Connecticut
Petroleum Council
A Division of API

Steven Guveyan
Executive Director

44 Capitol Avenue
Suite 103-B
Hartford, Connecticut 06106
Telephone 860-246-8846
Fax 860-246-6495
Email ctpetroleum@comcast.net
www.api.org

February 2, 2012

Mr. Ric Pirolli
Mr. Robert Girard
CT Department of Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106

Dear Mr. Pirolli & Mr. Girard:

We are submitting these written comments regarding the de la Torre Klausmeier Consulting Draft Report entitled "Analysis of Future Options for Connecticut's Gasoline Dispensing Facility Vapor Control Program," dated December 8th, 2011.

As you know, the Connecticut Petroleum Council is a division of the American Petroleum Institute (API), a trade association representing 490 member companies in the oil and gas business.

We look forward to working with you as this project unfolds.

Thank you for considering our comments.

Most Sincerely,

Steven Guveyan
Executive Director

An equal opportunity employer

The consultant to the Connecticut Department of Energy and Environmental Protection (CT DEEP) has prepared emissions calculations for underground storage tank (UST) "breathing losses" at gasoline dispensing facilities (GDFs) which (a) indicate that currently, these emissions are relatively high and (b) are being used to support additional regulatory requirements for pressure management (PM) systems and continuous monitoring (CM) systems (which can in turn be credited in State Implementation Plans for ozone). The consultant used essentially the same methodology used by the New York State Department of Environmental Conservation (NYS DEC) and API, and API has previously produced a White Paper which documented why these calculations (as well as the cost analysis for CM systems, and other interpretations) are erroneous. We reiterate many of the key issues pertinent to Connecticut here. This memorandum is divided into four sections:

1. Identifying the origin of the uncontrolled emission factor used in NYS DEC's methodology (which was used by DEEP's consultant, de la Torre Klausmeier Consulting, dKC), and adjustments to account for the fact that ozone season gasoline volatility is much lower than it was in the early 1960s (when the factor was developed);

2. Presentation of data showing that PV valves can be very effective in controlling breathing losses (contrary to the results of dKC's calculations);

3. Information regarding equipment improvements that have already been made to reduce system leakiness that eliminates the need for continuous monitoring; and

4. An explanation of why the dKC calculations do not produce results that match experimental data.

Of course, there is some variability from GDF to GDF, but if CM requirements are enacted, they will confirm that for many GDFs, the PM requirements are unnecessary and that the ozone season benefits estimated by dKC are grossly overstated.

Uncontrolled UST Breathing Loss Emission Factors (no PV valves)

The NYS DEC methodology starts with an emission factor of 1.0 lb/1000 gal (for GDFs not equipped with any PV valve). Although this factor is listed in the most recent (1995) relevant section of EPA's AP-42 publication, it actually dates back to 1962: i.e., AP-42 cites a 1975 report[1] which in turn cites a 1973 publication[2] which in turn cites a 1963 paper by staff at the Los Angeles Air Pollution Control District (LA APCD)[3] which in

---

[1] C.E. Burklin, et al., "A Study of Vapor Control Methods for Gasoline Marketing Operations: Volume I – Industry Survey and Control Techniques", report EPA-450/3-75-046-a prepared by Radian Corporation (Austin, TX) for US EPA (Research Triangle Park, NC), available from the National Service Center for Environmental Publications (NSCEP), May 1975.

[2] Vatavuk, W.M., "Marketing and Transportation of Petroleum Products," Section 4.4 of US EPA's Compilation of Air Pollutant Emission Factors (2nd edition, Supplement 1), AP-42, 1973, Table 4.4-1.

