

CALIFORNIA
ENERGY
COMMISSION

**2005
INTEGRATED
ENERGY
POLICY
REPORT**

COMMISSION REPORT

NOVEMBER 2005
CEC-100-2005-007-CMF



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Excerpted From Executive Summary (Pages E-3 and E-4)

An important alternative to building large new power plants is distributed generation, which is electricity produced on site or close to load centers that is also connected to a utility's distribution system. The most efficient and cost-effective form of distributed generation is cogeneration or combined heat and power. By recycling waste heat, these systems are much more efficient than systems that separately serve thermal and electric loads. They are also considerably more efficient than almost all conventional gas-fired power plants. California has more than 9,000 MW of combined heat and power systems throughout the state, representing approximately 17 percent of statewide generation. Most of these systems are larger than 5 MW, suggesting that the state should focus its efforts on large-scale projects that could provide more than 5,000 MW of additional generating capacity over the next 15 years.

Current state policy must change for California to tap into this potential generation source and retain the existing pool of combined heat and power facilities so critical to reliable operation of the state grid. Developers of new combined heat and power facilities are struggling to find customers to purchase their excess power at the wholesale level, and the state's suspension of direct access hampers their ability to sell their excess power at the retail level. For existing facilities, the unwillingness of utilities to renew existing qualifying facility contracts has led some operators to remove their combined heat and power systems entirely and rely instead on less efficient boilers to meet their heating needs. There will be serious adverse consequences for electric reliability, natural gas demand, and air quality if this trend is allowed to continue.

The Energy Commission strongly supports the following combined heat and power recommendations:

- The CPUC and the Energy Commission should establish annual utility procurement targets for CHP facilities by the end of 2006.
- The CPUC should require investor-owned utilities to purchase electricity from CHP facilities at prevailing wholesale prices.
- The CPUC should explore regulatory incentives that reward utilities for promoting customer and utility-owned combined heat and power projects.
- The CPUC should require that investor-owned utilities provide CA ISO scheduling services for these facilities and be compensated for doing so.

Excerpted From
***“Distributed Generation and
Combined Heat and Power”***
Section
(Pages 74-80)

Distributed Generation and Combined Heat and Power

An important alternative to new central station fossil-fueled generation is distributed generation (DG), which includes both cogeneration and self-generation.¹⁰¹ DG is broadly defined as electricity produced on-site or close to a load center that is also interconnected with a utility distribution system. California has approximately 2,500 MW of small-scale renewable and non-renewable DG and has added an average of 100 MW of new small-scale DG capacity every year since 2001.

The benefits of DG go far beyond actual generation. DG reduces the need for new transmission and distribution infrastructure and improves the efficiency of the state's electricity system by reducing losses at peak delivery times. Customers can use DG technologies as either peaking resources or for energy independence and protection against supply outages and brownouts. DG is a key element of California's loading order strategy and will help meet the state's energy efficiency and renewable energy goals.

Cogeneration, or combined heat and power (CHP), is the most efficient and cost-effective form of DG, providing numerous benefits to California including reduced energy costs; more efficient fuel use; fewer environmental impacts; improved reliability and power quality; locations near load centers; and support of utility transmission and distribution systems. In this sense, CHP can be considered a viable end use efficiency strategy for California businesses. There are more than 770 active CHP projects in California totaling 9,000 MW,¹⁰² with nearly 90 percent of this capacity from systems greater than 20 MW. CHP has significant market potential, as high as 5,400 MW, despite high natural gas prices.

California should particularly encourage CHP at the state's petroleum refineries to make them less vulnerable to power outages. An electricity outage on September 12, 2005, in

¹⁰¹This is a working definition for distributed generation used in various policy activities at the California Energy Commission and the CPUC.

¹⁰² *Assessment of California CHP Market and Policy Options for Increased Penetration*, California Energy Commission, Publication #CEC-2005-060-D, April 2005.

Southern California caused the shutdown of three refineries in Wilmington. These shutdowns resulted in pressure buildups that forced refinery operators to flare excess gases, affecting air quality in the area. The shutdown also impacted gasoline production and supply, causing shortages and price spikes. Increased CHP use at refineries is an important strategy that can help insulate refineries from these kinds of electric grid problems and maintain gasoline production and refinery safety.

