Torrance Refining Company

Torrance Refining
Company LLC
3700 W. 190th Street
Torrance, CA 90504
www.pbfenergy.com

VIA E-MAIL: pfine@aqmd.gov

February 6, 2018

Philip Fine, Ph.D.
Deputy Executive Officer
Planning and Rules
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Re: **Comments on South Coast Air Quality Management District Staff's January 20, 2018 Refinery Committee Presentation**

Dear Dr. Fine,

Torrance Refining Company LLC ("TORC") provides the South Coast Air Quality Management District (the "District") with our comments in response to staff's January 20, 2018 presentation to the Refinery Committee related to "*Proposed Rule 1410, Hydrogen Fluoride Storage and Use at Petroleum Refineries*" ("PR 1410"), which only impacts two of the five Southern California refineries: TORC's Torrance Refinery and Valero Energy Corporation's ("Valero") Wilmington Refinery. This letter and Attachment A supplements our preliminary comments that were submitted to Dr. Parker on January 18th.

As I stated at the January 20th meeting, we are encouraged by the focus of enhancing safety systems in Tiers 1 and 2 of the rulemaking conceptual framework for PR 1410. However, although we were told by staff before the start of the meeting we would be given four to five minutes to respond to the presentation, I was only given about two minutes, prohibiting me from providing all our preliminary comments and concerns with staff's presentation, so I have attached them to this letter.

Based on our current analysis, as detailed in Attachment A, we have identified multiple areas of concern with staff's presentation and the currently proposed PR 1410 rulemaking conceptual framework. Specifically, Attachment A offers detailed comments and responses to specific slides related to the District's January 20th presentation that address staff's misunderstanding of the MHF technology; their continuing misuse, misinterpretation, and misunderstanding of the federal Environmental Protection Agency's Risk Management Program ("RMP") Worst Case Scenario ("WCS"); elements of the District's "tiered" conceptual rulemaking approach; timing of the tiered approach, and staff's proposal to potentially phase-out MHF. Our comments, along with TORC's prior written comments and Working Group meeting oral comments, must be considered and addressed before the District continues with its PR Rule 1410 conceptual rulemaking framework, in keeping with established and precedential District procedures.

* * *

We note at the end of the January 20th Refinery Committee meeting, the Chairs of both the Refinery Committee and Governing Board provided direction to the respective stakeholders - both refineries, District staff, and activist groups - to work out a mutually satisfactory agreement that would enable the District to resolve outstanding issues and proceed to a conclusion on the rulemaking. Specifically, Governing Board Chair Dr. Burke directed these stakeholders to "…come back, to this Committee with a more highly negotiated approach and then give the Chair of this Committee, who really knows what he is doing, a bite at the apple and then let's go forward." Similarly, at the conclusion of the meeting, Refinery Committee Chair Dr. Parker directed "[t]here's a lot of ways to basically look at this; I would urge everyone to sit down and look at it realistically and positively … and reason together."

We are committed to engaging in good faith with all parties involved in the rulemaking process to set the stage for a potential amicable resolution or in Chair Dr. Parker's words "we can find a solution that we might be able to all agree on." To this end, we have an initial meeting with District staff currently scheduled for February 7, 2018 and are looking to set up a meeting with the activist group, Torrance Refinery Action Alliance, in the very near future.

In addition, to put the discussions in the appropriate positive context, we recommend that TORC and District staff meet as soon as practicable to resolve outstanding unresolved and unaddressed technical issues. These are primarily associated with the District's "uncertainty" about the efficacy of MHF, despite the fact that both refineries operate under AQMD permits that were issued more than twenty years ago for TORC and ten years plus for Wilmington, without either refinery ever having had an offsite HF or MHF release in 100 years of combined operations. Proposing "approaches" that include unproven, alternative technologies or phasing out MHF Alkylation due to the potential for an incident that possibly may or may not occur in the future ignores the fact that both units have been operating with permits from the District and have demonstrated safety performance records.

Your records should reflect the fact the District contracted with Quest Laboratories to learn more about the behavioral characteristics of MHF from the research scientists who assisted Mobil and Phillips with testing and modeling MHF in the 1990s. The District's work with Quest led to the District issuing an operating permit for the Torrance MHF Alkylation Unit in 1997.

In closing, TORC seeks to work more closely with the District to thoroughly review and analyze all the technical and scientific data that District staff has on hand, as well as all the information TORC provided in 2017, most often at the District's request. As discussed in detail in Attachment A, TORC believes the District currently lacks a fundamental and sound scientific understanding of the MHF technology, the use of EPA's RMP WCS regulations, and the cost, timing, and commercial viability of Alternative Alkylation technologies.

By addressing these concerns collaboratively and openly with the District, TORC is confident we can reach an amicable resolution regarding PR 1410 based on sound science and technology, and current state of Alkylation technologies.

Please note that in submitting this letter, TORC reserves the right to supplement its responses and comments as it deems necessary, especially if additional or different information is made available to the public regarding the PR 1410 rulemaking process.

Sincerely,

Steve Steach
Refinery Manager

cc: **District Staff - via e-mail and overnight delivery**

Wayne Nastri	Executive Officer
Susan Nakamura	Assistant Deputy Executive Officer
Michael Krause	Planning and Rules Manager

cc: **District Governing Board Members - via overnight delivery**

Dr. William A. Burke	Governing Board Chair
Dr. Clark E. Parker, Sr.	Governing Board Vice-Chair and Refinery Committee Chair
Hon. Larry McCallon	Governing Board Member and Refinery Committee Vice-Chair
Dr. Joseph K. Lyou	Governing Board and Refinery Committee member
Hon. Judy Mitchell	Governing Board and Refinery Committee member
Hon. Dwight Robinson	Governing Board Member
Hon. Janice Rutherford	Governing Board Member
Hon. Marion Ashley	Governing Board Member
Hon. Ben Benoit	Governing Board Member
Hon. Joe Buscaino	Governing Board Member
Hon. Michael A. Cacciotti	Governing Board Member
Hon. Shawn Nelson	Governing Board Member
Hon. Hilda L. Solis	Governing Board Member

Attachment A
TORC's Comments and Responses
February 6, 2018

TORC offers the following detailed analysis and comments to specific slides related to the District's January 20th PR 1410 presentation to the Refinery Committee. We address staff's misunderstandings and statements concerning the "uncertainties" of MHF technology; the misuse, misinterpretation, and misunderstanding of EPA's RMP WCS; elements of the District's proposed "tiered" conceptual rulemaking "approach;' timing of the tiered approach; and the premature call for phasing-out MHF.

