2008 Combined Heat and Power Baseline Assessment and Action Plan for the Nevada Market

Final Project Report

September 30, 2008

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Executive Summary

The purpose of this report is to provide an updated assessment and summary of the current status of combined heat and power (CHP) in Nevada and to identify the hurdles that prevent the expanded use of CHP systems. This report has been prepared by the Pacific Region CHP Application Center (PRAC). The PRAC is a United States Department of Energy (DOE) and California Energy Commission[1] sponsored center to provide education and outreach assistance for CHP in the Pacific region of California, Nevada, and Hawaii. The PRAC is operated by the University of California – Berkeley (UCB), the University of California – Irvine (UCI), and San Diego State University (SDSU).

The information presented in this report is intended to provide:

- an overview of the current installed base of CHP systems in Nevada;
- a summary of the technical and economic status of key CHP system technologies;
- a summary of the utility interconnection and policy environment for CHP in Nevada;
- an assessment of the remaining market potential for CHP systems in Nevada;
- an "action plan" to further promote CHP as a strategy for improving energy efficiency and reducing emissions from Nevada's energy system; and
- an appendix of contacts for key organizations involved in the Nevada CHP market.

The Nevada CHP Landscape

Nevada's electrical and natural gas services are primarily provided by investor-owned utility companies (IOUs), with additional services provided by rural cooperatives. The major IOUs – providing a combined total of over 90% of the electricity used in the state – are Nevada Power Company and Sierra Pacific Power Company. These two companies merged in 1999 and now are jointly held by Sierra Pacific Resources. Natural gas is supplied in Nevada by Southwest Gas Company and Sierra Pacific Power Company.

Nevada currently has approximately 320 MW of installed CHP capacity, which contributes to 7% of the state's electricity generation. Although only a fraction of the population and economy of the Pacific region, Nevada has significant opportunities for reducing greenhouse gas emissions through the deployment of CHP in their buildings sector, particularly in the growing hospitality industry.

CHP systems in the western states of California, Hawaii, Nevada, and Arizona are collectively estimated to be saving more than 370 trillion BTUs of fuel and 50 billion tons of CO_2 emissions per year, compared with the conventional generation they have replaced (Hedman, 2006).

Technical and Economic Status of Key CHP Technologies

The various types of CHP systems have different capital and maintenance costs, different fuel costs based on fuel type (e.g. natural gas, landfill gas, etc.) and efficiency levels. The main types of CHP system "prime mover" technologies are reciprocating engines, industrial gas turbines, microturbines, and fuel cells. The more efficient systems (in terms of electrical efficiency) tend to have higher capital costs. Table ES-1 below presents a summary of key characteristics of each of these types of generators.

[1] Hereafter, the California Energy Commission is referred to as "the Energy Commission."

Table ES-1: CHP "Prime Mover" Technology Characteristics

	Microturbines	Reciprocating Engines	Industrial Turbines	Stirling Engines	Fuel Cells
Size Range	20-500 kW	5 kW – 7 MW	500 kW – 25 MW	<1 kW – 25 kW	1 kW – 10 MW
Fuel Type	NG, H, P, D, BD, LG	NG, D, LG, DG	NG, LF	NG plus others	NG, LG, DG, P, H
Electrical Efficiency	20-30% (recup.)	25-45%	20-45%	12-20%	25-60%
Overall Thermal Efficiency	Up to 85% (AE)	Up to 75% (AE)	Up to 75% (AE)	Up to 75% (AE)	Up to 90% (AE)
Emissions	Low (<9-50 ppm) NOx	Controls required for NOx and CO	Low when controlled	Potential for very low emissions	Nearly zero
Primary cogeneration	50-80° C. water	Steam	Steam	Hot water	Hot water or steam (tech. dep.)
Commercial Status	Small volume production	Widely Available	Widely Available	Small production volume	Small volume production or pre-commercial (tech. dep.)
Capital Cost	$700-1,100/kW	$300-900/kW	$300-1,000/kW	$2,000+/kW	$4,000+/kW
O&M Cost	$0.005-0.016/kWh	$0.005-0.015/kWh	$0.003-0.008/kWh (GTI)	$0.007-0.015/kWh (GTI)	$0.005-0.01/kWh
Maintenance Interval	5,000-8,000 hrs	ID	40,000 hours	ID	ID

Source: Data from Energy Commission, 2007, except Gas Tech. Institute for O&M costs as noted by "GTI" and "AE" for author estimates
Notes: ID = insufficient data
For Fuel Type: NG = natural gas; H = hydrogen; P = propane; D = diesel, LF = various liquid fuels; LG = landfill gas; DG = digester gas; BD = biodiesel.

Summary and Status of CHP Policy Issues in Nevada

Important policy issues for CHP include utility interconnection procedures, utility rate structures including "standby charges" and "exit fees," and economic incentive measures. An overview of these CHP/DG policy areas for the Nevada market is provided below.

Grid Access and Interconnection Rules -- On December 17, 2003, the Public Utilities Commission of Nevada (PUCN) adopted interconnection rules – known as Rule 15 -- for customers of Nevada Power and Sierra Pacific Power. The provisions of Rule 15 are consistent with California's interconnection standards

(Rule 21), IEEE 1547 rules, and the model interconnection agreement of the National Association of Regulatory Utility Commissioners (NARUC). Rule 15 specifies interconnection procedures for the DG systems of up to 20 MW in size. Somewhat controversially, Rule 15 allows utilities to charge customer-generators for past fuel and purchased-power expenses in their tariffs (DSIRE, 2007). The December 2003 agreement also revised Nevada's net metering standards for renewable energy systems including biomass-powered ones. The rules revised the net-metering program to allow systems of up to 150 kW to be net metered, up from a previous limitation of 10 kW (DSIRE, 2007a).

Market Incentives for CHP System Installation - In contrast to states like California, which have been actively promoting the installation of CHP systems through incentive programs, Nevada does not yet have clear plans for promoting CHP technology. Nevertheless, the state has taken steps toward working with industry and recognizes the need to change interconnection rules so that distributed generation can be better accommodated (NSOE, 2005; ACEEE, 2006). Nevada does not currently offer funding or rate class exemptions for CHP. However, they have established environmental regulations and net metering standards, which now encourage the implementation of a wide range of distributed power sources, and could potentially include CHP in the future.

Energy Portfolio Standard - As part of its restructuring efforts, Nevada established its Energy Portfolio Standard (EPS) in 1997. The PUCN administers the EPS and requires the two IOUs to obtain a certain fraction of their energy from renewable sources. The EPS was later revised in 2001 to require a scheduled portfolio increase of 2% every two years, hitting a maximum of 15% in 2013. In 2005, the EPS was amended once again under *Assembly Bill 3* (*AB 3*). Increases were raised to 3% every two years, reaching a maximum of 20% in 2015. The bill allows for the EPS to be met through renewable energy generation or credits and savings from efficiency measures. Also, *AB 3* requires that at least 5% of total electricity come from solar systems. Under the current standard, systems that quality for the portfolio include biomass, solar, geothermal energy, wind, and some hydro projects.

Net Metering Rules and Utility Rates - First introduced in 1997, net metering in Nevada allowed IOUs to meter renewable systems up to 30 kW. The rules were subsequent modified in 2001, 2003, and 2005 to allow to systems as large as 150 kW. Nevertheless, for units greater than 30 kW, customers are required to install their own meter. Moreover, the utilities can arbitrarily charge interconnection facility and demand fees. For units smaller than 30 kW, net excess generation (NEG) could be carried over to the next billing cycle indefinitely. Under utility terms for time-of-use rates, the excess generation would be added to the same time-of-use period of the subsequent months.

Governor's Energy Plan - The state of Nevada has provided relatively little policy or financial support for DG and CHP. However, the Governor's most recent comprehensive energy plan makes general pro-DG/CHP recommendations such as to make "incremental changes in tariffs to allow net metering and self-generation" and make "changes in tariffs and interconnection rules to accommodate distributed generation" (NSOE, 2005).

Energy Requirements for Government Buildings - Starting on July 1, 2007, Nevada will require that all public buildings sponsored or financed by the state must meet standards specified by the Leadership in Energy and Environmental Design (LEED) system (NRS 338.187). Technologies that earn LEED certification points include passive solar space heating, and renewable energy systems (including biomass and biogas), as well as a potential point or two for CHP systems more generally in the "innovation and design" category. In addition, the measure requires at least two constructed public buildings to meet the equivalent of LEED "silver" or higher over every two-year period.

Beyond these issues, a more general issue for Nevada is the controversial construction plans for future coal-fired power generation in the state, relative to other power-generation alternatives. A specific recent issue is the potential construction of the Ely Energy Center (EEC). Since proposed, the EEC has proven to be highly controversial and the project has recently been delayed over environmental concerns. This plant has been proposed to provide 1500 MW of generation capacity and potentially up to 2500 MW, with the first of two 750 MW units to be online by 2015 and the potential for two additional 500 MW units to be added in a future phase (Sierra Pacific Resources, 2008). Figure 1, below, shows the location of the proposed EEC and a new transmission line that would connect the facility to Las Vegas.

