the results of WECC's 2007 probabilistic analysis after including all of its "more likely" resources.[78] Northern Nevada falls into WECC the Basin region along with Idaho, Utah and the Intermountain Power Project; southern Nevada is in the WECC Desert Southwest region with Arizona, New Mexico and the power plants at Palo Verde and Four Corners. This analysis shows that the Basin region has sufficient capacity until 2013 if the Ely plant is built in 2012, but then it falls below resource adequacy by 2013. The Desert Southwest region is short by 2011 and rapidly loses ground. On the other hand, the Northwest and Canada reveal large supply excesses that last past 2016.

Table 1-2 Power Supply Margin (MW) by Sub-Region with Coal Plants Included

Sub-region	2008	2009	2010	2011	2012	2013	2014	2015	2016
Canada	2,250	2,119	1,846	2,457	1,781	1,470	1,128	915	575
Northwest	9,143	9,163	7,866	7,536	7,085	7,003	6,094	5,595	5,000
North	*11,393*	*11,282*	*9,712*	*9,993*	*8,866*	*8,473*	*7,222*	*6,510*	*5,575*
Basin	9	0	32	0	1,036	(759)	(1,087)	(726)	(1,762)
Rockies	138	500	0	380	223	(124)	(1,114)	(1,526)	(1,918)
Desert SW	321	283	509	(1,076)	(2,576)	(4,655)	(5,429)	(6,621)	(8,007)
No.CA	3,733	645	609	54	0	(413)	(503)	(1,397)	(1,929)
So.CA/MX	4,072	5,965	4,242	2,610	(528)	892	(1,533)	(2,090)	(3,252)
South	*8,273*	*7,393*	*5,392*	*1,968*	*(1,845)*	*(5,059)*	*(9,666)*	*(12,360)*	*(16,868)*

Source:WECC 2007 Power Supply Assessment.

78 These fall into Class 1, 2 and 3 resource types discussed in the WECC report. The results shown are from Case #3 with Classes 1-3 Resources and fixed transfers capabilities between bubbles.

Table 1-3 shows the same results, but excluding the coal plants planned in the region. This could be the scenario if strict greenhouse gas (GHG) emission restrictions are adopted across the region, or even if investors decide that building such plants is risky in the face of substantial regulatory uncertainty. In this case, northern Nevada falls into deficit one year earlier, but the Desert Southwest is only about 1000 MW lower throughout the same period. The Northwest surplus is reduced about 2000 MW by 2016, but still is greater than 3000 MW *before* adding significant longer-term resources after 2011.

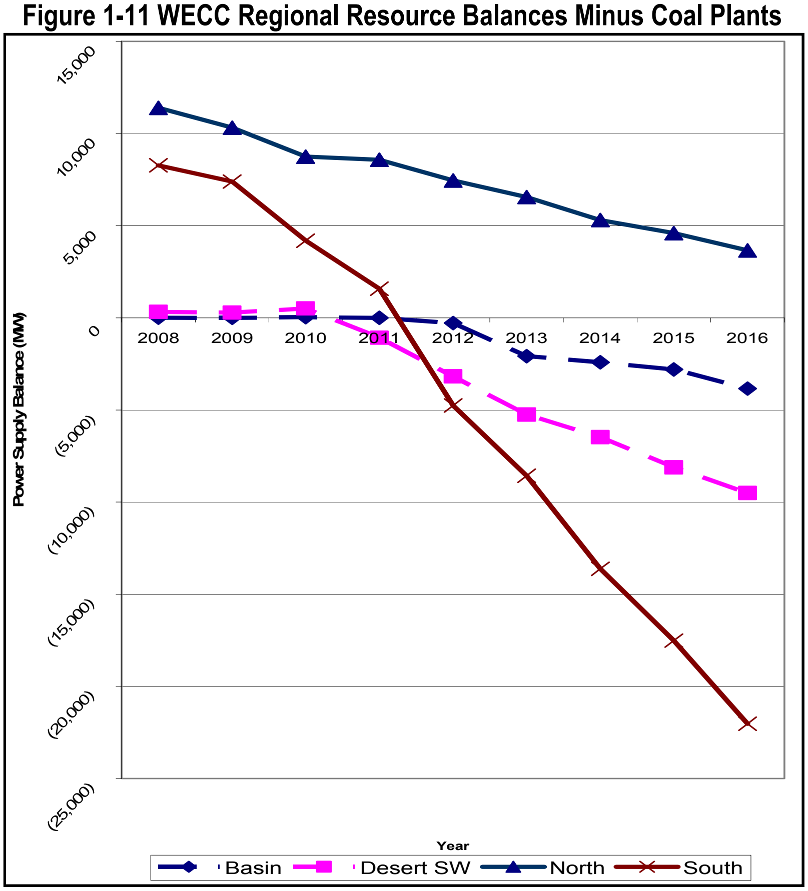
Table 1-3 Power Supply Margin (MW) by Sub-Region Minus Coal Plants

Sub-region	2008	2009	2010	2011	2012	2013	2014	2015	2016
Canada	2,250	2,119	1,846	2,457	1,781	1,470	1,128	915	575
Northwest	9,143	8,195	6,898	6,118	5,667	5,085	4,176	3,677	3,082
North	*11,393*	*10,314*	*8,744*	*8,575*	*7,448*	*6,555*	*5,304*	*4,592*	*3,657*
Basin	9	0	32	0	(289)	(2,084)	(2,412)	(2,801)	(3,837)
Rockies	138	500	0	(5)	(762)	(1,709)	(2,699)	(3,111)	(3,503)
Desert SW	321	283	509	(1,076)	(3,176)	(5,255)	(6,479)	(8,121)	(9,507)
No.CA	3,733	645	609	54	0	(413)	(503)	(1,397)	(1,929)
So.CA/MX	4,072	5,965	3,042	2,610	(528)	892	(1,533)	(2,090)	(3,252)
South	*8,273*	*7,393*	*4,192*	*1,583*	*(4,755)*	*(8,569)*	*(13,626)*	*(17,520)*	*(22,028)*

Source: WECC 2007 Power Supply Assessment.

Figure 1-11 shows the balances for the north and south sides of the western transmission divide and for the Basin and Desert Southwest regions.

Figure 1-11 WECC Regional Resource Balances Minus Coal Plants



Source: M Cubed

However, it is important to note how conservative the WECC analysis is in assuming what resources will be available in the future. It counts generation plants that are "committed" in some manner, and leaves little room for the "market-driven" resources of the type that have arisen in the last 20 years to meet growing demand in the west. This omission by WECC occurs because many of those plants are not owned by load-serving entities (LSEs) that are the majority of members in the WECC. Because power plants are rarely committed to more than four years out, the planning horizon for the WECC essentially ends in 2011, four years from 2007. In contrast, the California Energy Commission (CEC) maintains an extensive database of identified power plants under or being considered for development in the WECC.[79] Comparing the two databases highlights the contrast. Through 2011, the CEC shows 20,305 MW more of identified potential available resources than the WECC, and the CEC sees an additional 70,712 MW of development potential after 2017. Most of that difference is in gas-fired plants in California that have siting permits in hand from the CEC, but have delayed construction for economic reasons, and coal-fired plants throughout the rest of the West, with more than 5,000 MW of wind power projects also identified. Compared to the CEC data, it is apparent that the WECC analysis is only a starting point for making an assessment of resource needs, but it is not adequate to planning for resource additions in the most prudent manner. That can only be done in an integrated resource plan that accounts for a range of potential outcomes.

The WECC report highlights that substantial capacity is available in the Northwest, but that it is bottled up behind a transmission barrier in Idaho. Another bottleneck for getting power to southern Nevada is the lack of an inter-tie across the state—the power must be routed through Utah. At the other end, other Desert Southwest utilities could benefit from acquiring the excess Northwest capacity. This raises the potential for finding partners in developing a means of transmitting power from the Northwest to the Southwest.

In addition, substantial gas-fired capacity that is not accounted for in the WECC report could be constructed on relatively short notice in California. Given the restrictions on GHG emissions from new generation now incorporated into California state law, its utilities may be forced to look internally for new generation. These factors could relieve California's demand for generation elsewhere in the West, thus allowing the Nevada Utilities to acquire it instead.

Accessing Regional Resources

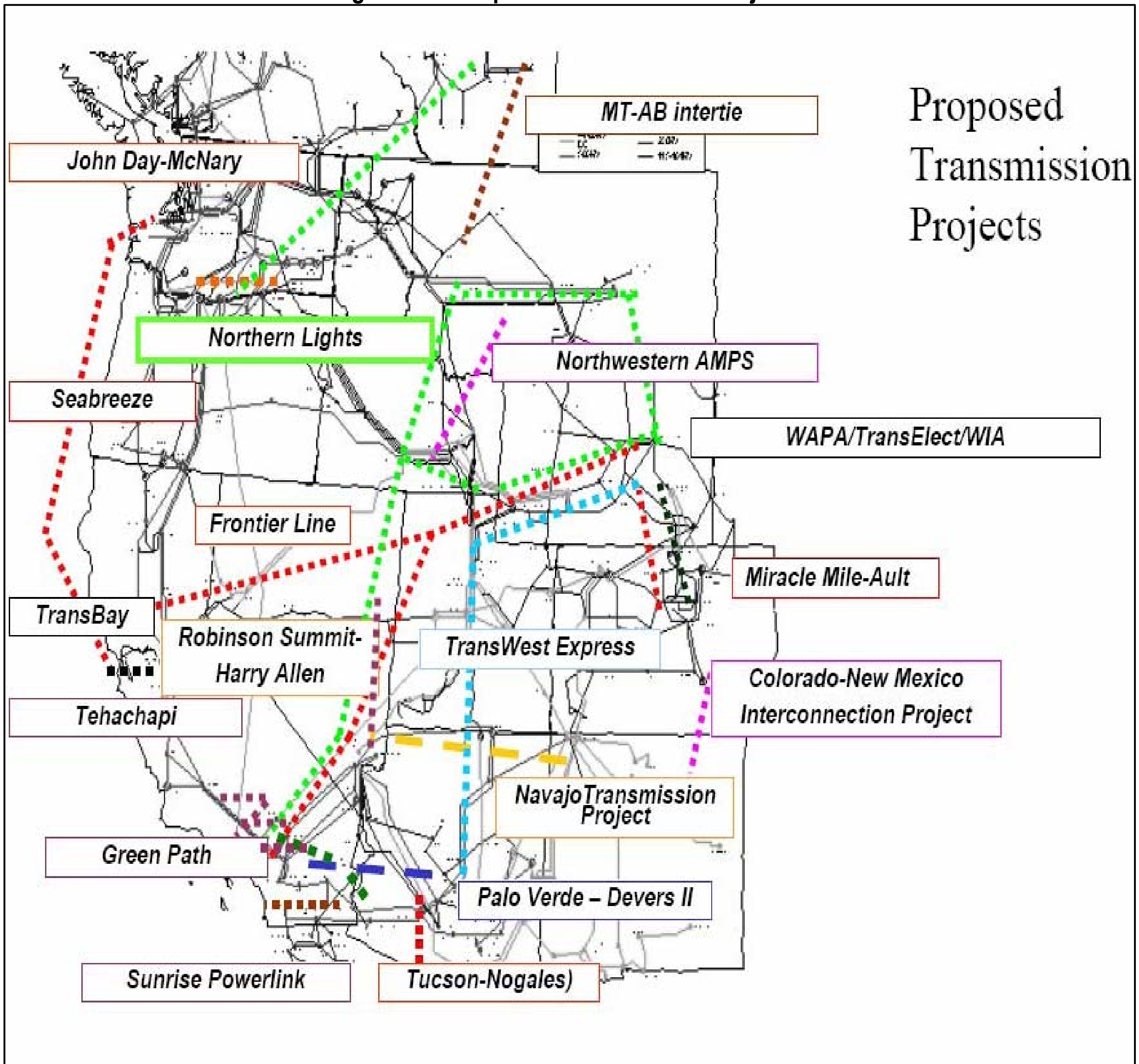
Transmission expansion in the west is active and a map of the interstate projects proposed as of the fall of 2007 is shown on the following page.[80] Federal Energy Regulatory Commission (FERC) order 890 provisions that will be discussed in chapter 5 appear to have had a positive effect on transmission project development and the large number of active projects seems to offer opportunities for NPC and SPPC to partner in regional energy development projects. Figure 1-13 shows the paths contemplated by the TransWest Express project and shows how a north-south inter-tie in Nevada from Midpoint, Idaho to Harry Allen could be coordinated with that project.[81] SPR filed a December 7, 2007 response to FERC's Order requiring an updated Schedule K that more fully reflects the intent of Order 890's nine planning principles. SPR Schedule K indicates a number of initiatives the SPR is already pursuing to meet the openness, coordination and transparency requirements of FERC. The plethora of projects under consideration and the encouragement of FERC both indicate that substantial opportunities appear to be available for partnering with others in the west to meet regional resource needs.

