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March 4, 2005

VIA HAND DELIVERY

Docket Clerk  
Docket Office  
California Public Utility Commission  
505 Van Ness Ave.  
San Francisco, CA 94102

Re: *R.04-01-025 Order Instituting Rulemaking to Establish Policies and Rules to Ensure Reliable, Long-Term Supplies of Natural Gas to California*

Dear Docket Clerk:

Enclosed, for filing with the Commission, per Rule of Practice and Procedure 2.5(b), in lieu of an original, are five copies of the following document:

**COMMENTS OF CALPINE CORPORATION ON  
GAS QUALITY SPECIFICATIONS**

We have also enclosed one additional copy to be file-stamped and returned to the person delivering the filing.

Please feel free to contact me if you have questions. Thank you for your assistance in this matter.

Regards,

Marjorie Oxsen  
Paralegal

cc: Commissioner Michael R. Peevey (Via E-mail)  
Commissioner Susan P. Kennedy (Via E-mail)  
Administrative Law Judge John S. Wong (Via E-mail)  
Administrative Law Judge Steven A. Weissman (Via E-mail)  
California Energy Commission Docket Unit, Docket No. 04-IEP-01-D  
R.02-11-039 Service List (Via E-mail)

**BEFORE THE ENERGY RESOURCES CONSERVATION  
AND DEVELOPMENT COMMISSION AND THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

In the Matter of:	)	
Informational Proceeding and Preparation of the	)	
California Energy Commission 2005	)	Docket No. 04-IEP-01
Integrated Energy Policy Report and	)	
	)	
California Public Utilities Commission	)	
Natural Gas Order Instituting Rulemaking to	)	Docket No. R.04-01-025
Establish Policies and Rules to Ensure Reliable	)	
Long Term Supplies of Natural Gas to California	)	

**COMMENTS OF  
CALPINE CORPORATION  
ON GAS QUALITY SPECIFICATIONS**

Pursuant to the California Public Utilities Commission's ("CPUC") Rules of Practice and Procedure and the Presiding Administrative Law Judge's ("ALJs") January 22, 2004 ruling, Calpine Corporation ("Calpine") respectfully submits these comments following the joint workshop held February 17 and February 18, 2005. Calpine is a large independent generator and natural gas producer in California as well as an active supporter of the development of liquefied natural gas ("LNG"). As such, Calpine has a significant interest in safe, reliable and sufficient supplies of natural gas that will meet the needs of the market as well as its fleet of new efficient and environmentally friendly gas fired turbines. Calpine's interest extends beyond California with electric generation facilities in 21 states, Canada, Mexico and the United Kingdom.

The issues surrounding gas quality in California have been a matter of debate for several years but has moved to the forefront with the anticipation that significant amounts of LNG will be transported to the state. Therefore, much of Calpine's comments will focus on the issue of

natural gas interchangeability and the potential impacts on gas turbines. Calpine has in excess of 5,100 MW of gas fired generating capacity either operating or under construction in California. Of this total, more than 3,900 MW utilize a combination dry low nitrogen oxide or NOx (“DLN”) and Selective Catalytic Reduction (“SCR”) technology for emissions control. It is these DLN units that are the most sensitive to changes in gas composition.

#### Interchangeability Criteria for Gas Turbines

Interchangeability is defined by the Natural Gas Council+ Interchangeability Work Group (“NGC+”) as the ability to substitute one gaseous fuel for another in a combustion application without materially changing operational safety, efficiency, performance or materially increasing air pollutant emissions. Natural gas fired turbines can be designed to run on a wide range fuels with differing gas quality. However, once a turbine is designed and constructed based on an expected gas quality then there is a narrow range of variability in the quality of gas that can be consumed without causing problems with operations and emissions. Calpine’s gas quality requirements are driven by the specifications of the turbine or original equipment manufacturers (“OEM”). Operation of the turbines using fuel that is outside the OEM specifications can create operating problems and increased emissions<sup>1</sup>. After a review of the OEM specifications, Calpine has concluded that the criteria in Table 1 should be established in setting gas quality standards for interchangeability.

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<sup>1</sup> Calpine will not detail out in these comments the various operating problems and emission issues that can occur but refers the CPUC and others to the extensive report compiled by Mike Klassen of Combustion Science Engineering contained in Appendix C of the White Paper on Natural Gas Interchangeability and Non-Combustion End Use compiled by the NGC+ Interchangeability Work Group.

Table 1.

