BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Implement the Commission's Procurement Incentive Framework and to Examine the Integration of Greenhouse Gas Emissions Standards into Procurement Policies.	Rulemaking 06-04-009 (Filed April 13, 2006)

ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION
OF THE STATE OF CALIFORNIA

In the Matter of: AB 32 Implementation	CEC Docket 07-OIP-01

COMMENTS OF CAPSTONE TURBINE CORPORATION REGARDING COMBINED HEAT AND POWER POLICIES

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June 2, 2008

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In accordance with the May 1, 2008 Administrative Law Judges' (ALJs') Ruling Requesting Comments on Combined Heat and Power Policies and the May 20, 2008 ALJs' Ruling Modifying Schedule and Correcting Suggested Outline for Comments and Reply Comments, Capstone Turbine Corporation files these Comments Regarding Combined Heat and Power Policies. Capstone thanks the Commissions for the opportunity to provide its input and commends the Commissions on their thoughtful treatment of CHP in California's greenhouse gas policy.

1) Taking into account and synthesizing your answers to other questions in this paper, explain in detail your proposal for how GHG emissions from CHP facilities should be regulated under AB 32.

California has taken a leadership role in the United States in the area of GHG reduction through the adoption of AB 32. As a leader, the state must take care to adopt policy that will serve as a positive precedent for future state and even national efforts to regulate GHGs. In particular, policy should serve as an incentive to develop and deploy a combination of best available as well as emerging clean energy technologies.

The basis of AB 32's approach towards CHP should be that CHP is clean, efficient power. CHP is technology that can reduce GHG emissions here and now. No less than

the leaders of the Group of Eight ("the G8") have called on countries to "adopt instruments and measures to significantly increase the share of combined heat and power (CHP) in the generation of electricity." The global energy think tank, the International Energy Agency, has made the following statements in support of CHP[1]:

- CHP can reduce CO_2 emissions arising from new generation in 2015 by more than 4% (170 Mt /year), while in 2030 this saving increases to more than 10% (950 Mt / year) – equivalent to one and a half times India's total annual emissions of CO_2 from power generation. CHP can therefore make a meaningful contribution towards the achievement of emissions stabilization necessary to avoid major climate disruption. Importantly, the near-term reductions from CHP can be realized starting today offering important opportunities for low- and zero-cost GHG emissions reductions.
- Through reduced need for transmission and distribution network investment, and displacement of higher-cost generation plants, increased use of CHP can reduce power sector investments by $795 billion over the next 20 years, around 7% of total projected power sector investment over the period 2005 - 2030.
- If the energy saving and capital cost benefits of CHP are allocated to its electricity production, growth in CHP market share can slightly reduce the delivered costs of electricity to end consumers. This is contrary to the common view that CHP and other decentralized energy solutions result in higher electricity costs to consumers.

A precedent to California's current action, the Kyoto Protocol, identified CHP as instrumental to Europe meeting its emission targets. The European Cogeneration Directive of 2004 states, "The increased use of cogeneration geared towards making primary energy savings could constitute an important part of the package of measures needed to comply with the Kyoto Protocol to the United Nations Framework Convention on Climate Change, and of any policy package to meet further commitments… as one of the measures needed to reduce the greenhouse gas emissions from the energy sector."

The challenge before California policymakers is to incent this beneficial technology to allow widespread adoption so that the state can realize positive economic and environmental effects.

Our recommendations are summarized below:

1. CHP systems should not be regulated unless they exceed a minimum rated electric output (20MW) or are selling electricity into the grid. Net metering would not qualify as selling into the grid for this regulatory purpose.
2. A special CHP category should be created for systems that are regulated, in order to fairly account for both the thermal and electric outputs of CHP systems.
3. A standard method for calculating the greenhouse gas emissions from CHP systems should be established that assigns a portion of the GHG emissions to the thermal output and the remaining portion to the electric output. It is proposed that

[1] *Combined Heat and Power: Evaluating the benefits of greater global investment.* International Energy Agency, 2008; pg. 7.

the standard assumes a 1.3 multiplier to convert useful hot water or steam output from the CHP system to a "thermal" fuel input. The CHG emissions associated with this effective "thermal" fuel input should be subtracted from the total CHP system emissions to calculate an effective "electric" GHG emission output. This effective "electric" GHG emission is what would be attached to the sale of any electricity into the grid, and could be purchased and resold by Electric Utilities.

