Comments of Southern California Edison Company on
Draft Guidelines for Certification of Combined Heat and Power Systems Under the Waste Heat and Carbon Emissions Reduction Act

2008 Rulemaking on Implementation of the)
Waste Heat and Carbon Emissions Reduction Act) Docket No. 08-WHCE-1
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I. INTRODUCTION

Southern California Edison Company (SCE) appreciates the efforts of the California Energy Commission in developing the "Guidelines for Certification of Combined Heat and Power Systems under the Waste Heat and Carbon Emissions Reduction Act" ("Guidelines") pursuant to Public Utilities Code §2840 through 2845. SCE respectfully submits the following comments which strive to maintain a balance between having a successful and robust program and adopting guidelines that ensure customers and the State receive the benefits intended by AB 1613: efficient CHP systems and reduced emissions. As such, SCE's comments are guided by the following principles:

1) Implementation of a program where generators continue to fulfill their efficiency and operating obligations thereby contributing to the State's energy mix and environmental goals.
2) Consistent guidelines that apply equally to both topping and bottoming cycles systems (with supplemental firing).

In general, SCE believes that more stringent performance standards are needed to allow CHP to contribute to meeting California's aggressive environmental goals. SCE appreciates the proposed Guideline's careful distinguishing of topping cycle and bottoming cycle CHP units. However, the proposed discrepancy in efficiency for CHP topping cycle versus bottoming cycle systems (with supplemental firing) is of concern. Suggesting that topping cycle systems meet a 60 percent efficiency, while requiring bottoming cycle systems to meet a separate, insubstantial

efficiency of 40.8 percent efficiency is inconsistent and should be remedied. There is no reason in theory, or in the statute itself, that warrants such a distinction.

Similarly, SCE appreciates the introduction of a more rigorous GHG savings metric with a proposed performance standard of 985 pounds per MWh. Although SCE agrees that incremental GHG emissions from the electricity system is currently around 985 pounds per MWh, GHG emissions from the electricity system will most certainly decline over time as inefficient older units are retired or repowered, and as California's utilization of out-of-state coal resources is reduced. Any adopted standard should be much lower than 985 pounds per MWh, to reflect the incremental GHG emission rates likely to exist over the time that the certified CHP units are in operation. SCE recommends using the GHG performance of a modern combined cycle gas turbine (CCGT) plant (820 pounds per MWh, which corresponds to a heat rate of about 7,000 Btu/kWh) as the GHG emission standard. In addition to reflecting readily achievable performance, this value assures that the addition of new CHP capacity will not crowd out even more efficient CCGT units.

Lastly, SCE recommends more stringent energy efficiency and fuel savings standards. While SCE commends the proposed Guideline's adoption of a "double benchmark" for fuel savings, using inefficient values of 8,358 btu/kWh stand-alone electricity efficiency and 80% stand-alone boiler efficiency is simply not enough, given that existing stand-alone facilities can readily achieve much better performance.

Details on each of these points and other recommended modifications are presented below. SCE presents the existing language in the Guidelines along with SCE's recommended revision, followed by an explanation of the proposed modification.

II. PROPOSED REVISIONS

A. DEFINITIONS (SECTION II)

Many of the definitions outlined in Section II of the Guidelines are consistent with the industry, and state and federal definitions for Combined Heat and Power (CHP) systems.[1] However, SCE recommends the following changes based on SCE's considerable administration, contractual and operating experience with cogeneration Qualifying Facilities and to align the Guidelines with the terms and conditions used in the Power Purchase and Sale Agreement ("PPA")[2] developed by the CHP Working Group in the CPUC's proceeding R.08-06-026.

f) Combined Heat and Power (CHP) System:

Guidelines: *A new or eligible retrofit system, with a net electrical generating capacity less than or equal to 20 megawatts, located at a residential, commercial or industrial facility owned and operated by an "Eligible Customer-Generator" or "retail end-use customer," as those terms are used in California Public Utilities Code sections 2840.2(b) and 2841.5, respectively, that produces both electricity and/or thermal energy for heating and/or cooling from a single fuel. The CHP system includes the unit in which fuel is consumed (e.g. gas turbine, boiler, engine), the electric generator, and the heat recovery unit that transforms otherwise wasted heat to useable thermal energy.*