	Minimum	Maximum
Wobbe Index	1153	1391
Btu/scf	900	1200
Ethane, vol%	0	15
Propane, vol%	0	2.5
Butane (C4+), vol%	0	1
Inert gas (N2), vol %	0	15
Wobbe Variation, +/-%	0	2
Wobbe Rate of Change, %/min	0	2

Note: Wobbe Index based on real gas properties, high heating value, specific gravity at 60 degrees Fahrenheit and 14.73 PSIA

While the Wobbe Index is a good starting point for establishing gas interchangeability, gas turbines require that the constituents of the gas stream also be considered. This is because the Wobbe Index number can remain constant even when the relative percentage of ethane, propane or butane changes. Limitations on the volume of each component are necessary to meet OEM specifications. In addition to the nominal minimum and maximum specifications, the rate of change between these limits and the variation from the turbine specification design must be considered. For example, if a turbine is designed and tuned to operate on a gas stream with a Wobbe Index of 1200, the Wobbe Index should not fall below 1176 or exceed 1224. Variances outside the equipment design specifications may result in shut down of the unit, equipment damage and increased emissions requiring the generation unit to be retuned or retooled. This could involve a shutdown of the turbines for a period of time in order to replace the fuel injection nozzles to obtain the appropriate air/fuel ratio. The cost of such event would include new equipment, labor and loss in revenue. If a DLN turbine gas supply is subject to changes in the Wobbe Index outside the acceptable range, the reliability of the unit will be severely compromised.

## Emissions

Sempra LNG (“Sempra”) and Chevron U.S.A. Inc. (“Chevron”) state in their filed pre-workshop comments that the potential increase in NOx emissions from the combustion of natural gas with a higher heating value and Wobbe Index will be minimal. Sempra states that natural gas fired turbines account for only 0.5% of California NOx emission and 80% of the these turbines have SCR which bring NOx emission down to less than 10 p.p.m. While gas fired generation accounts for a fraction of a percent of the total NOx emissions, regulations do not allow individual plants to vary NOx emissions beyond a set limit. Even with SCR, which all of Calpine’s DLN facilities utilize, the amount of headroom available for any increase in NOx emissions and not violate the air permits is minimal. Calpine’s new combined cycle generation facilities operate on average with NOx emission levels at 80% to 90% of their maximum permit levels that range from 2.0 to 2.5 p.p.m. There is no room for a 50% to 100% increase of 1-2 p.p.m as suggested by Chevron. The SCR equipment utilizes ammonia as a reagent in a catalytic reaction to convert NOx into nitrogen and water. The release of ammonia or ammonia slip is also limited by regulation. Additional ammonia cannot simply be added to compensate for the increase in NOx emissions from the gas fired turbines. The air districts and the California Energy Commission strive to further reduce the allowed levels of ammonia slip. An increase of 1-2 p.p.m. of NOx emissions is anything but minimal.

## Point of Measurement

A consistent quality of delivered natural gas is critical to Calpine’s operations in California and across the country. Southern California Gas Company (“SoCalGas”) and Pacific Gas and Electric Company (“PG&E”) have each taken a different approach to application of

their gas quality rules. SoCalGas has chosen, apparently without CPUC approval, to apply the California Air Resources Board (“CARB”) standards at their system receipt points for supply whereas PG&E works to ensure the gas quality meets the needs of the customer at the end-use delivery point. This difference in approach can have a negative impact on the available sources of natural gas supply in California.

PG&E’s end-use delivery point approach is much more effective and pragmatic approach and increases the available supply of natural gas to California. Gas quality specifications should reflect the quality of gas that customers can expect to receive from the pipelines and should not unnecessarily restrict the supply received into the pipeline. Where natural gas supply at the receipt points does not meet the end-use delivery specification but will not cause the aggregate end-use delivered supply to fall outside the necessary parameters, the pipeline should be required to accept the supply. This necessarily provides a significant amount of responsibility and discretion to the pipeline.

The pipelines are in the best position to understand the operations and flow patterns of their systems and should use their knowledge and expertise to provide the greatest opportunity for supply to access their system. A pipeline’s discretion in determining what supply will or will not create a problem to its end-use customers should of course be applied in a non-discriminatory manner. Calpine recommends that a last-in/first-off approach be taken for gas supply that does not meet the delivery specifications. For example, if at a particular receipt point, a portion of the supply does not meet delivery specifications but there is sufficient total supply to offset the negative impact so that the supply delivered to the end-use customer is within specified limits, then the “off-spec” supply should be allowed access to the pipeline system. If additional, “off-spec” supply that would exceed the specified limits of the end-use

delivered quality of natural gas, desires to access the pipeline system then the pipeline would and should deny access to that additional supply. In this case, the pipeline would continue to provide access to the first supplier. SoCalGas' approach of applying the end-use delivery specifications at the receipt point is unduly restrictive and limits the supply of natural gas to California consumers.

#### Management of Interchangeability

The interchangeability of natural gas supply can be managed at various points along the supply chain. The heavier hydrocarbons that could cause the delivered LNG to exceed the delivery specifications can 1) be removed at the point of production or liquefaction, 2) removed just prior to point of receipt into the pipeline system or 3) removed at the point of delivery. An alternative to removing the heavy hydrocarbons could be the injection of inert gas such as nitrogen in order to lower the Wobbe Index. This could be accomplished at any of the same points.