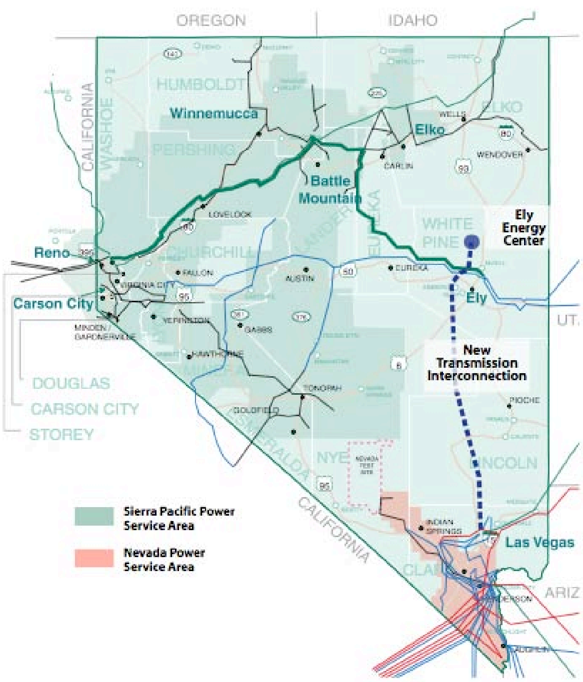

Figure 1: Proposed Ely Energy Center
(Source: Sierra Pacific Resources, 2008)

<u>The Market Potential of CHP Systems in Nevada</u>
The major lodging, resort, and casino sector provides Nevada with a significant opportunity to

implement CHP in higher-end hotels. The EPA estimates that about 10,000 hotels nationwide have energy demand profiles that can be efficiently met by CHP, and Nevada establishments have the highest average number of rooms in the country. Many existing sites in Nevada are eligible for conversion to CHP, and many more lodging units are expected to be built with the tourism and gambling industries expanding for the foreseeable future.

Other major industries include manufacturing, printing, and publishing. In 2003, the state gross product was estimated to be $88 billion according for the Bureau of Economic Analysis. Nevada is the fastest growing state in the country with 8.0% annual growth last year (Wachovia, 2006). The growth is largely driven by gains in the tourism and gaming industries, commercial and residential construction, and an influx of retirees.

EEA has recently completed a market assessment report for Nevada and Arizona that indicates that Nevada has a technical potential for 2,334 MW of additional CHP through 2020. EEA estimates that 1,792 MW of this potential is in existing facilities, and 1,216 MW of the potential is in new facilities that are expected to be built between 2005 and 2020. The total technical potential is reduced somewhat to arrive at the 2,334 MW figure, to avoid double counting in some applications where both traditional and cooling CHP opportunities were assessed. Table ES-2 below presents these technical potential estimates by existing and new facilities and the application (EEA, 2005a).

Table ES-2: EEA Estimate of Nevada CHP Technical Market Potential by Application

CHP Type	**MW Capacity**
Existing Facilities (MW)	
Industrial – On Site	316
Commercial -- Traditional	669
Cooling CHP	801
Large Industrial – Export	0
Resource Recovery	6
New Facilities (2005-2020) (MW)	
Industrial – On Site	32
Commercial/Institutional	518
Cooling CHP	666
Net Total Technical Potential*	**2,334**

Source: EEA, 2005a
Note: *Total adjusted to avoid double counting some applications that are analyzed in both traditional and cooling CHP categories

Summary of CHP System Financial Assistance Programs

There are no specific state incentive programs for CHP system installation in Nevada. The state's net metering program provides a form of incentive for biomass-based CHP projects, of 150 kW or less, by allowing export of extra power to the grid that can then be withdrawn at a later time. The main applicable financial assistance programs include federal tax programs, including the microturbine and fuel cell system tax credits, and CHP project screening services that are available on a limited basis from the PRAC and the U.S. Environmental Protection Agency.

Action Plan for Advancing the CHP Market in Nevada

The final section of this report presents a series of ideas for further advancing the CHP market in Nevada. Key recommendations include:

1. Consider legislation to provide capital cost buy-down incentives and/or low-interest loan programs for CHP systems, potentially with a performance-based component;

2. Institute co-metering for CHP systems to allow for power export to the grid with rules for power purchase from CHP system owners based on wholesale power prices plus consideration for their T&D, grid support, and GHG reduction benefits;

3. Encourage the use of CHP as a power reliability measure for critical need applications such as refineries, water pumping stations, emergency response data centers, etc.;

4. Include DG/CHP in the state integrated resource planning process; and

5. Consider PUCN direction to the Nevada utilities to develop more consistent and favorable utility tariff structures for CHP customers.

See Section 9 of the main text of this report for further elaboration of these "action plan" concepts.

Conclusions

Nevada is the highest growth state in the country in terms of population and energy demand growth. The state has relatively little CHP installed at present, with only a few hundred MW of installed capacity. The hotel and casino sector represents a particularly attractive sector for CHP systems, and one that is growing rapidly. Additional market potential includes the hospital, grocery, and wastewater treatment sectors, and some remaining mining and industrial sector opportunities.

Further DG/CHP policy development in Nevada could be important to furthering CHP opportunities in the state. Some basic elements are in place, in terms of interconnection standards for systems of up to 20 MW in size and net-metering programs for renewable systems. Additional programs to provide financial support for CHP system installation – to encourage them for their energy efficiency, economic, and environmental benefits – and to consider further development of CHP compared with other alternatives in the context of the state IRP process, would be helpful to further develop the CHP market in Nevada.

1. Introduction

The purpose of this report is to assess and summarize the current status of combined heat and power (CHP) in Nevada and to identify the hurdles that prevent the expanded use of CHP systems. This report has been prepared by the Pacific Region CHP Application Center (PRAC). The PRAC is a United States Department of Energy (DOE) and California Energy Commission[2] sponsored center to provide education and outreach assistance for CHP in the Pacific region of California, Nevada, and Hawaii. The PRAC is operated by the University of California – Berkeley (UCB), the University of California – Irvine (UCI), and San Diego State University (SDSU).

The information presented in this report is intended to provide:

- an overview of the current installed base of CHP systems in Nevada;
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- an assessment of the remaining market potential for CHP systems in Nevada;
- an "action plan" to further promote CHP as a strategy for improving energy efficiency and reducing emissions from Nevada's energy system; and
- an appendix of contacts for key organizations involved in the Nevada CHP market.

As a general introduction, CHP is the concept of producing electrical power onsite at industrial, commercial, and residential settings while at the same time capturing and using waste heat from electricity production for beneficial purposes. CHP is a form of distributed generation (DG) that offers the potential for highly efficient use of fuel (much more efficient than current central station power generation) and concomitant reduction of pollutants and greenhouse gases. CHP can also consist of producing electricity from waste heat or a waste fuel from industrial processes.

The following figures depict the manner in which CHP systems can provide the same energy services as separate electrical and thermal systems, with significantly less energy input. As shown in Figure 1, to provide 30 units of electricity and 45 units of heat using conventional generation would require energy input of 154 units. A typical CHP system using a 5 MW combustion turbine could provide these same energy services with only 100 units of energy input, thereby saving net energy, cost, and greenhouse gas emissions.

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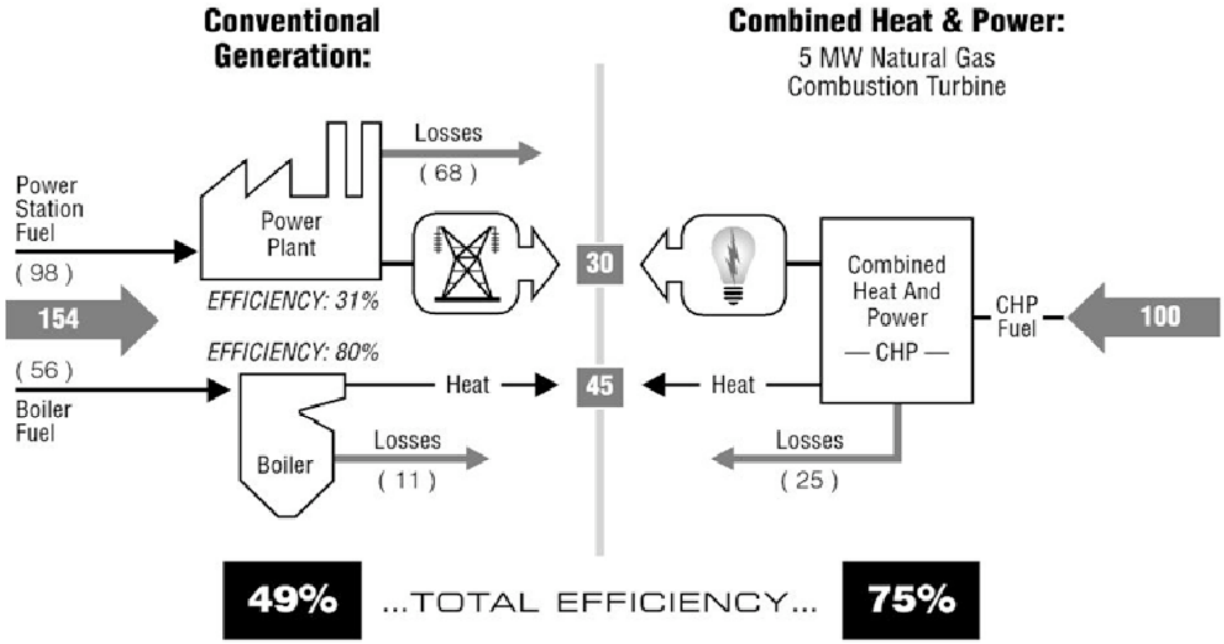
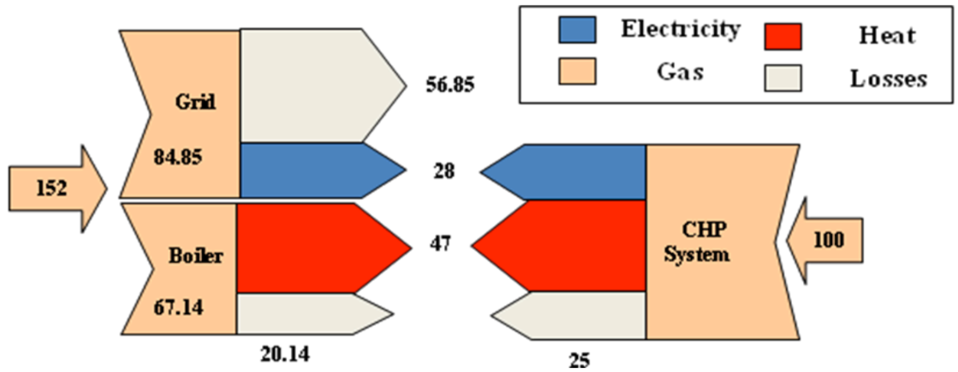