These comments and concerns, along with TORC's oral and written responses provided to the District on the dates and forums shown in the Table below, must be considered and addressed with TORC before the District continues with its current PR Rule 1410 conceptual rulemaking framework.

Forum	Dates
Meetings	May 4, June 7, June 28, July 26, August 17, and December 19, 2017
Refinery Tour	May 16, 2017
Written Comments	May 4, August 1, August 11, August 23, September 12, September 20, December 12, 2017, and January 18, 2018
Working Group Meetings	April 19, May 18, June 15, August 2, August 23, 2017, and September 20, 2017
Refinery Committee Meeting	January 20, 2018

Slide 2 - PUBLIC PROCESS

This slide indicates that District staff have provided Refinery Committee members with copies of the Torrance Refinery Action Alliance's ("TRAA") presentation "*TRAA's Modified HF (MHF)/HF Alkylation Dangers*" for members to review. However, TORC's letter to District staff, dated December 12, 2017, wherein we provide staff with a comprehensive analysis of TRAA's presentation, correcting many of the misleading, unfounded, and incorrect statements related to MHF in the presentation, is conspicuously missing from the slide and the Refining Committee's consideration of all relevant facts and information.

Additionally, concerning is the fact this slide fails to mention TORC's "*Setting the Record Straight, The Truth About Torrance Refinery MHF,*" which we included with our January 18th preliminary comment letter to Dr. Parker and other members of the Refinery Committee, and copied District staff. In "*Setting the Record Straight*" we expose many of the "myths" in TRAA's presentations and provide the "facts" about MHF, which is still acknowledged by the refining industry to be the newest, commercially viable alkylation technology available globally.

Our presentation outlines the facts about MHF based on testing, modeling, and research by qualified scientists and researchers, correcting misinformation and data manipulation in these TRAA presentations: "The Case Against MHF, -ARF-SRI-and Barriers-" (January 4, 2017) and TRAA's feedback to Torrance Fire Department (February 28, 2017). Our presentation provides factual information for use in the District's PR 1410 rulemaking process. District staff have all the supporting documentation referenced in the report, which also addresses community concerns that has been heightened by mis- and disinformation generated by the TRAA.

Finally, "Setting the Record Straight" provides insights into many of the issues raised by the public at meetings and hearings related to the use of MHF. Importantly, we also highlight work done by the District in the past that supports the efficacy of MHF in this presentation, primarily related to the permit process associated with the MHF alkylation units at the Torrance and Wilmington refineries.

Notably, the District in the mid-1990s contracted with Quest Laboratories[1] to assist it with the California Environmental Quality Act ("CEQA") evaluation for permitting the use of MHF in the Torrance Refinery's Alkylation Unit. The District's CEQA analysis and its permitting files reveal that Quest and the District reviewed the MHF testing and modeling data. Based on this review, the District determined that MHF was safe for use and subsequently issued a permit to Torrance in 1997 for its use.

To have a fair and unbiased PR 1410 rulemaking process, it is imperative that District staff provide the ultimate decision-makers -- the Refinery Committee and Governing Board -- with all the information, rather than one-side of the debate, particularly involving mis- and disinformation generated by activist groups that have misrepresented the scientific basis for and safe use of MHF, whose members have no experience with refining operations or alkylation chemistry. In the future, when staff gives a presentation to the Refinery Committee, Governing Board, and other decision-makers such as elected or appointed officials, and/or the public, we request that staff present both sides of the issue fairly and openly.

Slide 3 - GENESIS OF PR1410 RULEMAKING and Slide 5 - "NEAR-MISS" ACCIDENT

In Slides 3 and 5, District staff refer to the February 18, 2015 Electrostatic Precipitator ("ESP") incident that occurred at the Torrance Refinery under the former owner and operator, ExxonMobil Oil Corporation ("ExxonMobil"). Staff refers to this incident as a "Near-miss," apparently taking this term from the Chemical Safety Board's ("CSB") investigation into the February 18, 2015 incident.

However, this characterization is misleading. Recently, the Federal California Central District Court denied the portion of a motion brought on behalf of the CSB by the Department of Justice to enforce administrative subpoenas issued to ExxonMobil for the production of MHF Alkylation Unit related documents. These documents had been sought by the CSB from ExxonMobil in the course of the Agency's investigation into the February 18, 2015 incident.

In denying the production of these documents, the Court held that "the requests [were] **UNFORCEABLE** because the requested information is not sufficiently related to the facts, conditions, and circumstances and the cause or probable cause of the February 2015 accidental release to reasonably be considered relevant". *See United States of America v. Exxon Mobil Oil Corp.*, Case No. MC 17-00066 CBM (November 3, 2017), p. 7, lns. 14-17; (emphasis in the original).

[1] Quest's research scientists worked with Mobil and Phillips on the original testing, modeling, and experiments that led to the development of MHF.

Moreover, there is no evidence as to whether a MHF release would have occurred if debris from the ESP would have come into contact with an acid settler on February 18, 2015 – stating that a "release could have occurred" is speculative at best and generates unwarranted fear.

Based on public statements by the prior owner, there was no risk of the piece of ESP ductwork causing an MHF Alkylation Unit release on February 18, 2015. Specifically, they said that the MHF Alkylation Unit's safety and mitigation systems were fully functional during the incident and one of them, the rapid Acid Evacuation System ("AES"), was successfully deployed within ten seconds of the ESP incident occurring, and worked as designed, as described to the District staff by the MHF Alkylation Unit's Console Supervisor during its Refinery visit on May 16, 2017.