SCE's recommended revision: *A new or eligible retrofit system, with a ~~net~~ nameplate electrical generating capacity less than or equal to 20 MW located at a residential, commercial or industrial facility owned and operated by an "Eligible Customer-Generator" or "retail end-use customer," as those terms are used in California Public Utilities Code sections 2840.2(b) and 2841.5, respectively, that produces both electricity and thermal energy for heating and/or cooling from a single fuel. The CHP system includes the unit in which fuel is consumed (e.g. gas*

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[1] See California Public Utility Code § 216.6 and Code of Federal Regulations, 18 CFR § 292, 205.

[2] Power Purchase and Sale Agreement filed in the Working Group Report Submitted by Pacific Gas and Electric Company dated May 15, 2009.

turbine, boiler, engine), the electric generator, and the heat recovery unit that transforms otherwise wasted heat to useable thermal or electrical energy.

Although the proposed definition for a CHP system is technically correct, a more transparent method would be to use the sum of the generator power ratings as inscribed on the physical nameplate of the generator(s). The use of nameplate electrical generating capacity, instead of net electrical generating capacity is simpler to interpret and more practical to use for administration and can be easily verified without having to determine the parasitic electrical loads of the ancillary equipment needed to operate the CHP systems. More importantly, the use of nameplate has been commonly used by various parties in the comments of this proceeding, in discussions involving the contract terms and conditions, and is consistent with the language of the negotiated draft PPA. Specifically, the terms and conditions in the PPA use the term "Power Rating" defined as "the electrical power output value indicated on the generating equipment nameplate."

To correlate with this recommended change, the Commission should add the following definition for Power Rating: *Power Rating: The electrical power output value indicated on the generating equipment nameplate as designated by the manufacturer at temperature, humidity, and elevation conditions specified by the International Organization for Standardization.*

o): Supplementary Firing

Guidelines: *Combustion of fuel to add heat to an already hot gas stream in a CHP system in order to increase the temperature of the hot gas stream.*

SCE's recommended revision*: Combustion of fuel to add heat to a gas stream within a Topping Cycle CHP System for purposes of changing the amounts or temperature of the thermal output or if within a Bottoming Cycle CHP System, to increase the amount of electricity production.*

A distinction is needed within the definition to clarify the intended purpose of Supplemental Firing. Such firing should be an element of the design of a Topping Cycle CHP System only for the purpose of controlling the thermal output, to the extent it is necessary. For

Bottoming Cycle CHP, such firing should only be allowed for control of the electrical output. This aligns the allowed use of Supplemental Firing with the intent of AB 1613 which is to utilize waste heat and not just create waste heat. Supplemental Firing should be discouraged if not used for the purpose of operating the facility to follow the host customer's need for thermal or electric energy. Supplemental Firing should not be used to maximize electricity export sales by firing within a Topping Cycle CHP for extra steam turbine generation or within a Bottoming Cycle when sufficient waste heat is available from the process alone to generate electricity that meets the needs of the host customer.

q): Useful Energy Output

Guidelines*: Output energy from a CHP System used in a productive manner for a beneficial use; may include thermal, mechanical and electrical energy."*

SCE's recommended revision: *Output energy from a CHP System used in a productive manner for a beneficial use; may include thermal, ~~mechanical~~ and electrical energy.*

Useful Energy Output should be revised to delete mechanical energy, making it consistent with the definition of a Combined Heat and Power System in Section II (f) of the Guidelines and also Section 2840.2(a) of AB 1613, which only includes electricity and thermal energy.