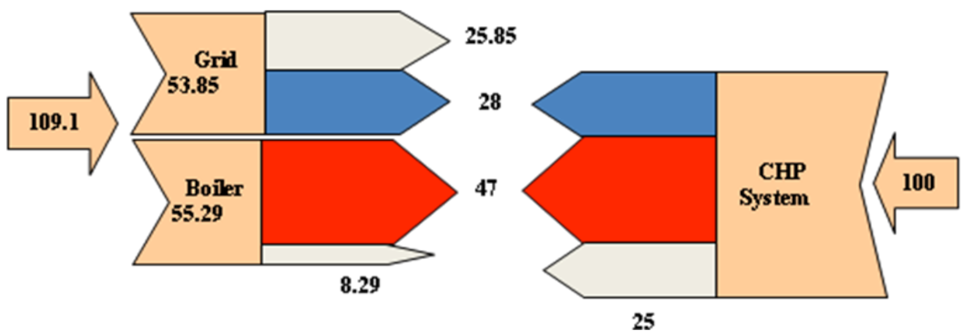
Source: Hedman, 2006

Figure 1: CHP Flow Diagram Based on 5 MW Combustion Turbine (generic energy units)

Figure 2 shows a more generalized depiction of the same concept. Compared with typical conventional generation, a present-day CHP system could provide the same electrical and thermal energy services with approximately two-thirds of the energy input. Even compared with a much advanced and more efficient combination of utility grid power and boiler technology in the future, the CHP system can still compete favorably.



Typical Conventional Generation



Advanced Technology for Grid and Boiler Technology

Figure 2: Generic CHP Flow Diagrams Compared with Typical and Advanced Conventional Generating Systems (generic energy units)

In addition to improving energy efficiency by capturing waste heat for thermal energy uses, CHP systems eliminate transmission and distribution (T&D) losses inherent in power produced from conventional centralized generation. These T&D losses are typically in the range of 7-11% of the amount of power delivered (Borbely and Kreider, 2001). CHP systems can also provide important grid "ancillary services" such as local voltage and frequency support and reactive power correction (i.e. "VARs"), and emergency backup power when coupled with additional electrical equipment to allow for power "islands" when the main utility grid fails.

Recognizing the potential of CHP to improve energy efficiency in the U.S., the DOE established a "CHP Challenge" goal of doubling CHP capacity from 46 GW in 1998 to 92 GW by 2010 (U.S. CHPA, 2001). As of 2006, there were an estimated 83 GW of CHP installed at 3,168 sites in the U.S., representing about 9% of total generating capacity in the country (Bautista et al., 2006). This suggests that the nation is generally on track to meet the DOE goal of 92 GW by 2010. However, new capacity additions appear to have slowed in recent years, with less than 2 GW installed in 2005 compared with about 4 GW in 2003 and 2004, and over 6 GW in 2001 (Bautista et al., 2006).

2. Report Purpose

As noted above, the purpose of this report is to assess the current status of combined heat and power (CHP) in Nevada and to identify the hurdles that prevent the expanded use of CHP systems. The report summarizes the CHP "landscape" in Nevada, including the current installed base of CHP systems, the potential future CHP market, and the status of key regulatory and policy issues. The report also suggests some key action areas to further expand the market penetration of CHP in Nevada as an energy efficiency, cost containment, and environmental strategy for the state.

An additional purpose of the report is to alert stakeholders in Nevada of the creation of the U.S. DOE "regional application centers" (or "RACs") for CHP. The PRAC serves the states of California, Hawaii, and Nevada by:

- providing CHP education and outreach services (e.g. with the PRAC website at http://www.chpcenterpr.org and through conferences and workshops);
- conducting "level 1" CHP project screenings for promising potential projects;
- developing CHP baseline assessment and action plan reports for each state in the region, to be periodically updated and improved; and
- developing example project profile "case studies" for CHP system projects in the Pacific region.

For the Nevada CHP market specifically, the PRAC would like to work with CHP stakeholders and potential "end-users" in the state to further develop CHP resources for the state. Nevada is a unique state with special conditions and concerns related to its energy sector. The PRAC hopes to work with local groups in the state to develop energy strategies for Nevada that are technically and economically sound, and also appropriate for the state's larger energy and environmental concerns.

3. The Nevada CHP Landscape

Nevada currently has approximately 320 MW of installed CHP capacity, which contributes to 7% of the state's electricity generation. Although only a fraction of the population and economy of the Pacific region, Nevada has significant opportunities for reducing greenhouse gas emissions through the deployment of CHP in their buildings sector, particularly in the growing hospitality industry.

The great majority – 93% – of Nevada's electricity needs are currently served by two major investor owned utilities (IOUs): Nevada Power Company and Sierra Pacific Power Company (NSOE, 2005). These two companies merged in 1999 and now are jointly held by Sierra Pacific Resources. The primary fuel used by both IOUs is coal. In addition, the publicly owned Colorado River Commission of Nevada and numerous cooperatives provide power for the rest of the state, predominantly in the rural areas. The two IOUs are not interconnected and evaluations of their load demands are treated independently of one another.

Electricity demands are growing rapidly in Nevada. The two major IOUs currently have a peak system demand of about 8.2 GW. This is forecast to grow to 10.3 GW by 2016 and to 12.2 GW by 2026 (NSOE, 2007). The Nevada utilities plan to meet these growing needs for electricity through a mix of new conventional generation, new renewables, and energy efficiency/demand side management programs.

Natural gas is supplied in Nevada by Southwest Gas Corporation and Sierra Pacific Power Company. Natural gas demands are also growing in Nevada, primarily for electricity generation in recent years but also for end-use applications. Nevada does not produce natural gas within the state and must therefore import it from other nearby states (NSOE, 2007).

A major issue for Nevada is the controversial construction plans for future coal-fired power generation in the state, relative to other power-generation alternatives. A specific recent issue is the potential construction of the Ely Energy Center (EEC). Since proposed, the EEC has proven to be highly controversial and the project has recently been delayed over environmental concerns. This plant has been proposed to provide 1500 MW of generation capacity and potentially up to 2500 MW, with the first of two 750 MW units to be online by 2015 and the potential for two additional 500 MW units to be added in a future phase (Sierra Pacific Resources, 2008). Figure 3, below, shows the location of the proposed EEC and a new transmission line that would connect the facility to Las Vegas.

Figure 3: Proposed Ely Energy Center
(Source: Sierra Pacific Resources, 2008)

Key organizations for the Pacific region CHP market include equipment suppliers and vendors, engineering and design firms, energy service companies, electric and gas utility companies (both "investor owned" and "municipal"), research organizations, government agencies, and other non-governmental organizations. Appendix D of this report includes a database of contact information for key organizations involved in the CHP market. The organizations listed in the appendix are those that have responded to requests for contact information. As subsequent revisions of this report are made, the PRAC expects the contact database to become more complete and comprehensive.

4. Overview of CHP Installations in Nevada

The Pacific region of California, Hawaii, and Nevada has several hundred CHP installations at present, with most located in California and in a wide range of industrial and commercial applications. The latest version of the Energy and Environmental Analysis Inc. (EEA) database of CHP installations in the state shows a total of 947 sites. This total is not exactly correct because some of the older installations in the database may not be currently operational, and because the database is not comprehensive with regard to new installations. PRAC is working with EEA to update the database and improve its accuracy.

Table 1 shows a breakdown of the CHP sites by Pacific region state, along with additional data for the overall electricity generation in each state. California currently has approximately 9 GW of CHP capacity, with over 500 MW in Hawaii and 300 MW in Nevada. The average capacity of Pacific region CHP installations is 10.7 MW, and 55% of the CHP capacity is in large industrial systems of 50 MW or greater (Hedman, 2006). CHP systems in the western states of California, Hawaii, Nevada, and Arizona are estimated to be saving more than 370 trillion BTUs of fuel and 50 billion tons of CO_2 emissions per year, compared with the conventional generation they have replaced (Hedman, 2006).

