Clean and Diversified Energy Initiative

WESTERN GOVERNORS' ASSOCIATION

Combined Heat and Power White Paper

Executive Summary
January 2006

Western Governors' Association
Clean and Diversified Energy Initiative

Combined Heat and Power White Paper

Executive Summary

At the invitation of the Western Governors' Association's Clean and Diversified Energy Advisory Committee (CDEAC), the individuals below prepared this white paper on Combined Heat and Power. The white paper was presented to the CDEAC on December 8, 2005 and it was accepted for further consideration as the CDEAC develops recommendations for the Governors. At their Annual Meeting in June, 2006, Western Governors will consider and adopt a broad range of recommendations for increasing the development of clean and diverse energy, improving the efficient use of energy and ensuring adequate transmission. The CDEAC commends the individuals listed below for the thorough analysis and thoughtful recommendations.

Joel Bluestein	Energy and Environmental Analysis
Tom Bourgeois	Northeast Regional Application Center and Pace University Energy Project
Christine Hurley Brinker	Intermountain CHP Application Center and Southwest Energy Efficiency Project
Dan Bullock	Gulf Coast CHP Application Center and Houston Advanced Research Center
Patti Case P.E.	Intermountain CHP Application Center and etc Group
Sean Casten	Turbosteam and U.S. Combined Heat and Power Assoc.
Brennan Downes	Primary Energy
Neal Elliott	American Council for an Energy Efficient Economy
Rick Fioravanti	ICF Consulting
Steve Fisher	Oak Ridge National Laboratory
Patti Garland	Oak Ridge National Laboratory
Sandy Glatt	U.S. Department of Energy
Bruce Hedman	Energy and Environmental Analysis
Arun Jhaveri	U.S. Department of Energy
John Jimison	U.S. Combined Heat and Power Association
John Kelly	Gas Technology Institute
Dana Levy	New York State Energy Research and Development Authority
Timothy Lipman	Pacific Region CHP Application Center and University of California-Berkeley
Rajita Majumdar	BCS Inc.

Vincent McDonell	Pacific Region CHP Application Center and University of California-Irvine Advanced Power and Energy Program
Dennis Moran	Mid-Atlantic CHP Application Center and CHP Integration Test Center
Tod O'Conner	O'Conner Consulting and Intermountain CHP Initiative
Katrina Pielli	U.S. Environmental Protection Agency CHP Partnership
Karl Rabago	Gulf Coast CHP Application Center and Houston Advanced Research Center
John Ryan	Northwest CHP Application Center and Washington State University Energy Program
David Sjoding	Northwest CHP Application Center and Washington State University Energy Program
Merrill Smith	U.S. Department of Energy
Suzanne Watson	Watson Strategy Group

Acronyms and Abbreviations

CHP	Combined Heat and Power
DG	Distributed Generation
FERC	Federal Energy Regulatory Commission
GW	Gigawatt
IEEE 1547 Standards	Standards for interconnecting distributed resources with electric power systems
ISO	Independent System Operator
kW	Kilowatt
kWh	Kilowatt-hour
LCOE	Levelized Cost of Energy
MW	Megawatt
OPUC	Oregon Public Utility Commission
PJM Interconnection	A regional transmission organization covering Pennsylvania, New Jersey, and Maryland that plays a vital role in the U.S. electric system
PUC	Public Utility Commission
PURPA	Public Utility Regulatory Policies Act
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable Portfolio Standard
RTO	Regional Transmission Organization
T&D	Transmission and Distribution
VARs	Volt Amperes Reactive is a component of an electrical system that is often referred to as the “useless part.” Fewer VARs mean more useful energy and better performance.

Executive Summary

The Western United States is facing explosive growth in electricity consumption and water usage, while at the same time facing escalating fuel costs, "not in my backyard" attitudes towards new transmission lines, continuing air pollution challenges, growing climate change concerns, and new concerns over electric reliability to better cope with major disasters. Given these unprecedented challenges, it will be quite difficult to meet the demands of load growth based on the outdated paradigm of centralized generation with large transmission and distribution investments.

We need to take advantage of electric system advancements in technology and design. There is a better way to move forward.

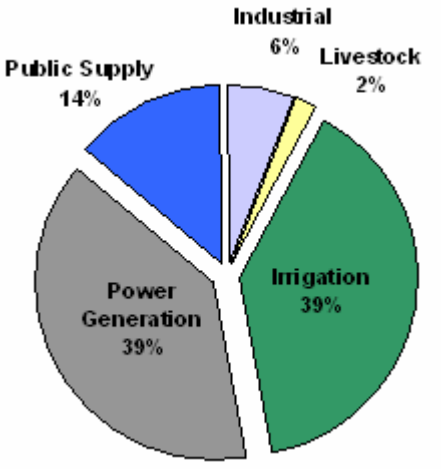

Figure: U.S. Freshwater

Extensive Benefits from CHP Are Key to a Sound Energy Policy

Combined heat and power (CHP) is an affordable, efficient, clean, and reliable piece of the puzzle for meeting the Western region's energy needs. CHP refers to any system that simultaneously or sequentially generates electric energy and utilizes the thermal energy that is normally wasted. CHP is sometimes called "recycled energy" because the same energy is used twice. The recovered thermal energy can be used for space heating, hot water, steam, air conditioning, water cooling, product drying, or for nearly any other thermal energy need. The end result is significantly more efficient than generating electric and thermal energy separately. In fact, many CHP systems are capable an overall efficiency of over 80 percent – double that of conventional systems.