B. STANDARDS FOR CERTIFICATION OF CHP SYSTEMS (SECTION III)

a): Net Electrical Generating Capacity Standard

Guidelines: *The net electrical generating capacity of the CHP System shall be no more than 20 megawatts (MW)*

SCE's recommended revision: *The Power Rating of the CHP System shall be no more than 20 megawatts (MW).*

This definition should be revised to reflect the change suggested in Section II (f) which uses nameplate instead of net. As noted, this change will ensure consistency with the terms of the PPA and the definition in Section II (f).

b) Topping Cycle Thermal Energy Output Standard

Guidelines: *"The useful thermal energy output of a Topping Cycle CHP system, as designed, shall be no larger than the maximum thermal load served by the CHP system."*

SCE's recommended revision: *"The useful thermal energy output of a Topping Cycle CHP system, as designed shall be either (i) no larger than the minimum thermal load of the host facility; or (ii) capable of being varied as required to meet the instantaneous thermal load of the host facility using such means as supplementary firing or fuel modulation."*

If the system is sized for the maximum possible thermal load, which is typically only reached at certain times during the year and at certain points during the day, it will not operate continuously. AB 1613 states that the guidelines set forth by the California Energy Commission should accomplish the following: "reduce waste heat, be sized to meet the eligible customer-generator's thermal load, and operate continuously in a manner that meets the expected thermal load." To do so, the system should have a continuous load to serve.

The recommended revision will allow design flexibility but discourage oversized systems that would not be operated as envisioned by AB 1613. Given that thermal loads can fluctuate over time, a CHP system sized to meet the maximum thermal load could be underutilized at many other times. This could result in either (1) running the CHP at partial electrical output to match the thermal load, or (2) continuing to run the system at full electrical output while dumping the unused waste heat. Either operating strategy is contrary to the plain language of AB 1613 and will reduce fuel efficiency and increase GHG emissions. A more efficient approach would be to simply require that the CHP be sized no larger than the minimum thermal load.[3] A system thus sized would "operate continuously in a manner that meets the expected thermal load and optimizes the efficient use of waste heat" as required by the statute.

[3] Comments of Southern California Edison Company on Electricity and Natural Gas Committee Workshop on Combined Heat and Power Guidelines, Docket No. 08-WHCE-1, April 27, 2009.

c) Energy Efficiency Standard

Topping Cycle CHP

Guidelines: *A topping Cycle CHP System shall achieve an Energy Efficiency of no less than 60 percent, calculated by dividing the Useful Energy Output of the CHP System by the fuel energy input on a HHV basis.*

SCE recommended revision: *A topping Cycle CHP System shall achieve an Energy conversion Efficiency of no less than 75 percent, during the 12-month period beginning with the date the CHP system first produces electrical energy, and any calendar year subsequent to that year, calculated by dividing the Useful Energy Output of the CHP System by the fuel energy input on a HHV basis.*

As stated in previous comments, a 60% efficiency standard will simply not "dramatically advance the efficiency of the state's use of natural gas" or provide the carbon reduction goals of AB 1613. Nor will it reach the goals in CARB's Scoping Plan of 6.7 MMT of carbon reductions.[4] The CEC must do more. SCE recommends that the CEC adopt an efficiency level of 75% to ensure the intended savings and emissions reductions are achieved. A 60% efficiency will only maintain the status quo; however, a 75% efficient CHP system would use 20% less fuel than separate heat and power, thus achieving the "environmentally beneficial" goals required by AB 1613.

In SCE's more than 30 years of experience with CHP systems, efficiencies of 75% are attainable. In fact several CHP projects in SCE's portfolio continually achieve efficiencies of 75% or greater, with some even reaching efficiencies in the mid-to-high 80 % range.[5] Additionally, high efficiencies are well noted in the industry. For example, the U.S. Clean Heat and Power Association states, "*...under common circumstances, CHP systems will achieve efficiencies regularly exceeding 60%, and where conditions of thermal load and site permit, may achieve efficiencies exceeding 80%. Some systems have been shown to reach efficiency levels in*

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[4] Climate Change Scoping Plan, California Air Resources Board, December 2008. See page 44.
[5] Based on 2006 QF Efficiency Monitoring data, Southern California Edison.

excess of 90%."[6] The U.S. Environmental Protection Agency notes, *"By using waste heat recovery technology to capture a significant proportion of this wasted heat, CHP systems typically achieve total system efficiencies of 60 to 80 percent for producing electricity and thermal energy."*[7] With such qualifications, it would seem that 75% percent efficiency is an attainable standard, thereby setting a bar that is reasonably high enough to achieve tangible carbon reductions.