Table 1: Electricity Generating Capacity and CHP Installations in the Pacific Region

	California	Hawaii	Nevada
Retail Customers (1000s)	13,623	435	981
Generating Capacity (MW)	56,663	2,267	6,856
Generation (Million MWh)	184	12	32
Retail Sales (Million MWh)	235	10	29
Active CHP (MW)	9,121	544	321
CHP Share of Total Capacity	16.1%	24.0%	4.7%

Source: Hedman, 2006

Nevada has fewer than ten CHP installations, most of which are in the industrial sector with units that are between 50 and 100 MW and powered by natural gas (Appendix A). Only one major casino employs co-generation, with a capacity of 5 MW. There is significant additional CHP potential in Nevada, particularly in the lodging and gaming industries.

5. Technical and Economic Status of Key CHP Technologies

The various types of CHP systems have different capital and maintenance costs, different fuel costs based on fuel type (e.g. natural gas, landfill gas, etc.) and efficiency levels. The main types of CHP system "prime mover" technologies are reciprocating engines, industrial gas turbines, microturbines, and fuel cells. The more efficient systems (in terms of electrical efficiency) tend to have higher capital costs. Table 2 below presents key characteristics of each of these types of generators.

Table 2: CHP "Prime Mover" Technology Characteristics

	Microturbines	**Reciprocating Engines**	**Industrial Turbines**	**Stirling Engines**	**Fuel Cells**
Size Range	20-500 kW	5 kW – 7 MW	500 kW – 25 MW	<1 kW – 25 kW	1 kW – 10 MW
Fuel Type	NG, H, P, D, BD, LG	NG, D, LG, DG	NG, LF	NG plus others	NG, LG, DG, P, H
Electrical Efficiency	20-30% (recup.)	25-45%	20-45%	12-20%	25-60%
Overall Thermal Efficiency (typical LHV values)	Up to 85% (AE)	Up to 75% (AE)	Up to 75% (AE)	Up to 75% (AE)	Up to 90% (AE)
Emissions	Low (<9-50 ppm) NOx	Controls required for NOx and CO	Low when controlled	Potential for very low emissions	Nearly zero
Primary cogeneration	50-80° C. water	Steam	Steam	Hot water	Hot water or steam (tech. dep.)
Commercial Status	Small volume production	Widely Available	Widely Available	Small production volume	Small volume production or pre-commercial (tech. dep.)
Capital Cost	$700-1,100/kW	$300-900/kW	$300-1,000/kW	$2,000+/kW	$4,000+/kW
O&M Cost	$0.005-0.016/kWh	$0.005-0.015/kWh	$0.003-0.008/kWh (GTI)	$0.007-0.015/kWh (GTI)	$0.005-0.01/kWh
Maintenance Interval	5,000-8,000 hrs	ID	40,000 hours	ID	ID

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Notes:

ID = insufficient data

For Fuel Type: NG = natural gas; H = hydrogen; P = propane; D = diesel, LF = various liquid fuels; LG = landfill gas; DG = digester gas; BD = biodiesel.

For more details on characteristics of specific fuel cell technologies, see: http://www.energy.ca.gov/distgen/equipment/fuel_cells/fuel_cells.html.

Additional CHP system equipment includes electrical controls, switchgear, heat recovery systems, and piping for integration with building HVAC systems. Waste heat can be used to assist boilers to raise steam for building heating systems, to directly provide space heating or heat (or steam) for industrial processes, and/or to drive absorption or adsorption chillers to provide cooling.

6. Summary and Status of CHP Policy Issues in Nevada

Important policy issues for CHP include utility interconnection procedures, utility rate structures including "standby charges" and "exit fees," and economic incentive measures. An overview of these CHP/DG policy areas for the Nevada market is provided below.

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The December 2003 agreement also revised Nevada's net metering standards for renewable energy systems including biomass-powered ones. The rules revised the net-metering program to allow systems of up to 150 kW to be net metered, up from a previous limitation of 10 kW (DSIRE, 2007a).

Market Incentives for CHP System Installation

Many states have already moved forward with incentivizing the deployment of CHP systems as a strategy for lowering energy and fuel costs as well as improving the overall reliability of power. Some utility companies also recognize the market value of CHP for both the avoided expansion of the grid and for end-users. Nevertheless, significant barriers to CHP are still present to lesser or greater degrees in each area. These include initial capital costs for projects, lack of utility interest, perceptions of safety issues, and unfamiliarity with CHP technologies.

In contrast to states like California, which have been actively promoting the installation of CHP systems through incentive programs, Nevada does not yet have clear plans for promoting CHP technology. Nevertheless, the state has taken steps toward working with industry and recognizes the need to change interconnection rules so that distributed generation can be better accommodated (NSOE, 2005; ACEEE, 2006). Nevada does not currently offer funding or rate class exemptions for CHP. However, they have established environmental regulations and net metering standards, which now encourage the implementation of a wide range of distributed power sources, and could potentially include CHP in the future.

Energy Portfolio Standard

As part of its restructuring efforts, Nevada established its Energy Portfolio Standard (EPS) in 1997. The PUCN administers the EPS and requires the two IOUs to obtain a certain fraction of their energy from renewable sources. The EPS was later revised in 2001 to require a scheduled portfolio increase of 2% every two years, hitting a maximum of 15% in 2013. In 2005, the EPS was amended once again under *Assembly Bill 3* (*AB 3*). Increases were raised to 3% every two years, reaching a maximum of 20% in 2015. The bill allows for the EPS to be met through renewable energy generation or credits and savings from efficiency measures. Also, *AB 3* requires that at least 5% of total electricity come from solar systems.

Under the current standard, systems that quality for the portfolio include biomass, solar, geothermal energy, wind, and some hydro projects. In addition, the PUCN has created a program that allows energy suppliers to buy and sell renewable energy credits (RECs) to help meet the standard and has also established a Temporary Renewable Energy Development (TRED) Program that assures renewable energy providers of their payments, encouraging them to expand their capacities.

Net Metering Rules and Utility Rates

First introduced in 1997, net metering in Nevada allowed IOUs to meter renewable systems up to 30 kW. The rules were subsequent modified in 2001, 2003, and 2005 to allow to systems as large as 150 kW. Nevertheless, for units greater than 30 kW, customers are required to install their own meter. Moreover, the utilities can arbitrarily charge interconnection facility and demand fees. For units smaller than 30 kW, net excess generation (NEG) could be carried over to the next billing cycle indefinitely. Under utility terms for time-of-use rates, the excess generation would be added to the same time-of-use period of the subsequent months (DSIRE, 2007a).

Nevada Power Company has a "Cogeneration and Small Power Production Qualifying Facility" program, which currently allows generators to participate in short term wholesale power markets and for large generators of 250 MW or more of capacity to enter into long term contracts. The short-term contract rate is set by a Dow Jones index and the log term rate is currently $0.041 per kWh (see Appendix B for details).

Governor's Energy Plan

The state of Nevada has provided relatively little policy or financial support for DG and CHP. However, the Governor's most recent comprehensive energy plan makes the following recommendations in its Chapter 6 (NSOE, 2005):

- "support a cautious approach to increased distributed generation, including utility-owned distributed generators";
- "support a balanced portfolio of resource types, including base load, intermittent, peak load, rapid response generators for support of intermittent renewable generators";
- make "incremental changes in tariffs to allow net metering and self-generation"; and
- make "changes in tariffs and interconnection rules to accommodate distributed generation."

This language suggests a desire by the Governor's office to further develop the DG market in Nevada. In future revisions of the energy plan, these general recommendations could be made more specific. The state legislature and/or the PUCN could also take more specific action, based on this general policy guidance by the Governor.

Energy Requirements for Government Buildings

Starting on July 1, 2007, Nevada will require that all public buildings sponsored or financed by the state must meet standards specified by the Leadership in Energy and Environmental Design (LEED) system (NRS 338.187). Technologies that earn LEED certification points include passive solar space heating, and renewable energy systems (including biomass and biogas), as well as a potential point or two for CHP systems more generally in the "innovation and design" category. In addition, the measure requires at least two constructed public buildings to meet the equivalent of LEED "silver" or higher over every two-year period.

7. The Market Potential of CHP Systems in Nevada

Nevada has significant CHP opportunities in both existing and newly built facilities, and has exploited the potential for CHP to contribute to state generating capacity less than other states in the region. As discussed below, a recent Nevada CHP technical market potential assessment report found that over 2 GW of CHP additions were possible (EEA, 2005a). Not all of this technical CHP resource is fully economic to develop (i.e., with rates of return and simple payback times acceptable to the private sector), particularly absent a state-level incentive program, as discussed in a later section. However, based on economic CHP potential assessments done in California and other states, the economic potential in Nevada through 2020 is likely to be well over 200 MW, and probably more likely in the 300-500 MW range.

One of the most high value CHP opportunities in Nevada is in the major lodging, resort, and casino sector. The size and character of this sector in Nevada provides it with a significant opportunity to implement CHP in larger, higher-end hotels. The EPA estimates that about 10,000 hotels nationwide have energy demand profiles that can be efficiently met by CHP, and Nevada establishments have the highest average number of rooms in the country. Many existing sites in Nevada are eligible for conversion to CHP, and many more lodging units are expected to be built with the tourism and gambling industries expanding for the foreseeable future.

With regard to the hotel potential specifically, the EPA estimates that about 10,000 hotels nationwide have energy demand profiles that can be efficiently met by CHP. Up to this point, only a relatively small number of hotels have installed CHP, with California having the greatest number of installations at 95 hotels, followed by New Jersey, and New York (EEA, 2005b). Most of the existing installations are reciprocating engines that were installed in the 1980s. As CHP technologies have evolved over the past 20 years, potential system types now also include microturbines, fuel cells, and gas turbines.