turn cites a 1962 LA APCD paper by Burlin and Fudurich[4]. Both of the LA APCD papers concluded that emissions are "less than 1" lb per 1000 gal and that "this small amount could be practically eliminated by the installation of a combination pressure-vacuum valve on existing vent lines from the underground tanks"[5] (which is consistent with data we present later in this memo). California agencies have adjusted the uncontrolled emission factor to account for the fact that ozone season gasoline volatilities have been reduced substantially since the early 1960s, and this fact should be taken into account by other state agencies as well. In 1999, the California Air Pollution Control Officers Association (CAPCOA) identified a factor of 0.84 lb/1000 gal for RVP 7.8 gasoline.[6] Several areas in the northeast are required to use Federal Reformulated Gasoline during the ozone season, which EPA has estimated to have an RVP of approximately 6.8.[7] Applying CAPCOA's correction methodology to more recent information developed by the California Air Resources Board (CARB) for RVP 7.0 gasoline**Error! Bookmark not defined.** would result in the uncontrolled factor being 0.76 lb/1000 gal.[8] The California agencies' corrections still do not account for benefits from increased dispensing activity; these are more complex to account for. (We have suggested a means for making these types of corrections in the White Paper we provided regarding New York's proposed regulations,[9] but will not repeat all of the details here.)

Experimental Data and Effectiveness of PV Valves

In addition to the NYS DEC emissions estimation methodology that was cited by dKC, we have also been made aware of a vendor presentation currently in the public domain that discusses emissions estimates. Below, we address some of the technical deficiencies of these methodologies.

Slide 6 of the vendor presentation showed wintertime UST pressure data for a single evening (January 7, 2010)[10] for a very high-throughput GDF (400,000 gal/month) in Utah and showed that approximately 9 lb of emissions were emitted that evening after the PV valve opened (based on an estimate of 220 gal/hr of vapor growth for 6 hours after the PV valve opened, and approximately 0.0065 lb of hydrocarbon emissions per gallon of air and vapor exhausted). Assuming throughput for that day was typical (e.g., 400,000 gal/30 = 13,333 gallons), this would correspond to emissions of approximately 0.68 lb per 1000 gallons dispensed.

---

[4] Burlin, R.M. and A.P. Fudurich, "Air Pollution from Filling Underground Gasoline Storage Tanks," Air Pollution Control District – County of Los Angeles, December 1962.
[5] Chass et al., p. 527; Burlin and Fudurich, p. 25.
[6] California Air Pollution Control Officers Association (CAPCOA), Air Toxics "Hot Spots" Program: Gasoline Service Station Industrywide Risk Assessment Guidelines, November 1997, Appendix A, Scenario 4 (no control equipment).
[7] US EPA, "Estimating Emission Effects of RFG Gasoline in MOBILE6," M6.FUL.005, April 2001, p. 4.
[8] CARB, "Uncontrolled Vapor Emission Factor at Gasoline Dispensing Facilities," draft, January 5, 2000.
[9] Tamura Environmental, Inc., "White Paper: NYSDEC Part 230 Proposed Changes for Gasoline.
[10] Slide 9 of the vendor presentation appears to show 3 days' worth of data for what is likely the same site (i.e., the same throughput is identified, and the dates include January 7, 2010).

First, it should be recognized that the emissions are overestimated by a wide margin. Based on the ullage identified by a vendor representative (24,000 gallons),[11] it appears that 220 gal/hr may have been approximately correct at the beginning of the evening (between 9 PM and 10 PM), when the UST pressure raised 4.5 inches of water column ("wc) per hour. However, the rate of evaporation was not constant, and tapered off considerably: just two hours later (between 11 PM and 12 AM), the rate of the UST pressure increase was just 1.5" wc/hr (corresponding to approximately 88 gal/hr of evaporation).[12] Even if it were to be conservatively assumed that the rate did not taper off further after the PV valve opened, the 88 gal/hr evaporation rate would correspond to approximately 528 gal of evaporation over 6 hours (3.4 lb of hydrocarbon emissions for the evening or approximately 0.26 lb/1000 gal).

Second, it seems very unlikely that these data are representative of what would occur during the ozone season. It has been well established in California that the wintertime peak UST pressures are often much higher than summertime peak UST pressures (possibly due to the fact that the RVP of wintertime gasoline RVP is much higher than the RVP during the ozone season) and data collected in at least two other locations (over multiple days) are substantially different.