Bottoming Cycle CHP

Guidelines: *A Bottoming Cycle CHP System that uses supplementary firing shall achieve an energy conversion efficiency of no less than 40.8 percent calculated as (the sum of the useful electrical energy output plus useful mechanical energy output) divided by the fuel energy input on a HHV basis for supplementary firing. A Bottoming Cycle CHP System that does not use supplementary firing is exempt from the Energy Efficiency Standard.*

SCE's recommended revision: *A Bottoming Cycle CHP System that uses supplementary firing shall achieve an energy conversion efficiency of no less than 75% percent during the 12 month period beginning with the date the CHP system first produces electrical energy, and any calendar year subsequent to that year. This shall be calculated by dividing the incremental output attributable to the supplemental fuel by the fuel energy input on a HHV basis for supplementary firing. A Bottoming Cycle CHP System that does not use supplementary firing is exempt from the Energy Efficiency Standard.*

The CEC Guidelines appropriately distinguish between topping and bottoming cycle systems, correctly stating that bottoming cycle systems that do not use supplemental firing are exempt from any efficiency standard. This is consistent with the standards set by FERC. However, the Guidelines inappropriately require topping cycle systems to meet a 60 percent efficiency, but then require bottoming cycle systems with supplemental firing to meet a 40.8 percent efficiency. Such a discrepancy is without justification and outside of the statute. PU Code Section 2840 explicitly states that systems shall meet a minimum 60% percent efficiency.

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[6] U.S. Clean Heat & Power Association (USCHPA). www.uschpa.org. See CHP Basics.
[7] http://www.epa.gov/chp/basic/efficiency.html.

Bottoming cycle systems that fire supplemental fuel are converting fuel to useful output, just like topping cycle systems. There is no reason in theory or in statute to require different efficiency standards. Both should have the same requirements. This revision is necessary to bring the Guidelines in line with PU Code Section 2840.

(d) Greenhouse Gas Emission Standard

Guidelines: *A CHP System shall meet a Greenhouse Gas (GHG) Emission Standard of 985 pounds of carbon dioxide equivalent emissions per megawatt-hour (985 lb CO2 equivalent / MWh), crediting 1 MWh per 1,341 hp-hr of useful mechanical energy output, and 1 MWh for each 3.4121 MMBtu of useful thermal energy output. Carbon dioxide equivalent emissions shall be calculated according to Title 17, California Code of Regulations, Section 95125.*

SCE's recommended revision*: A CHP System shall meet a Greenhouse Gas (GHG) Emission Standard of ~~985~~ 820 pounds of carbon dioxide equivalent emissions per megawatt-hour (~~985~~ 842 lb CO2 equivalent / MWh), crediting 1 MWh for each 3.4121 MMBtu of useful thermal energy output. Carbon dioxide equivalent emissions shall be calculated according to Title 17, California Code of Regulations, Section 95125.*

Although the incremental GHG emissions from the electricity system is currently around 985 pounds per MWh, GHG emissions from the electricity system will most certainly decline over time as inefficient older units are retired or repowered, and as California's utilization of out-of-state coal resources is reduced. Unfortunately, the proposed standard does not go far enough, since it merely sets a performance standard based on the current electric systems incremental GHG production per MWh, without consideration of likely efficiency improvements that will take place over time.

Any adopted standard should be much lower than 985 pounds per MWh, to reflect the incremental GHG emission rates likely to exist over the time that the certified CHP units are in operation. SCE recommends using the GHG performance of a modern CCGT plant (842 pounds per MWh, which corresponds to a heat rate of about 7,000 Btu/kWh) as the GHG emission standard. In addition to reflecting readily achievable performance, this value assures that the

addition of new CHP capacity will not crowd out even more efficient CCGT units. Without a more stringent standard, the CEC may certify CHP projects that result in construction of new CHP facilities that increase GHG emissions over their lifecycle (in comparison to stand alone electricity and process heat production).