79 The most recent update available from www.energy.ca.gov was posted on September 5, 2007.

80 See Figure 1-12, Proposed Transmission Projects.

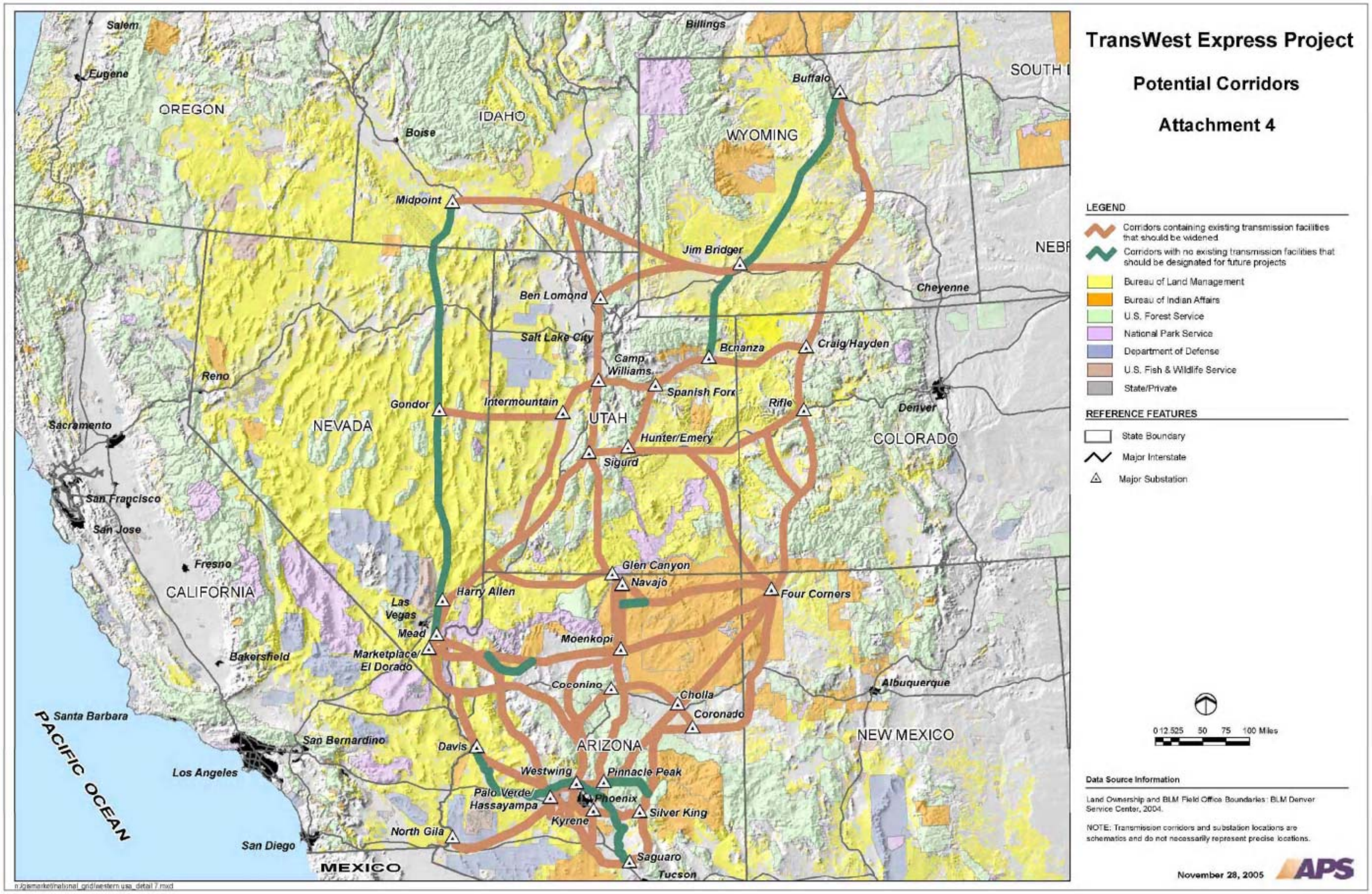
81 See Figure 1-13, TransWest Express Projects.

Figure 1-12 Proposed Transmission Projects



Source: Western Governor's Association. *CDEAC Transmission Project Report: Report of the Transmission Task Force,* May 2006.

Figure 1-13 TransWest Express Project



Source: Smith, B. "APS Transmission Planning," presented at the 2006 Southwest Transmission Expansion Plan (STEP) Meeting, San Diego, CA, January 24, 2006.

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Chapter 2 Improving Efficiency

Accessing renewable energy and existing reserves in the north is a necessary but not a sufficient condition for addressing the needs resulting from Ely coal plant delays. Assessing the demand impacts of non-utility efficiency programs, expanding utility and non-utility efficiency programs, and improving access to distributed resources are each critical to ensuring that Nevada's electricity needs will be met in a cost-effective and environmentally sound manner.

Further delays in the EEC coal plants may justify additional investment in efficiency including, but not necessarily limited to, expanded utility DSM programs and further improvement in local or state codes and standards. Accessing some DG and demand side capacity resources is possible without investment in new demand side infrastructure. However, additional distributed generation (DG) contributions to reliability become possible with investments in a more sophisticated distribution and energy services delivery infrastructure in Nevada. Table I-1 includes a very conservative estimate of 395 to 630 MW that efficiency, distributed resources and demand side resources could contribute by 2013. This aggregate estimate of conservative savings potential is a combination of the effects of: (1) fully capturing existing programs in the utility demand forecasts, (2) expanding existing utility programs, (3) fully capturing existing non-utility standards programs in the forecasts, and (4) expanding DR and DG programs.

Utility and Non-utility Efficiency Programs

Accounting for All Existing Programs in the Forecast

Utility forecasting of energy and demand should properly account for the effects of non-utility and utility DSM programs. SPPC and NPC deduct projected first year DSM savings from energy forecasts. However, there have been discrepancies between reported savings in utility load forecasts and DSM filings. SPPC acknowledged that its estimate of energy savings from DSM programs used in its load forecast was off by 27 GWh.[82,83] Such discrepancies are inevitable given the requirement that the Utilities provide DSM savings estimates to their internal resource planners relatively early in the resource planning process. Nevertheless, this difference along with additional discrepancies attributable to expansions in DSM programs must be noted so load forecasts can be adjusted accordingly.

To NPC's credit, it has continued to pursue and expand cost-effective DSM programs as evidenced by its recent DSM amendments.[84] Unfortunately, expansions in the DSM programs do not get immediately translated into an updated load forecast. If such savings are not properly accounted for, utility load forecasts are too high and overestimate the need for additional supply-side resources

Future utility forecasts should also validate that savings from all utility and non-utility programs are subtracted from projected loads. Load forecasts should also reflect savings associated with lamp

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82 Direct Testimony of Howard Geller on Behalf of Nevadans for Clean Affordable Reliable Energy (NCARE). *Public Utilities Commission of Nevada. Docket No. 07-06049*. October 17, 2007, p.18.

83 Pre-Filed Rebuttal Testimony of Rick Thompson on Behalf of Sierra Pacific Power Company. *Public Utilities Commission of Nevada. Docket No. 07-06049*. October, 2007, p.7.

84 NPC. *2006 Integrated Resource Plan 2007-2026*. Vol. 3, Fifth Amendment to the Action Plan, Demand Side Plan.

standards, federal and state building codes, and appliance efficiency standards. NPC has already conceded in the 2007 Energy Supply Plan docket that the effect of lamp standards on demand should be separately accounted for in its future forecasts and it has committed to address this problem in its next forecast.[85] This correction will be a step in the right direction but a good forecast should fully account for all utility and non-utility programs in all resource plan filings from this point forward.

Appliance and Lamp Standards

The enactment of recent lamp standards in Nevada will generate a substantial level of energy savings. Southwest Energy Efficiency Project (SWEEP) estimates of projected cumulative energy savings estimates resulting from these lamp standards by 2013 are roughly 1900 GWh. Some of these lamps are in use in homes or commercial buildings during peak demand periods. Assuming only one in five lamps is on and saving energy during times of peak demand, the peak demand reduction due to the lamp standards would be about 200 MW by 2013.[86] Further savings would occur later in the decade after the stock of incandescent lamps is fully replaced. Therefore, a conservative estimate of potential energy efficiency savings in the range of 100 – 150 MW is reported in Table I-1. Energy savings from appliance standards enacted prior to 2007 and anticipated changes to future standards will further equip Nevada with energy efficient resources. The Energy Policy Act of 2005 (EPAct 2005) and the 2007 Energy Bill both included mandatory appliance efficiency standards on a variety of products. This appears to constitute structural changes in energy consumption; however, no adjustment in energy forecasts to reflect these new standards are apparent in NPC or SPPC resource plan filings. In addition, DOE Rulemakings have resulted in updates. For example, EPAct 2005 increased the minimum air conditioner efficiency standard from 10 Seasonal Energy Efficiency Ration (SEER) to 13 SEER that took effect in 2006. This improvement in baseline air conditioner energy efficiency rendered utility air conditioner rebate programs largely cost ineffective, but it also needs to be accounted for in load forecasts. There will be much larger energy savings than what had been previously assumed from utility rebate program because all new central air conditioners sold starting in 2006 (once older inventory is exhausted) will meet this efficiency threshold. It does not appear that NPC's and SPPC's forecasts reflect this and other national energy efficiency standards.

The American Council for an Energy Efficiency Economy (ACEEE) estimated that 4% of projected nationwide electricity consumption will be reduced through appliance standards enacted prior to 2007 and an additional 1.6% of national energy consumption will be saved from EPAct standards and provisions by 2030.[87] By applying ACEEE's result to NPC and SPPC 2007 forecasted energy sales, the amount of energy saved in Nevada through EPAct could be 7 MW per year starting in 2009.[88]

Taken together, changes in appliance standards, the Nevada lamp standard, and changes in building codes as well as the success of the ENERGY STAR homes program should significantly reduce future energy consumption. However, the effects of these policies and programs are not accounted for in

85 Pre-Filed Rebuttal Testimony of Rick Thompson on Behalf of Nevada Power Company. *Public Utilities Commission of Nevada. Docket No. 07-07013*. October, 2007, p.3.

86 SWEEP. *Lamp Standards Analysis*. Provided by H. Geller on December 31, 2007.

87 ACEEE. *Appliance Energy Efficiency Standards in the 2007 Energy bill: Key Facts*. December 2007. See Chapter 3 of this report for details.

88 The estimate of 7 MW/yr was computed by multiplying ACEEE's implied contribution to peak by 31,411 GWh, the Utilities' forecasted level of energy sales for 2007. This estimate is conservative since it assumes no growth in utility energy sales after 2007.

utility forecasts. It is essential to account for the cumulative effect of DSM programs as well as these non-utility policies and programs in order to not overbuild costly electricity supply infrastructure.

Building Codes and Standards

Building energy codes and standards have also improved in Nevada, yielding significant energy efficiency gains. Furthermore, Nevada leads the country in terms of the fraction of new homes that are built to the more stringent, voluntary ENERGY STAR criteria. The fraction of new homes that are ENERGY STAR-compliant increased from about 25% of all new residential construction in 2003 to about 75% today.[89] A forecast based on historical trend data alone cannot capture a change this rapid and significant – such a forecast requires estimates of transformative responses as well.[90] Furthermore, Clark County, the Cities of Las Vegas and Henderson, Washoe County and Carson City have each adopted the 2006 International Energy Conservation Code and one would expect this to lower NPC's and SPPC's respective peak load forecasts since that forecast relies on historic data and does not account for structural changes in the way that consumers use energy in Nevada. Without an adjustment to account for the effect of better building standards, the energy use per customer trends will be systematically too high.

SWEEP estimated in 2005 that Nevada could achieve a peak demand savings of 319 MW from updated commercial building energy codes by 2010.[91] Furthermore, SWEEP's High Performance Homes analysis suggests that 309 MW of residential peak demand savings could be attainable by 2020 if new homes maximize use of cost-effective energy efficiency and renewable energy measures.[92] To avoid double-counting potential energy savings from updated residential codes and a high performance homes scenario, only savings from the High Performance Homes Analysis were incorporated into the energy and demand savings estimate from upgrading residential building codes and standards. The range of estimates in Table I-1 represent a cautious interpretation of SWEEP's projected savings; 125 - 175 MW demand savings by 2013 for commercial upgrades and standards and 10 – 25 MW of savings associated with improved residential building standards. These numbers do not include the potential for residential retrofit programs that will emerge with the residential disclosure requirement in 2012.

Expanded Demand Response Programs

DR programs induce small changes in the electricity consumption patterns of utility customers by means of price signals, incentives, or alerts during periods of tight supply. The use of advanced metering technology (AMT) infrastructure and time-of-use (TOU) pricing programs have successfully reduced peak load in many states across the country. According to NPC's most recent load forecast, peak capacity savings from the ACLM program is expected to increase by more than 55% or 30 MW

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89 SWEEP. *High Performance Homes in the Southwest: Savings Potential, Cost Effectiveness and Policy Options Fact Sheet*. November 2007.

90 The utility industry learned this lesson once before in the 1970s when it used trend forecasts to justify the construction of large nuclear power plants. In that case, consumer responses to higher prices and the aggressive introduction of efficiency measures caused demand to fall by more than half and the "need" for the new power plants did not materialize until decades later.