4. Since Electric Utilities will be regulated for GHG emissions, they should provide their customers with the effective CO_2 content of each kWh they deliver. This effective CO_2 content per kWh should include the CO_2 emissions associated with electricity generation as well as losses associated with transmission and distribution. Customers should be given the choice to purchase "standard" kW's, or kW's with more or less CO_2 emissions associated with them. Fuel suppliers should also be required to report the carbon content of their products so that local CO_2 emissions can be calculated.
5. Facilities that are required to report GHG emissions as a result of AB 32 should simply convert their annual fuel consumption into CO_2 using the suppliers' reported carbon content, and add to it the effective CO_2 content of the electricity they purchased during the same period. This will account for the true total CO_2 emissions associated with their business, and provide a transparent mechanism to value all forms of onsite generation as well as changes in remote power generation and use of alternative fuels.
6. CHP systems that meet specific performance criteria should be considered a GHG emissions reduction measure, and treated preferentially in order to stimulate end user investment and accelerate adoption. The minimum performance standard should be 60% total system efficiency.
7. Barriers to small scale CHP system adoption should be minimized through use of state incentives to end users, elimination of punitive utility charges such as standby rates and exit fees, implementation of net metering, financing through utility managed programs, and other mechanism.

2) Should GHG emissions from CHP systems be regulated in one sector? If so, which one? How?

First and foremost, CHP should be considered clean, efficient power. As clean, efficient power, we do not believe that CHP should be regulated. If CHP is to be regulated at all, it should be placed in its own CHP sector, due to the specific benefits and needs of CHP. Any regulatory treatment of CHP should be designed to provide users of the technology with a benefit for adopting CHP. Moreover, since CHP is a special case given its GHG emission reduction benefits, the ARB should take care that reporting requirements under AB 32 do not represent a burden, and thus a disincentive to its widespread use.

As previously recommended by the Electricity Producers and Users Coalition and the California Association of Cogerators (EPUC/CAC), "Creation of a separate CHP sector by regulators will break down barriers to further CHP development, ensure proper incentives for CHP operations, and ease administrative burdens. Without this careful

step, particularly as regulators approach the question of allowance distribution, the incentive to maintain existing and build new CHP may easily be lost."[2]

CHP typically saves between 20% and 50% of CO_2 emissions compared to the separate production of heat and power from fossil fuels.[3] This simple fact alone makes any regulation of CHP's GHG emissions problematic, if that regulation is intended to impose increasing costs on CHG emissions. As long as systems satisfy a threshold level of efficiency, calculated by comparing energy output against a reference case (for both heat and power), they should be recognized as an emission reduction measure. See further comments on why CHP is an emission reduction measure in response to Question 16.

3) For in-state CHP systems, should all of the GHG emissions (i.e., all of the emissions attributed to the electricity generation and to the thermal uses) be regulated as part of the electricity sector? If so, for the electricity that is delivered to the California grid, should the deliverer as defined in D.08-03- 018 be the point of regulation? And, what entity(ies) should be the point(s) of regulation for thermal usage and electricity that is not delivered to the California grid if those uses are included in the electricity sector for GHG regulation purposes?.

Again, we do not think that CHP should be regulated since it is clean, efficient power. If CHP is regulated, it should be placed in its own sector to avoid penalizing the emission reduction benefits it can achieve. Central to this purpose will be the proper recognition for both the electric and thermal outputs created by CHP.

CHP delivered to the electricity grid is perhaps a special case and may require some regulatory treatment since it will mix with power generated by the utilities and be sold to users. In that case, the CHP system should be the point of regulation. However, even CHP power that is delivered to the grid should be recognized for its efficiency benefits relative to the utility-generated power.

A standard method for calculating the greenhouse gas emissions from CHP systems should be established that assigns a portion of the GHG emissions to the thermal output and the remaining portion to the electric output. It is proposed that the standard assumes a 1.3 multiplier to convert useful hot water or steam output from the CHP system to a "thermal" fuel input. The GHG emissions associated with this effective "thermal" fuel input should be subtracted from the total CHP system emissions to calculate an effective "electric" GHG emission output. This effective "electric" GHG emission is what would be attached to the sale of any electricity into the grid, and could be purchased and resold by Electric Utilities.

Since Electric Utilities will be regulated for GHG emissions, they should provide their customers with the effective CO2 content of each kWh they deliver. This effective CO2 content per kWh should include the CO2 emissions associated with electricity generation as well as losses associated with transmission and distribution. Customers should be

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[2] See comments filed on February 28, 2008, CEC docket # 07-OIIP-01.

[3] *Will Emissions Trading Put Combined Heat and Power at Risk?* COGEN Europe, 2003.

given the choice to purchase "standard" kW's, or kW's with more or less CO2 emissions associated with them. Fuel suppliers should also be required to report the carbon content of their products so that local CO2 emissions can be calculated.

Facilities that are required to report GHG emissions as a result of AB 32 should simply convert their annual fuel consumption into CO2 using the suppliers' reported carbon content, and add to it the effective CO2 content of the electricity they purchased during the same period. This will account for the true total CO2 emissions associated with their business, and provide a transparent mechanism to value all forms of onsite generation as well as changes in remote power generation and use of alternative fuels.

4) For out-of-state CHP systems, how should GHG emissions attributed to the electricity delivered to the California grid be regulated? If part of the electricity sector, should the deliverer of the CHP-generated electricity delivered to the California grid be the point regulation? (These questions are based on our view that, for out-of-state CHP systems, only emissions attributed to electricity delivered to California, and not attributed to other electricity or the thermal output, are subject to AB 32.)