Importantly, within two minutes of the AES system being deployed on February 18, 2015, 80% of the acid in the Alkylation Unit was transferred to the AES evacuation tank, which is behind a blast wall. In another five minutes the remaining acid was moved to this same location. Other safety systems, including the water deluge and point and shoot water monitors, were on stand-by and fully functional, but were unneeded.

Based on what the prior owner stated, it is highly unlikely the ESP debris from the explosion had the force, or could have had the force, necessary to penetrate the 2-inch thick carbon steel Alkylation Unit settlers. The function of a settler is to "settle out acid" in the bottom third of each of the settlers. Again by design, the upper two-thirds of a settler contains light hydrocarbons.

Accordingly, if the debris had struck an acid settler and somehow had the force to penetrate the 2" thick carbon steel shell, the former owner has indicated this would likely occur in the upper section of the settler, which would cause the released light hydrocarbons to auto-refrigerate on exposure to ambient air. If that were to happen, the Console Supervisor would evacuate the acid from the bottom of the settler(s) at the same time and the Alkylation Unit's multiple layers of protection would deploy.

In addition, we note here and expand on this theme later: District staff's presentation fails to take into consideration the Torrance Refinery MHF Alkylation Unit's active mitigation systems when claiming that an 89% Airborne Reduction Factor ("ARF") was the highest ARF level the unit could achieve, despite having observed and commented on the effectiveness of the water cannons / deluge system and remotely-operated cameras on their May 2017 Torrance Refinery visit. The District must consider these active mitigation systems when measuring the unit's overall ARF performance, rather than ignoring them, which as discussed below results in an ARF greater than 89%.

Importantly, to prevent a similar ESP incident, the Torrance Refinery implemented the following corrective actions to the Fluidized Catalytic Cracking Unit ("FCC") and ESP:

- Installed new instrumentation, new equipment, and additional alarms;
- Defined and began using minimum levels for operation;
- Developed a "safe park" procedure and updated shutdown/startup steps for the FCC; and
- Trained Refinery personnel to use the new instrumentation, equipment, additional alarms, and procedures.

In addition, TORC recently initiated a Refinery-wide training program to enhance focus, professionalism, competency and capabilities across the Refinery. This investment in our workforce touches every site employee, who are giving the program positive, enthusiastic feedback.

In Slide 3, District staff state that "Hazards and human health risk due to exposure to HF are greater than those of sulfuric acid." This contradicts and ignores the fact that the Refinery has been using modified HF since 1997, after an extensive technical review conducted by a Court-appointed Safety Advisor that led an experienced and well respected Los Angeles County Superior Court Judge to approve the use of MHF at the Torrance Refinery. Specially, under the City of Torrance Consent Decree, the Judge approved the use of the MHF technology at the Torrance Refinery, finding:

> *"...that the modified HF catalyst (including mitigation) presents no greater risk than a sulfuric acid alkylation plant producing a comparable amount of alkylate."*

(Emphasis added.)

The Judge's decision was reached after a thorough, multi-year review of voluminous MHF testing results, technical analyses, and modeling data by the independent, court-appointed Safety Advisor and the Judge. The Torrance Refinery has been safely using MHF since 1997 with no offsite release of the chemical. Additionally, the Torrance Refinery used HF in the Alkylation Unit without any HF offsite release from 1966 when the unit was commissioned until 1997, when the unit was modified to use MHF.

Slide 6 - ASSESSMENT OF MHF TECHNOLOGY

In Slide 6, staff state the following:

- Assessing the safety of MHF technology is very complex and uncertainty still exists
- Summary results of MHF assessment:
    - Some, but uncertain, HF mitigation benefits offered by MHF (< 35%)
    - Ability to prevent formation of vapor/aerosol cloud is uncertain
    - Conditions of testing are different from current operating conditions
    - Large hole sizes were not considered

We appreciate that MHF technology and behavior represent an extremely complex scientific subject that is difficult to grasp. Consequently, based on staff's acknowledging their uncertainty, we remain concerned they have yet to fully understand or comprehend how MHF works, despite past collaboration between the District and Quest Laboratories, which worked on the initial development of MHF with Mobil and Phillips.

Based on Slide 6, District staff admittedly have a lack of understanding and fail to grasp the following important concepts related to MHF:

- The polarity of the molecules causes hydrogen bonding, which forms larger droplets that fall to the ground and easily contained by water; and

- The amount of water present in the MHF solution is highly polar and 3 times more effective at bonding HF molecules than the additive.

In this slide, staff states that "Some, but uncertain, HF mitigation benefits offered by MHF (<35%)." This appears to be mistakenly stating that MHF's ability to form droplets that rainout and not aerosolize is only 35%. However, this statement and the left-hand side chart presented on Slide 7 is based on 1992 data from the first PARC MHF testing, which was deemed inconclusive by the scientists working on the MHF formulation at the time.

Specifically, the 1992 PARC testing report[2] specifically indicates that future work was needed and recommended additional testing. Subsequently, the scientists working on MHF performed extensive testing that proved the efficacy of MHF. In 1997, the District collaborated with Quest to review MHF testing results. Based on this review, the District issued a permit to the Torrance Refinery to modify the Alkylation Unit to use MHF.

Also the right-hand side chart presented on Slide 7 is not directly comparable to the left-hand side chart presented on the same slide. In these two charts, staff is comparing rainout to ARF which cannot be directly compared as they are different.

The totality of MHF testing, analysis, modeling data, and other information TORC has provided to the District to date, as well as information already existing in the District's own files, shows that MHF:

- Prevents flash atomization
- Prevents formation of an airborne aerosol
- Promotes rainout of liquid MHF at current Torrance Refinery MHF Alkylation Unit operating conditions

These conclusions support the thorough decision-making process both the Court and the District engaged in that led to adopting and permitting MHF Alkylation at the Torrance Refinery in the 1990s.

As has been explained to the District in multiple forums and correspondences, qualified, experienced scientists performed extensive MHF testing on a parametric basis to evaluate MHF efficacy on each operating condition for the Torrance Refinery's Alkylation Unit. Each individual parameter (i.e., temperature, pressure, and concentrations), was indisputably tested at ranges that include current MHF Alkylation Unit operating conditions.