91 SWEEP. *Nevada Energy Efficiency Strategy*. February 2005, p. 33.

92 SWEEP. *High Performance Homes in the Southwest: Savings Potential, Cost Effectiveness and Policy Options Fact Sheet*. November 2007.

by 2013.[93] Nevada's existing infrastructure can accommodate additional ACLM demand response. More of these resources could become available with accelerations in the deployment of advanced metering and revision of rules and tariffs applicable to real time pricing. Although Nevada continues to experience significant peak demand savings from its ACLM program, the adoption of a TOU pricing program would greatly augment critical peak demand savings in the near future.

A conservative estimate of the growth in energy savings from NPC's ACLM program uncovers additional savings that have not been accounted for in NPC load forecasts. Assuming a target penetration of 30% of NPC residential customers, the ACLM program could save 299 MW by 2013.[94] After subtracting the 68 MW savings from the ACLM program that has been accounted for by NPC from the 299 MW estimate mentioned above, there is potential for an additional 231 MW of savings from ACLM programs not accounted for in NPC load forecasts. While this 30% penetration of new ACLM is a conservative estimate, this report assumes an even more conservative penetration rate of 15%. The 15% penetration rate by 2013 yields an additional ACLM demand savings of 82 MW above and beyond the 68 MW assumed by NPC for 2013.

A recent study of DR efforts in California estimates that existing price-responsive and day-of-reliability triggered DR programs would reduce California's peak load by 5.7%.[95] Partial deployment of AMT in Nevada could enable TOU or critical-peak-pricing (CPP) programs to achieve notable peak demand savings in Nevada. By adopting such measures, SWEEP estimates that NPC could reduce peak load by 216 MW (3.3% of NPC forecasted load or about one-half of that being targeted in California) by 2010.[96] Assuming TOU or CPP programs lead to a conservative 1% peak load savings in Southern Nevada, NPC's peak demand would decrease by 65 MW in 2010. On the basis of these points of reference, this report suggests Nevada could readily achieve an additional savings of 65 to 130 MW by 2013 through the adoption of TOU and/or CPP initiatives.

Expanded Distributed Generation

Combined Heat and Power

Nevada's gaming and hotel industries face a unique opportunity for capturing additional energy savings from combined heat and power systems at new resort properties. New capital sharing partnerships between NPC and hotel and casino properties that can host CHP facilities could facilitate the expansion of CHP generation in Southern Nevada. Based on the number of existing hotels, Nevada has an estimated economic CHP potential of 387 MW.[97]

The potential contribution of hotel CHP systems to energy and capacity reductions varies according to the number and size of participating hotels among other factors. Furthermore, installing CHP systems in newly constructed hotels tends to be more cost effective. Table 2-1 below summarizes the

93 NPC. *2006 Integrated Resource Plan 2007-2026*. Vol. 1, Fifth Amendment to the Action Plan, p. 24. The savings are included in NPC's load forecast.

94 This estimate was computed by multiplying the average household per unit demand reduction (kW) taken from NPC's 2006 ACLM project Measurement & Verification Report, NPC's 2013 residential population forecast and a 30% penetration rate.

95 The Brattle Group. *California's Next Generation of Load Management Standards*. Prepared for the California Energy Commission. September 2007, p. 5.

96 SWEEP. *Nevada Energy Efficiency Strategy*. February 2005, p. 62.

97 Energy and Environmental Analysis, Inc. *Hotel and Casino CHP Market Assessment*. December 2005, p. 47.

relationship between hotel size and CHP capacity based on reciprocating engine and gas turbine technologies.

Table 2-1 Hotel Size and CHP Capacity

	100-199 Rooms	200-499 Rooms	500-999 Rooms	1000-1999 Rooms	2000+ Rooms
CHP Capacity (MW)	0.1	0.3	1	5	10

Source: Energy and Environmental Analysis, Inc.

As indicated by Table 2-1, various combinations of large, medium and small hotels can be added to yield a conservative estimate of energy savings from CHP. For example, six new hotels with 2000 or more rooms and four new hotels with 1000-1999 rooms would provide 80 MW of CHP capacity. 80 MW falls in the middle of the 60-120 MW range of high potential CHP capacity by 2013 identified in Table I-1 of this report.

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Chapter 3 Probable Renewable Energy Projects

Current Renewable Energy Resources

As discussed in utility IRPs, NPC and SPPC expect that geothermal energy purchases will contribute less than 100 MW in added resources in 2010 and 2012. The expected increase of renewable energy contracts in 2010 is anticipated to occur almost exclusively as a result of geothermal purchases in northern Nevada.

Aside from an unspecified 33 MW solar contract in 2011, NPC supply plans do not indicate any renewable purchases that will contribute to serving load prior to interconnection with SPPC in 2012. After 2012, NPC plans to access more geothermal power from northern Nevada. Again, the execution of NPC's renewable resource purchases is contingent on system interconnection with SPPC. Utility IRPs and IRP updates have not identified any significant renewable resource additions beyond specific facilities for which contracts are being negotiated or have been signed. Instead, the Utilities continue to rely on gas and coal in their "Preferred Portfolios."[98]

The Utilities have yet to report any wind generation projects in their loads in resources tables for the current resource planning period. Nevertheless, SPPC and non-utility sources have specified a significant amount of impending wind development in northern Nevada.

Biomass energy projects are currently operating in both the Ely and Carson City areas. However, NPC and SPPC resource plans do not mention biomass development in the near future.

In addition to Nevada Solar One, NPC's current renewable portfolio consists of 3 MW from the Las Vegas Valley Water District Solar Project and the recently completed 14 MW Solar PV facility at Nellis Air Force Base. Table 3-1 includes SPPC's existing renewable energy projects.

98 SPPC. *2007 Integrated Resource Plan 2008-2027*, Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan, pp. 60-61.

Table 3-1 SPPC and NPC Renewable Energy Projects

Project	Type	MW[99](Peak)	MW[100,101,102,103] (Nameplate)	MWh[104,105]
ORNI 3*	Geothermal	7	15	130,935
ORNI 7*	Geothermal	11	20	215,916
ORNI 9*	Geothermal	7	13	98,810
ORNI 14	Geothermal	12	20	183,842
Beowawe*	Geothermal	14	16.6	123,645
Nevada Solar One	Solar	33	64	88,092
Fleish	Hydro	2	2.3	17,633
Verdi	Hydro	2	2.2	15,396
Washoe	Hydro	2	2.2	13,286
Qualifying Facilities	Various	105	-	-

Source: Various; see footnotes.
* SPPC export to NPC in 2012 (if interconnected).

Presently, the renewable energy capacity contributing to Nevada summer peak demand is 202 MW This number is expected to rise with the completion of future projects and will be facilitated by interconnection of northern and southern Nevada's electrical systems.

Renewable Resource Projects Under Development

Table 3-2 includes all NPC and SPPC proposed renewable resource generation identified in resource plans and includes all projects that appear in loads and resources tables as new new resources from 2009 to 2027.

99 All peak capacity numbers reported in Tables 3-1 and 3-2 are summer peak capacities as reported in NPC and SPPC loads and resources tables.

100 RETAAC. *Phase 1 Report: Appendix 1 Background on Nevada's Portfolio Standards*. December 2007, p. 6.

101 NPC/SPPC. *Portfolio Standard Annual Report: Compliance Year 2006*, pp. 41-44. Projected MWh contributions for 2011.

102 SPPC. Retrieved on December 19, 2007 from http://www.sierrapacific.com/company/renewables/geothermal.cfm

103 State of Nevada Commission on Mineral Resources, Division of Minerals. *Nevada Geothermal Update*. January 2008, p. 3.

104 NPC/SPPC. *Portfolio Standard Annual Report: Compliance Year 2006*, pp. 9 -10.

105 Op. cit, pp. 41-44. Projected MWh contributions for 2011.

Table 3-2 NPC and SPPC Proposed Renewable Generation Contracts[106]

Project	Type	MW (Peak)	MW [107,108,109,110] (Nameplate)	MWh[111]
Carson Lake*	Geothermal	49	62	N/A
Hot Sulphur Springs*	Geothermal	27	46	N/A
ORNI 3*	Geothermal	7	13.7	130,935
ORNI 9*	Geothermal	7	21.1	99,810
ORNI 13*	Geothermal	14	N/A	N/A
ORNI 16*	Geothermal	14	31.5	236,900
ORNI 15	Geothermal	14	31.5	236,900
ORNI 20*	Geothermal	14	31.5	N/A
Saltwells*	Geothermal	3	16.9	95,312
Stillwater*	Geothermal	8	20	188,927
Faulkner 1*	Geothermal	19	35	286,204
Unspecified (NPC)	Solar	33	-	-
Unspecified (NPC)	Non-Solar	118	-	-
Unspecified (SPPC)	Solar	8	-	-
Unspecified (SPPC)	Non-Solar	8	-	-

Source: Various; see footnotes.
* SPPC export to NPC in 2012 (if interconnected).

Geothermal

Without question, Nevada is richly endowed with geothermal energy resources. A comprehensive study prepared for the CEC by GeothermEx estimates that Nevada has 1500 MW of likely total geothermal capacity potential, more than any other state.[112] It is unclear how much of the resources identified in Tables 3-1 and 3-2 are included in the 1500 MW potential; this report assumes 1200 MW remains after deducting the nameplate capacity reflected on table 3-2. The recently completed RETAAC report identifies five geothermal zones with strong potential for development and refers to 162 MW of geothermal capacity currently under development.[113]

106 Only includes projects listed on SPPC NPC loads and resources tables. Some MW (Nameplate) and MWh figures unavailable in public documents.

107 RETAAC. *Phase 1 Report: Appendix 1 Background on Nevada's Portfolio Standards*. December 2007, p. 6.

108 NPC. Geothermal Energy. Retrieved on December 19, 2007 from http://www.nevadapower.com/company/renewables/geothermal.cfm.

109 NPC/SPPC. *Portfolio Standard Annual Report: Compliance Year 2006*, pp. 9 -10.

110 SPPC. *Geothermal Energy*. Retrieved on December 19, 2007 from http://www.sierrapacific.com/company/renewables/geothermal.cfm

111 NPC/SPPC. *Portfolio Standard Annual Report: Compliance Year 2006*, pp. 41-44. Projected MWh contributions for 2011.

112 GeothermEx, Inc. 2004. *New Geothermal Site Identification and Qualification. Prepared for California Energy Commission Public Interest Energy Research Program*. April 2004, p. 187.

113 RETAAC. 2007. *Phase 1 Report, Appendix 1: Background on Nevada's Portfolio Standard*, p. 6.

The Nevada Public Utilities Commission recently approved funding for study of a transmission line connecting Ft. Churchill to Emma.[114] The approval of this study affirms the importance of connecting potential geothermal projects in Dixie Valley with other geothermal projects to the South in Esmeralda County. GeothermEx estimates 550 MW of likely total generation capacity in the Dixie Valley corridor and 210 MW of likely generation in Esmeralda County.[115] This study assumes that 300 to 500 MW of development to serve Nevada customers from the regions identified in the GeothermEx assessment beyond the development already announced in SPPC and NPC resource plans is reasonable. The 300 to 500 MW of nameplate capacity translates into a contribution to meeting peak need of about 210 to 350 MW assuming that the current average summer capacity factor of geothermal projects of about 70% continues for new projects.

Wind

One of Northern Nevada's most promising regions for wind potential lies directly to the north of Reno and Carson load areas along an existing 345 kV line. SPPC has estimated that at least 500 MW of wind generation could be developed along the proposed Ft. Sage to Raven line route.[116] As discussed by SPPC, the Raven Substation is being studied by Pacific Gas and Electric as a connection point for numerous transmission lines that could bring renewable generation into California's Central Valley. It appears reasonable to investigate how SPPC and NPC might share in this development or leverage it to serve Nevada customers.

Although not reflected in its IRP, SPPC has elsewhere discussed plans to develop 200 MW of wind generation in the Jackpot area near the Idaho border.[117] Furthermore, an independent renewable energy developer has announced plans to undertake a 450 MW wind generation project 40 miles north of Pioche and it appears that the military will not object to developing that area.[118] These three recent announcements indicate a relatively near term interest in developing a total of 1150 MW of wind that could supply energy to SPPC or NPC after an inter-tie is completed and the required collector systems are built.

Furthermore, SPPC has reported in public documents produced for its 2007 IRP filing that prior to the construction of the inter-tie, SPPC could accommodate up to 450 MW of intermittent wind resources and NPC could accommodate up to 700 MW. SPPC reports in these same documents that after the inter-tie, the Utilities will have a combined ability to interconnect between 1850 MW and 1925 MW of intermittent wind conditions under ideal conditions.[119] Therefore, the announced 1150 MW of wind projects noted above apparently could be accommodated on the SPPC and NPC integrated system. This study conservatively assumes it is reasonable to develop 200 to 600 MW of this potential for Nevada's benefit prior to the summer of 2013.

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114 Nevada Public Utilities Commission. *Docket No. 07-06049*, Final Order, p.68.

115 GeothermEx, Inc. 2004. *New Geothermal Site Identification and Qualification*. Prepared for the California Energy Commission Public Interest Energy Research Program. April 2004, p. 187.