The *2003 Energy Report* highlighted the importance of DG and CHP in meeting California's growing energy needs and providing an essential element of customer choice. The *2003 Energy Report* called for the creation of a transparent distribution system planning process addressing the utility benefits of DG and CHP. While some slight progress has been made, almost two years later there has been only a very small increase in the use of DG and CHP.

Despite policy preferences, DG and CHP in California still struggle with major barriers to market entry in the context of traditional utility cost-of-service grid management. In fact, many of the state's operating larger-scale CHP systems still run under the terms of generation contracts signed during the early 1980s following the national energy crisis of the late 1970s. These projects could shut down in the near future as their contracts expire. It is estimated as much as 2,000 MW could shut down between now and 2010 because project owners have been unable to renew their utility contracts.^{103,104}

The *2005 Energy Report* reaffirms its commitment to DG and CHP by separating the discussions of CHP and DG to provide more clarity for policy makers. As a first step, the Energy Commission funded the *Assessment of California CHP Market and Policy Options for Increased Penetration*, a study that identified a series of policy scenarios that could help focus policy direction on the effective deployment of future CHP.¹⁰⁵ The assessment produced a number of important findings.

California has more than 9,000 MW of CHP across the state. With statewide generation capacity at approximately 60,000 MW, CHP is a key component of generation delivered to the grid. CHP represents approximately 17 percent of the state's generation and is often key to preserving grid reliability. CHP systems smaller than 5 MW represent only about 3 percent of total CHP capacity in the state, though much of California's policy efforts over the past seven years have focused on these smaller DG systems, including small-scale CHP. This finding suggests that the state should broaden its policy focus to include large-scale CHP, which could produce several thousand MW of additional generation capacity over the next 15 years.

¹⁰³Public comments by Rod Aoki, representing Cogeneration Association of California and the Energy Producers and Users Coalition, *Energy Report* Loading Order Workshop, July 25, 2005.

¹⁰⁴Comments by Cogeneration Association of California and the Energy Producers and Users Coalition, Docket No. 04-IEP-1E, August 1, 2005.

¹⁰⁵*Assessment of California CHP Market and Policy Options for Increased Penetration*, California Energy Commission, Publication #CEC-2005-060-D, April 2005.

Current state policy must clearly change for California to take advantage of this valuable generation potential. It is equally important to retain the state's existing CHP that is so critical to the current reliable operation of the electric grid. CHP developers seeking to install new generation are presently discouraged from sizing their systems to satisfy their full thermal loads because they would have to generate more electricity than they could use on site. These developers frequently have trouble finding customers interested in buying their excess power at wholesale prices. Lack of a robust, functioning wholesale market in California worsens CHP concerns about this risk.¹⁰⁶ Even if wholesale markets were functioning well, CHP owners would still struggle with the complexity and cost of complying with the California Independent System Operator's (CA ISO's) tariff requirements, including scheduling exports hour-by-hour, installing costly metering and reporting equipment, and other factors.

At the retail level, policy decisions (including suspension of direct access) have hampered CHP owners' ability to sell their excess power to customers. The lack of distribution wheeling tariffs and restrictions on "over the fence" transactions by Public Utilities Code Section 218 create additional barriers.¹⁰⁷ During the 2000-2001 energy crisis, Berry Petroleum needed additional steam for enhanced oil recovery and was willing to install additional CHP facilities to provide that steam. Berry was ultimately forced to install traditional boilers, however, because it could not secure a viable long-term contract for the excess electricity from the CHP facilities.¹⁰⁸ In another example, owners of a 300 MW facility that has been reliably providing enough power to serve more than 400,000 SCE customers for two decades have been trying to negotiate a new contract for more than two years.¹⁰⁹ In yet another example, Valero Refining Company has been trying to secure a contract for over a year with PG&E to sell its excess power, but has been unsuccessful because PG&E and the CA ISO are requiring Valero to execute a FERC jurisdictional interconnection agreement and pay the wholesale CA ISO tariff before selling power to the utility.¹¹⁰ Equally troubling is the fact that Valero has received all necessary permits to install a second generating unit at its refinery but is reluctant to do so because of the "regulatory limbo" between the FERC and CPUC jurisdictions.¹¹¹

Looking ahead to the future development of more workable CHP policies, California must recognize that CHP owners are not in the business of producing or selling electricity. CHP owners will choose to operate their businesses and simultaneously produce electricity only when the economics are favorable to them. CHP policy

¹⁰⁶ Comments by Cogeneration Association of California and The Energy Producers and Users Coalition, Docket No. 04-IEP-01E, August 1, pp. 19-20.