API sponsored a study to evaluate the extent to which PV valves control emissions during warmer ambient temperatures; data collected are shown in Figure 1 and details of that study are available from a letter report which API has made available to agencies upon request.[13] The PV valve was very effective at preventing the UST breathing emissions; overnight peak pressures were not even close to the valve's cracking setpoint of +13.8 inches water column ("wc). Although the cracking setpoints currently required are different, they have (approximately) an 11" difference between the vacuum and pressure cracking pressures (-8" wc vacuum and +3" wc pressure are often cited, and were used in emissions calculations made by NYS DEC[14] that were cited by dKC) it can be seen in Figure 1 that the magnitude of the overnight pressure increases were less than 11" wc on at least 22 of the 23 days (data early in the morning on October 18 may have peaked 11" wc above the vacuum cracking point for a brief period of time). Therefore, emissions even with a +8"/-3" wc PV valve would still have been negligible and the PV valve would have been nearly 100% effective over this time period. This differs markedly from the NYS DEC and dKC calculations, which indicate that for GDFs in this same size range (150,000-300,000 gal/month), PV valves are only capable of capturing less than half of the emissions.

---

[11] This information was provided to me by e-mail on November 16, 2011.

[12] Our calculation of 88 gal/hr is based on the fact that a 1.5" wc pressure rise is approximately 0.37% of atmospheric pressure (approximately 407 "wc) and that a 0.37% increase in the ullage would be 88 gal. This neglects any influences due to changes in barometric pressure or UST temperature over this timeframe (which are most likely minor anyway).

[13] T. Tamura (Sonoma Technology, Inc.), letter report to Prentiss Searles (API) "Re: Results of pressure monitoring at gasoline dispensing facility," December 9, 2005.

[14] These setpoints are typical of equipment certified by the California Air Resources Board and in the middle of ranges identified by the recent Federal GD-GACT regulation