116 SPPC. *2007 Integrated Resource Plan 2008-2027*. Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan, p. 101.

117 California Energy Markets. "Sierra Pacific Resources, UK Company Discuss Wind-Power Project." November, 2007.

118 Industrial Wind Action Group. "No Military Objection to Nevada Wind Farm." November, 2007.

119 SPPC. *Integrated Resource Plan 2008-2027*, Vol. 6, Supply Side Plan, Transmission Plan and Financial Plan, p. 86.

Due to its intermittent nature, nameplate capacity for wind does not represent the capacity that can be expected to be producing at peak. Translating the nameplate capacity into a "contribution to meeting peak" number is generally site specific, but various heuristic measures have been used by utility planners in the west. The California Public Utilities Commission (CPUC) has given wind a "dependable capacity" of 20% of nameplate for measuring resource adequacy; Xcel Energy in Colorado uses 10% to determine contribution to peak; and PacifiCorp uses from 10 to 20%. Based on these analyses, this report uses a range of 10% to 20% based on these analyses to estimate the potential contribution to resources. Therefore, for 400 MW, 40 to 80 MW can be expected to be available on peak.

CPUC consultant E3 recently estimated the cost of integrating wind resources as part of its CPUC GHG modeling efforts. For the purposes of this study, E3 used a capacity factor of 34% to estimate energy output for all wind energy facilities.[120] Applying a 34% capacity factor to the 400 MW of nameplate capacity identified above yields approximately 1191 GWh per year.

Central Station Solar

In June 2007, Acciona Energia's Nevada Solar One facility became the first solar thermal plant constructed in the United States in 20 years and the third largest in the world.[121] Nevada Solar One has a nameplate capacity of 64 MW and NPC appears to only count 33 MW of that capacity as contributing to meeting the summer peak. In studies beyond this report, more careful analysis should be performed to determine the contribution to peak of these facilities.

Ausra, Inc. disclosed plans to construct the United States' first solar thermal manufacturing plant in Nevada by April 2008.[122] The company chose Las Vegas for its manufacturing facility, stating "[Nevada] is the center of America's solar energy future."[123] The impact of such a plant on solar energy development in Nevada is likely to be positive. Recent innovations by Ausra in mirror technology could decrease solar thermal prices in the Southwest. Ausra claims it can generate power from concentrating solar electric sources for 12 cents/kWh.[124] Nevada Senator Harry Reid also expressed a desire for Nevada energy developers to convert the retired Mohave coal generation facility into a solar plant.[125]

Ausra has promised the development of over 1000 MW of solar energy in the southwest and has expressed a specific interest in developing near Boulder City, and most recently, in the possibility of developing solar generation in northern Nevada. According to Ausra, solar development in northern

120 Energy and Environmental Economics, Inc. (E3). *California Public Utilities Commission Greenhouse Gas Modeling; Cost of Integrating Wind Resources*. November, 2007.

121 "Utility-Scale Solar Plant Goes Online in Nevada." *Environment News Service*. June 4, 2007. Retrieved on December 18, 2007 from http://www.ens-newswire.com/ens/jun2007/2007-06-05-09.asp#anchor2

122 "Ausra Also Eyes Open Sun-Drenched Valleys of Northern Nevada." *The Ely Times*. January, 2008. Retrieved on January 2, 2008 from http://www.elynews.com/articles/2008/01/02/news/news07.txt

123 Ausra Inc. News Releases. December 13, 2007. Retrieved on December 15 from http://ausra.com/news/releases/071213.html

124 "Solar Company Sees Potential in North and South" *Nevada Appeal.* December 2007. Retrieved on December 28, 2007 from http://www.nevadaappeal.com/article/20071227/NEWS/720010386

125 Las Vegas Review-Journal. "Reid Calls for Solar Power Plant at Site of Closed Station." December 19, 2007. Retrieved on December 21 from http://www.lvrj.com/business/12586841.html

Nevada may result in significant energy efficiency gains (10% above an equivalent sea level plant) due to the region's relatively high altitude.[126]

Arizona Public Service (APS) held an RFP conference call on January 17, 2008 where Curt Brechtel reported that the Mohave site is one of four being considered for a multiple utility 250 MW project . Barbara Lockwood with Arizona Public Service (APS) reported on January 10, 2008 at the Central Solar Power Forum at Northern Arizona University that 3300 MW of new projects have been announced in the United States and 653 MW of that capacity intends to use solar trough technology.

Black and Veatch (B&V) prepared renewable energy potential studies for SPPC and NPC, as well as for several other states including Arizona. The study for Arizona recommends targeting solar thermal production in the near term to satisfy state solar renewable portfolio standards. The study indicates that 100 MW of solar thermal generation could be developed by 2011 and that two to four 200 MW plants could be developed per year after that.[127]

Given the more recent Ausra announcements, an additional 40 MW of solar thermal development per year starting in 2011 appears to be a conservative estimate for Nevada. While B&V expect larger developments in the 200 MW range, the conservative numbers presented here reflect the possibility that Nevada utilities might participate in larger projects but only take a portion of the output. Therefore, 80 MW of new development prior to the 2013 peak is assumed although some may argue this is substantially below what should be expected.

Photovoltaic

The recent unveiling of the Nellis Air Force Base 14.2 MW Solar PV arrays, the largest in the United States, exemplifies Nevada's significant PV potential. Other recent PV construction includes the 3 MW Las Vegas Valley Water District project, the 2.45 MW of cumulative Solar Generations program installations, the Utilities' 0.97 MW project and the 0.21 MW installation at the Procaps Laboratory. The cumulative total of these projects brings Nevada's current PV installations to approximately 21MW.

The Western Governors' Association (WGA) projected 132 MW of solar PV potential for Nevada by 2015. Based on the existing levels of PV installation, on-going utility programs and the WGA potential estimate, additional installations of 30 to 60 MW of PV capacity by 2013 appears conservative and reasonable. Applying the capacity factor of 50% used by NPC for Nevada Solar One results in a contribution to peak by 2013 of 15 to 30 MW.

Renewable Energy Potential in Context

Based on the research reported, 300 to 500 MW of geothermal, 400 MW of wind, 80 MW of central station solar and 30 to 60 MW of PV are conservative estimates of additional renewable resources, beyond those currently reported in Nevada utility resource plans, that could be brought on-line prior to the summer of 2013 under the assumption that the infrastructure required is planned for and built prior to 2013. The reported renewable resource potential in Nevada is significantly greater than these conservative estimates and the following table summarizes these more aggressive renewable energy potential estimates.

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126 The Ely Times. "Ausra also Eyes Open Sun-Drenched Valleys of Northern Nevada." January, 2008. Retrieved on January 2, 2008 from http://www.elynews.com/articles/2008/01/02/news/news07.txt

127 B&V. Arizona Renewable Energy Assessment. September, 2007, p. 1-5.

Table 3-3 NPC and SPPC Proposed Renewable Generation Contracts

Source	Type of Resource	Estimated Capacity (MW)
WGA[128]	Geothermal	2895
Renewable Energy Atlas of the West. 2006. Nevada.[129]	Geothermal	2000
RETAAC[130]	Geothermal	1500
Renewable Energy Atlas of the West. 2006. Nevada.[131]	Solar	Greater than 2000
EcoNorthwest[132]	Solar	165,000
WGA[133]	Wind	2770
NSOE[134]	Wind	2000

Source: Various; see footnotes.

Comparing Costs for Generation Resources

Identifying the potential for developing renewable resources is one important step in assessing the flexibility in meeting Nevada's future load growth. Just as important is estimating the range of costs for those resources—resource potential will not be developed if doing so will unduly increase electricity rates. To this end, this report includes a survey of cost estimates prepared by government agencies and other investor-owned utilities in the WECC region. These studies typically look at resources located in a various states and are representative of expectations about these costs throughout the West. The cost estimates were drawn from publications prepared by:

- The Western Governors' Association's Clean and Diversified Energy Initiative (CDEAC)
- The Northwest Power Planning Council's (NPPC) Fifth Resource Plan
- Consultant reports prepared for the National Renewable Energy Laboratory (NREL)
- The CEC's *Cost of Generation* study for the *2007 Integrated Energy Planning Report* (IEPR)
- A consultant study prepared by E3 for the CPUC's rulemaking on regulating greenhouse gases.[135]
- The integrated resource plans for 2006 and 2007 for:
  - Idaho Power[136]

128 WGA. *Geothermal Taskforce Report*, January 2006, pp.62-64

129 Renewable Energy Atlas of the West. 2006. Nevada. Retrieved November 19, 2007 from http://www.energyatlas.org/PDFs/LowRes/atlas_state_NV.pdf

130 RETAAC. *Phase1 Report: Appendix 3, Meeting Minutes with Public Comment*. September 21, 2007, p. 19.

131 Renewable Energy Atlas of the West. 2006. Nevada. Retrieved November 19, 2007 from http://www.energyatlas.org/PDFs/LowRes/atlas_state_NV.pdf

132 ECONorthwest. 2007. *Economic Analysis of Nevada's Future Electricity-Generating Alternatives*. November 2007, p. 31.

133 WGA. Clean and Diversified Energy Advisory Committee, Energy Efficiency Task Force. 2006. *Clean and Diversified Energy Initiative: Energy Efficiency Task Force Report*. January 2006.

134 NSOE. *T-4 Wind Report: Northwestern Consortia to Study Regional Wind Development Benefits of Upgrades to Nevada Transmission Systems*. May 2007, p. 7.

135 E3. *California Public Utilities Commission Greenhouse Gas Modeling; Stage 1 Documentation*. November, 2007.

- Avista[137]
- PacifiCorp[138] and
- Portland General Electric (PGE).[139]

Nevada utilities redact their cost estimates for new generation resources in their filed IRPs, so this report does not compare the Nevada estimates with those of the rest of the west.

Table 3-4 summarizes the median, minimum and maximum values for several key inputs and the levelized costs for seven technologies—wind, geothermal, combined-cycle natural gas turbines (CCGT), pulverized coal steam turbines, biomass, solar thermal and solar PV The parameters shown include installed cost per kilowatt, capacity factor, financial assumptions, operating costs, and fuel prices and efficiency. In most cases, there are significant differences in these assumptions, indicating substantial uncertainty about underlying costs for all technologies.

Table 3-5 culls the results down to the total levelized median, minimum and maximum costs for these technologies, and compares them to estimates presented by the PUCN staff at public meetings held in Nevada in the fall of 2007. The technologies are ranked by median cost from lowest to highest. On the lower part of the table, the range of these estimates is then compared for each technology as the percent of median cost. The PUCN staff estimates also are shown as a percent of the median. The least cost resource is wind power with geothermal, gas CCGT and coal all close in a range from $62 to $67 per megawatt-hour (MWh). The median cost for biomass is $91 per MWH. Solar is more expensive, costing $111 for solar thermal and $425 for PV, but these solar units are intermediate resources so the costs will be higher than for the base load resources listed here. The PUCN staff's low cost estimates are generally similar to the regional medians, but the high cost estimates show more variation compared with the regional estimates. The most striking contrast is between the high end of the coal cost range for the region of $119/KWh and the high end of the PUCN coal cost range which is only $65. It is also interesting to note that the regional median costs per kilowatt-hour KWh finds wind, natural gas, and geothermal energy slightly below the median coal cost.

136 Idaho Power. *2006 Integrated Resource Plan*. October, 2006.

137 PacifiCorp. *2007 Integrated Resource Plan*. May, 2007.

138 Avista. *2007 Electric Integrated Resource Plan*. August, 2007.

139 PGE. *2007 Integrated Resource Plan*. June 2007.

Table 3-4 Median, Minimum and Maximum Values for Several Inputs and Levelized Costs for Selected Technologies

Technology		Levelized Cost $/MWH	Installed Cost $/kW	Capacity Factor	Financial % Equity	Equity Return	% Debt	Debt Rate	WACOG	Operating Costs Fixed $/kW-Yr	Variable $/MWH	Fuel $/MMBtu	Heat Rate Btu/kWh
Wind	Median	$62	$1,734	34%	49.5%	15.0%	50.5%	6.5%	8.8%	$20.00	$1.09		
	Min	$49	$981	27%	40.0%	10.5%	40.0%	5.7%	6.9%	$11.30	$1.00		
	Max	$114	$2,009	42%	60.0%	15.2%	60.0%	7.8%	10.7%	$33.39	$16.40		
Geothermal	Median	$63	$3,399	92%	49.5%	15.0%	50.5%	6.5%	9.8%	$96.00	$5.48		
	Min	$36	$1,874	90%	40.0%	10.5%	40.0%	5.7%	6.9%	$0.00	$1.80		
	Max	$277	$19,101	95%	60.0%	15.2%	60.0%	7.8%	10.7%	$222.00	$26.70		
Gas CCGT	Median	$65	$801	75%	49.5%	15.0%	50.5%	6.5%	8.8%	$9.83	$2.76	$6.94	6,974
	Min	$62	$640	56%	40.0%	10.5%	40.0%	5.7%	6.9%	$2.20	$1.00	$5.34	6,653
	Max	$103	$957	93%	60.0%	15.2%	60.0%	7.8%	10.7%	$12.77	$5.00	$8.72	7,340
Coal	Median	$67	$2,066	86%	44.7%	12.8%	55.3%	6.7%	7.9%	$30.44	$2.08	$2.33	8,957
	Min	$44	$1,596	84%	40.0%	10.5%	50.5%	5.7%	6.9%	$17.10	$1.00	$1.04	8,825
	Max	$119	$2,510	91%	49.5%	15.0%	60.0%	7.8%	8.8%	$47.06	$3.97	$3.93	9,550
Biomass	Median	$91	$2,784	80%	44.7%	15.0%	55.3%	6.1%	7.9%	$82.27	$3.12	$2.47	13,648
	Min	$61	$2,061	80%	25.0%	10.5%	40.0%	5.0%	6.0%	$22.60	$1.00	$1.25	8,911
	Max	$125	$4,073	90%	60.0%	15.2%	75.0%	7.8%	10.7%	$126.77	$10.43	$5.31	17,065
Solar Thermal	Median	$111	$3,579	56%	100.0%	14.0%	45.3%	6.1%	14.0%	$55.43	$1.07		
	Min	$39	$2,221	21%	49.5%	10.5%	40.0%	5.7%	6.9%	$32.10	$1.04		
	Max	$277	$4,230	73%	100.0%	15.2%	50.5%	6.5%	14.0%	$70.65	$3.10		
Solar PV	Median	$425	$6,872	23%	54.7%	15.1%	45.3%	6.5%	9.8%	$23.77	$0.00		
	Min	$197	$4,938	22%	40.0%	10.5%	40.0%	5.7%	6.9%	$11.30	$0.00		
	Max	$1,100	$9,682	30%	60.0%	15.2%	60.0%	7.8%	10.7%	$31.50	$0.00		

Source: PacifiCorp 2007, Avista 2007, PGE 2007, CDEAC 2006, NREL 2007, E3 2007, CEC 2007, Idaho Power 2006, Idaho Power 2007, NPPC 2007.