¹⁰⁷ Comments by Kevin Duggan representing California Clean DG Coalition, Docket No. 04-IEP-1E, August 1, 2005, p. 2.

¹⁰⁸ Panel Discussion by Barry Lovell, Berry Petroleum Company, *Energy Report Combined Heat and Power Workshop*, April 28, 2005 and comments filed, Docket No. 04-IEP-1E, October 11, 2005, p. 2.

¹⁰⁹ Comments by Cogeneration Association of California and The Energy Producers and Users Coalition, Docket No. 04-IEP-01E, August 1, p. 7.

¹¹⁰ *Ibid*, p. 7.

¹¹¹ Panel discussion by David Dyck, Valero Energy Corporation, *Energy Report Combined Heat and Power Workshop*, April 28, 2005.

therefore must be different from the policies developed for traditional customer generators and merchant power plants. To illustrate this point, the CHP industry notes that “CHP resources are not and will never be fully dispatchable merchant facilities, designed solely for the purpose of producing power; CHP resources were built primarily to serve thermal energy load, or a combination of thermal and electric energy load.”¹¹² This may not be especially problematic since neither all merchant plants nor all IOU power purchases serve a single purpose in an IOU’s generation portfolio. IOUs structure their portfolios to include resources with different terms, load shapes, and operational characteristics.¹¹³

Based on analyses conducted over the course of the *2005 Energy Report* and extensive input from the industry, utilities, the public, and others, the Energy Commission believes there are several key initiatives that California must pursue to encourage construction of additional cost-effective DG and CHP. CHP is of such unique value in meeting loading order efficiency and new generation objectives that CHP deserves its own place in the loading order. The Energy Commission and the CPUC should therefore separate CHP from DG in the next version of the *Energy Action Plan* so that CHP issues and strategies are not lost in broader DG issues and strategies.

The state also needs to improve access to wholesale energy markets and streamline the utilities’ long-term contract processes so that CHP owners can easily and efficiently sell their excess electricity to their local utility. This would provide CHP owners with the certainty needed to guide their investment decisions to install or expand their CHP operations. By the end of 2006, the CA ISO should modify its CHP tariffs in recognition of the unique operational requirements of CHP and allow CHP owners to sell their power to the state’s electric grid at reasonable prices. This is particularly important given the value CHP provides both IOUs and the CA ISO in reducing transmission congestion and increasing local reliability. Additionally, utilities should be required to offer CA ISO scheduling services at cost to their CHP customers. Congestion and reliability issues will be compounded if California is derelict in addressing these barriers and ultimately loses these strategic generation resources. Natural gas resources and infrastructure would also feel the loss of this valuable generation, as would the environment, because of increases in boiler installations to meet thermal loads. If companies decide to leave California because of energy costs or reliability concerns, it would also mean the loss of well-paying industrial jobs.

Recent federal energy legislation suggests that the Public Utilities Regulatory Policies Act, enacted in 1978, will likely remain in effect in California because of the lack of a robust and functioning wholesale market. By the end of 2006, the CPUC should require IOUs to buy, through standardized contracts, all electricity from CHP plants in their service territories at their avoided cost, as defined by the CPUC in R.04-04-025.¹¹⁴ The

¹¹² Comments by Cogeneration Association of California and The Energy Producers and Users Coalition, Docket No. 04-IEP-01E, August 1, p. 14.

¹¹³ Ibid.

¹¹⁴ CPUC, April 28, 2004, [http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/36203.htm], accessed November 6, 2005.

Legislature should pass legislation requiring similar requirements for POUs, irrigation districts, and other electricity service providers. These long-term contracts should be long enough for CHP owners to make well-informed investment decisions and provide assurances to the Energy Commission and the utilities of their long-term availability. The terms of these contracts should be at least 10 years; however, the Energy Commission and the CPUC should work together to evaluate whether these contracts should have terms with the same economic life as avoided resources.