Results of this testing were used to create and validate a "first principles thermodynamic model" that accurately predicts liquid rainout of HF across all the Refinery's MHF Alkylation Unit's operating conditions. TORC has provided District staff with MHF parametric testing data, analyses, and modeling data from the earlier and subsequent testing (1992, 1993, and 1995) that prove MHF is safe

[2] *See* Document 12 "93M-0160: PARC HF Aerosol Reduction Studies" (February 1993) disclosed to the District on May 4, 2017 under Trade Secrets/Confidential Business Information.

to use at the Refinery's current operating conditions, which should also already be reflected in the District's files for both the Torrance and Wilmington refineries.

More specifically, as presented by TORC to the District on several occasions, the Additive range of concentrations was tested at equal to or less than 20 percent by wt% in multiple trials from 1991-1995. These tests confirm the Additive increases ARF even at low concentrations.[3]

As the District has been informed, daily unit ARF is calculated as a function of: (1) HF concentration, (2) Additive concentration, (3) water concentration, and (4) reactor temperature. Rainout Model results for the Torrance MHF Alkylation Unit are consistent with ARF test results. Importantly, the supplemental MHF data and information TORC provided to the District on August 11th and September 12th, and discussed with District staff on August 17th, validates this consistency and efficacy of the Rainout Model, and in turn, the efficacy of MHF at current MHF Alkylation Unit current operating conditions.

To further help District staff understand this information, at the District's request on August 11th, TORC confidentially provided an Excel spreadsheet containing all testing data, complete with associated operating parameters, measured rainout, and predicted rainout. As TORC explained in its August 11th and September 12th letters, and discussed with District staff on August 17th, this data summarizes all of the MHF testing documents from the 1990s to which TORC had access at the time, showing the wide range of operating parameters parametrically tested.

Each relevant case was then run on the Rainout Model - measured versus predicted values. The following graph summarizes the experimental data results and correlates these results to the Rainout Model used as the foundation for the Safety Advisor's and Court's evaluation and approval of the use of MHF. Correlating the experimental data to the Rainout Model's results definitively shows that:

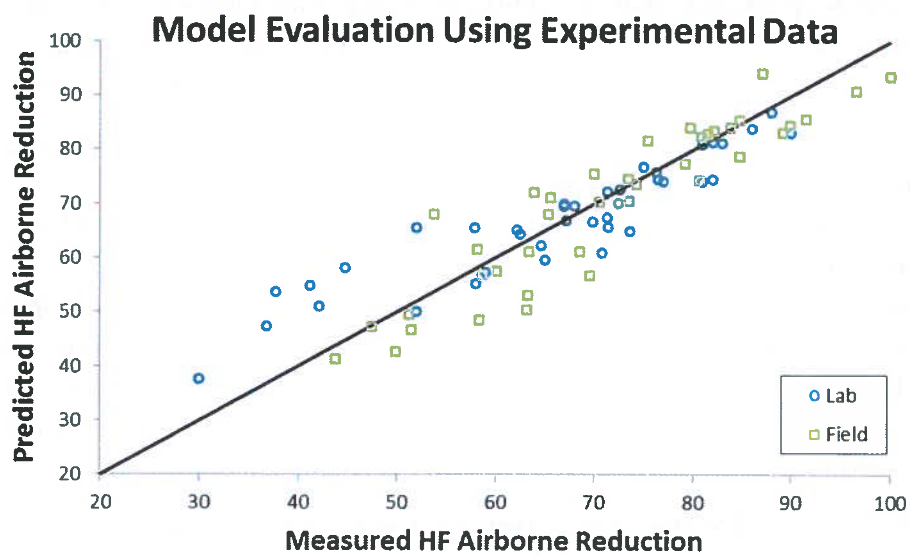
- Rainout Model calculations are valid
- Stated safety improvements offered by MHF are valid

---

[3] Specifically, the extensive testing that was completed by Mobil as presented in Document 8, DAN 95M-0874 – "MHF Airborne HF Reduction Estimates", disclosed by TORC to the District on May 4, 2017 under Trade Secrets/Confidential Business Information, clearly supports this.

> "Mobil has performed small … and large scale release tests … to understand the effect of storage composition, temperature and pressure and release orifice size on the fraction of released HF that becomes airborne. A key finding of the experiments was that the addition of the additive causes a significant fraction of the released HF to fall on the ground as liquid rainout. The set of experiments … showed that the presence of the additive eliminates flash atomization of the released jets. More specifically, no flash atomization was observed for compositions containing as much as 85 wt% HF up to 140° F.
>
> Mobil has also developed an aerosol model … to interpret the experimental data and to predict the airborne fraction of HF in releases with conditions outside the range of variables experimentally tested. The model predicts small and large scale release data in the subcooled and superheated regimes of interest."

(Internal references omitted.)



Experimental results shown as measured Rainout versus model predicted rainout, validating the Rainout Model's strong predictive abilities at a wide range of HF and Additive percentages

Also at the District's request, TORC graphed each tested parameter separately to show any testing bias. These graphs, provided in previous technical submissions to District staff show the difference between measured and predicted Rainout separately for each operating parameter: pressures, temperatures, HF wt% concentrations, Additive wt% concentrations, including current MHF Alkylation Unit conditions. The accuracy of the Rainout Model at the full range for each condition, as well as its suitability in validating MHF safety margins, is clearly demonstrated for all key operating parameters.

Additionally, at the District's request, TORC provided a comparison of the rainout at MHF Alkylation Unit operating conditions at 55 psig versus 225 psig as predicted by the Rainout Model.

As has been repeatedly explained to the District, the Rainout Model is a liquid spray model developed by Mobil engineers and scientists to predict the airborne fraction of MHF, based on extensive testing and technical analyses. The model calculates the evaporation of HF in a two-phase HF/additive jet discharging from an orifice. Given the release conditions (pressure, temperature, and composition) and release geometry (hole size, release orientation, and elevation of the orifice from the ground), the model calculates HF Rainout, or capture, which is defined as the fraction of HF discharged from an orifice that falls to the ground as liquid.