The major lodging, resort, and casino sector provides Nevada with a significant opportunity to implement CHP in higher-end hotels. These establishments have the highest average number of rooms in the country. Table 3, below, shows that on average, Nevada has the largest hotels in the U.S. with over 1,200 rooms per hotel.

Table 3: Summary of Hotel Capacity in States in the U.S.

Most Luxury and Upper Upscale Hotels	Hotels	Largest Average Upper Upscale Hotels	Avg. Rooms / Hotel
California	246	Nevada	1,214
Florida	162	Hawaii	728
Texas	124	New York	515
New York	73	Louisiana	515
Illinois	73	District of Columbia	510
Georgia	56	Illinois	449
Virginia	55	Georgia	423
Arizona	49	California	406
Massachusetts	46	Alaska	404
Colorado	45	Massachusetts	390
Percent of U.S.	58.1%	Average Rest of U.S.	338

Source: EEA, 2005b

Previous installations suggest that custom-designed CHP systems can economically meet up to 75% of the total energy needs of these sites, which typically consist of space heating and cooling, water heating, lighting, and restaurant and laundry operations. To be practical, CHP systems for hotels typically require facilities of at least 100 rooms in size. For a 100 to 200-room site, an appropriate CHP system might consist of a 100-kW reciprocating engine or microturbine system that supplies electricity and waste heat for domestic hot water, space heating, and laundry needs. For larger hotels and especially for casino hotels, it is likely to make technical and economic sense to also include absorption chillers for chilled water and/or air conditioning.

Appendix B includes a list of major casinos and hotels in Nevada, with 115 entries. These hotels/casinos have a combined total of over 116,000 rooms. This list indicates that Nevada has about 40 hotel/casinos of over 1,000 rooms, representing a major opportunity for CHP at these facilities to provide more efficient onsite generation, cost savings for the facility, reduced pollutant emissions, and reduced reliance on the electrical grid.

With a general rule that hotels with over 100 rooms may find CHP economical, we can get a rough sense of the economic potential in this sector by applying the example case study shown below, for the Rio All-Suites Hotel and Casino in Las Vegas that recently installed a 4.9 MW CHP system. If the other hotels listed in Appendix B with over 100 rooms each installed a CHP system scaled relative to the one installed at the Rio All-Suites (which has 2,500 rooms), that would equal about 230 MW of CHP capacity in this sector alone.

Nevada CHP Case Study – Rio All-Suites Hotel and Casino

As an example of the potential for CHP in the Nevada hotel and casino sector, consider the system installed by the Rio All-Suites Hotel and Casino in Las Vegas. This first casino CHP system in Nevada went online in May of 2004 and is providing about 50% of the facility's annual electricity requirements and much of its water and space heating. The hotel has 2,500 rooms and 16 restaurants.

The system consists of six reciprocating engine generators by Caterpillar (each rated at 817 kW for a total of 4.9 MW), with the waste heat used for water and space heating. The system cost about $7.5M to install and with estimated energy cost savings of $1.5M per year, it is expected to provide a simple payback of about 5 years. The overall thermal efficiency of the system is projected to be about 75%, once the captured waste heat is factored in.

Along with additional backup generators, the CHP systems can continue to provide power in the event of a blackout by supplying electricity and hot water for the facility's most important requirements.

Pictured: Caterpillar reciprocating engine generator and hot water loop

<u>CHP System Quick Facts</u>

4.9 MW Reciprocating Engine CHP System

Initial cost:
$7,500,000
Expected net annual savings:
$1,500,000/yr
Simple Payback:
5 years
Overall Efficiency:
~75% (overall thermal)

Note: See http://www.chpcenterpr.org for more details of this project and other CHP case studies from the Pacific region

EEA has recently completed a market assessment report for Nevada and Arizona that indicates that Nevada has a technical potential for 2,334 MW of additional CHP through 2020. EEA estimates that 1,792 MW of this potential is in existing facilities, and 1,216 MW of the potential is in new facilities that were expected to be built between 2005 and 2020.

As of 2008, with development since 2005, the opportunity for retrofitting CHP into existing facilities should be somewhat greater, perhaps about 2,075 GW (with an average of 5% annual growth over that time). Meanwhile, the potential in new facilities would be slightly less at this point, when assessed through the year 2020.

Note that the total technical potential is reduced somewhat to arrive at the 2,334 MW figure to avoid double counting in some applications where both traditional and cooling CHP opportunities were assessed. Table 4 below presents these technical potential estimates by existing and new facilities and the application (EEA, 2005a).

Table 4: Estimate of Nevada CHP Technical Market Potential by Application

CHP Type	MW Capacity
Existing Facilities (MW)	
Industrial – On Site	316
Commercial - Traditional	669
Cooling CHP	801
Large Industrial – Export	0
Resource Recovery	6
New Facilities (2005-2020) (MW)	
Industrial – On Site	32
Commercial/Institutional	518
Cooling CHP	666
Net Total Technical Potential*	**2,334**

Source: EEA, 2005a
Note: *Total adjusted to avoid double counting some applications that are analyzed in both traditional and cooling CHP categories

Nevada's technical CHP potential through 2020 is thus estimated to be over 2.3 GW, with the majority of that, and perhaps as much as 2 GW, being in the form of retrofit opportunities in existing facilities that could be developed right away. The projections for opportunities in new facilities are probably conservative given Nevada's likely growth rate over the next ten to fifteen years and the many possible commercial and industrial applications where CHP can be applied.

With regard to the potential for CHP that could be economically developed – i.e., with "reasonable" payback times of 4-5 year or less – a detailed assessment of Nevada has not yet been performed, but detailed estimates of economic CHP potential have been made for the California market. One recent assessment found that about 1.1 GW to 7.3 GW of new CHP can be economic in California, depending on market conditions and the presence of support policies (EPRI, 2005). This compares to a technical potential that is believed to be as high as about 30 GW when both retrofit opportunities and new construction through 2020 are considered (EPRI, 2005).

Figure 4, below shows that most potential CHP system adopters require a payback time of less than 5 years, but that those who are already seriously considering CHP systems (the "strong prospects") are more likely to accept somewhat longer payback times. Municipal entities often can accept longer paybacks of 10 or more years, and some private sector entities may accept longer payback times as well if there are significant "green public relations" benefits (e.g., the high temperature fuel cell and solar PV systems at the Sierra Nevada Brewing Company in Chico, California).[3]

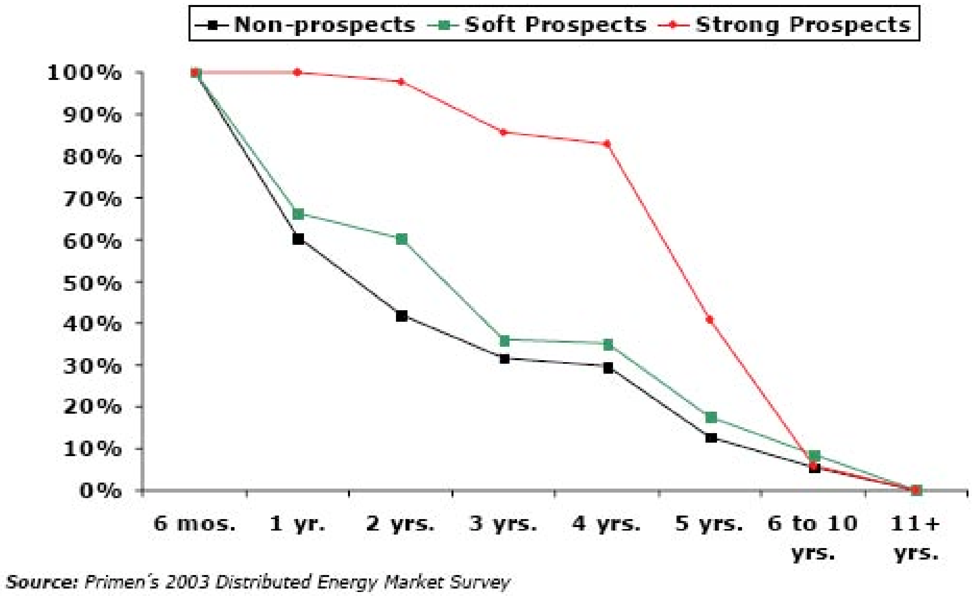

Figure 4: Acceptable CHP/DG System Payback Time by Percentage of Respondents

Nevada's "spark spread" (the difference between the prevailing price of electricity and the cost of the input fuel for power production) is slightly smaller than California's. However, recent data suggest that commercial customers in Nevada are only paying about $0.01/kWh less than in California (10.46 ¢/kWh in Nevada vs. 11.48 ¢/kWh in California). Meanwhile, industrial customers in Nevada on average pay about 1.5 ¢/kWh less than in California (7.80 ¢/kWh in Nevada vs. 9.45 ¢/kWh in California) (U.S. EIA, 2008).

In comparison to these utility rates, medium to large-sized CHP systems (in the range of 500 kW to 50 MW) can have levelized electricity costs of around $0.055-0.065/kWh (WADE, 2006). A general "rule of thumb" is thus that if commercial or industrial customers are paying more than about $0.07/kWh and have fairly large and steady thermal loads (either heating, cooling, or both), they may be attractive candidates for a CHP project.