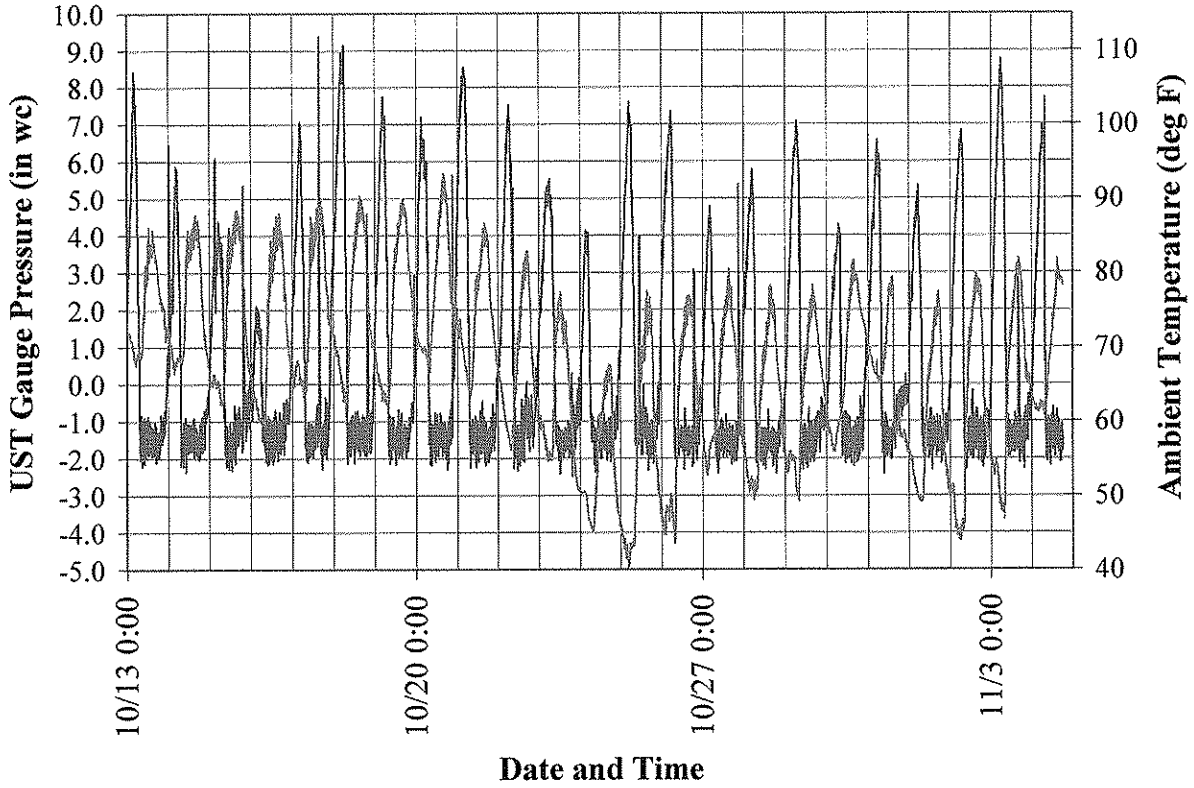

Figure 1. Data collected from a GDF in Texas (magenta = UST pressure, green = ambient temperature) with PV valve rated cracking pressures of +13.8/-0.9 inches of water column ("wc).

Separately, NYS DEC provided a limited quantity of UST pressure data monitored at a GDF in Rensselaer, New York with Stage I systems (including PV valves set for +8"/-3" wc) in the wintertime (see Figure 2). NYS DEC stated that this GDF was completely closed at night (worst case, compared to facilities that remain open and have at least some limited dispensing activity). However, even these data showed that out of four overnight periods, the pressures only reached the PV valve cracking point on one occasion (and this only occurred for approximately 1 hour or less). Again, the PV valve is capturing almost all of the UST breathing emissions, whereas dKC's calculations (Table 11) showed that PV valves applied to GDFs of this size (i.e., throughput of 1.2 million gallons/year) can only control 48% of the emissions.

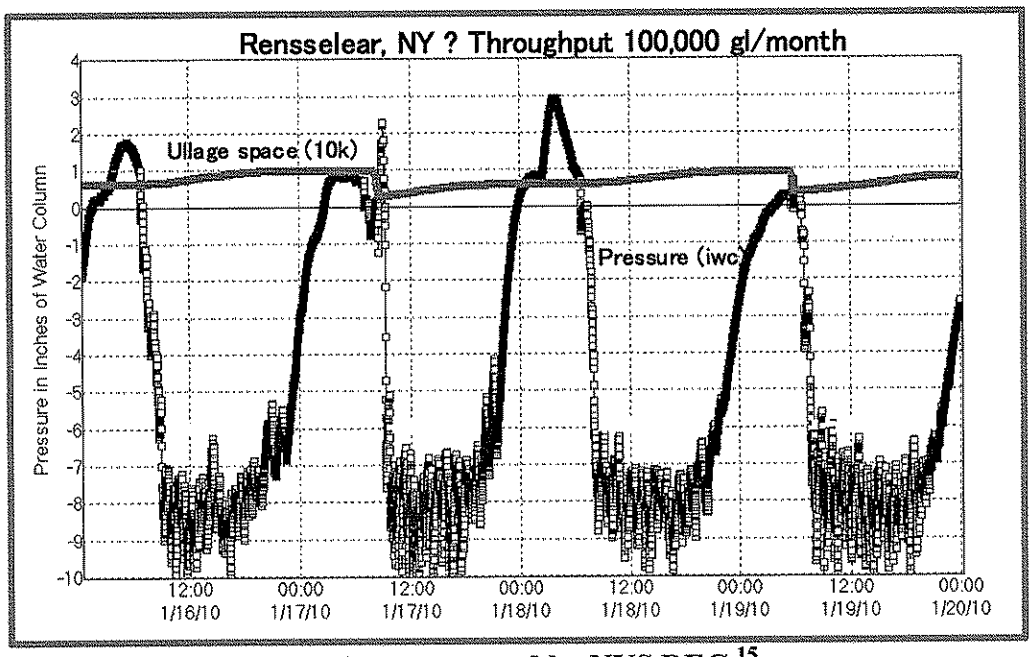

Figure 2. UST pressure data presented by NYS DEC.[15]

In short, consistent with the previously mentioned conclusions made by regulators back in the early 1960s, the data in Figure 1 and Figure 2 both show that PV valves can be very effective at controlling UST breathing emissions, in contrast to what is indicated by dKC's calculations.