The Rainout Model output at 55 psig versus 225 psig supports the premise that pressure has a relatively small impact on ARF as the release velocity is proportional to the square root of pressure. Even at higher pressures tested and small orifice sizes, the projected ARF remains above 50% for the Refinery's MHF Alkylation Unit operating conditions.

In summary, the supplemental analysis TORC provided to the District on August 11th and September 12th, then discussed with District staff on August 17th, and provided in this Attachment A, unequivocally confirms, based on substantial sound and scientific evidence, that[4]:

- Rainout Model calculations for current Torrance Refinery MHF Alkylation Unit operating conditions are within the range of model validity for Rainout
- Experimental data points exist at the Torrance Refinery MHF Alkylation Unit's current operating temperature and composition
  - Increasing operating pressure increases hydrodynamic forces with ***no observable increase to the propensity to flash atomize***, thus the validity of the model is retained and reinforced
  - The Rainout Model has been proven to accurately predict release characteristics for all operating conditions within the hydrodynamic regime, hence the model is able to accurately predict rainout across the full range of unit operating pressures.

Finally, TORC explained to the District that the Rainout Model was derived from extensive release testing. In other words, after the initial rounds of testing *and* modeling, researchers subsequently validated the model through additional experiments that proved the model's predictive ability across all MHF Alkylation Unit operating ranges. Validation tests were performed at representative unit operating conditions: i.e., lower Additive concentrations and higher temperatures.

Despite this wealth of verifying information, District staff at the August 17th meeting presented for the first time its analysis of supplemental MHF testing and modeling data provided by TORC on August 11th. Staff's analysis was inaccurate, failed to account for the testing data being hydrocarbon-free, and most importantly, ignores the fact that higher unit operating pressure relative to the tested data points has no observable increase in the propensity to flash atomize. That presentation stands as further evidence that District staff fail to understand MHF behavior and chemistry, and therefore the efficacy of MHF, which has been proven at Torrance Refinery's current MHF Alkylation Unit operating conditions.

Another important aspect of the MHF technology staff fails to understand or has overlooked is water's positive impact on MHF rainout and its effectiveness in reducing MHF flash atomization at the Torrance Refinery.

Water is a highly polar molecule, and its polarity causes water to bond tightly with a similarly polar molecule, HF. This known strong polarity, when combined with the rigorous testing data from the 1990's and a validated thermodynamic model predicting HF Rainout, supports the strong, attractive benefits of small amounts of water in MHF solutions.

A common metric used to compare molecular polarity is the polarity index. The higher the index number the more polar the material. The indices for HF, water, and additive are:

- HF: 0.2892

[4] Under separate cover, TORC will be submitting additional statistical analysis to show the accuracy of the experimental data to the modeling data.

- Water: 0.2586
- Additive: 0.1283

Therefore, HF will preferentially bond with water before bonding with additive. This allows one to positively conclude that water will still have the same flash atomization-reducing impacts, even in the absence of, or at low concentrations of, additive in a MHF mixture. Stated another way, the water-HF molecule pair forms a stronger bond than the water-additive pair or the HF-additive pair.

The dielectric constant is also used to measure the polarity of solvents, with higher values corresponding to more polarity:

- HF: 83.6
- Water: 80.1
- Additive: 43.3

This separate metric reinforces the conclusions previously stated. Water and HF are roughly equally polar, and Additive is about half as polar. Therefore, we can expect HF to preferentially associate with water over additive, forming much stronger bonds at any concentration.

Testing data performed in the 1990s measured rainout for mixtures of 50 wt% HF and 50 wt% water as well as 50 wt% HF and 50 wt% additive. The HF/Water mixtures consistently showed higher rainout than the HF/additive mixtures, supporting the conclusion that water is more effective at creating rainout. This fact was upheld by the additional testing performed at various HF/Additive/Water concentrations (going as low as 10% additive and 5% water) that showed 1 kg of water to be roughly as effective as 3.9 kg additive. Again, due to the higher polar attraction between HF and water compared with HF and additive, this experimental data can be applied to any level of water present in a HF mixture, regardless of additive concentration. Water will preferentially bond with HF before additive.

Another way to look at this and the data is on a molar basis. Using molecular weight conversions, there are 6.7 times more molecules in 1 kg of water than molecules in 1 kg of additive. In addition, the Additive has two primary bonding sites on a single molecule, while water has one primary bonding site. With 6.7 times as many molecules, but half as many bonding sites, a HF/Water mixture yields roughly 3.3 more primary bonds than a HF/additive solution. Although there are other factors that determine a solvent's effectiveness against flash atomization, such as the polarity and physical properties of the solvent, this simple analysis indicates that we can expect water to be roughly three to four times as effective as additive, which is on par with the experimental data.

As we previously discussed, the Rainout Model developed by Mobil is an accurate predictor of MHF mixture rainout for the full range of unit operating conditions at varying acid, additive and water concentrations. This "liquid spray model" is based on extensive testing and technical analysis, with modeling that was validated after development with additional testing data. Using first principles, such as conservation of mass, momentum, and energy, the model calculates the evaporation and liquid rainout of HF in a two-phase HF/additive jet discharging from an orifice.

The model is able to reproduce the vapor pressure and rainout characteristics over the entire range of testing, using only NRTL binary interaction parameters. Because of this statistically significant predictive ability, one could reasonably conclude that describing a ternary interaction between water-HF-additive is unnecessary. Binary interactions, such as those listed above for HF/Water and HF/Additive, are effective and accurate for any concentration range.

When the above theoretical, experimental and modeling data are joined with real life experiences in the Torrance MHF Alkylation Unit, the effectiveness of MHF technology is readily apparent. The combined concentration of additive and water in our unit acid stream effectively stops flash atomization, keeping any potential release in a liquid phase, eliminating the potential for a ground-hugging cloud, and allowing for containment within the unit boundaries. This significantly reduces the risk of harm to both our employees and the community. Use of higher water concentrations is infeasible due to known corrosion acceleration and increased potential for unstable unit operations.