Give all of this, a reasonable estimate for economic CHP market potential in Nevada through 2020 would appear to be at least 200 MW, and very likely more in the 300 to 500 MW range. Furthermore, much of this opportunity exists in the retrofit market and could be pursued very rapidly. The potential in Nevada is likely to be at least as high as California's in a relative sense because CHP has been less fully developed in Nevada and many of the more attractive opportunities are likely to remain. This suggests that estimates on the higher end of the 300 to

[3] Visit http://www.chpcenterpr.org for this and other CHP case studies in the Pacific region

500 MW range through 2020 are not implausible, are potentially readily achievable, and even could potentially be exceeded if supportive state policies are adopted.

It is important to note that because CHP makes more efficient use of natural gas, and also can run on biogas where this is a natural methane source (e.g., dairy farm, landfill, wastewater treatment plant, etc.), significant carbon emission reductions are possible. For example, as shown in Figure 5, the Electric Power Research Institute (EPRI) calculates that a 300 kW CHP system could provide an annual reduction of 778 tons of carbon dioxide, relative to natural gas fired central generation. A 5 MW CHP system for a major hotel/casino could potentially have emission reductions of about 13,000 tons per year, or almost 400,000 tons over a 30-year project life.

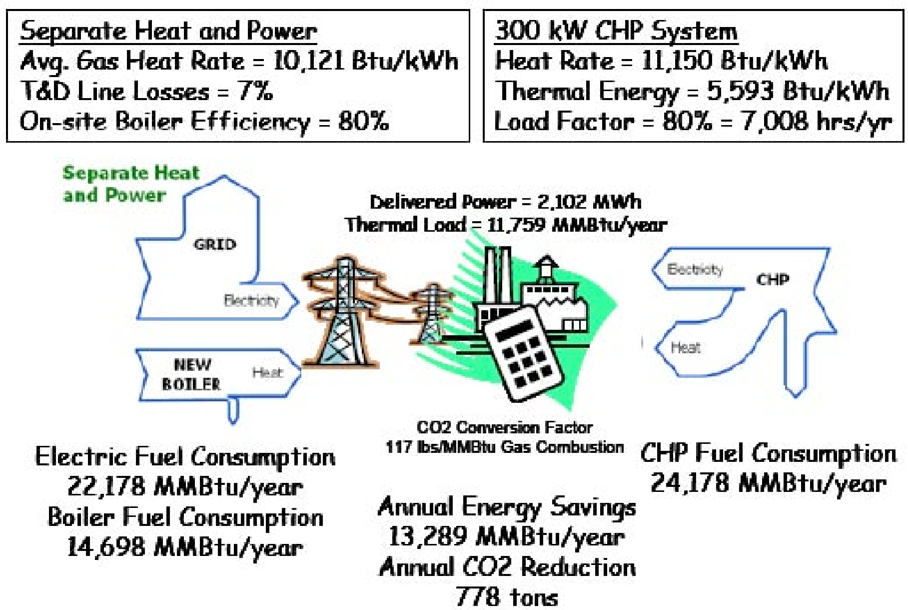

Figure 5: Estimate of the Carbon Reduction Benefits from CHP Systems (Source: EPRI, 2005)

With an average car producing about 2 tons of carbon dioxide per year, even the relatively modestly sized, 300-kW system would provide similar benefits to taking 390 cars off of the road. If Nevada could succeed in doubling its installed base of CHP by 2020 (with an additional 320 MW of CHP generation), that would provide the equivalent carbon dioxide emission reduction benefit of taking 415,000 vehicles off of Nevada's roads, even if the alternative power source were natural gas.

With the prospect of additional coal-fired generation to meet Nevada's needs, instead of natural gas, the benefits of installing CHP as an alternative would be even greater. In the above example, instead of 415,000 vehicles, the impact of doubling Nevada's installed CHP base would be closer to the effect of taking 700,000 vehicles off the road. And when CHP is powered with biogas at dairy manure digesters and wastewater treatment plants, the greenhouse gas benefits are tremendous. This is because the bio-methane that otherwise would be emitted (with a climate impact more than 30x that of carbon dioxide, per molecule) is converted to carbon dioxide during the course of the CHP system operation, a much preferable outcome.

8. Summary of CHP System Financial Assistance Programs

There are no specific state incentive programs for CHP system installation in Nevada. The state's net metering program provides a form of incentive for biomass-based CHP projects, of 150 kW or less, by allowing export of extra power to the grid that can then be withdrawn at a later time. The main applicable financial assistance programs include federal tax programs and CHP project screening services that are available on a limited basis from the PRAC and the U.S. Environmental Protection Agency.

Federal investment tax credits for CHP system installation have been included under various energy policy legislation proposals in recent years. At present, investment tax credits are available for fuel cell and microturbine installations, but not for CHP systems more generally. A broader CHP federal investment tax credit of 10% was proposed under the 2005 Energy Policy Act, but was cut in the final conference meeting at least partly due to a shift in Office of Management and Budget methodology that showed the program to be a net resource consumer instead of a revenue generator. The USCHPA is currently working on a new proposal for a federal CHP investment tax credit, with either a 20 MW or 50 MW cap on qualifying system size.

For energy end-users in Nevada that are interested in potential CHP projects, both the PRAC and the U.S. EPA offer services to perform initial project screenings to determine CHP system feasibility, optimal system type and size, and potential system economics. The PRAC feasibility studies are conducted by San Diego State University, with a team of experts deployed to the site to collect equipment and energy use data and a year of utility bills. The CogenPro software package is then used to determine optimal system sizing and approximate system economics. Project screenings are offered by the PRAC on either a no-charge or cost-shared basis, depending on the nature of the potential installation.[4]

The U.S. EPA also offers initial CHP project screening services. Interested parties can contact EPA staff, and if qualified, can then fill out a data submittal form that is available on the U.S. EPA CHP Partnership website. They will then receive a report with the findings from the "Level 1" screening analysis.[5]

9. Action Plan for Advancing the CHP Market in Nevada

Nevada has some of the basic elements in place for expansion of the CHP market, but lags behind other states in certain key respects. Nevada has an interconnection standard but no financial incentives for CHP system installation. The state has lower energy prices than other states in the Pacific region, limiting the future market potential of CHP systems to particularly attractive locations.

We recommend consideration of the following measures for advancing the CHP market in Nevada:

1. Consider legislation to provide capital cost buy-down incentives and/or low-interest loan programs for CHP systems, potentially with a performance-based component

Nevada currently has a modest system benefits charge on electricity sales to promote demand-side management programs. This incentive could be extended – or other public funds could be

[4] For more details on PRAC CHP project feasibility screenings, please visit http://www.chpcenterpr.org or contact Dr. Asfaw Beyene directly at abeyene@rohan.sdsu.edu.
[5] For more details, please visit: http://www.epa.gov/chp/project_resources/tech_assist.htm

appropriated – to provide capital cost buy-down incentives for CHP systems in order to encourage installations where they can provide enhanced energy efficiency. The incentives could be scaled relative to the efficiency and environmental benefits of various system types, as in the California Self-Generation Incentive Program. Or, the incentives could be tied the projected energy efficiency of the installation or the actual performance of the system over time, where the incentive could be paid out over the first years of the project rather than entirely as an up-front payment. Alternatively or in addition, low-interest loan programs could be considered to help small and medium sized businesses to raise the capital needed to install CHP systems at their sites

2. Institute co-metering for CHP systems to allow for power export to the grid with rules for power purchase from CHP system owners based on wholesale power prices plus consideration for their T&D, grid support, and GHG reduction benefits

In some cases, CHP system sizes are limited by rules that restrict their ability to export power to utility grids, rather than by the thermal loads at the site. Allowing export of power from CHP systems to utility grids under a wholesale power market would entail administrative complexities for utilities, but we believe that in many cases these would be offset by the benefits that could be obtained. Export of power from CHP systems to utility grids could be accomplished through co-metering, whereby one utility meter measures power usage and a second meter measures power exports. Net exports of power could then be compensated at wholesale power rates, thus incentivizing CHP system operation at times of high electricity prices and peak system demand. These payments could potentially be augmented by consideration of T&D and grid support benefits, and environmental benefits in terms of reduced GHG emissions compared with those from conventional generation. In Nevada, this would represent an extension of the current net-metering program, which currently allows for net-metering of biomass-based projects but not the actual sale of power to wholesale markets from customer generators.

3. Encourage the use of CHP as a power reliability measure for critical need applications such as refineries, water pumping stations, emergency response data centers, etc.

CHP systems offer the potential for energy supply (both electrical and thermal) with reduced costs and environmental impacts compared with conventional systems. In settings that also require high-reliability power and that are currently backup up with rarely-used generator systems, CHP systems can provide the additional functionality of providing backup power with the incorporation of fuel storage to protect against fuel supply disruptions. The economics of CHP in these settings can be further enhanced through this combined functionality, whereby existing backup generators can be decommissioned and replaced with CHP systems that can provide day-to-day power along with emergency "black start" power services. The PRAC will be studying these applications in greater detail in 2007, in the context of specific premium power settings in the Pacific region.

4. Include DG/CHP in the state integrated resource planning process

Investments in DG/CHP systems should be considered along with other power generation system investments in the context of Nevada's integrated resource planning (IRP) process. Specific attention should be paid to the economic and environmental benefits that CHP systems can provide relative to the "status quo" option of building additional coal-fired generation to meet the state's growing energy needs. Additional benefits to consider include grid-support for local utility systems as well as backup power/power quality for sites that adopt CHP.