Out-of-state CHP systems that deliver electricity to the California grid should be treated the same as in-state systems to the extent possible and consistent with Federal laws. We see no reason to make a distinction if the electricity is being delivered to California's grid customers.

5) Should CHP units be placed in different sectors based on CHP unit capacity size?

Since unit size dictates many factors at question in this proceeding, such as emission levels and efficiency, we support making regulatory distinctions based on this criterion. ARB has already exempted systems less than 1 MW from its reporting requirements, and the staff states that they do not suggest modifying these requirements. We propose that the Commissions recommend to the ARB that small-scale CHP systems below a certain size, perhaps 20 MW, be exempt from cap-and-trade.

A precedent for regulating large industrial users and centralized power facilities has been set by the Kyoto Protocol, which does not regulate entities that generate less than 20 MW. The emission allowance trading scheme of the EU includes all combustion plants with more than 20 MW, refineries, coke plants, the production of steel, cement, mineral products and paper and pulp.

Small-scale CHP systems face additional barriers based on their size that may warrant either a) exemption from regulation of GHG emissions; b) inclusion in a separate CHP sector; or c) special treatment within the CHP sector. Additional barriers to smaller CHP systems include:

- Small businesses have a host of other priorities, such as meeting code and safety requirements and focusing their cash on their core business expertise.

- Putting cash down (or financing, which ties up credit for other needs) has risks, some of which are outside of the businesses' control – such as the future price of electricity and natural gas, whereas continued reliance on the local electric utility requires no financial commitment up front.
- Compliance costs can negatively impact smaller entities more than larger entities.
- Commercial entities, which usually require smaller CHP systems, are oftentimes in close proximity to public spaces, living quarters, etc., and therefore often have more stringent air quality and building codes.
- Operating CHP systems can exceed the capability and business focus of smaller entities which lack the engineering capability that typically exists at a large, industrial site.

For these reasons, together with the sheer number of small-scale CHP in California, the Commissions should consider treating smaller CHP differently .

6) Should any of the options for assigning the emissions of a CHP unit to one or more sectors be rejected because it might violate the dormant Commerce Clause?

No comment.

7) Should the type of GHG regulation (i.e., cap and trade or direct regulation) be different for a topping-cycle CHP unit versus a bottoming-cycle unit?

No comment.

8) Should the sectors used for GHG regulation be different for topping cycle and bottoming cycle CHP units?

No comment.

9) Should CHP be part of a cap-and-trade program or not? If so, should the entire unit or certain CHP outputs be part of the cap and trade program?

Participation in a cap-and-trade program should be voluntary for CHP. It is our position that since CHP represents a valuable source of GHG emission reductions, facilities should not be obliged to a) take part in an emissions trading scheme; b) reduce their emissions beyond a reasonable, achievable efficiency level; nor c) purchase allowances through an auction process.

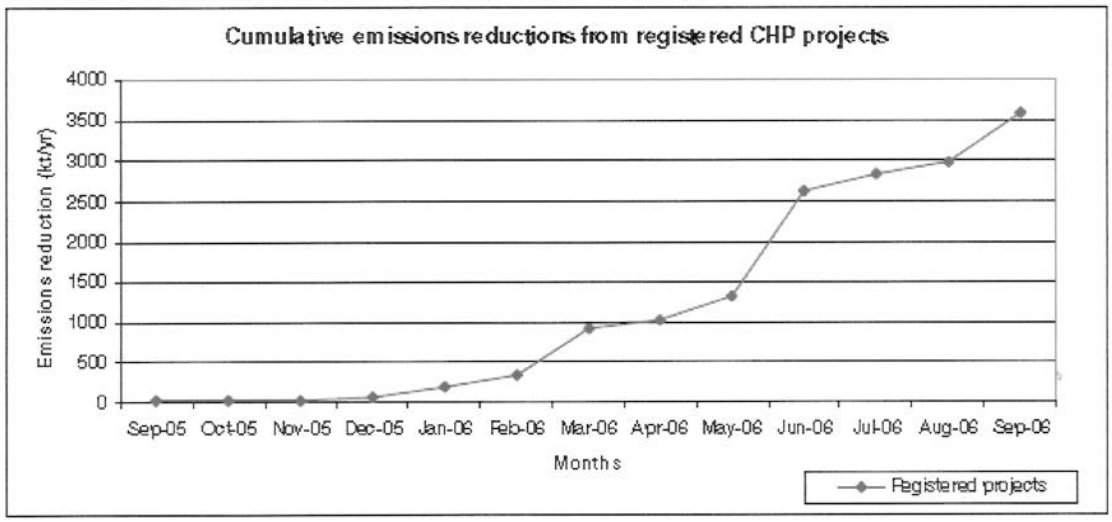
A cap and trade system involves imposing an emissions quota on a facility which is then reduced over time in order to achieve lower emissions. Since the act of installing a CHP system achieves the intended emissions reduction, a cap and trade system, as described here, is problematic to apply to CHP facilities. Emissions trading schemes' (ETS) frameworks have not historically been designed to properly account for CHP, partly due to confusion over whether to place CHP in the electricity or industrial sector. Another

challenge, identified by the Commissions, is that installation of CHP leads to an increase in onsite GHG emissions, although net GHG emissions decrease.