(e) Thermal Energy Utilization Standard

(1)(A): Guidelines: *The useful electrical energy output plus the useful mechanical energy output plus one-half of the useful thermal energy output, during the 12-month period beginning with the date the CHP system first produces electrical energy, and any calendar year subsequent to that year, shall be no less than 42.5 percent of the total fuel energy input, measured on a HHV basis.*

SCE's recommended revision*: Delete. The annual requirement should be as explained in SCE's revision to Section c) Energy Efficiency Standard (above).*

This provision is confusing and should be deleted. The minimum efficiency standard and methodology has already been set forth in Section 2843(e) of AB 1613, and is incorporated in these Guidelines at *Section II (c) Energy Efficiency Standard*. A combined heat and power facility creates two outputs that are required by host customers. There is no reason or provision in the statue to discount the value of the heat or to value the electricity more.

B (3): Guidelines: *A bottoming cycle CHP system using supplementary firing shall achieve a useful electrical energy output plus useful mechanical energy output that is not less than 50 percent of the fuel energy input, measured on a HHV basis, for supplementary firing."*

SCE's Recommendation: *Delete. The annual requirement should be as explained in SCE's revision to Section c) Energy Efficiency Standard (above).*

As noted in earlier sections, both topping cycle and bottoming cycle systems should be held to the same annual efficiency standard.

g) Fuel Savings Standard

Topping Cycle

Guidelines: *"A topping cycle system must use less fuel than would have been used by the separate generation of electricity delivered by the utility grid and an onsite boiler. The power plant supplying the utility grid shall be assumed to have an efficiency of 40.8 percent or a heat rate of 8,358 Btu/kWh on a HHV basis after transmission and distribution losses have been subtracted. The displaced boiler shall be assumed to have a fuel-to-steam efficiency of 80 percent.*

A Bottoming Cycle CHP System is exempt from the Fuel Savings Standard."

SCE's recommended revision: *A topping cycle system must use less fuel than would have been used by the separate generation of electricity delivered by a combined cycle gas turbine at 48.5% efficiency (7,000 heat rate) and an onsite boiler. The displaced boiler shall be assumed to have a fuel-to-steam efficiency of 85 percent.*

"A Bottoming Cycle CHP System with supplementary firing should use the same electric production benchmark applied only to the incremental electricity production and supplemental fuel use."

Achieving greater efficiency than the "usual separate systems" and reducing natural gas fuel consumption depends on the benchmarks used for comparison and the use of both products – heat and power. This double benchmark should be an "apples-to-apples" comparison of separate generation, specifically what the electrical and thermal output of a CHP system would ultimately displace.[8] For a natural gas fired topping cycle CHP system, the electric benchmark should be a state-of-the-art natural gas fired combined cycle gas turbine with a 48.5% efficiency (7,000 heat rate), not the average power plant supplying the utility grid. Much of these plants are fossil fuel or coal that, once retired, will be replaced with newer technologies. Certainly exceeding such a low threshold will not result in any fuel savings or emissions reductions. For

[8] The double benchmark method was also presented in the *"Joint California Public Utilities Commission and California Energy Commission Staff Paper on GHG Regulation for Combined Heat and Power."* Michael Colvin, California Public Utilities Commission and Gerry Bemis and Marc Pryor, California Energy Commission, May 1, 2008. R. 06-04-009 and D.07-OIIP-01. See page 10.

the thermal side, the benchmark should be an 85% efficient boiler. Without such appropriate benchmarks, natural gas fuel savings attributable to the new CHP systems under AB 1613 will be negligible.

For bottoming cycle systems, obligations should be equal. The benchmark for bottoming cycle CHP with supplementary firing should be the same electric production benchmark applied to the incremental electricity production and supplement fuel use.

C. INITIAL QUALIFICATION AS AN ELIGIBLE CHP SYSTEM (SECTION IV)

Section IV (a) Submittal of Annual Reporting Form:

This section should be modified to add a requirement that the applicant shall also provide a copy of the certification Form CEC-2843, including all required schedules and attachments, to the electrical corporation or utility with whom the applicant intends to interconnect the CHP facility with and sell power to. This is necessary to allow the utility an opportunity to review the application and, if appropriate, exercise its right (set forth in Section IV (d) of the Guidelines) to appeal the Executive Director's determination.

Although the PPA between the buyer and the seller may obligate the applicant to provide such documentation to the utility, it is possible that some CHP project developers will start the application process with the CEC prior to executing a PPA with the utility (*i.e.*, before such a reporting obligation exists). This change will harmonize the Guidelines with the intent of the PPA.