5. Consider PUCN direction to the Nevada utilities to develop more consistent and favorable utility tariff structures for CHP customers

Utility rates are often structured in ways that disadvantage customer-owned generation systems. CHP system owners are disadvantaged when short periods of system downtime in a given month negate their savings of facility-related demand charges. It is in general reasonable for utility operators to insist that CHP facilities be reliable and available, but a system downtime of e.g. 15 minutes per month is enough to eliminate demand charge savings in many cases, and this translates into an availability of over 99.9%. Meanwhile, independent power producers subject to power purchase agreements are typically expected to achieve system availabilities of 90-95%. We recommend that the PUCN establish regulations such that demand charges are assessed over 1 or 2-hour blocks, rather than 15 or 30 minutes, so that brief periods of system downtime do not negatively impact CHP system economics in an unreasonable fashion.

10. Conclusions

Nevada is the highest growth state in the country in terms of population and energy demand growth. The state has relatively little CHP installed at present, with only a few hundred MW of installed capacity. The hotel and casino sector represents a particularly attractive sector for CHP systems, and one that is growing rapidly. Additional market potential includes the hospital, grocery, and wastewater treatment sectors, and some remaining mining and industrial sector opportunities.

There are only about 300 MW of CHP in Nevada at present, or less than 5% of state capacity, compared with nearby states that have much higher levels of CHP market penetration (e.g., about 9 GW or about 16% of capacity in California). Nevada's technical CHP potential is estimated at well over 2 GW. A detailed assessment of the economic potential for CHP in Nevada has yet to be conducted, but assessments for California suggest that the economic potential in Nevada is likely in the 300-500 MW range through 2020, with most of the opportunity in retrofit applications that could be pursued immediately. Supportive state policies could be critical to achieving the high end of that range, or potentially even exceeding it. The Nevada hotel/casino sector alone appears to have over 200 MW of economic potential for retrofit systems, with more in the future in new construction.

Further DG/CHP policy development in Nevada could be important to furthering CHP opportunities in the state. Some basic elements are in place, in terms of interconnection standards for systems of up to 20 MW in size and net-metering programs for renewable systems. Additional programs to provide financial support for CHP system installation – to encourage them for their energy efficiency, economic, and environmental benefits – and to consider further development of CHP compared with other alternatives in the context of the state IRP process, would be helpful to further develop the CHP market in Nevada.

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Appendix A – Operational CHP Systems in Nevada

City	Facility Name	Application	Op Year	Capacity (kW)
Carson City	Carson City Aquatic Center	Amusement/Recreation	2002	150
Fernley	Quebecor Printing Nevada Inc.	Printing/Publishing	2000	3,000
Gardnerville	WJN Enterprises	Nursing Homes	-	15
Henderson	Pioneer Alkali Company	Chemicals	1991	90,000
Las Vegas	Spring Gardens Greenhouse/Sunco	Agriculture	1994	53,000
Las Vegas	Georgia Pacific Garnet Valley Project	Pulp and Paper	1992	85,000
Las Vegas	Pabco Gypsum Black Mountain Project	Stone/Clay/Glass	1993	85,000
Las Vegas	Rio All-Suite Hotel and Casino	Hotels	2003	4,900

Source: EEA, 2005

Appendix B – Cogeneration and Small Power Production Qualifying Facilities Schedule

NEVADA POWER COMPANY
P.O. Box 98910
Las Vegas, NV 89151
Tariff No. 1-B
cancels
Tariff No. 1-A (withdrawn)

35th Revised	PUCN Sheet No. **32**
Cancelling **34th Revised**	PUCN Sheet No. **32**

COGENERATION AND SMALL POWER PRODUCTION - QUALIFYING FACILITIES
SCHEDULE QF – SHORT TERM

APPLICABLE – This schedule is applicable only to short term purchases from qualifying facilities as set forth in NAC 704.8711 through NAC 704.8793.

AVAILABLE – To qualifying facilities located in the Company's service area.

RATES
Utility will pay the sum of the following rates for the energy and capacity provided as determined by meter readings:

(1) ENERGY RATE

ALL MONTHS:

FIRM ENERGY

The rate paid for firm on-peak or firm off-peak energy deliveries shall be calculated for each hour as follows:
The hourly rate paid shall equal the applicable firm on-peak or firm off-peak price taken from the daily Dow Jones Mead/Marketplace Electricity Price Index shaped by the Dow Jones Palo Verde hourly index report for the same day.

NON-FIRM ENERGY

The rate paid for non-firm energy deliveries shall be calculated for each hour and is defined as the lesser of:

The highest hourly system incremental generation cost. The incremental generation cost shall be calculated based on the daily incremental fuel cost and the applicable unit's incremental heat rate curve; or
The hourly Market Price calculated from the applicable firm on-peak or firm off-peak price taken from the daily Dow Jones Mead/Marketplace Electricity Price Index shaped by the Dow Jones Palo Verde hourly index report for the same day.

(2) CAPACITY RATE – The capacity cost is included in the above firm energy rate.

(Continued)

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COGENERATION AND SMALL POWER PRODUCTION - QUALIFYING FACILITIES
SCHEDULE QF – SHORT TERM
(Continued)

SPECIAL CONDITIONS

1. Subject to the provisions of 18 C.F.R. § 292.304 (f), the Utility will accept all offered purchases.

2. Qualifying Facilities providing energy to Utility hereunder shall be entitled to receive electric service from Utility on the filed rates schedule(s) contained in Utility's Electric Tariff No. 1-B applicable to the type and location of the Qualifying Facility.

3. Should the index described under ENERGY RATE section become permanently unavailable, the Utility shall refile its tariff as soon as reasonably possible. Until the refiled tariff becomes effective, Qualifying Facilities shall be paid a rate per MWH equal to the average of the applicable firm on-peak or firm off-peak daily Mead/Marketplace Index prices for the last available month.

4. The Dow Jones Mead/Marketplace Electricity Price Index firm on-peak and firm off-peak prices are not published on Sundays and NERC holidays. The price paid for any energy and capacity delivered on Sunday or NERC holidays shall be based on the "Sunday and NERC Holiday 24 Hour" Mead/Marketplace Index price shaped by the Dow Jones Palo Verde hourly index report for the same day. If the "Sunday and NERC Holiday 24 Hour" Mead/Marketplace Index price is not available, the price paid for any energy and capacity delivered on Sunday or NERC holidays shall be the firm on-peak and firm off-peak price from the last available day.

5. If the Dow Jones Palo Verde hourly index report referenced in the ENERGY RATE section of this tariff and special condition 4 is not published for the same day, then the last published index report shall be used to shape the firm on-peak and firm off-peak daily Mead/Marketplace Index prices.

6. The Utility shall provide upon demand to any person who receives or desires to receive payment under this schedule, all materials and procedures used in calculating rates for this schedule.

7. Firm energy is defined as (1) Energy that has firm resources backing up the energy and is under a firm contract for delivery to the utility, or (2) energy that has been pre-scheduled, or (3) energy that is financially firm and backed up with liquidated damages pursuant to the terms of a contract between the Utility and the Qualifying Facility governing liquidated damages. Energy not meeting the criteria of firm energy will be considered and paid at the non-firm rate.

NEVADA POWER COMPANY
P.O. Box 98910
Las Vegas, NV 89151
Tariff No. 1-B
cancels
Tariff No. 1-A (withdrawn)

	3rd Revised	PUCN Sheet No. **32B**
Cancelling	**2nd Revised**	PUCN Sheet No. **32B**

COGENERATION AND SMALL POWER PRODUCTION - QUALIFYING FACILITIES
SCHEDULE QF – LONG TERM

AVAILABLE: To qualifying facilities willing to execute thirty (30) year contracts, until the Company executes and the Commission approves contracts, for at least two hundred fifty (250) megawatts of capacity, other than the capacity associated with contracts approved by the Commission prior to January 1, 1990, from qualifying facilities or until the Commission approves an amended or new resource plan for the Company, whichever comes first.

APPLICABLE: To the purchase of electrical energy and capacity from qualifying facilities as defined in NAC 704.8771 through NAC 704.8793

TOTAL RATE:

All Hours	$0.04100 per kWh

SPECIAL CONDITIONS

TIME DIFFERENTIATION: The Company and the qualifying facilities shall time differentiate the above cited rate prior to incorporation of such rate into power purchase contracts. Such time differentiated rates shall be filed with the Commission for review and approval.

ANNUAL ADJUSTMENT: The rate under this schedule shall be effective through April 30, 1991. The rate under this schedule shall be adjusted annually on May 1 of each year to reflect changes in the Consumer Price Index for All Urban Consumers experienced during the preceding year. The base index for the first adjustment shall be the index for January 1, 1990.

CONTRACT REQUIREMENT: Purchases of capacity and/or energy from qualifying facilities shall not be undertaken by the Company prior to the execution of a power purchase contract generally in the form on file with the Commission.

SUPPLEMENTAL AND STANDBY SERVICE: Supplemental and Standby Service shall be provided in accordance with the Company's retail tariff on file with the Commission.

OPERATING COST ADJUSTMENT: The Company reserves the right to adjust the rates under this schedule to reflect changed operating costs attributable to purchases of capacity and/or energy from qualifying facilities. Such adjustments shall be subject to Commission Approval.