This "emissions paradox" makes including CHP in a cap-and-trade problematic, unless actions are taken to explicitly recognize the net GHG reduction benefits that CHP can deliver. For example, administering permits on a historical basis can discourage investment in energy efficiency measures such as CHP if indirect emissions are not taken into account.

It is notable that the EU Emissions Trading Scheme only regulates facilities with an output over 20 MW. It is also notable that the Kyoto Protocol established flexibility mechanisms whereby regulated entities can implement emission reduction measures in developing countries as a means of offsetting their GHG emissions. CHP projects are considered an attractive option for Clean Development Mechanism (CDM) activities under the Protocol, and registration of such projects has been increasing (see graph below). The potential for CHP in developing countries is large, the expertise is available, and interest is rising, so the trend is likely to continue. Cogeneration projects could therefore represent a large share of the GHG emissions reductions from the CDM in the future, and facilitate significant investment in the power sector of developing countries.[4]

TRENDS IN REGISTRATION OF CHP PROJECTS IN THE CDM



If California decides to include CHP in a cap and trade program, the annual CO2 allowance balance of a specific CHP installation covered by the cap and trade program needs to reflect the CO2 reduction which the installation achieves compared to the separate production of heat and power by a power plant and boiler. This can be achieved in two ways:

1. Either the CHP installation obtains during initial allocation the number of allowances required to cover emissions from the separate reference case,

[4] *Clean Development through Cogeneration: Combined Heat and Power Projects in the Clean Development Mechanism.* World Alliance for Decentralized Energy (WADE), 2006; pg. 3.

i.e. the operator receives allowances for more CO2 than his installation actually emits, and can consequently sell these on the market.

2. Or the amount of CO2 saved by CHP is deducted from the actual annual emissions of the installation, i.e. the operator needs to surrender less allowances to cover his installation's emissions. [5]

10) Should electricity delivered to the California grid by a CHP unit be regulated under the deliverer point of regulation established in D.08-03-018? Why or why not?

First and foremost, CHP-derived electricity delivered to the grid should be considered an emission reduction measure. It is critical that any regulation recognize the energy efficiency benefits of CHP relative to production of electricity and heat from two separate processes. CHP delivered to the electricity grid is perhaps a special case and may require some regulatory treatment since it will mix with power generated by the utilities and be sold to users. In that case, the CHP system should be the point of regulation. However, even CHP power that is delivered to the grid should be recognized for its efficiency benefits relative to the utility-generated power.

11) Should electricity generated by in-state CHP systems for on-site use be subject to the same regulatory treatment as CHP electricity delivered to the California grid? Why or not?

It is our view that electricity generated by a CHP system for on-site use should not be regulated. If it is regulated, it should be in its own CHP sector. CHP-derived electricity, whether consumed onsite or exported to the California grid, accomplishes the same important goal of offsetting less-efficient energy production. On a net energy savings level, the benefit is the same. However, CHP delivered to the electricity grid is perhaps a special case and may require some regulatory treatment since it will mix with power generated by the utilities and be sold to users. Since CHP-generated electricity consumed on-site will not be included in the electricity sector, we do not see any reason to impose regulations on those emissions.

On a related note, exporting electricity from CHP systems to the grid often takes place in the context of financial and technical barriers, such as, interconnection difficulties and low tariffs. Therefore, regulation should serve to create a level playing field by reducing these barriers. To facilitate interconnection that will produce a net reduction in statewide GHG emission, CHP should be classified as an emission reduction measure so that utility companies are encouraged to purchase cogenerated power in order to offset their emissions.

12) If CHP is regulated in the electricity sector (either as one combined unit or based only on the total electricity output or based only on the electricity delivered to

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[5] *Position of COGEN Europe on Emissions Trading and CHP.* COGEN Europe, 2003.

the California grid), do any of the proposed staff allocation options for electricity need to be modified? How?

The three critical points related to this issue are:

1. Regulations should be output-based.
2. If CHP is regulated it should be given allowances gratis.
3. If allowances are allocated on a historical basis this could create a disincentive for CHP, unless historical emissions take into account indirect emissions from electricity purchased from the utility.