Table 3-5. Range Of WECC Technology Cost Estimates

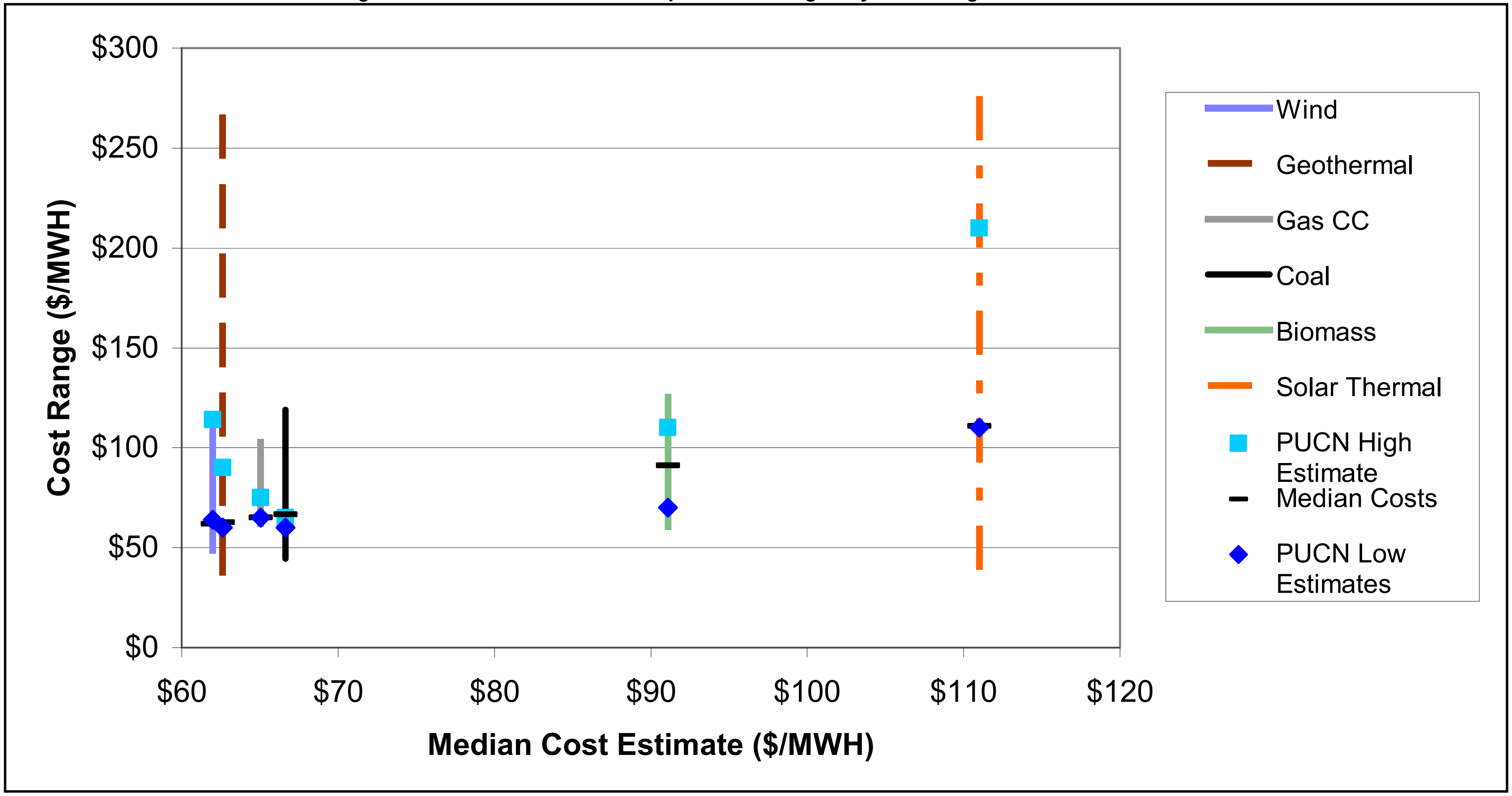
	Minimum	Median	Maximum	PUCN Low	PUCN High
Wind	$49	**$62**	$114	$64	$114
Geothermal	$36	**$63**	$277	$60	$90
Gas CCGT	$62	**$65**	$103	$65	$75
Coal	$44	**$67**	$119	$60	$65
Biomass	$61	**$91**	$125	$70	$110
Solar Thermal	$39	**$111**	$277	$110	$210
Solar PV	$197	**$425**	$1,100	$200	$300

	% of Median			% of Median		
	Minimum	**Maximum**	**Relative Range**	**PUCN Low**	**PUCN High**	**PUCN Range**
Wind	78%	184%	**105%**	103%	184%	**81%**
Geothermal	58%	442%	**385%**	96%	144%	**48%**
Gas CCGT	95%	158%	**62%**	100%	115%	**15%**
Coal	67%	179%	**112%**	90%	98%	**8%**
Biomass	66%	137%	**71%**	77%	121%	**44%**
Solar Thermal	35%	250%	**215%**	99%	189%	**90%**
Solar PV	46%	259%	**213%**	47%	71%	**24%**

Source: PUCN 2007, PacifiCorp 2007, Avista 2007, PGE 2007, CDEAC 2006, NREL 2007, E3 2007, CEC 2007, Idaho Power 2006, Idaho Power 2007, NPPC 2007.

Figure 3-1 visually compares the range of regional cost estimates to the PUCN staff estimates. Again, the technologies are ranked by median cost (solar PV is not shown in order to improve visual resolution for the other technologies). The regional median and PUCN staff estimates also are shown. The range of cost estimates varies by technology, with gas CCGT showing the least variation at 62%, biomass next at 71%, and wind and coal with a range of 105% and 112% respectively. The PUCN staff estimates show a different pattern, with the coal estimate reflecting substantial confidence at 8%, with gas CCGT close at 15%. Solar PV, biomass and geothermal show more uncertainty, and wind and solar thermal have the largest range in the PUCN staff estimates. The range for the coal estimate is entirely below the regional median, while the wind estimate is entirely above the median.

Figure 3-1 Generation Cost Comparisons Ranges by WECC Agencies and Utilities



Source:

Of particular note is the similarity between the estimates for the four lowest cost resources. The ranges of uncertainty overlap in a manner such that the costs cannot be distinguished for planning purposes on an expected value basis. This leads to consideration of another dimension: the risk that is reflected in the range of uncertainty about costs. The regional range for coal reflects an important parameter about which there is substantial uncertainty—the value of a GHG "adder" or tax on carbon dioxide emissions. This translates into coal having a larger range than wind or gas CCGT. (The wide geothermal range reflects the inclusion of two distinct technologies, flash (lower cost) and binary, and increasing costs of exploiting marginal geothermal reserves.)

Changes in Cost and Performance of Renewable Energy over Time

The cost and performance of renewable energy technologies are generally expected to improve over time. NPC and SPPC's chosen consultant for its PS compliance advice reported in September 2007 that PV, concentrating PV, wind and solar thermal technologies could improve considerably over the next ten years. B&V reports that concentrating PV is expected to decline to approximately 55% of its current cost in real dollars by 2016.[140] According to B&V, rooftop PV is expected to decline at about 2.5% per year which means that PV in 2016 will be about 80% of current PV cost in real dollars.[141] B&V reports that solar thermal costs could decline substantially with the development of larger sites in the 200 MW range and with domestic production of solar thermal mirrors. However, B&V expressed concern that there could be partially off-setting costs as storage is added to conventional solar thermal facilities.[142] Since storage increases the volume of energy produced and the percent of peak consumption that can be covered with solar thermal output, additional storage adds both value and cost.

With the large Ausra production facility announced for Las Vegas, it appears that domestic production and the lower costs projected by B&V are likely. Finally, B&V comments that wind production capacity factors have increased by 15% every two years since 2000. B&V expects future increases in capacity factors to be more modest with a cumulative 20% increase between now and 2030. As with the solar PV costs, CEC analysis has shown increasing wind costs, driven by demand for the resource and constrains on turbine supply. As happened with gas turbines around 2001, a substantial backlog for wind turbines has combined with a general increase in construction costs to increase costs. All fossil and renewable technologies have felt this latter effect in the last two years with steel, construction and materials costs increasing across the board.

Fossil and renewable resources also experience some cost increases over time as the best sites for resource extraction are accessed. The net effect of; cost decreases attributable to technological improvements and reduced cost of production; performance increases attributable to improved efficiency in converting energy resources into electricity; cost decreases as infrastructure is built that allows low cost access to high quality resources; and cost increases associated with the use of the best quality, easily accessible resources; is laden with uncertainties. Deriving a family of supply curves that represent the range of possible costs over time given these uncertainties is not a simple matter and cost curves produced to date do not fully reflect all of these effects. However, B&V asserts that the technologies identified above; rooftop PV, concentrating PV, solar thermal and wind, are each likely to benefit in cost and performance from technological and production economics advances.

140 Black &Veatch, *Arizona Renewable Energy Study*, Sept 2007, p. 5-33.

141 Op. cit., p. 5-32.

142 Op. cit., pp. 5-23,5-24.

Accessing Regional Renewable Energy Potential

Nevada should consider the possibility of taking advantage of regional renewable resource developments as well as developing Nevada's own resources. For example, the best wind resources in the west are located in Wyoming and others are already planning on developing that wind and exporting it to the Southwest by way of the Transwest Express and High Plains Express transmission projects. It may be economic for Nevada to partner with the entities developing that resource and use the north-south inter-tie to move high efficiency wind from intermountain west renewable sites to SPPC and NPC service territories. The following summary of recent Requests for Proposals (RFPs) results and lease sale results in and near Nevada indicates the substantial developable potential that may offer partnering opportunities that help to meet needs caused by further delays in the EEC coal plants.

LBNL Study

Lawrence Berkeley National Laboratory (LBNL) reviewed renewable energy solicitations in the Western United States and in the Midwest in 2005 to determine the degree of response from potential providers. As shown in Table 3-6 below, the results indicate that the amount of bid response typically far exceeds utility needs.[143]

Table 3-6 Solicitation Responses

Utility	Renewable Energy or All-Source RFP?	Bid Response	Capacity Response
Xcel (MN)	All-Source	n/a	3700 MW wind
Great River Energy	RE	62 offers; 25 bidders (56 wind; 6 other RE)	n/a
MG&E/WPPI	RE	16 offers; 11 bidders	n/a
PacifiCorp	RE	56 offers; 42 bidders	6000 MW of RE, 85% wind, 15% geothermal/hydro
Portland General Electric	All-Source	n/a	2600 MW of RE; 550 MW of biomass, 165 MW of geothermal
Puget Sound Energy	RE & All-Source	n/a	1800 MW of wind
Xcel/PSCo	RE	17 offers; 12 bidders	2000 MW of wind
North Western	RE	23 offers; 15 bidders	1650 MW of wind
NCPA (CA)	RE	66 offers	1900 MW of RE
SCAPPA (CA)	RE	44 offers	2110 MW of RE
SMUD	RE	58 offers	1940 MW of RE
SCE	RE	53 offers; 37 bidders	5300 MW of RE
Nevada Power/Sierra Pacific	RE	25 non-solar offers; 14 solar offers	Over 1000 MW of RE
Avista	RE	10 offers; 8 bidders	n/a
LADWP	RE	40 offers	n/a

Source: Lawrence Berkeley National Laboratory, 2007.