Additionally, the Court-appointed Safety Advisors September 2001 report it further supports MHF at the MHF Alkylation Unit's current operating conditions and the effectiveness of water.[5] In this report, the Safety Advisor reviewed the MHF testing and modeling prior to shutting down the MHF Alkylation Unit for the fall 2000 turnaround. In order to undertake this turnaround, the Torrance Refinery proposed the removal of nearly all Additive from unit to minimize the potential for corrosion, which meant that for a short period of time the unit must be operated with lower concentrations or no Additive.

The Safety Advisor concluded that under this scenario the unit's risk would remain within the bounds required by the Consent Decree. Specifically, that the Alkylation Unit could retain the required Unbarriered ARF of 50% by compensating for the decrease in Additive concentration by increasing water and/or ASO.

Accordingly, as explained above, the totality of all MHF testing, analysis, modeling data, and other information TORC has provided to the District to date shows that MHF (1) prevents flash atomization; (2) prevents the formation of an airborne aerosol; and (3) promotes rainout of liquid MHF at current Torrance Refinery MHF Alkylation Unit operating conditions. All these conclusions support the decision-making process applied in the 1990's that supports the acceptability and approval of MHF alkylation by both the Court and the District.

This is further demonstrated by the fact that in 1997 the Refinery began using MHF to comply with the City of Torrance Consent Decree. Since then, the MHF Alkylation Unit has been operating without any MHF offsite release of the chemical. Importantly, Torrance Refinery also used HF in the Alkylation Unit without any HF offsite release from 1966 until 1997, a period that includes both the 6.5+ Sylmar and Northridge earthquakes. In total, 51 years have passed since the unit went online, a performance record that staff fails to recognize in its apparent rush to judgement against MHF, a technology acknowledged by the refining industry to be the latest, most advanced, commercially proven alkylation catalyst available in the world and covered by American Petroleum Industry's

[5] Under separate cover, TORC will be submitting this report.

Recommended Practice 751, "*Safe Operation of Hydrofluoric Acid Alkylation Units*", ("API RP-751").

Moreover, staff's position contradicts the recommendation of an independent Court-appointed Safety Advisor and the decision of a well-respected Los Angeles Superior Court Judge who in 1995 under the City of Torrance Consent Decree approved and required the use of the MHF technology at the Torrance Refinery, finding MHF to be "...as safe as and possibly safer than sulfuric acid for a similarly-sized alkylation unit." Their decision was reached after a thorough, multi-year review of voluminous MHF testing results, technical analyses, and modeling data by the Safety Advisor and judge that has also been disclosed to the District with the consent of the technology licensor, and already in the District's files as a result of their collaboration with Quest Laboratories during the permitting process for both the Torrance and Wilmington refineries' MHF Alkylation Units.

Additionally, staff's current position contradicts the District's precedential position on this technology that extends back to permitting the Torrance Refinery MHF Alkylation Unit. More publicly, in 2003, the District issued a press release announcing an "enforceable agreement" with Valero to phase-out the Wilmington Refinery's use of HF with MHF by 2006.

In the press release, the District publicizes and supports the use of MHF technology[6]:

> "Once this refinery stops using concentrated hydrogen fluoride, we will have virtually eliminated the potential for a catastrophic accidental release of this compound in our region," said Barry Wallerstein, executive officer of the South Coast Air Quality Management District."
>
> "The agreement fulfils one of the 23 Environmental Justice goals adopted by AQMD's Governing Board last fall."
>
> "Switching to modified HF will minimize the possibility of a catastrophic accidental release not only at the refinery, but along Southland transportation corridors, as the additive is added to the chemical before shipping."

By endorsing and permitting Valero Wilmington's Reduced Volatility Alkylation Process (ReVAP) project to modify the Wilmington Refinery's Alkylation Unit to use MHF under an "enforceable agreement" between Valero and the District, the District further reinforced the efficacy of MHF, while also stating in its California Environmental Quality Act ("CEQA") Environmental Impact Report ("EIR") for the project the following about the efficacy of MHF:

> "ReVAP incorporates a suppressant in the HF that reduces volatility in the event of an accidental release with a concurrent reduction in safety risks (i.e., distance that the HF could travel and number of persons exposed) in the surrounding area. Use of this modified process meets the SCAQMD's objectives with respect to elimination of concentrated HF."

[6] *See* Highly Toxic Chemical to be Phased Out at Valero Refinery: SCAQMD, Feb. 7, 2003.

See District's "Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Statement Of Findings, Statement Of Overriding Considerations, And Mitigation Monitoring Plan", p. 3, (SCH #20030536, certified December 2004). Note that both the Wilmington and Torrance refineries use the same "suppressant"/Additive.

> "An accidental release of HF could migrate off the Refinery property and expose individuals in the surrounding community. The proposed (MHF) project will substantially reduce the potential hazard impacts associated with an accidental release of HF."

Id., p. 9.

> "The proprietary additive is a non-volatile, non-odorous, low toxicity material that is completely miscible in the acid phase. It has very limited affinity for other hydrocarbons, including the alkylate product and acid soluble oil (ASO) by-product, similar to the organic polymer produced in the current process. The unique physical properties of the additive substantially reduce the volatility of the acid at ambient conditions. This reduction in volatility proportionately reduces the amount of HF that can vaporize and subsequently disperse off-site from a given liquid release quantity. *The modified HF catalyst reduces acid vapor pressure sufficiently to suppress the usual flash atomization process of hydrofluoric acid, causing most of the acid to fall to the ground as an easily controlled liquid and reduces the potential for off-site consequences of an accidental HF release.*"

See District's "Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Final EIR", Chapter 2, p. 2-7, (SCH #20030536, certified December 16, 2004) (emphasis added).

This District's stated position for the Valero MHF project is consistent with the District's previous supportive conclusion regarding the efficacy of MHF in its CEQA Addendum to the Torrance Refinery's MHF Alkylation Unit project, in which the District specifically states:

> "The experimental testing indicated that the addition of the Mobil additive to HF was an effective method for reducing or elimination the amount of aerosol formed during a release. The additive is a water-soluble, thermally stable compound that is solid at ambient conditions. In addition, the health data indicate that the additive has very low toxicity and limited health impacts as compared to HF which has more severe health impacts."