California has an opportunity to draft its allocation rules to properly reflect the CO2 savings achieved by CHP, thus promoting its wider use. Allowances should be allocated on an output basis to the largest percentage feasible. According to the USEPA, "Output-based regulations (OBR) can be an important tool for promoting an array of innovative energy technologies that can help achieve national environmental and energy goals by reducing fuel use. OBR encourages energy efficiency and clean energy supply, such as combined heat and power (CHP), by relating emissions to the productive output of the process rather than the amount of fuel burned."[6]

Because there is an "emissions paradox" associated with CHP whereby onsite GHG emissions increase while net GHG emissions decrease, we are concerned that allocations based on historical emissions will create a disincentive for CHP. COGEN Europe has issued the following recommendations on an allocation system based on historical emissions in order to minimize the negative impacts on CHP[7]:

- Allocation rules should not penalize the investment in new cogeneration installations by requiring operators to acquire extra allowances.
- Rules should consider new CO2-saving cogeneration installations as new entrants and allocate freely all extra allowances needed locally to cover their emissions.
- There should be a set aside allowance reserve for this purpose. The size of this reserve should reflect cogeneration development targets and strategies.
- Reward existing industrial and district heating cogeneration operators with full allocation as they have taken early action.

13) If CHP is treated separately from the electricity sector, but is still included as part of a cap-and-trade program, how should allowance allocation to CHP units be handled?

As stated above, we prefer an allocation system that is output based and rewards the efficiency of CHP. Given that CHP can deliver energy efficiency gains relative to processes that provide power and heat separately, it should not be treated the same as the electricity sector. With regard to allowance allocation, CHP plants should be given enough allowances to cover their emissions. Cogeneration, as the most efficient

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[6] http://www.epa.gov/chp/state-policy/obr_factsheet.html

[7] *The National Allocation Plan: Getting the Rules Right for Cogeneration.* COGEN Europe, 2003.

conversion technology, should not be submitted to reduced allocations of emission allowances.

14) If allowances are allocated administratively to CHP units, should the allocations take into account increased efficiency of CHP? If so, how?

If allowances are to be allocated administratively to CHP units, such a system must take into account the increased efficiency of CHP. This should be done by allocating allowances based on output.

The American Council for an Energy Efficient Economy (ACEEE) provides an instructive example of how such an output-based system can be implemented in the context cap-and-trade. Under an output-based system, plants receive the same allocation of allowances for the same level of production. However, the more efficient CHP plants will surrender fewer allowances with relatively lower emissions, resulting in an end-of-the-year revenue bonus. EPA's guidance document on NO_x cap and trade program has explicitly addressed output-based allocation to CHP systems (U.S. Environmental Protection Agency 2001a). The cap and trade model has been extended to the discussion of reducing carbon dioxide (CO_2) emissions, which would most directly reflect the efficiency benefits of CHP.

The ACEEE goes on to say that in a trading system where emission allowances are allocated to CHP, particular provisions are needed to avoid allowance double-counting. CHP displaces emissions from the electricity-generating units from the grid, as well as emissions from boilers. Therefore, when allowances are awarded to the CHP system, the allowances should be subtracted from the allowances pool for the power plants and boilers.[8]

Furthermore, allowances should be granted based on both power and heat output of CHP systems through a double benchmarking method.

15) Are there advantages to having all emissions from in-state CHP regulated as part of the electricity sector under cap and trade (and therefore with the need for only a single set of allowances?) How should this be accomplished?

As stated above, we do not support regulating CHP under cap and trade if doing so would necessitate a reduction in emissions for CHP facilities. If CHP is to be regulated at all, it should be placed in its own CHP sector, due to the specific benefits and needs of CHP. However, we do agree that a single set of allowances, albeit under a differentiated CHP-specific sector, is preferable from the perspective of regulatory clarity.

16) Should CHP be considered an emission reduction measure under AB 32? Why or why not?

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[8] *Certification of Combined Heat and Power Systems: Establishing Emissions Standards.* ACEEE, 2001; pg. 13.

Yes, it is imperative that CHP be recognized as an emission reduction measure by AB 32. Energy policy supportive of CHP for the purposes of GHG reduction is beginning to emerge on a global scale. A recent study by McKinsey highlighted the part that can be played by CHP in achieving emission reductions in the USA. CHP alone provides around 13% of all identified negative cost CO_2 emission reductions (70 megatons) for buildings by 2030 and 53% of all negative cost reductions (80 megatons) for industry by 2030 (McKinsey, 2007). Furthermore, in a study undertaken to assess the cost of carbon abatement policies in the Netherlands, CHP was identified as one of the least-cost solutions at EUR25 / ton CO_2, lower than building insulation, condensing boilers and wind power (RIVM / ECN, 2004).[9]

No less than the leaders of the Group of Eight ("the G8") have called on countries to "adopt instruments and measures to significantly increase the share of combined heat and power (CHP) in the generation of electricity." The global energy think tank, the International Energy Agency, has made the following statements in support of CHP[10]:

- CHP can reduce CO_2 emissions arising from new generation in 2015 by more than 4% (170 Mt /year), while in 2030 this saving increases to more than 10% (950 Mt / year) – equivalent to one and a half times India's total annual emissions of CO_2 from power generation. CHP can therefore make a meaningful contribution towards the achievement of emissions stabilization necessary to avoid major climate disruption. Importantly, the near-term reductions from CHP can be realized starting today offering important opportunities for low- and zero-cost GHG emissions reductions.
- Through reduced need for transmission and distribution network investment, and displacement of higher-cost generation plants, increased use of CHP can reduce power sector investments by $795 billion over the next 20 years, around 7% of total projected power sector investment over the period 2005 - 2030.
- If the energy saving and capital cost benefits of CHP are allocated to its electricity production, growth in CHP market share can slightly reduce the delivered costs of electricity to end consumers. This is contrary to the common view that CHP and other decentralized energy solutions result in higher electricity costs to consumers.