143 LBNL. Retrieved on December 10, 2007 from http://repositories.cdlib.org/cgi/viewcontent.cgi?article=3422&context=lbnl

PacifiCorp

In February 2004, PacifiCorp issued an RFP to acquire up to 1100 MW of renewable resources. In response to the request, PacifiCorp received more than 50 bids for wind, geothermal, hydro, solar and biomass resources generating 6000 MW. In May 2005, PacifiCorp announced the first project to be negotiated - a 64.5 MW wind project to be built 10 miles southeast of Idaho Falls, Idaho.[144]

Idaho Power

Idaho Power issued an RFP in January 2005 for 100 MW of wind generation. A moratorium on wind projects was subsequently put in place to allow the utility to evaluate the effects of more than 200 MW of QF wind projects. The moratorium was lifted in September 2005. In January 2007, the Idaho Public Utilities Commission announced Idaho Power Company's application to enter into a sales agreement to purchase 100 MW of wind from an eastern Oregon wind farm owned by Telocaset Wind Power Producers LLC.[145] The wind farm was selected as the preferred bidder from among seven bids representing 19 projects between 45 MW and 200 MW. Idaho Power expects to issue another RFP for an additional 150 MW of wind generation in 2009.

Idaho Power issued an RFP for 100 MW of geothermal power in June 2006. In March 2007, it named US Geothermal as the sole successful bidder, providing a total of 45.5 MW from geothermal plants located near Raft River, Idaho and Vale, Oregon.[146] According to US Geothermal, a number of competing proposals were submitted in response to Idaho Power's request for proposals.

Arizona Public Service

Arizona Public Service Co. issued an RFP in March 2007 for 30 MW of renewable energy resources that would provide the following targeted annual energy (MWh):

- 2007 – 125,000
- 2008 – 190,000
- 2000 – 210,000
- 2010 – 427,000
- 2011 – 736,000

Final selections were to be made in the July-August timeframe but no official announcements have been made regarding bid selection.

Xcel Energy

In 2007 Xcel Energy added 775 MW of wind to their Colorado system. In addition, as part of its 2007 IRP, it is proposing to add another 800 MW of wind and roughly 250 MW of solar power by 2015. Xcel plans to issue a 300 MW wind RFP and a 25 MW solar RFP in late 2007/early 2008 and a 500 MW wind RFP in 2008.

144 PacifiCorp. Retrieved on December 10, 2007 from http://www.pacificorp.com/Press_Release/Press_Release51089.html

145 Idaho Public Utilities Commission. Retrieved on December 10, 2007 from http://www.puc.idaho.gov/internet/press/012607_IPCoTelocaset.htm

146 Idaho Power. Retrieved on December 10, 2007 from http://www.idahopower.com/newsroom/pressreleases/20070320.htm

BLM Lease Sales

As an indication of interest in geothermal resources on federal public lands in Nevada and California, bids reaching almost $20 million were received from a competitive auction of lease parcels. A total of 49 land parcels were offered for lease. The 43 parcels in Nevada sold for nearly $11.7 million. The 6 parcels in California accounted for the remainder, with 2700 acres in the Geysers geothermal field bringing bids totaling over $8 million. In an earlier Idaho-Utah sale, leases on 8 parcels sold for a total of $9.4 million.[147]

147 Bureau of Land Management (BLM). Retrieved on November 30, 2007 from http://www.blm.gov/wo/st/en/info/newsroom/2007/august/NR_0708_04.html

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Chapter 4 Complementary Gas Generation

Need for Gas Generation that Complements Intermittent Resources

In response to the first delay in the EEC, NPC has announced its intent to seek approval to build a new 500 MW combined-cycle power plant at the Harry Allen substation. While the need for that particular plant is uncertain, the ability to build the plant quickly reveals value of having pre-permitted sites and cost of having a predilection for replacing delayed fossil generation with new fossil generation. Furthermore, it is clear that the impediment to accessing and comparing resource alternatives is the lack of infrastructure to access these known, diverse resources. While the gas generation represented by the facility could provide further assurance of resource adequacy given the delay in the EEC, it is unclear if another combined cycle gas fired facility is the best response to a delay in the coal plant. Building a flexible infrastructure that can access diverse Nevada resources and regional resources may require more gas generation. However, such new generation should complement these diverse resources that will be accessible upon the completion of a north south inter-tie.

NPC is fortunate to have a pre-permitted site that can be accessed quickly and the value of having this site should be a lesson for future pre-permitting activities. For example, pre-permitted transmission routes will allow those routes to be constructed more quickly and will allow the energy resources accessed by the collector systems to be brought on line more quickly. Releasing requests for renewable energy proposals concurrently with proposals for the collector systems will allow the PUCN to assess the viability and relative value of accessing energy resource zones. Unfortunately, the lack of competing pre-permitted sites and facilities to access renewable resources traps the PUCN into a resource plan response to the coal plant delays that continues to be driven by new, centralized gas generation. One lesson that should be learned from this first coal plant delay is that pre-permitting of infrastructure and RFPs for resources that can be accessed by that infrastructure is vital to giving both the Nevada utilities and the PUCN meaningful choices in how needs will be met.

The utility recommendation that a delay in coal generation should be met with construction of more combined cycle gas generation indicates that Nevada has not yet taken the step of building a flexible infrastructure that could accommodate alternatives that are less fossil dependent. Geothermal, wind, solar, CHP, DR and conservation resources can fill the need created by the delay in the coal plant. New gas generation should be selected to complement the combination of these resources that Nevada decision makers select to meet the need created by the delay. Furthermore, using new gas generation as a complementary resource rather than a base load resource reduces Nevada's dependence on increasing volumes of natural gas.

The capabilities of the NPC and SPPC generation fleet may need to be adjusted to accommodate intermittent resources. Some of the resources proposed here for closing the gap created by the potential absence of new coal plants are intermittent while others are not. The characteristics of the complementary gas generation needed will depend upon the extent to which intermittent resources are accessed. The WGA's CDEAC wind report indicates that, "It is likely that least-cost power system solutions that incorporate moderate or high wind penetrations will need a different mix of resources that can handle the increased ramping requirements on the conventional generation fleet."[148] More recently, the CAISO completed a study of system needs to accommodate renewable resources in November 2007. The study cites increases in the morning and evening system ramp and found that, "The California ISO regulation capacity requirements will increase by 170 MW to 250 MW for "Up

148 WGA. Clean and Diversified Energy Initiative. *Wind Task Force Report*. March 2006, p. 36.

Regulation" and 100 MW to 500 MW for "Down Regulation."[149] The study also specifies the need for generation that can ramp up quickly to meet Automatic Generator Control (AGC) and Automatic Dispatch Signal (ADS) requirements. While the study indicates that California's existing generation fleet seems adequate to meet these additional requirements, the study represents another affirmation that conventional generation fleet performance should be matched to operating characteristics of diverse generation sources and thus indicates that Nevada should evaluate new gas generation capabilities carefully.

Building gas generation that complements Nevada's native resources depends on two issues relative to the supply of natural gas to Nevada. First, are there sufficient gas resources available to serve any anticipated incremental gas resource needs? And secondly, are there infrastructure opportunities that will enhance Nevada's capability to access these resources cost effectively? The following section addresses these questions.

Regional Gas Supply Adequacy and the Need for Gas Storage

Concerns of the Public Utilities Commission of Nevada

Commissioners and staff of the PUCN have raised concerns about Nevada's dependency on natural gas for residential use and for electricity generation (both locally generated and imported). As stated by PUCN Commissioner Jo Ann Kelly at an October 31, 2007 special session on natural gas, there are risks to being overly dependent on natural gas:

> "…the time is now to finalize a strategy to assess the risks and options for Nevada regarding our natural gas supply. We get 80 percent of our electric generation from natural gas, which means how reliant our economy is on that commodity. Nevada is a landlocked state. We have many fewer options than our neighbors to the west. We don't have market power as our neighbors to the west. We don't have any natural resources that will fuel electricity needs so we import all of our fuel to generate electricity from other parts of the country…"

The PUCN is concerned about the following issues: the effect of new pipelines transporting Rockies gas to the east, availability of West Coast liquefied natural gas (LNG), whether new Canadian sources of gas (e.g., McKenzie Delta) will actually materialize, whether Canadian natural gas exports will decline if coal plants in Ontario are replaced with natural gas-fired plants, lack of natural gas storage in Nevada, and impacts to reliability should there be an disruption in Kern River Pipeline deliveries.

Natural Gas Supplies to Nevada

Nevada receives natural gas from pipelines in the northern and southern part of the state, with most of the gas coming from Canada and the Rocky Mountains. In the north, natural gas from Alberta and British Columbia is transported through a pipeline system that includes the Northwest Pipeline Company (Northwest) and Gas Transmission Northwest (GTN), which collectively represent 99% of the import capacity. Northwest imports about 24 percent of the gas, with GTN importing about 76%. In the south, natural gas from the Rockies is transported on the Kern River Pipeline system (Kern River), providing over 85% of the gas consumed in southern Nevada.

149 CAISO. *Integration of Renewable Resources: Transmission and Operating Issues and Recommendations for Integrating Renewable Resources on the California ISO-Controlled Grid*. November 2007, p. 7.

In northern Nevada, the GTN pipeline interconnects with the Tuscarora pipeline system near Malin, Oregon. Tuscarora terminates near Wadsworth, Nevada, where it interconnects with Paiute Pipeline Company. SPPC is the primary customer for natural gas transported on the Tuscarora pipeline. The Northwest pipeline connects with Paiute Pipeline Company at its eastern terminus, for delivery of gas to the Reno area.

In the south, Kern River delivers Rocky Mountain gas to Southwest Gas Company (Southwest) for distribution to customers. In addition, Kern River provides natural gas directly to southern Nevada power plants. Additional supplies of natural gas come from the El Paso natural gas pipeline which supplies customers in California and Arizona as well as serving as a secondary source of supply to southern Nevada and the Las Vegas area.

Natural Gas Demand Growth

Nevada's consumption of natural gas increased form 176,835 million cubic feet (MMcf) in 2001 to 227,375 MMcf in 2005 28.5% over four years or an average of 6.5% annually. The 2007 Nevada Energy Status Report states that Southwest and SPPC currently have adequate supplies of gas, and Reno, the Interstate-80 corridor and Clark County have adequate access to these supplies with capacity for additional growth.[150]

The CEC, in its 2007 Natural Gas Market Assessment, indicates that California natural gas demand will grow at an annual rate of less than 1 percent, while Western Canada and the other western states will have annual growth rates of 3% and 2%, respectively.[151] By 2017, the western United States and western Canada will be consuming over 1.6 billion cubic feet (Bcf) more of natural gas each day with most of this new demand needed to generate electricity.

However, future demand for natural gas could be affected by numerous external events. As Nevada (and other western states) increase the percentage of electricity derived from renewable resources, natural gas power plants will be needed to complement the renewable resources since gas plants have the ability to come on line quickly when wind or solar resources lose output due to lack of wind or sunshine. California's decision to not allow its utilities to contract for coal-generated electricity could result in the construction of fewer coal plants and more natural gas plants in the West. Any carbon taxes imposed on coal plants could have a similar effect. For example, the CEC conducted multiple scenario analyses for its 2007 Integrated Energy Policy Report, one of which calculated that if a $60 per ton of carbon price were attached to CO2 emissions, projected levels of coal-generated electricity in the WECC would decline by about 30 to 40% in 2020, causing natural gas consumption in the WECC to increase between 35 to 127%.[152]

Adequacy of Supply and Delivery Infrastructure

Nevada's natural gas supplies are derived from Canada, and the Rockies and Southwest gas basins in the U.S. Both the Energy Information Administration (EIA) and the National Energy Board of Canada have scenarios where North American natural gas supplies could significantly decrease. However, in any scenario it is useful to recognize that Nevada is situated between California, one of the largest

150 NSOE. Retrieved on November 11, 2007 from http://energy.state.nv.us/2007%20Status%20of%20Energy%20in%20Nevada%20Report.pdf

151 CEC. Retrieved on November 11, 2007 from http://energy.ca.gov/2007publications/CEC-200-2007-009/CEC-200-2007-009-SD-REV.PDF

152 CEC. Retrieved on November 11, 2007 from *Integrated Energy Policy Report (IEPR).* http://energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CTF.PDF

single gas consumers in the U.S., and most of the available gas supplies. Since Nevada's demand will be a fraction of California's and given the size of California's clout in the market, Nevada is likely to benefit from any efforts to overcome supply and delivery bottlenecks in the West.

Rocky Mountain Gas

Most of the natural gas consumed in Nevada comes from the Rocky Mountains. Production in Wyoming, Utah and Colorado has increased from an average of 5.5 billion cubic feet (Bcf) per day in 2000 to 8.6 Bcf per day in 2006.[153] According to EIA, natural gas production in the Rocky Mountain region will increase nearly 19% from 2004 to 2010.[154]

The Rockies Express Pipeline will deliver up to 1.8 Bcf per day of natural gas to eastern markets beginning in the 2008-2009 timeframe, although demand for this new supply may not materialize immediately. The Rockies Express pipeline could reduce supplies on existing pipelines such as the Cheyenne Plains pipeline which began transporting gas to the East in 2004. If gas currently flowing to the East from Canadian supplies is reduced, this could divert Canadian gas deliveries to the West Coast. For the Kern River pipeline (which supplies much of Nevada's natural gas), the CEC projects that flows will be maintained and slightly increase (200 MMcf per day) between 2007 and 2017.[155] Since this pipeline supplies only 20 percent of California's natural gas demand, actions by California are unlikely to significantly affect pipeline operations. In terms of reliability, at a special PUCN hearing on natural gas held October 31, 2007, Kern River indicated that it has had only one minor delivery issue since beginning operations and that the company has provisions with its suppliers in case of emergencies.