See District's "Addendum, Mitigated Negative Declaration, Mobil Modified Hydrogen Fluoride Conversion Project", p. 2, (July 9, 1997).

> "*In summary, after review of the available test data and performing release/dispersion modeling, under similar release conditions, the addition of the Mobil additive to an HF alkylation unit was determined to result in a reduction of HF hazard zones for equivalent releases.* The amount of reduction will be a function of the additive concentration, and will vary with many parameters which govern the release/dispersion process. *In all cases, addition of the additive to the alkylation unit will reduce the distance traveled by HF in the event of a release. At any concentration of additive, the vapor pressure of the HF will be reduced, thus reducing the potential for public exposure to HF.* Therefore, modification to

> the HF alkylation unit and the use of MHF at the Mobil Refinery are expected to have a beneficial impact on the environment by reducing the potential impacts associated with an accidental release from the alkylation unit."

Id., p. 4, (emphasis added).

Neither the MHF Alkylation technologies employed by TORC at its Torrance Refinery, nor, to TORC's knowledge, those employed by Valero at its Wilmington Refinery have changed since the District originally permitted both refineries' MHF Alkylation units. MHF technology is the same today as when originally permitted at Torrance more than 20 years ago. However, the safety systems, training, and knowledge of the MHF Alkylation process and equipment have improved related to MHF alkylation, which has been the case at the Torrance Refinery. Consequently, the Torrance Refinery MHF Alkylation Unit is even safer today than when it was permitted 20 years ago.

Importantly and as previously noted, the District issued permits to the Torrance Refinery in 1997 and Valero Wilmington Refinery in 2004, after performing statutorily required CEQA analyses for the MHF technology. Fast forward to 2017 - how does current District staff justify their current concerns with the MHF technology when the District previously endorsed, permitted, and supported MHF technology? We also note for the record we are unaware of any MHF release that has gone offsite from the four operating alkylation units in the U.S. that safely and reliably utilize this technology.

In our view, the District appears to be ignoring its own research, reports, findings, conclusions, and permits to arrive at a premature and/or predetermined conclusion of phasing-out MHF. To achieve this, staff are defying sound science, technology, and logic by changing the District's prior position on MHF technology without any supporting technical criteria or credible evidence, including testing, modeling, or operational experience, other than appearing to rely on in part guidance and presentations from the TRAA Science Advisory Panel that have been shown by TORC in "Setting the Record Straight"[7] to include mis- and disinformation regarding MHF technology.

Despite this perception, we urge the District to avoid rushing to judgment on the PR 1410 rulemaking and take the additional time necessary to continue its evaluation of the MHF technology, including the information in the District's files and that provided by TORC, and then address TORC's and other stakeholders' comments.

Also in Slide 6, staff states "Ignoring all the uncertainties, best case scenario with all existing mitigation measures added at TORC, HF reduction is 89% leaving 11% released". "In case of breach in one settler tank at TORC, potential release of 5,200 lb HF assuming all passive mitigation functioning properly".

District staff is taking Torrance Refinery's currently submitted EPA RMP WCS analysis out of context, specifically as an additional rationale for including Tier III or a phase-out of MHF in the PR 1410 conceptual rulemaking framework. The District appears to be mistakenly equating "hazards" with "risks." By doing so, the District is removing the event probability component from their

[7] *See* staff's Slide 7 charts, which appear similar to charts included in TRAA's "The Case Against MHF, -ARF-SRI-and Barriers-" (January 4, 2017).

analysis. Use of EPA RMP consequence analysis information in a rulemaking process is inappropriate for a number of reasons.

When put into context, according to EPA the purpose of the RMP WCS analysis is not to be a predictor of an event or incident, but rather used as an emergency response planning tool. EPA also states that "[l]ocal emergency planning organizations can use RMPs to prepare response plans and allocate resources. *See* EPA's "Evaluating Chemical Hazards in the Community: Using an RMP's Offsite Consequence Analysis" (550-B-99-015 Risk Management, May 1999), p. 9.

EPA also cautions that "[c]haracterizing data using only worst-case scenarios can be misleading and unnecessarily alarming." *See Id.*, p. 7. Moreover, EPA has further cautioned that "[t]hey are not intended to represent a 'public danger zone' ". *Id.*, (emphasis added.)

EPA RMP guidelines acknowledge the WCS uses unrealistic modeling parameters and is an ultra-conservative, unrealistic scenario:

> "Because the assumptions required for the worst-case analysis are very conservative, the results likely will also be very conservative ... The distance to the endpoint estimated under worst-case conditions should not be considered a zone in which the public would likely be in danger, instead it is intended to provide an estimate of the maximum possible area that might be affected in the unlikely event of catastrophic conditions."

See EPA's "General RMP Guidance", Chapter 4 – Offsite Consequence Analysis (2004), pp. 4-6.

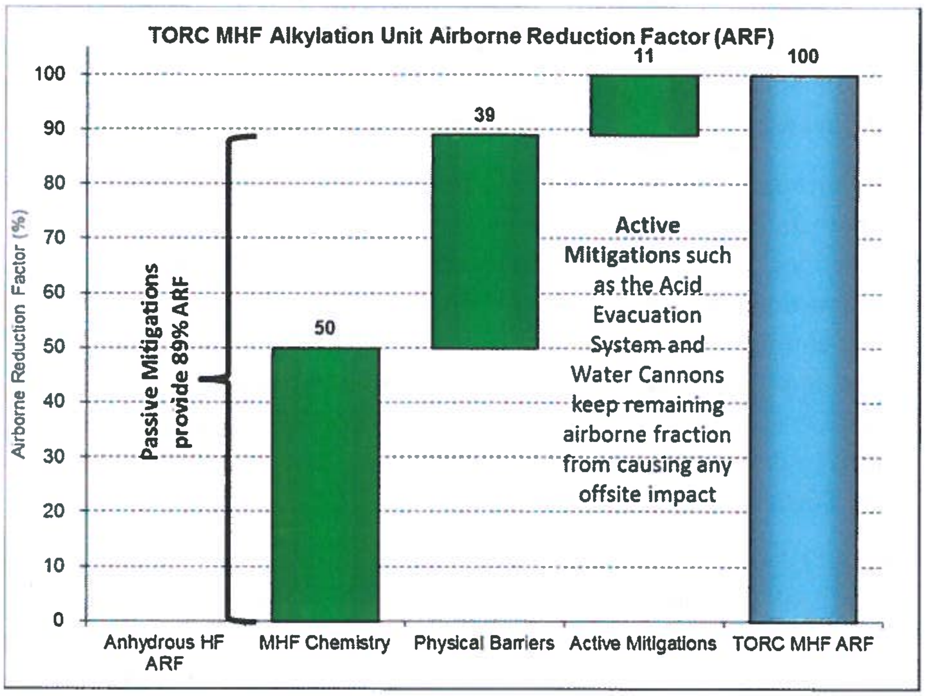
Just as importantly, in determining the WCS the facility is prohibited from taking credit for active safety measures such as automatic shutdown systems, firewater monitors, deluge systems, etc.) Plus, they are unable to include emergency response actions and weather conditions are purposefully deemed unfavorable.