Smaller systems deliver similarly positive energy and environmental benefits. The figure below provides a comparison between the traditional means for obtaining useful hot water and electricity versus a CHP solution. The specific example is based on EPA and DOE data for the average US electric power plant and EPA test results for a Capstone microturbine with integral heat recovery. Other combined heat and power solutions will provide similar results. While the actual efficiency of utility-supplied electricity varies depending on location and time of day, the overall U.S. average provides a simple comparison to demonstrate the efficiency gains. In fact, the actual benefits could be even

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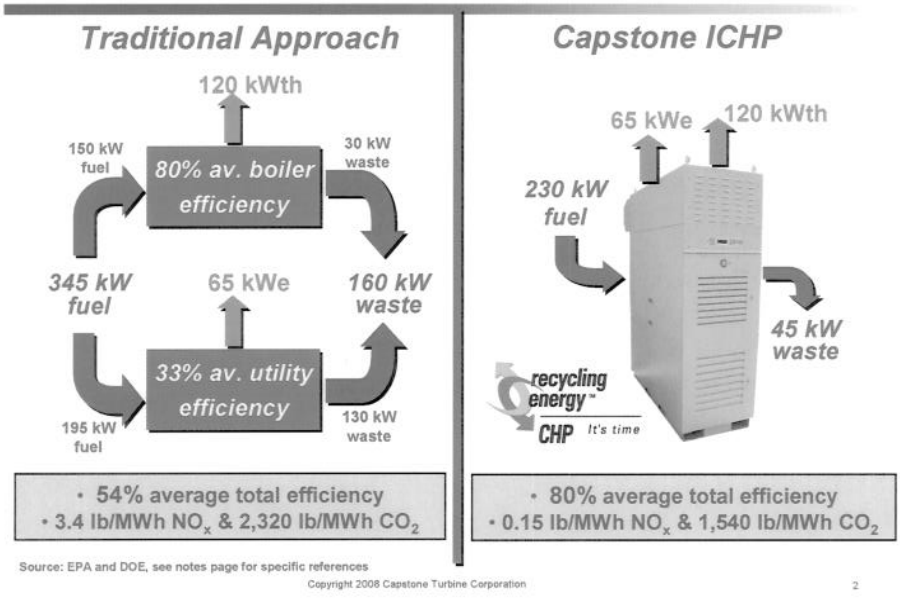
[9] *Combined Heat and Power: Evaluating the benefits of greater global investment.* International Energy Agency, 2008; pg. 10.
[10] Ibid, pg. 7.

greater if clean, efficient DG were to replace generation from older and less efficient plants.

The example above shows a fuel savings of 6,000 BTU per kWh (on an electric basis). The key to this increased efficiency is to site projects according to their need for thermal energy. Most of these applications are in the commercial and light industrial sectors, and have significant thermal loads during operating hours – which typically equates to about 4,000 hours per year. For an installation totaling 500kW, and operating 4,000 hours per year, the annual fuel reduction amounts to more than 12 billion BTU's. Using EPA figures for the average passenger vehicle, this is the equivalent of taking 167 cars off the road.



17) What is the best approach to regulation of CHP emissions to minimize the potential for disincentivizing new installations of CHP and why is that the best approach?

The best approach would involve the following measures:

- Treating CHP differently in order to properly reward onsite generation that results in a net reduction in emissions, even if onsite GHG emissions increase.
- Institute an efficiency test in order to qualify CHP systems as emission reduction measures.
- Avoid allocating allowances to sites based on historic emission levels ("grandfathering"), because the costs for acquiring additional allowances would penalize the operator investing in CHP. However, if allowances are allocated historically, they should take into account the carbon associated with electricity bought from the grid so that users will have an incentive to switch to cleaner sources of power.
- Calculate CO_2 savings achieved by a CHP system by comparing it with a reference case, i.e. the separate production of electricity and heat in the average