D. ONGOING COMPLIANCE, PERFORMANCE MONITORING AND ANNUAL REPORTING (SECTION V)

Monitoring and verification are the most critical elements of the implementation of AB 1613. These requirements ensure that projects are fulfilling their obligation and if they fall short, are given time to make appropriate corrections. As SCE commented at the April 13, 2009 workshop, it is imperative that ongoing monitoring, verification, and enforcement (if necessary) be conducted on AB 1613 systems. The benefits of this program can only be quantified if there is an effective monitoring program.

a): Submittal of Annual Reporting Form

(1): This section should be modified to add a requirement that the owner/operator shall also provide a copy of the completed Form CEC-2843A to the utility purchasing the power.

(2): Upon finalization of the Guidelines, Staff should provide a sample of the forms referred to herein (CEC-2843 and CEC-2843A) for parties to comment.

(3): SCE understands the need to simplify the process for smaller generators and has recognized such a need in the Working Group's development of a more simplified contract for smaller generators. Although the contract may be shorter and less cumbersome for smaller generators, the obligation to save fuel and reduce carbon emission does not decrease.

Contrary to the proposed Guidelines, SCE does not agree that any generator, regardless of size, should be exempt from compliance and annual monitoring. The statute makes no distinction between a large and small generator or suggest any flexibility should be given to a generator simply because they are smaller in size. All systems use fuel, and all systems are required to meet the efficiency standards, therefore all systems should be treated equally and report operating data.

In our experience, even the smallest generators, as small as 32 kW are able to provide the requested data. There are no size limits in the FERC rules that implement PURPA or in the Self Generation Incentive Program (SGIP). As such, there is no reason to distinguish generators under AB 1613 from such requirements, regardless of size. As owners and operators of CHP systems, these generators have obligations to retain log books and keep records of fuel inputs and outputs. With requirements for and access to such data, there should be no distinction made between a small generator and a large generator for compliance or annual reporting. All generators should be required to comply equally with these reporting requirements.

b): Review of the Annual Reporting Form

The language in this section appears to indicate that the Annual Reporting Form will only be reviewed if the CHP System Owner/Operator declares the system out of compliance, or the

declaration is challenged. These contracts are long-term obligations predicated on long-term benefits. There is an inherent need for annual verification otherwise this guideline is just a formality and not a meaningful implementation of the statute. Specifically, the language of AB 1613 requires that, "An eligible customer-generator's combined heat and power system shall adequately maintain and service the combined heat and power system so that during operation, the system continues to meet or exceed the efficiency and emissions standards established pursuant to subdivisions (a), (d), and (f)." Surely the CEC recognizes the need to review all data and not just at the trigger of a checkbox on the reporting form.

This section should be modified to recognize that all data will be reviewed, and not only on the basis that an owner/operator declares non-compliance. It should also include that the CEC will notify the owner/operator and utility with a pass or fail statement after review of the submitted data because both the owner/operator and the utility need to know that such a review was performed and the corresponding results. The results of that review must be communicated in a clearly worded pass or fail notification. The parties to the PPA need such a determination for administration of the agreement. The data contained in such annual reports is vital input to the effectiveness of this program. A simple affidavit will provide no useful data.

c): Correction of Non-Compliance

The time period allowed for correction of noncompliance should be shortened from two years to one reporting year. If the failure of a CHP project to comply with the standards set forth in Section III of the Guidelines was due to a failure of equipment or instrumentation, it is difficult to imagine a scenario where the owner, acting in good faith, could not complete repairs within one year following the initial determination of noncompliance by the CEC. Further, there is no reason to give "small" systems more time for correction than larger systems; to the contrary, it would be expected that remediation for small systems would be simpler and faster to implement. On the other hand, if noncompliance is due to a deliberate operating strategy or business decision on the part of the CHP owner rather than equipment failure, there is no justification for giving the owner more than one year to revise its operation.

III. CONCLUSION

SCE appreciates the CEC's consideration of these comments and looks forward to participating in the next steps to implementation of AB 1613.

Respectfully submitted,

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