Removal of the heavier hydrocarbons at the point of production or liquefaction but prior to shipping will increase the per unit cost of the delivered LNG and possibly limit the marketability of the LNG, assuming that supply is tailored to a specific market. Injection of inert gas prior to shipping the LNG would also increase the per unit shipping cost. There will necessarily be an investment required in equipment necessary to remove these heavier hydrocarbons or injection of inert gas.

Removing the heavier hydrocarbons or injection of inert gas at the point of regasification or prior to injection into the pipeline can also be done in order to meet natural gas specifications. Removal of the hydrocarbons can create a problem in some areas as to the disposition of the hydrocarbons removed if there is not a local market or existing infrastructure for the processing,

storage or handling of the removed hydrocarbons. Nitrogen can be injected but at additional costs. Infrastructure beyond the regasification facilities will be required.

The same options for removal of hydrocarbons or injection of inert gas are technically available but significantly multiplied to the extent interchangeability is managed at the individual end-use delivery points that cannot utilize the off-spec gas supply. Other options at the point of consumption include the retooling or addition of equipment in order to handle a wider variety of natural gas supply<sup>2</sup>.

It is Calpine's position that the best point of management is near the point of regasification and prior to entry into the pipeline grid rather than at the multitude of end-use delivery points. It would appear that it would be more economically efficient to adjust the regasified natural gas quality at a single point rather than at multiple points across pipeline systems. Based on Calpine's understanding of the expected LNG compositions, much of the expected LNG production could meet the specifications in Table 1 through the removal of heavier hydrocarbons or the injection of nitrogen. Injection of nitrogen at a single point of receipt would avoid the problem of liquids removal and disposition and eliminate the need for ongoing equipment adjustments and investments at the pipeline end-use delivery point. The economic feasibility of either approach must be fully examined.

### SoCalGas' Gas Rule 30

As discussed above in regard to the Wobbe Index as a measure of gas quality, there is no single measure for gas quality that is adequate for application to DLN gas fired turbines.

SoCalGas' Rule 30 does not provide for limits on the ethane, propane or butane+ components of

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<sup>2</sup> It is Calpine's understanding that certain OEM's are testing their turbines to verify the limits of their design specifications and in the process of developing new fuel management equipment to extend the limits of the current specification. Those tests and the development of additional equipment have not been completed and the costs are unknown at this time.



delivered natural gas. Gas specifications must delineate these individual components so that the advanced gas fired generation can continue to operate without damage or excessive wear on the turbines and to remain within emission limits.

CARB Specifications

CARB specifications with the delineated components for vehicles fueled by natural gas are within the range specified by turbine manufactures but are more restrictive than necessary for turbine operations to the extent they establish a floor for gas quality.

**Table 2**

	Turbine	Turbine	
	Minimum	Maximum	CARB
Wobbe Index	1153	1391	1328
Btu/scf	900	1200	-
Ethane, vol%	0	15	4.02
Propane, vol%	0	2.5	2.01
Butane (C4+), vol%	0	1	0
Inert gas (N2), vol %	0	15	3.52
Wobbe Variation, +/-%	0	2	-
Wobbe Rate of Change, %/min	0	2	-

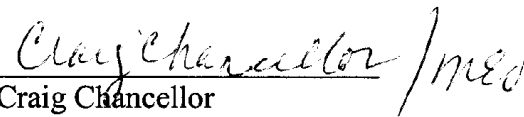
Note: Turbine Wobbe Index based on real gas properties, high heating value, specific gravity at 60 degrees Fahrenheit and 14.73 PSIA  
Parameters for calculation of CARB Wobbe are unknown.

**CONCLUSION**

Calpine believes that California should develop gas quality specifications that provide for the widest variety of gas supply options and that do not impair the ability of end-use customers to utilize natural gas supply cost effectively. Natural gas supply that cannot be utilized by customers does not improve California's gas supply. There is a balance that needs to be struck

between increasing natural gas supply and the requirements of end-use customers so that the environment, safety and reliability are not compromised. Like Sound Energy Solutions, Calpine believes that "California will be best served by LNG facilities that are capable of adjusting the quality of the LNG".

Respectfully submitted,

  
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**CERTIFICATE OF SERVICE**

I, Marjorie Oxsen, certify:

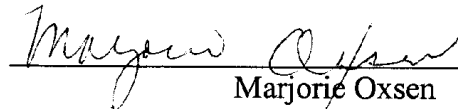
I am employed in the County of Alameda, City of Dublin, California, am over eighteen years of age and am not a party to the within entitled cause. My business address is 4160m Dublin Blvd., Dublin, CA 94568.

On March 4, 2005, I caused the following to be served:

**COMMENTS OF CALPINE CORPORATION ON GAS QUALITY  
SPECIFICATIONS**

by electronic distribution to all parties on the attached service list.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that this declaration was executed on the date above at Dublin, California.

  
Marjorie Oxsen

Service List R. 04-01-025