Central Valley Gas Storage

May 15, 2017

Re: RESPONSE TO CPUC DATA REQUEST OF MAY 1, 2017; COMPOSITION OF GAS AFTER WITHDRAWAL FROM NATURAL GAS STORAGE FACILITY

Attached is the response of Central Valley Gas Storage, LLC ("CVGS") to the Data Request you issued on May 1 2017, provided by the Operations Manager of the facility. I've also attached an analysis of the composition of the natural gas delivered by CVGS to Pacific Gas and Electric ("PG&E") taken on May 2, 2017.

As we've discussed, the only processing done by CVGS is to remove water vapor that may be withdrawn along with natural gas from the CVGS storage formations. Adding water vapor to the analysis would not change the composition of the gas to a significant degree.

If you have any questions regarding CVGS gas composition or need further information, please let me know.

California Public Utilities Commission

Data Request

May 1, 2017

To: Central Valley Storage, LLC

Re: Composition of gas after withdrawal from natural gas storage facility.

The information below is being requested for the study undertaken by the California Council on Science and Technology pursuant to Senate Bill 826.

++

1) What is the composition (e.g., identification and proportion of various constituents) of the gas after a standard operational withdrawal prior to processing from each well at the underground storage facility or facilities you operate in California?

Central Valley Gas Storage, LLC ("CVGS") Response:

Attached is an analysis of the composition of the natural gas delivered by CVGS to Pacific Gas and Electric ("PG&E") taken on May 2, 2017 ("May 2 Analysis"). This analysis is a typical representation of both the gas CVGS delivers to PG&E and the gas CVGS receives from PG&E. The May 2 Analysis shows that the composition of the gas was:

- Methane ~ 94.1%
- Ethane ~ 4.5%
- Other Hydrocarbons ~0.1%
- Nitrogen ~ 0.5%
- Carbon Dioxide ~ 0.8%

The chromatograph that measures the gas composition at the CVGS/PG&E interconnection metering station is actually owned by PG&E. CVGS receives a signal from PG&E's chromatograph and the gas composition analysis is updated every 10 minutes.

CVGS does not take composition readings at each of its wells and the composition reading at the PG&E interconnect metering station is the only composition measurement CVGS utilizes other than monitoring water vapor content.

To provide overall context, the CVGS facility was developed from depleted natural gas reservoir formations that were not believed to produce any compounds (i.e. oil or heavy hydrocarbons) other than natural gas. CVGS has withdrawn gas for approximately 5 years and has not seen any indications of other compounds attaching to gas. The only substance that has been confirmed to attach to gas stored in the CVGS reservoirs is water vapor. The only processing CVGS performs on the gas withdrawn from its wells is dehydration. CVGS has equipment to monitor water vapor content of the natural gas delivered, which must meet PG&E standards.

CVGS receives pipeline quality natural gas from PG&E, injects it into the depleted reservoir formations, withdraws it at a later date, dehydrates the gas to remove water vapor and delivers dry natural gas to PG&E. The composition of the gas received from PG&E and the gas returned to PG&E are not materially different. The composition of the gas returned to PG&E only differs from that of the gas withdrawn from CVGS' wells by the water vapor content removed by CVGS through dehydration.

CVGS periodically takes measurements on the water vapor/moisture content of the gas entering the dehydration process. These measurements have indicated that water vapor content in the gas withdrawn from its formations averages roughly 12 lbs. per million cubic feet, or approximately 0.5% by volume. Therefore, if water vapor were added to the composition from the May 2 Analysis, the other numbers would be reduced very slightly but not significantly.

END

Gas Chromatograph Configuration

Data Set	Comm Mode	Port	Addr	GC IP Address	Comms Enabled	Status	GC Type	Stream	Current Source
1	Serial / IP	Com 4	1			0	Daniels Custom Mapping	1	Gas Chrom

Status General: No Errors — Check Values

Fixed: No Errors — Scheduled: No Errors

Data Set Source In Use: GC

Date: 50217 — Time: 1056

Current | Component | Delta Limit | Normalization | Custom

When All Disabled, Use: Last Good GC

Allow Local Entry

Scheduled Data: Disabled — Date (MMDD): 9999 — Time (HHMM): 9999

	Scheduled	GC	Fixed	In Use
HT Val		1037.0287		1037.0287
BTU Sat		1018.9843		1018.9843
SG		0.5879		0.5879
N2		0.5058		0.5058
CO2		0.8291		0.8291
CH4		94.1071		94.1071
C2		4.4386		4.4386
C3		0.0876		0.0876
IC4		0.0119		0.0119
NC4		0.0123		0.0123
NeoC5		0.0000		0.0000
IC5		0.0026		0.0026
NC5		0.0012		0.0012

	Scheduled	GC	Fixed	In Use
C6		0.0018		0.0018
C7		0.0013		0.0013
C8		0.0006		0.0006
C9		0.0000		0.0000
C10		0.0000		0.0000
H2O %		0.0000		0.0000
H2S		0.0000		0.0000
H2		0.0000		0.0000
CO		0.0000		0.0000
O2		0.0000		0.0000
HE		0.0000		0.0000
AR		0.0000		0.0000
Totals		100.0000		

Non AGA8 Components

Wobbe Index: 1352.4929 — Compressibility: 1.0022

Total GPM: 0.0000 — TotalUnNmMoleP: 99.4675

CHDP: 0.0000