Additional delivery of Rocky Mountain gas to the West is under consideration. Spectra Energy announced on November 1, 2007, that it plans to build a new pipeline to carry Rocky Mountain natural gas to markets in the Pacific Northwest and California. The pipeline would carry in excess of 1 Bcf per day and could be in service as early as 2011. Spectra plans to hold an open season in late 2007/early 2008 months, the results of which will determine the final route, market and timing.

Liquefied Natural Gas

A potential future supply of natural gas to Nevada is the Pacific Connector Gas Pipeline. The Pacific Connector is proposed to transport natural gas from the proposed Jordan Cove LNG facility in Oregon, currently undergoing FERC review. If approved and constructed, the pipeline would deliver 1 Bcf per day of natural gas to the Pacific Northwest, northern and central California, and northern Nevada.

Additional LNG facilities would also provide natural gas to the western United States. LNG supplies from the Costa Azul facility in Baja Mexico will likely enter the market in 2008 and are expected to serve California and southwest markets. The initial 1 Bcf per day may be augmented in the future with a 1.5 Bcf expansion that is in the final stages of permitting. The CEC believes that the influx of natural gas from Costa Azul will displace Southwest Basin gas supplies, making these supplies available to Nevada and other markets.[156]

153 EIA. *Short Term energy Outlook Supplement*. September 2007.

154 http://www.eia.doe.gov/emeu/steo/pub/special/Rockies_NatGas_2007.pdf

155 http://energy.ca.gov/2007publications/CEC-200-2007-009/CEC-200-2007-009-SD-REV.PDF

156 Op. cit.

Additional imports of LNG to markets on the East and Gulf Coasts are likely. EIA is projecting that LNG imports will grow from 0.6 Tcf in 2005 to 4.5 Tcf in 2030.[157] Table 4-1 provides a comparison of EIA projections with those made by other experts in the field. The EIA reference case forecast is the most conservative in almost every year.

Delivery of LNG faces many uncertainties. The United States faces considerable competition from Europe and Asia for LNG and a robust spot market has developed that prompts diversion of cargoes to the highest bidders. Buyers of regasified LNG would have to sign long-term contracts to be assured of continued delivery. In recognition of this, the CPUC has begun a Rulemaking (R. 07-11-011) to examine issues, including long-term contracts, relating to whether and how California utilities should enter into LNG contracts. Although shipments of LNG can be affected by geopolitical issues, a report by LNG expert James Jensen suggests that such events would more likely affect deliveries to Europe. Jensen indicates that under both a low LNG supply scenario and a business-as-usual scenario, LNG imports to North America would be in the range of 12.1 to 12.7 Bcf per day.[158]

Table 4-1 Net LNG Import Forecast Comparison (Tcf)

	EIA	GII	EVA	EEA	DB	SEER	Altos
2005	0.57						
2015	2.99	NA	4.22	3.13	2.29	3.70	6.84
2025	4.38	NA	7.82	5.04	8.29	6.00	11.49
2030	4.53	NA	NA	NA	9.47	7.64	11.97

Source: EIA, 2007. EIA: Energy Information Administration; GII: Global Insight, Inc.; EVA: Energy Ventures Analysis, Inc.; EEA: Energy and Environmental Analysis, Inc.; DB: Deutsche Bank AG; SEER: Strategic Energy and Economic Research Inc.; Altos: Altos Management Partners

Canadian and Arctic Sources of Natural Gas

EIA projects that net imports of natural gas from Canada will fall in its reference case from 3.3 Tcf in 2005 to 1.2 Tcf in 2030. Flows of natural gas from the McKenzie Delta (2012 timeframe) are insufficient to offset an expected decline in Alberta production and an increase in Canada's domestic consumption.[159] LNG imports are expected to offset the declines in Canadian natural gas available to the United States.

Natural Gas Storage

Natural gas storage helps to maintain a diverse gas supply portfolio, enhances reliability and operational flexibility, allows for the more efficient use of pipeline capacity assets, and reduces natural gas volatility. Natural gas can be stored in a number of ways, with the most common being in underground formations such as depleted oil or gas reservoirs, natural aquifers or salt domes.

Other than a small LNG facility (withdrawals approximately 590 MMcf in 2005) near Lovelock, Nevada currently has no natural gas storage capability. Storage is fairly limited in general in the West compared to the Midwest and East. In the West, only California, Oregon and Washington have natural gas storage capability, with the largest percentage (88%) in California. California expects to add three new storage facilities over the next few years: Sacramento Natural Gas Storage (7.5 Bcf); Lodi Gas

157 EIA. Retrieved on November 30, 2007 from http://www.eia.doe.gov/oiaf/aeo/gas.html

158 CEC. http://www.energy.ca.gov/2007publications/CEC-200-2007-017/CEC-200-2007-017.PDF

159 DOE. Retrieved on November 30, 2007 from http://www.eia.doe.gov/oiaf/aeo/gas.html

Storage Expansion (12 Bcf); and Gill Ranch (15 Bcf – Northwestern and 5 Bcf – PG&E). El Paso Natural Gas has proposed to develop a natural gas storage project in Arizona which will consist of four caverns capable of storing approximately 3.5 Bcf of natural gas. El Paso states that this supply would be available to Arizona and other western markets. An application for this project will be filed with FERC in late 2007 or early 2008.[160]

Storage costs vary depending on the type of reservoir. Depleted oil and gas reservoirs have storage costs on the order of $0.50 Mcf while salt dome storage costs are in the range of $1.00 Mcf. However, salt reservoirs permit multiple additions and withdrawals (cycles) throughout the year while depleted oil and gas reservoirs are more typically cycled once per season. The West has primarily depleted oil and gas reservoirs.[161]

A study was done on the geologic potential for carbon sequestration in Nevada.[162] Generally, reservoirs capable of storing CO2 are also candidates for natural gas storage. Oil (primarily) and gas exploration has occurred throughout Nevada, but commercial oil production has been from only two locations, Railroad Valley in Nye County and Pine Valley in Eureka County. Saline aquifers in the state that would have potential for CO2 sequestration are Granite Springs Valley in Pershing County, Antelope and Reese River Valleys in Lander County, and Ione Valley in Nye County.

Natural Gas Prices

Numerous experts have projected future natural gas prices. The following tables compare lower 48 well-head and residential price forecasts for the years 2005, 2015, and 2025 from a range of sources. None of these forecasts expect prices to increase substantially. EIA well-head prices (Reference Case) are generally lower than those projected by other experts. [163]

Table 4-2 Lower 48 Well-head Gas Price Forecast Comparison (2005 Dollars per Thousand Cubic Feet)

	EIA	GII	EVA	EEA	DB	SEER	Altos
2005	$7.51						
2015	$4.99	$6.10	$5.55	$6.51	$6.07	$5.12	$5.60
2025	$5.62	$6.21	$6.06	$6.83	$5.71	$5.61	$6.96

Source: EIA, 2007

160 El Paso Corporation. Retrieved on December 10, 2007 from http://www.elpaso.com/arizonagasstorage/projectinfo.shtm

161 EIA. Retrieved on November 30, 2007 from http://www.simmonsco-intl.com/files/63.pdf

162 West Coast Regional Carbon Sequesteration Partnership. Retrieved on December 10, 2007 from http://204.154.137.14/technologies/carbon_seq/partnerships/phase1/pdfs/final%20westcarb%20geo-nevada.pdf

163 EIA. Retrieved on November 30, 2007 from http://www.eia.doe.gov/oiaf/aeo/pdf/tbl18_24.pdf

Table 4-3 Residential natural gas price forecast comparison (2005 Dollars per Thousand Cubic Feet)

	EIA	GII	EVA	EEA	DB	SEER	Altos
2005	$12.80						
2015	$10.55	$11.28	NA	$10.95	NA	$10.89	NA
2025	$11.30	$11.21	NA	$10.95	NA	$11.19	NA

Source: EIA, 2007

Nevada's Flexible Generation Fleet and the Need for Natural Gas Storage

Based on the review of generation fleet operating characteristics in the presence of intermittent generation, Nevada may need strategically chosen gas generation that can ramp quickly and respond flexibly to changes in system net energy needs. This report did not review whether Nevada's existing generation fleet is adequate, rather we simply note that the utilities should choose new gas generation operating capabilities in the light of how that gas generation can best complement a fleet of diverse resources. Furthermore, we note that operating a system with diverse sources of demand and supply side resources may change the combination of gas contracts that meet system needs at least cost.

Based on the review of Nevada's sources of natural gas supply, it appears that there will be adequate supplies of natural gas to meet future demands in the West. Well-head prices for natural gas are projected to remain in the $5 to $7 range, although price volatility may continue. However, Nevada gas delivery requirements may change if the fleet is expanded to include more intermittent sources of generation and more flexible sources of demand response. Continued gas price volatility provides further support for increasing the contracting flexibility of Nevada's utilities to access gas supply and supports using Nevada's native energy resources to limit increases in the volume of natural gas consumption. Taken together, these findings support the further investigation of gas storage facilities in Nevada to accommodate more flexible contracting opportunities for natural gas in the future.

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Chapter 5 Policy Components of a Flexible Solution

The completion of a north-south inter-tie by 2011, expanded distribution level solutions, and expedited development of renewable energy accessed by selected collector systems require complementary policy implementation measures. All utilities are attracted to the prospect of building large, centralized generation facilities that the utility can finance and place into rate base. Nevada's Governors, legislators and PUCN Commissioners have each taken steps toward offering Nevada utilities the opportunity to build a business model that is less dependent on large, centralized fossil generation. The passage of the 20% Portfolio Standard (PS), the opportunity to have facilities that support compliance with the PS designated as critical facilities, the regulations that instruct the utilities to seek out state and regional partnerships, the opportunity to earn a return on equity premium on DSM programs and the adoption of rules and tariffs that support some distributed energy production are each examples of actions that Nevada policy makers and regulators have supported to start leveling the playing field between large fossil generation and alternatives to that generation. Even with these changes, the playing field is not level from a utility investor's point of view and the attraction of multi-billion dollar centralized generation that guarantees a large, sustained revenue stream for 40 years is highly desirable. Unfortunately, the risk of delays and cost increases have been cited in SPR's December 2007 10-Q. [164] As such, the prospect of a guaranteed forty year revenue stream is inextricably linked with the risk of having to scramble to meet near term needs when delays occur and with the cost of carrying for decades what may become a white elephant.

Further federal and state statutory, regulatory and policy initiatives are thus necessary to further level the playing field between large, centralized fossil generation sources and the diverse set of resource and demand side alternatives that are proposed here. In particular, constructing the north-south inter-tie can be facilitated by federal and state policies that mitigate transmission costs, expand the potential for accessing regional electricity resources and expedite transmission permitting. Expanding the use of distribution level solutions will be facilitated by policies that promote utility partnerships with large customers, promote the deployment of advanced metering technologies, promote the adoption of tariffs that facilitate demand response programs and promote the use of distributed resources to meet system ancillary services requirements.

Federal and State Policies in Support of a North-South Inter-tie

Policies to Mitigate Transmission Cost and Promote Regional Access

A north-south inter-tie and other key transmission projects in Nevada would benefit from policies that mitigate the cost of transmission, expand the potential for accessing regional electricity resources and expedite the permitting of projects. A transmission project that interconnects Nevada's two control areas will likely require more than 200 miles of new transmission line. U.S. Senate Bill 2076, the Clean Energy and Economic Development Act, proposes to mitigate transmission cost by providing for federal financing support for projects that access renewable energy zones. If a resource development

164 SPR. *Form 10-Q, Quarterly Report, Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations*. November 2007. Retrieved on November 6, 2007 from http://biz.yahoo.com/e/071102/srp10-q.html

plan is implemented that would ensure that 75% of the energy accessed and transported by the line is from renewable energy resources then the line could qualify for federal financing. A federal financing partnership could lower financing costs to Nevada ratepayers and could allow Nevada's utilities to consolidate their financing capabilities to build the renewable resources and collector systems accessed by the new line. State policies that provide regulatory certainty for the portion of transmission that is financed and built by NPC and SPPC can be an important companion to Federal financing initiatives. To further facilitate transmission financing, Nevada could choose to follow the path of Wyoming[165], Idaho[166], New Mexico[167] and Kansas[168] which have implemented transmission or infrastructure authorities. Taken together, federal and state support for the financing of a north-south interconnection should be implemented and applied so that an on-line date of 2011 is achieved.

The costs of a large transmission line can be mitigated if a large volume of resources are developed that can use the line to serve Nevada customers. This paper has discussed the importance of building collector systems and conducting RFPs for generation that is proximate to the selected collector systems. This report has also discussed the opportunity to build partnerships that can leverage regional renewable energy and transmission projects to serve Nevada customers with competitive and timely regional resources. FERC Order 890 has offered four important requirements that can improve access to aggregated generation resources in Nevada and the region.