We are aware of wintertime data obtained at another GDF with a very high throughput that was completely closed at night, which show the PV valve being cracked open for multiple hours per evening. Although we have not seen any report for that testing, it has been well established in California that vapor growth in the winter can often be much higher than (and therefore is not representative of) vapor growth in the summer,[16] possibly due to the much higher gasoline volatility (RVP) that is sold during the winter. Reductions in wintertime emissions are not creditable in ozone State Implementation Plans (SIPs) because such emissions do not occur during the ozone season.

Issue of Leaks

The existence of leakiness in past vapor recovery systems has certainly been documented, but several leak factors have been addressed in the recent Federal GD-GACT rules (e.g., requirements regarding the design of vapor recovery and product adaptors and caps for liquid fill connections) and staff at both CARB and NYS DEC have mentioned that at least some of the newer PV valves certified by CARB are significantly less leaky than in

---

[15] NYS DEC, "Part 230 – Gasoline Dispensing Sites and Transport Vehicles, Stakeholder Meeting," presentation given on December 7, 2010.

[16] For example, see CARB, Special Advisory Number 405-B, "Enhanced Vapor Recovery – Response to Winter Season ISD Pressure Alarms", available from http://www.arb.ca.gov/vapor/advisories/Advisory%20405-B%20OP%20Alarms%20Winter%202011%20-%2012-27-11%20Release.pdf

the past. NYS DEC staff have also stated that they have data from a contractor in California (for over 200 GDFs) showing that on average, systems can be leak-free for extended periods of time (i.e., to the point that the costs of hiring contractors to address those leaks was on the order of just $500/year). Given that the newer systems are capable of maintaining leak-tightness for a much longer duration than the old systems, it may be more efficient and cost-effective to simply require (a) installation of the more newly certified PV valves and (b) annual tightness checks, rather than requiring CM.

Reasons Why dKC's Emissions Calculations Overestimate Emissions

The NYS DEC emissions calculation methodology breaks GDFs into size categories and identify the emissions shown in Figure 3. (Although full details of dKC's calculations are not shown, they cite the NYS DEC methodology, which is based on the 1.0 lb/1000 gallon emission factor discussed previously).[17]

NYS DEC evaluated the degree of emissions control by applying the 1.0 lb/1000 gal uncontrolled emission factor to the daily throughput and assuming that the PV valve controlled emissions associated with an 11" wc increase. This is flawed not only because of the use of the 1.0 lb/1000 gal emission factor (for the reasons mentioned above) and the worst-case assumption that there is zero dispensing activity during the late evening/early morning hours (dispensing activity mitigates vapor growth), but also because it assumes that all of the emissions associated with that day's throughput (i.e., associated with re-equilibrating the vapor space) would be emitted overnight (without taking into account the mitigation associated with dispensing activity the next morning). Instead, what API found in the 2005 Texas study is that the rate at which vapor growth is occurring during periods of inactivity is less than what would be needed to re-equilibrate the system; i.e., the vapor growth associated with a given day's activity continues for several hours after the activity has stopped, and is partially mitigated by dispensing activity on the next day.

[17] D. Prunier (NYS DEC), "Emission Calculations.pptx", file e-mailed to Todd Tamura, Feb. 27, 2011 (values reproduced in the report referenced in footnote 9, Appendix A, Table A-1).