Issued: **03-31-04** Effective: **05-26-04** Advice No.: **306**	Issued By: Mary O. Simmons Vice President	

NEVADA POWER COMPANY
P.O. Box 230
Las Vegas, NV 89151
Tariff No. 1-B
cancels
Tariff No. 1-A (withdrawn)

Second Revised PUCN Sheet No. **33**
Cancelling **First Revised** PUCN Sheet No. **33**

COGENERATION AND SMALL POWER PRODUCTION - QUALIFYING FACILITIES
SCHEDULE QF
(Continued)

In order to qualify for a capacity payment, the following provisions must be met:

1. The Contract Capacity for payment purposes may not exceed the lowest capacity rating in any of the six peak months on Company's system, which are presently the months of May, June, July, August, September and October.

2. The Contract Capacity must be available[2] for all of the on-peak hours subject to an allowance of 10 percent of those on-peak hours for forced outages.

3. Scheduled outages must be performed in the months of March and April.

4. Contracts shall be required for all purchases hereunder. Such contracts will include the division of costs and responsibilities of both Company and Seller for metering, interconnection, control, protection and Special Facilities Charges. Where applicable, the contract shall state the available contract capacity.

GENERAL PROVISIONS

1. The billing and accounting period used herein shall be one (1) calendar month.

2. Payment for energy and capacity is due on or before thirty (30) days following the end of each billing month.

3. Charges for Supplementary Power will be in accordance with Company's applicable retail rate schedules filed with the Nevada Public Service Commission.

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[2]As used herein "available" means either dispatchable by Company or actually delivered to Company.

SPECIAL CONDITIONS – Refer to Rule 15 (C)

SYSTEM EMERGENCIES – Qualifying facilities are obligated to provide power during system emergencies as set forth in General Order No. 32 Section 7.0 System Emergencies. (C)

Issued: **05-11-01** Effective: **08-03-01** Advice No.: **262**	Issued By: Mary O. Simmons Vice President	

Source: Nevada Power, 2004

Appendix C – Major Hotel/Casinos in Nevada as CHP Market Opportunities

City	Hotel/Casino Name	Rooms	Restaurants
Beatty	Exchange Club Casino Motel Restaurant & Bar	44	1
Boulder City	Hacienda Hotel & Casino	375	3
Carson City	Carson City Nugget Hotel Casino	80	5
Carson City	Carson Station Hotel Casino	92	1
Carson City	Casino Fandango	No	5
Carson City	Pinon Plaza Resort Casino	148	3
Crystal Bay	CalNeva Resort and Spa	220	1
Crystal Bay	Tahoe Biltmore Lodge and Casino	70	2
Henderson	Eldorado Casino	No	3
Henderson	Fiesta Henderson Casino Hotel	224	4
Henderson	Sunset Station Hotel Casino	400	9
Henderson	The Green Valley Ranch Station Casino	200	6
Incline Village	Hyatt Regency Lake Tahoe Resort and Casino	458	4
Jackpot	Cactus Petes Resort Casino	300	5
Jackpot	Four Jacks Hotel and Casino	60	1
Jackpot	Horseshu Hotel & Casino	120	6
Lake Tahoe	Caesars Tahoe Resort and Casino	440	4
Lake Tahoe	Lake Tahoe Horizon Hotel and Casino	539	3
Las Vegas	Arizona Charlie's Hotel & Casino – East	303	5
Las Vegas	Arizona Charlie's Hotel & Casino – West	258	5
Las Vegas	Bally's Hotel Casino	2,900	6
Las Vegas	Barbary Coast Hotel Casino	200	3
Las Vegas	Barcelona Hotel Casino	172	1
Las Vegas	Bellagio Hotel Casino	3,000	17
Las Vegas	Best Western Mardi Gras Inn and Casino	314	1
Las Vegas	Binion's Horseshoe Hotel & Casino	360	4
Las Vegas	Boardwalk Casino – Holiday Inn	654	5
Las Vegas	Boulder Station Hotel Casino	300	8
Las Vegas	Bourbon Street Hotel & Casino	166	1
Las Vegas	Caesar's Palace Hotel Casino	2,500	11
Las Vegas	California Hotel Casino	781	8
Las Vegas	Casino Royale & Hotel	152	3
Las Vegas	Circus Circus Hotel Casino	3,500	9
Las Vegas	Excalibur Hotel Casino	4,032	7
Las Vegas	Fiesta Rancho Casino Hotel	100	5
Las Vegas	Fitzgeralds Hotel Casino	638	5
Las Vegas	Flamingo Hotel Casino	3,600	8
Las Vegas	Four Queens Casino Hotel	690	7
Las Vegas	Fremont Hotel & Casino	447	5

Las Vegas	Gold Coast Hotel Casino	750	8
Las Vegas	Golden Nugget Hotel Casino	1,500	3
Las Vegas	Hard Rock Hotel and Casino	650	6
Las Vegas	Harrah's Hotel Casino	2,500	8
Las Vegas	Imperial Palace Hotel and Casino	2,700	10
Las Vegas	Lady Luck Casino Hotel	797	4
Las Vegas	Luxor Las Vegas Hotel Casino	4,000	9
Las Vegas	Mandalay Bay Resort and Casino	3,200	16
Las Vegas	MGM Grand Hotel Casino	5,034	15
Las Vegas	Mirage Hotel Casino	3,044	8
Las Vegas	Monte Carlo Hotel Casino	3,002	7
Las Vegas	Nevada Palace	210	3
Las Vegas	New York New York Hotel Casino	2,000	9
Las Vegas	Palace Station Hotel Casino	1,000	8
Las Vegas	Paris Las Vegas Hotel Casino	3,000	10
Las Vegas	Planet Hollywood Resort Casino a Sheraton Hotel	2,567	11
Las Vegas	Rampart Casino	541	3
Las Vegas	Rio All Suite Hotel & Casino	2,500	16
Las Vegas	Sahara Hotel and Casino	1,700	6
Las Vegas	Sam's Town Hotel Casino	648	5
Las Vegas	San Remo Hotel Casino	711	4
Las Vegas	Santa Fe Station Hotel and Casino	200	3
Las Vegas	Silverton Hotel Casino RV Park	300	2
Las Vegas	Stardust Hotel Casino	1,500	7
Las Vegas	Stratosphere Casino Hotel & Tower	2,444	14
Las Vegas	Suncoast Hotel & Casino	392	7
Las Vegas	The New Frontier Hotel & Casino	970	7
Las Vegas	The Orleans Hotel and Casino	800	8
Las Vegas	The Palms Casino Resort	450	8
Las Vegas	The Riviera Hotel and Casino	2,100	6
Las Vegas	The Venetian Hotel Casino	3,000	15
Las Vegas	Treasure Island Hotel Casino	2,800	9
Las Vegas	Tropicana Resort & Casino	1,900	7
Las Vegas	Tuscany Hotel Casino	712	2
Laughlin	Avi Resort & Casino	300	5
Laughlin	Colorado Belle Hotel Casino	1,200	6
Laughlin	Edgewater Hotel Casino	1,421	6
Laughlin	Flamingo Hotel Casino	1,900	6
Laughlin	Golden Nugget	300	5
Laughlin	Harrah's Hotel Casino	1,600	5
Laughlin	Pioneer Hotel & Gambling Hall	416	3
Laughlin	Ramada Express Hotel & Casino	1,501	7
Mesquite	Eureka Casino Hotel	210	1
Mesquite	The CasaBlanca Hotel Casino Golf and Spa	500	3
Mesquite	The Oasis Resort Casino Golf and Spa	1,000	5
Mesquite	The Virgin River Hotel/Casino/Bingo	724	3

Minden	Carson Valley Inn	230	3
North Las Vegas	Texas Station Gambling Hall & Casino	200	7
Primm	Buffalo Bill's Resort & Casino	1,242	4
Primm	Primm Valley Resort and Casino	624	4
Primm	Whiskey Pete's Hotel & Casino	777	3
Reno	Atlantis Hotel Casino	1,000	7
Reno	Bonanza Casino	No	2
Reno	Bordertown Casino. RV Resort	No	1
Reno	Circus Circus Hotel Casino	1,572	5
Reno	Club Cal Neva Casino	300	6
Reno	Eldorado Hotel Casino	817	10
Reno	Fitzgeralds Hotel Casino	351	3
Reno	Grand Sierra Resort and Casino	1,000	9
Reno	Harrah's Hotel Casino	975	3
Reno	Peppermill Hotel Casino	1,255	7
Reno	Sands Regency Hotel Casino	800	5
Reno	Siena Hotel Spa Casino	214	2
Reno	Silver Legacy Resort Casino	1,720	6
Sparks	Alamo Travel Center	70	1
Sparks	Baldini's Sports Casino	No	3
Sparks	John Ascuaga's Nugget Hotel Casino	1,600	9
Sparks	Silver Club and Casino	206	4
Sparks	Western Village Inn & Casino	280	4
Stateline	Bill's Casino	No	1
Stateline	Harveys	740	6
Stateline	Lakeside Inn and Casino	124	2
Verdi	Boomtown Hotel Casino	347	4
West Wendover	Montego Bay Casino and Resort	300	3
West Wendover	Peppermill Hotel and Casino	300	3
West Wendover	Rainbow Hotel and Casino	450	4
Winnemucca	Winners Hotel Casino	123	2

Source: http://www.statescasinos.com/travel/hotel/casinos/Nevada/nvCasinos.html

Appendix D – Contact Information for Key Pacific Region CHP Organizations

Note: To be added to this database, or to make any corrections, please send an email to Tim Lipman at telipman@berkeley.edu

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