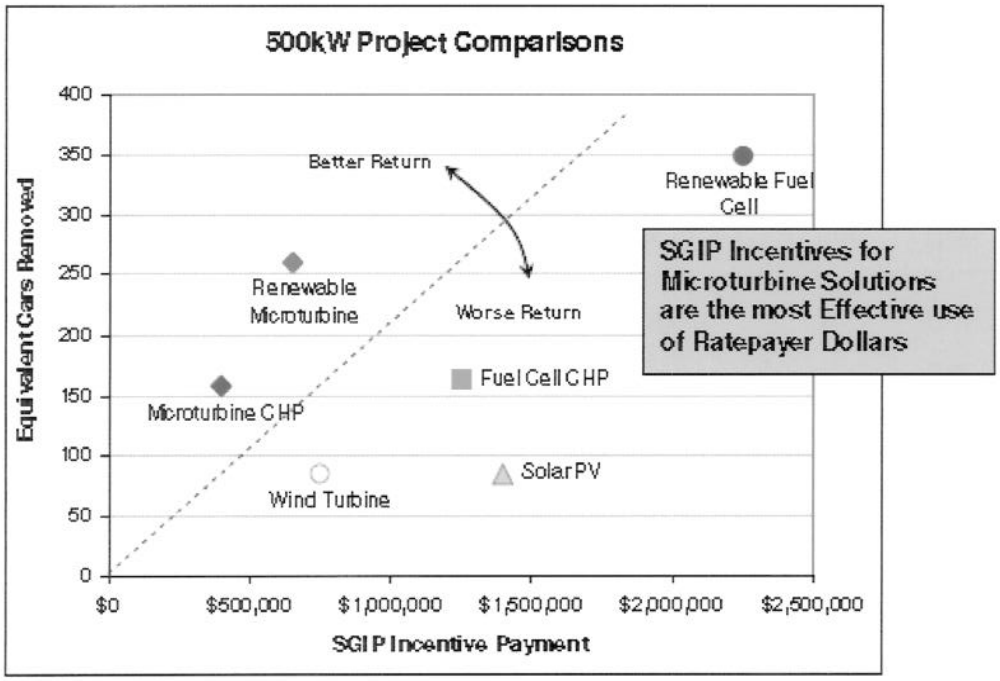
fossil-fuel-based power plant and in a boiler. If the method only takes into account the electricity generation part, or if unreasonable reference scenarios are chosen, CHP would have an unfair competitive disadvantage and new installations would not be built.

18) Should ARB and/or the Commissions consider policies or programs to encourage installation of CHP for GHG reduction purposes? Why or why not?

Yes, incentives should be introduced that fairly reflect the GHG reductions associated with CHP. Microturbines are one possible prime mover of a CHP system. When considering the introduction of policy and programmatic measures to promote clean, efficient power, California regulators should recognize that microturbine-driven CHP delivers more environmental benefit per dollar spent on incentives programs as illustrated by the figures below. With an SGIP rebate of $0.80 per kWh, a 500 kW microturbine CHP system removed 778 tons per year of CO2. This is a higher CO2 reduction than solar PV and wind power, which both received much higher rebate amounts ($2.80 per kWh and $1.50 per kWh, respectively).[11]

		Microturbine CHP	Fuel Cell CHP	Solar PV	Wind Turbine	Renewable Microturbine	Renewable Fuel Cell
SGIP Incentive	[$/W]	$0.80	$2.50	$2.80	$1.50	$1.30	$4.50
Annual Operation	[hours/yr]	4,000	4,000	1,489	1,489	8,000	8,000
NOx Reduction	[lb/year]	6,488	6,332	2,234	2,234	10,000	11,720
CO2 Reduction	[tons/yr]	778	882	518	518	-296	984
Fuel Reduction	[MMBTU/yr]	12,152	12,152	7,701	7,701	41,370	41,370
Equivalent Car Reduction based on:	NOx	170	166	58	58	262	307
	CO2	136	154	91	91	-52	172
	Fuel	167	167	106	106	570	570
	Average	158	162	85	85	260	349

[11] Calculations are based on average power plant and boiler information from EPA and DOE, along with information about the incentive payment and method of rating projects from the latest SGIP manual. The reductions in annual NOx, CO2, and fuel consumption are calculated for a 500kW project size. These results are converted into the equivalent number of cars removed from the highway, using EPA average passenger vehicle data.



19) Should CHP have an efficiency threshold in order to qualify as an emission reduction measure? If so, why?

Yes, we support having an efficiency threshold for CHP systems to qualify as an emission reduction measure. Under the SGIP, CHP systems were required to operate at 60% efficiency or higher in order to receive the incentive.

However, it is critical to note when developing policy that emissions and efficiency monitoring can be extremely difficult and that different methodologies can yield significantly different results. Deliberate consultation with industry technical experts will be required in order to develop the most appropriate methodology for calculating efficiency.

Furthermore, while small-scale CHP systems deliver significant economic, energy and environmental benefits, they are often less efficient than larger systems. Therefore, any efficiency threshold must take into account this technical reality. We propose that small-scale CHP systems be accorded a lower efficiency threshold than larger systems.

20) Which of the proposed methods best achieves the objectives of an efficiency threshold and why is it the best? Is there a superior method not proposed by staff and why is it superior?