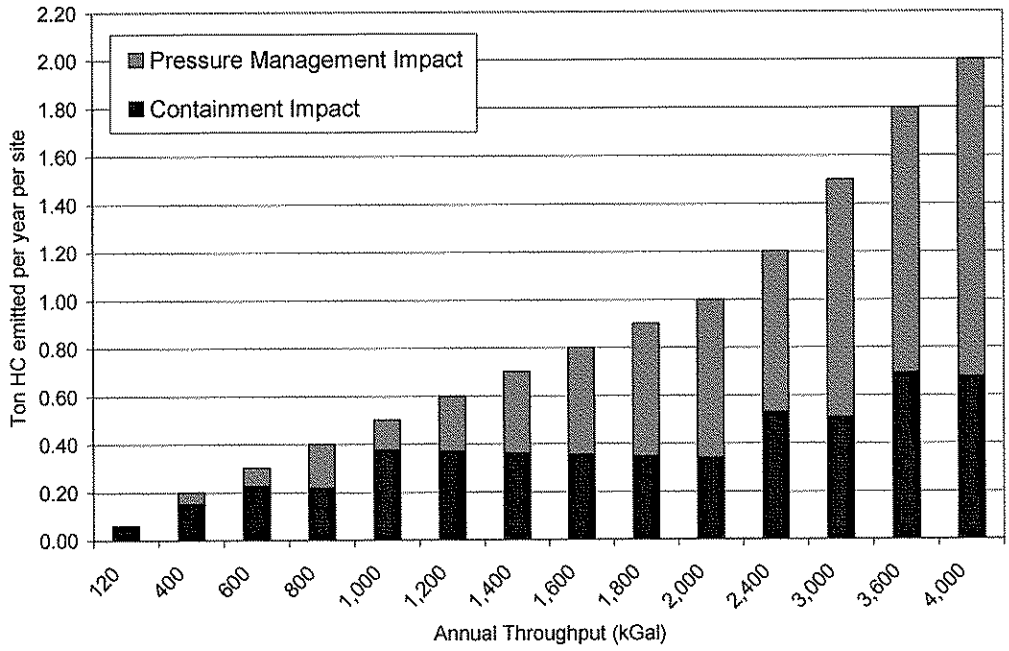

Figure 3. Plot of NYS DEC calculations as to the extent to which PV valves contain UST breathing emissions versus the extent that a pressure management system would be needed.

For these reasons, dKC's emissions calculations largely underestimate the effectiveness of the PV valves, which explains why they are not supported by Figures 1 and 2 (or other past estimates of PV valve efficiency, such as the 75% value identified by CAPCOA in 1999[6] or the more recent (preliminary) emission factor of 0.044 lb/1000 gal identified by CARB.[18] (In our White Paper, to address the issue of emissions mitigation from higher throughputs and better match the experimental data, we suggest that summertime uncontrolled breathing loss emissions be capped at 3.3 lb/day for all GDFs regardless of size, rather than assuming that breathing losses increase linearly with throughput; additional discussion of the rationale for this is provided in the White Paper.9)

Summary

In conclusion:

- The 1.0 lb/1000 gal emission factor used for uncontrolled emissions is not appropriate for current-day GDF operations and gasoline volatilities;

[18] CARB, "White Paper: Preliminary Analysis of U.S.EPA's Proposed Rule on Onboard Refueling Vapor Recovery Widespread Use Determination and California's Enhanced Vapor Recovery Requirements," attachment to letter from James M. Goldstene (CARB Executive Officer) to US EPA, Docket ID EPA-HQ-OAR-2010-1076, September 8, 2011.

- Emissions associated with UST pressure data presented for a single wintertime evening were significantly lower than represented, and are probably still not representative of emissions during the ozone season, given (a) evidence that peak UST pressures in the winter are often higher than in the summer and (b) data collected for multiple days at two other sites which showed near total control of emissions by PV valves;

- There are other means for assuring leak-tightness than continuous monitoring (CM); and

- The methodologies used to estimate the effectiveness of PV valves and pressure management systems are flawed (and correctible) partly because of the use of the 1.0 lb/1000 gal emission factor and partly because they do not fully account for the mitigation of emissions by dispensing activity.