Paragraph 323 of Order 890 requires consistent and transparent reporting of all available transmission capacity on the transmission system.[169] The ordering paragraph states:

> The Commission adopts the NOPR[170] proposal to increase transparency regarding ATC calculations by requiring each transmission provider to set forth its ATC calculation methodology in its OATT[171]. Each transmission provider must, at a minimum, include the following information in Attachment C to its OATT. It must clearly identify which of the NERC[172]-approved methodologies it employs (e.g., contract path, network ATC, or network AFC). It also must provide a detailed description of the specific mathematical algorithm the transmission provider uses to calculate firm and non-firm ATC for the scheduling horizon (same day and real-time), operating horizon (day ahead and pre-schedule), and planning horizon (beyond the operating horizon). In addition, transmission providers must include a process flow diagram that describes the various steps that it takes in performing the ATC calculation...

Development of a common ATC methodology that ensures that all ATC is made available will provide Nevada's utilities with the opportunity to more readily access regional resources at lower cost. Constraints outside of the SPPC control area have limited Nevada's access to resources in the Northwest, Basin and Rocky Mountain regions of the WECC. An open, transparent and inclusive ATC methodology along with the construction of new facilities will increase transfer capability in the region and offer Nevada's utilities greater access to resources and partnerships outside of Nevada.

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165 Wyoming Transmission Infrastructure Authority. http://www.wyia.org/

166 Idaho Energy Resources Authority. http://www.iera.info/

167 New Mexico Renewable Energy Transmission Authority. http://www.emnrd.state.nm.us/main/RETA2.htm

168 Kansas Electric Transmission Authority. http://www.kansas.gov/keta/

169 Federal Energy Regulatory Commission. Docket Nos. RM05-17-000 and RM05-25-000; Order No. 890. February 16, 2007, paragraph 323.

170 Notice of Proposed Rulemaking (NOPR)

171 Open Access Transmission Tariff (OATT)

172 North American Electric Reliability Council (NERC)

Paragraph 911 of Order 890 further expands renewable energy access to western transmission system by requiring that transmission system operators offer conditional firm capacity rights along side of firm capacity rights. The paragraph states:

> The Commission has determined that modifications to the current planning re-dispatch requirement and creation of a conditional firm option are both necessary for provision of reliable and non-discriminatory point-to-point transmission service. The planning re-dispatch and conditional firm options represent different ways of addressing similar problems. They can be used to remedy a system condition that occurs infrequently and prevents the granting of a long-term firm point-to-point service. These options also can be used to provide service until transmission upgrades are completed to provide fully firm service. Planning re-dispatch involves an ex ante determination of whether out-of-merit order generation resources can be used to maintain firm service. Conditional firm involves an ex ante determination of whether there are limited conditions or hours under which firm service can be curtailed to allow firm service to be provided in all other conditions or hours. As we explain below, both techniques are currently used under certain conditions by transmission providers to serve native load and, hence, it is necessary to make comparable services available to transmission customers in order to avoid undue discrimination.[173]

The absence of a conditional firm capacity product has left many developers who wish to develop new renewable resources with the unacceptable choice of accessing non-firm capacity, which precludes entering long term firm contracts, or firm capacity, which often requires the developer of a small project to pay the full incremental cost of expanding the firm capacity of the system. The mandate to offer conditional firm products will help Nevada utilieies to enter into contracts both within the state and also within the region as access to the transmission system is further opened.

Paragraph 1231 of Order 890 ensures that regional entities that enter into contracts using Nevada's transmission systems will not get rollover rights to firm capacity unless they reserve capacity for five years or more. The paragraph states:

> The Commission finds that the current rollover policy is no longer just, reasonable, and not unduly discriminatory. The rights and obligations of a rollover customer should bear a rational relationship to the planning and construction obligations imposed on the transmission provider by the rollover rights. We find, for the reasons explained below, that the current policy no longer meets this standard and that a five-year term will ensure greater consistency between the rights and obligations of customers and the corresponding planning and construction obligations of transmission providers.[174]

This revision gives Nevada electricity consumers the assurance that as regional entities use Nevada's systems, Nevada's utilities can retain the long term capacity rights to that transmission if they can nominate resources that will use that capacity within five year's of the transmission facility coming on-line. For example, if the EN-ti were to become the north-south interconnection project and if it were to come on line in 2011, NPS and SPPC would have to bring projects and contracts on line between 2011 and 2016 that would fill the capacity that Nevada needs for its own growth. NPC and SPPC need to begin developing the contracts and projects now that will use the north-south interconnection to ensure that the long term rights to that capacity needed to serve Nevada customers stay with Nevada. To the extent that this five year window is inadequate, the federal government should expand the window to a

173 Op. cit, paragraph 911.

174 Op. cit, paragraph 1231.

longer period to ensure that utilities have adequate time to build and fill transmission capacity intended for their native load customers.

Paragraphs 445 to 551 of Order 890 discuss eight of the planning principles adopted by FERC to require transmission entities to offer a transparent, open and coordinated application process for transmission service and paragraphs 593 to 594 express FERC's general support for offering open season opportunities to new transmission to mitigate the transmission access costs of individual generation projects.[175] In their December 7, 2007 filing with FERC, NPC and SPPC indicate their plans to comply with the FERC planning principles and interested parties should take note as FERC considers whether to approve the utilities plan. NPC and SPPC native load customers may potentially benefit if these open transmission planning activities are effective in enabling Nevada's utilities to share and spread the costs of new transmission facilities to serve its customers.

Expediting Transmission Permitting

The federal government and western State governments have been active in pursuing opportunities for expediting western transmission projects. Most federal activity at the present is driven by provisions of the 2005 EPAct. The EPAct sections 1221 and 368 addressed permitting of energy transportation facilities. Section 1221 established the Department of Energy (DOE) as the lead agency in coordinating federal agency permitting of energy facilities subject to federal jurisdiction. Section 1221 further called for the designation of National Interest Electric Transmission Corridors (NIETC). Once designated a NIETC, a project proponent can ask FERC to permit a project if the state authorities with jurisdiction do not action an application within one year. On October 2, 2007 the DOE announced the NIETC. DOE is currently considering whether further regulations are required to fully implement its responsibility to coordinate federal agencies on NIETC applications.

Section 368 designates the DOE and the BLM as co-lead agencies in coordinating the efforts of the Departments of Agriculture, Commerce, Defense, Energy and Interior in preparing a Programmatic Environmental Impact Statement (PEIS) for energy corridors on federal lands in an eleven state area of the western United States. The draft PEIS was noticed on November 8, 2007 and comments are due to the BLM by February 14, 2008.

State activities in support of transmission permitting include the efforts of sub-regional transmission planning groups, the efforts of the Western Climate Initiative, and the efforts of individual states. The sub-regional groups and the many western projects that are in development can be found at the Transmission Expansion page of the Western Interstate Energy Board home page.[176] The Western Climate Initiative has supported and expanded the efforts to identify renewable energy zones and to further identify the transmission needed to access those zones. Some states have implemented programs to expedite permitting of these transmission lines such as the Texas Competitive Renewable Energy Zone (CREZ) initiative and the Colorado Energy Resource Zones initiative.[177,178] Other states, including Nevada, have begun developing maps that identify zones and identify transmission needed to access those zones. The RETAAC report identifies zones and proposes potential transmission needed to access those zones but getting transmission collector systems built to access the best zones should be

175 FERC. *Docket Nos. RM05-17-000 and RM05-25-000*; Order No. 890. February 16, 2007, paragraphs 445-551 and 593-594.

176 See http://www.westgov.org/wieb/

177 Texas Renewable Energy Zones. See http://www.puc.state.tx.us/rules/subrules/electric/25.174/25.174ei.cfm

178 Colorado Transmission for Energy Resource Zones. See http://www.dora.state.co.us/PUC/rulemaking/SB07-100/SB07-100.htm.

expedited so that native resource alternatives will be available to NPC and SPPC to address the first and possible future delays in the EEC.

Federal and State Policies in Support of Distributed Loads and Resources

As noted in Chapter 2, Nevada demand response and distributed generation resources can contribute significantly to filling the need left by the first delay in the EEC. Furthermore, these resources should be developed and deployed by 2011 to ensure that there are options available to complement the resources made available by a north-south interconnection. FERC Order 890 has required that these resources be accessed to meet system planning and ancillary services.[179] A 2007 study by LBNL researchers surveys the international experience of using of loads to meet ancillary services requirements and finds specific applications that are proven and could be used in Nevada.[180] The study concludes, "There are no implicit or insurmountable barriers to loads providing any of the four ancillary services – Continuous Regulation, Energy Imbalance Management, Instantaneous Contingency Reserves and Replacement Reserves – considered in this report."[181] The researchers go on to recommend eight specific actions to increase demand side participation in supporting the system with the cornerstone of these eight recommendations being, "Adopt the principle of source neutrality in designing markets and establishing reliability rules."[182] Nevada should ensure that policies and regulations enforce "source neutrality" and Nevada should deploy the demand side infrastructure and tariffs that facilitate cost effective demand response, CHP and distributed generation in meeting the needs created by the first delay in the EEC.

Two specific opportunities exist to further promote the demand side solutions. First, just as Nevada has recognized the benefit of allowing the utility to experience some benefits as it implements DSM programs, Nevada should consider tariffs that allow NPC and SPPC to benefit as DG solutions such as CHP are deployed. Great Plains Energy (GPE) regulators have approved a program that allows GPE to share in the capital investment for DG facilities on customer premises and thus GPE reaps some rate base benefits when customer generation is deployed. Given the tremendous potential for CHP in Las Vegas, Nevada should consider tariffs that allow NPC to co-invest in these facilities with large customers.

The second opportunity comes with the deployment of the Nevada Utilities' Home Energy Display (HED) program. The HED represents one critical link building a demand side infrastructure that can access demand response resources. However, the HED alone will not deliver those resources. Metering, communication and tariff complements to HED are necessary to build the two-way communication system that will allow the utilities, customers and any contracting intermediaries that emerge to take full advantage of DR resources.

179 FERC. Docket Nos. RM05-17-000 and RM05-25-000; Order No. 890. February 16, 2007.

180 Heffner, G., Goldman, C., Kirby B., Kitner-Meyer, M. Lawrence Berkeley National Laboratory. *Loads Providing Ancillary Services: Review of International Experience*. May 2007.

181 Op. cit, p. 45.

182 Op. cit, p. 45.

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Conclusion: Setting the Cornerstones for Nevada's Electricity Future

Nevada is fortunate to have a number of options for meeting its electricity needs in the coming decade. The projected shortfall caused by delays or cancellation of the coal plants in eastern Nevada can be met by utilizing various combinations of the resources identified in this report. Furthermore, the infrastructure built to access these resources can become the foundation upon which Nevada's electricity needs are met for decades to come. Physical performance, production economics, environmental performance and regulatory changes can each affect the relative viability and desirability of competing technologies and resources over time. Given the uncertainties associated with changing technology and regulation, an infrastructure should be built now that can flexibly respond to the relative availability and performance of options as conditions and the options evolve.

The need for resources created by this initial delay in the first EEC coal plant can be met by some combination of statewide, regional, efficiency, renewable and gas resources. The longer term need to create access to a flexible array of resource alternatives can benefit from the construction of an infrastructure that:

- connects northern and southern Nevada and provides the opportunity to optimize the shared operation of the SPPC and NPC control areas,
- provides an avenue for sharing resources with the Northwest, Basin and Rocky Mountain regions of the WECC,
- creates opportunities for leveraging other generation and transmission projects under development in the west,
- increases NPC and SPPC use of efficiency and distributed resources,
- accesses Nevada's most cost effective renewable resources, and
- adds new gas generation when it can complement the aforementioned resources.

The infrastructure foundation can be built without further federal and state policy support, but the cost and timeliness of the construction can benefit from specific policy support. Nevada Senator Reid's Renewable Energy Zone legislation and Nevada State Infrastructure Authority proposals could help to get projects financed if financing proves to be a barrier. FERC Order 890's planning principles could facilitate partnerships and collaborative planning activities that could share the costs of building out the infrastructure so that Nevada's native load customers do not bear the full cost. Continued federal and state permitting agency support for pre-permitting environmental assessments can shorten the lead time from transmission project identification to construction and operation. FERC efforts to improve standardize and make transparent the calculation and posting of ATC and conditional firm products can help to improve the economics of new projects throughout the west that need to access the grid to reach customers. FERC and state efforts to facilitate the interconnection and use of distributed and efficiency resources to meet reliability and energy needs can encourage more demand side investment.

Evaluating the benefits of laying the infrastructure foundation for Nevada requires a Real Options framework such as Robust Decision Making where the option value of having the infrastructure in place can be fully expressed. Nevada will not meet its PS without appropriate transmission interconnections. Nevada will not have the option of sharing resources between the SPPC control area and the NPC control area without an interconnection. Nevada will not have the option of evaluating numerous resource alternatives within Nevada and in the west without the infrastructure described in this report. In the near term, establishing an infrastructure foundation in Nevada addresses the void created by the delay or absence of the EEC. The long term value is expressed in the option value; having a flexible infrastructure foundation in place that enables a wide range of alternatives and partnerships. Without a flexible infrastructure, these options would be patently infeasible.

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