Of the options proposed by CEC and CPUC, we believe that double benchmarking method that takes into account both the electric and thermal output is best. CHP is a system innovation and should be recognized as the most efficient means of producing heat and power.

We are concerned, however, that using a CCGT system as a reference case creates an artificial comparison. The ARB and Commissions should assess efficiency at today's levels rather than use CCGT which is not widely adopted. We propose using a statewide average level of efficiency based on all fossil-fuel power plants.

The third approach proposed by staff seems to be compatible with a double benchmarking methodology.

We urge the CEC and CPUC to consider carefully the methodology used to calculate efficiency levels and to consult with industry technical experts, including those from CHP equipment manufacturers, during this process.

21) What should the minimum efficiency threshold be (in terms of % savings) to qualify as an emissions reduction measure and why is that the appropriate minimum efficiency threshold?

The SGIP established a 60% efficiency rate as the threshold for CHP systems to qualify for that rebate. We recommend that the ARB follow that precedent for the purposes of AB 32.

Many factors contribute to the overall efficiency of a CHP system, as mentioned above. In addition to making considerations based on size of installations, we recommend that the efficiency threshold be further differentiated between existing installations and new installations. Existing installations should have a lower efficiency threshold than new installations. For example, under the European Cogeneration Directive, new installations must achieve 10% energy savings, while existing installations must achieve 5% energy savings in order to receive a "high efficiency" rating.

In any case, we recommend that the efficiency threshold be no more than 60% for any type of CHP system. Smaller and existing plants should be given a lower threshold than 60%.

Plants less than 1 MW should be classified as an emission reduction measure if they achieve any primary energy savings.

22) Are there other legal and regulatory barriers to CHP implementation in California that should be considered with respect to GHG regulation? If so, please explain in full with citations to specific relevant legal authorities. Also explain if and, if so, how the barriers could be avoided.

While CHP is widely accepted as capable of delivering economic, energy and environmental benefits, numerous barriers to implementation exist. Given the higher cost of CHP relative to traditional centralized energy, policy and programmatic incentives are critical to maintain a level playing field between CHP and central generation. The U.S. EPA CHP Partnership, U.S. CHP Association (USCHPA), and World Alliance for Decentralized Energy (WADE) have identified several policy measures that can be

adopted at the state level in order to incent the adoption of CHP systems. We have included some of these and other recommendations below for the consideration of the CEC and CPUC.

1. SGIP: The Self-Generation Incentive Program (SGIP) was a robust and helpful tool to make CHP systems cost competitive with central generation. The California CHP community has argued for its reinstatement and we mention it here as a top priority.
2. RPS: California should consider CHP as an integral component of the mandatory renewable portfolio standard (RPS). A set-aside for CHP[12] would further galvanize investment.
3. Standby Rates and Exit Fees: Standby rates and exit fees are major components of the competitive environment that the CHP community faces. Implementing rates that are both fair and rational is critical. If standby rates and exit fees are implemented incorrectly, it can create a disincentive for the use of onsite generation like CHP.
4. Tax Incentives: The U.S. Congress has so far failed to pass the proposed 10% investment tax credit for CHP. In absence of national leadership on this issue, California should adopt a state investment tax credit for CHP.
5. Air Permitting: CARB-certified CHP systems, such as Capstone's C65 microturbine, should be exempt from additional local air permitting rules.
6. Feed-In Tariffs: CHP systems can be capable of delivering power to the electricity grid in times of low onsite demand or if the system is designed for this purpose. Unfair prices for distributed generation (DG) systems such as CHP can discourage the delivery of power to the electricity grid. California should adopt a guaranteed feed-in tariff for CHP generators.
7. Availability of Financing: Credit markets have tightened worldwide, limiting access to financing. Banks have little experience with CHP and view most DG technologies as risky investments. Any revenues generated by regulation, such as auctioning of allowances, should go towards a clean energy fund that CHP projects can access.

24) Would including all of CHP in cap and trade create a disincentive if natural gas is not regulated under cap and trade?

It is difficult to predict the effect on CHP of not regulating the fuels sector in cap and trade. However, it is reasonable to assume that if the cost of running a CHP system rises under cap and trade while the cost of natural gas for heating remains relatively constant, users will opt to run their non-regulated boilers as a more cost-effective option than using a regulated CHP system for thermal power.

[12] Most notably among the state RPSs, Connecticut has set aside 4% of their energy mix to come from CHP and energy efficiency out of a total RPS of 27% by 2020. Nine states have incorporated CHP into their RPS: AZ, CO, CT, HI, NC, ND, NV, PA, and WA.

Unless CHP is promoted as an emission reduction measure under AB 32 with the appropriate price incentives, either through cap and trade or other means, the exclusion of natural gas from cap and trade will likely create a disincentive for CHP.

Capstone Turbine Corporation appreciates the opportunity to provide these comments and respectfully urges the Commissions to adopt the recommendations set forth herein.

DATED: June 2, 20008

CAPSTONE TURBINE CORPORATION

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