In addition to tremendous efficiency gain, increased adoption of CHP in the West would save literally billions in new capital investment, reduce power costs, reduce security vulnerabilities, improve reliability and power quality, avoid transmission losses, reduce water used by power plants, cut fossil fuel use, cut greenhouse gas emissions, and cut other pollutants. Combined heat and power, using proven and affordable technologies, significantly improves every key outcome from power generation.

State	Existing CHP Capacity (MW)	Add'l Potential Capacity (MW)
AK	438	277
AZ	155	1,801
CA	9,043	10,945
CO	791	1,578
HI	565	705
ID	192	1,142
KS	119	2,005
MT	99	470
ND	39	1,205
NE	25	834
NM	226	649
NV	549	393
OR	2510	1,862
SD	2.7	307
TX	17,122	13,489
UT	239	1,267
WA	1132	3,189
WY	59	747
Total	**33,304**	**42,864**

In the private sector, economically motivated investments in CHP by unregulated businesses now generate almost 9 percent of all power consumed in the United States at a total fuel efficiency nearly twice that of the rest of the U.S. power grid. One need only ask what would happen to our electric reliability, fuel prices, or air emissions if these private-sector investments were to be shut down to realize how dependent our electricity infrastructure is on CHP technology.

CHP Potential Exists to Meet the 30,000 MW Goal by 2015 and Beyond

The WGA has set a goal of adding 30,000 MW of new, clean, and efficient capacity by 2015. CHP has the potential to exceed the entire WGA goal of 30,000 MW all by itself. Yet, despite its advantages to end-use customers, utilities, ratepayers, and society as a whole, the potential has not been met. The existing CHP capacity is still far below its technical and economic potential. As of 2005, the WGA states had approximately 33,304 MW of CHP at 1,262 sites. The additional technical potential in the WGA states is estimated to be 42,864 MW.

Significant CHP Development Opportunities Have Been Lost Over the Past 15 Years due to Major Policy and Regulatory Barriers

In spite of supportive federal policy directives and guidance, many state utility commissions lack the resources to incorporate CHP policy objectives into the minutiae of utility rate filings, docketed hearings, and other tasks that necessarily shape their day-to-day agenda. Their mandate is typically to interpret and enforce existing law rather than to consider larger issues of energy and environmental policy. Compounding this resource limitation is the fact that electric utilities typically perceive CHP as a competitive threat, to the extent that it reduces their electricity sales and hence, their revenue. Unreasonable interconnection policies[i], standby rates, and demand charges often stem from this conflict. This combination has slowed, and in some cases, prevented deployment of CHP in most Western states, in spite of its beneficial impact on the grid, environment, and economy.

Long-Term, Stable CHP Policy and Regulatory Changes Are Needed to Meet WGA's Expectations

The barriers to increased CHP are deeply rooted in the outdated U.S. electricity framework and deserve a long-sustained effort to address. This will require both intellectual rigor and political courage, but the returns will justify the effort in the long term. In the near term, we recommend first steps that each of the WGA governors should undertake to move toward greater deployment of CHP systems. These are small steps, but they are in the right direction and politically realizable in the short term. The Western states should adopt and implement the following fair and workable CHP policies:

- Have each state undertake a thorough review of policies affecting CHP.
- Adopt recently enacted FERC standards for interconnection agreements.
- Give fair credit for CHP emissions reductions by adopting output-based emission standards and greenhouse gas market trading networks.
- Seek CHP solutions to T&D-constrained areas.
- Undertake a review of electricity rates, including standby rates, to make sure they are not discriminatory toward CHP.
- Incorporate policies that will appropriately promote CHP in state utility Least Cost Planning and Integrated Resources Plans.

- Consider adding CHP to Demand Side Management and other energy efficiency programs.
- Decouple utility revenues from throughput.
- Enact a state equivalent of the Federal Section 45 Production Tax Credit including CHP, wind, geothermal, and biomass technologies.
- Adopt simplified, streamlined, and consistent permitting for CHP systems.
- Offer state-funded training and technical assistance programs for local code officials.
- Ensure that renewable portfolio standards, environmental portfolio standards, advanced energy portfolio standards, and other renewable energy laws include the full range of renewable CHP options, including waste heat recovery and spent pulping liquor.
- Call on CHP Regional Application Centers for help in policy, programs, and analysis.
- Wherever possible, adopt consistent, region-wide policies.

[i] Introducing new energy sources on electrical distribution systems designed for one-way energy flow requires technical management to prevent harm to customers and support workers. However, the FERC model standards and IEEE 1547 standards completely and adequately address all safety concerns, and we recommend state adoption of these standards. Otherwise, current utility interconnection standards will continue to prevent CHP in two ways. First, they are often, by design, very costly and time-consuming to the potential CHP user. Second, they differ from utility-to-utility, and this disparity further increases the costs and time to comply. Interconnection standards are addressed further in Section 6, "Recommended Policies for Western Governors."