IOUs also need an incentive to incorporate CHP into their systems and, more importantly, incorporate CHP into their system planning. The Energy Commission's recommendation is three-fold:

- As the Assessment of California CHP Market and Policy Options for Increased Penetration indicates, society as a whole benefits from CHP, though all CHP policy scenarios unfortunately produce utility revenue losses. For California to practically establish its societal preference for DG and CHP, IOUs should be compensated for their revenue shortfalls at least to the point of making them cost neutral. California should explore regulatory incentives to reward IOUs for promoting public- and utility-owned CHP and DG projects. Approaches like the Earned Rate Adjustment Mechanism, which have been successful in keeping IOUs revenue-neutral for energy efficiency programs, could also be implemented for both CHP and DG. California could additionally implement a regulatory approach similar to that of the United Kingdom, where utilities are provided incentives to interconnect DG and CHP projects. The United Kingdom provides even larger incentives to utilities for DG and CHP systems installed on constrained portions of their electricity systems. The CPUC should immediately develop a method to provide DG and CHP incentives to utilities and implement them by the end of 2006.
- The Assessment of California CHP Market and Policy Options for Increased Penetration determined the realistic goal of 5,400 MW of CHP by 2020, which will only be possible if the policies recommended here are actually implemented. By the end of 2006, the Energy Commission and CPUC should collaboratively translate this goal into annual IOU procurement targets. The Energy Commission and CPUC should establish mechanisms in this process to ensure that existing CHP systems retain their baseload positions in IOU portfolios. These mechanisms should rely upon cost/benefit methodologies being developed in CPUC Proceeding R.04-03-017 to make sure that California builds projects that provide the greatest societal benefit.
- California must carefully consider how additional DG and CHP facilities could affect distribution system operations, reliability, and safety. California utilities are planning to invest billions of dollars in their distribution systems in coming years to keep up with their load growth. Now is the time to require the infrastructure investment that will enable utilities to include DG and CHP in their distribution systems. A careful review of Denmark's system, where CHP and DG make up more than 50 percent of the country's generation capacity, shows that distribution system operations can become expensive, complicated, and unpredictable if they are not designed to

accommodate DG and CHP.¹¹⁵ California should require utilities to design and construct distribution systems that are DG and CHP compatible. These designs must recognize the system benefits DG and CHP provide, including voltage support, system restoration and reliability, and intentional islanding.

Initial research from the Energy Commission's Public Interest Energy Research program shows that DG and CHP can provide quantifiable benefits to utility systems. The results of recently completed research on Silicon Valley Power's system show that a majority of Silicon Valley Power's customers could install DG, providing various degrees of utility benefits.¹¹⁶ In this case study, the optimal portfolio was made up of smaller DG systems, averaging less than 160 kW. Some locations on the utility system are also better than others for utility voltage variability, losses, and other factors. The CPUC should require utilities to implement comparable planning models to determine where DG and CHP is most beneficial from system transmission and distribution perspectives.

CHP effectively reduces greenhouse gas (GHG) emissions and both transmission and distribution congestion. CHP facilities are located in local load centers where system operators often struggle to maintain local reliability. CHP also provides significant resources during peak demand periods, which helps mitigate operational problems involved with meeting peak demand. To maintain these environmental and transmission benefits, California should explore production credits for CO₂ reductions and, by the end of 2006, the CPUC should direct utilities to provide transmission and distribution capacity payments to CHP projects in the state.

Recommendations for Distributed Generation and Combined Heat and Power

- California should encourage the use of CHP at California refineries to make them less vulnerable to power outages.
- The state should require utilities to design and build distribution systems that are more DG and CHP compatible.
- The CPUC should require utilities to develop and implement planning models to determine where DG and CHP would be most beneficial, from transmission and distribution perspectives.
- California should explore establishing production credits for CO₂ reductions from CHP.

¹¹⁵ Presentation on the operational impacts from large penetrations of CHP/DG, Paul-Frederick Bach, Eltra – Independent System Operator for Denmark, *Energy Report Combined Heat and Power Workshop*, April 28, 2005.

¹¹⁶ Presentation by Peter Evans, New Power Technologies, *Energy Report Distribution Planning Workshop*, April 29, 2005.

- By the end of 2006, the CPUC should direct utilities to make transmission and distribution capacity payments to CHP projects.