The WCS is modeled to a threshold of ERPG 2, which eliminates irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action after one hour of exposure. In addition, RMP regulations require the release to occur over just 10 minutes. These factors add another level of conservatism to the WCS analysis, further skewing the consequences and undermining District staff's statements in the presentation.

The RMP WCS analysis purposefully overestimates the potential hazard to create an ultra-conservative, unrealistic scenario for planning purposes. Similarly, the hazard of flying is the plane crashing; the hazard of crossing a street is the pedestrian being hit by a vehicle; and the hazard of driving across a bridge is the bridge collapsing. Accordingly, EPA considers the RMP WCS to be an emergency planning tool. The EPA does not use WCS results for determining the acceptability of facility operation or rulemaking, so using the WCS for rulemaking is completely inappropriate and unreasonable for the District, and we request you stop the practice.

By including the Torrance Refinery's current RMP WCS information in the January 20th presentation out of context with EPA's guidelines, the District misinforms and confuses the public, elected officials, and Refinery Committee and Governing Board members, generating unwarranted fears and concerns to support a phase-out of MHF, despite the proven efficacy of the technology and the Torrance Refinery MHF Alkylation Unit's robust passive and active safety measures.

Importantly, and potentially misleading, is staff's failure to mention in the presentation the benefits of active mitigation by only showing the WCS results, which as noted previously are used to create an ultra-conservative, unrealistic scenario. In addition, by failing to include the effects of active safety mitigation systems on a release, the presentation misrepresents and inflates the potential impact of a release from the MHF Alkylation Unit. As shown in the chart below, TORC believes that with the combination of MHF, passive mitigation, and active mitigation, a release should be contained onsite.



Society generally makes rational, risk-based decisions using a number of factors, including the realistic likelihood of a hazard-related incident. In short, the inherent risk of an activity is among the criteria society uses to make all kinds of decisions.

Case in point: The District's own Hazard Impacts analysis as part of its California Environmental Quality Act ("CEQA") analysis for the Torrance Refinery MHF project. The Hazards Impacts analysis for this project estimated that the jet dispersion endpoint (EPRG 3) for a potential MHF release could be approximately 3.6 miles, which is farther than the 3.2 mile planning area for the Torrance Refinery's current RMP WCS. Yet, the District concluded under CEQA that with mitigation using MHF, the potential Hazards Impacts would be less significant.

However, in the current PR 1410 rulemaking, the District now appears to be establishing new, incorrect and unfair rulemaking criteria through which only the potential hazard, regardless of the probability or risk, is taken into consideration. For this rulemaking, the District ignores the totality of all the MHF testing, analysis, and modeling data and information provided to the District to date, as well as relevant data in the District's historic files, that proves MHF (1) prevents flash atomization;

(2) prevents aerosolization and associated vapor cloud density; and (3) promotes rainout of liquid MHF at current Torrance Refinery MHF Alkylation Unit operating conditions. Modeling and testing results support the conclusion that the Torrance Refinery MHF Alkylation Unit operation is as safe as and possibly safer than a similarly sized sulfuric acid alkylation unit, according to the Super Court Judge who oversaw the Consent Decree proceedings. There would thus be no justification for the District applying a regulatory framework to MHF alkylation that it does not also apply to sulfuric acid alkylation.

The District also ignores the fact that since the Torrance Refinery begin using MHF to comply with the City of Torrance Consent Decree, the MHF Alkylation Unit has been operating without any offsite HF release. As previously noted, Torrance Refinery had been using HF in the Alkylation Unit without any HF offsite release from 1966 until 1997, a period that includes the Sylmar and Northridge earthquakes, both of which registered more than 6.5 on the Richter scale.

The District also ignores the fact that a quantitative risk analysis ("QRA") following industry best practices was conducted as part of the City of Torrance Consent Decree process for the use of MHF at the Torrance Refinery. QRA was chosen by the City, the Court, and industry-peers as an appropriate decision-making tool because the QRA could take into consideration likelihood, severity, and other relevant comparison factors that need to be taken into account for rulemaking. The independent Court-appointed Safety Advisor reviewed, confirmed, and validated the conclusion of the QRA that MHF was as safe or safer than Sulfuric Acid for a similarly sized Alkylation Unit. This finding is included in the Safety Advisor's report to the Court, which approved the use of the MHF technology at the Torrance Refinery.

Just as importantly, District staff should consider reviewing the District's record that led to the District permitting both the Torrance and Wilmington MHF Alkylation projects. We recommend that District staff thoroughly review District files for both projects to fully understand its own position, including the CEQA analyses that led to the District issuing permits to both refineries for their MHF Alkylation Units, in advance of taking on the same process related to the current rulemaking.

Another important factor the District should consider goes back to 1993, when MHF was being developed. At that time, the EPA conducted extensive research and created a summary report for Congress on the use of HF in the U.S., which at the time was more than 200,000 tons per year in over 500 facilities. In its Executive Summary[8], EPA states:

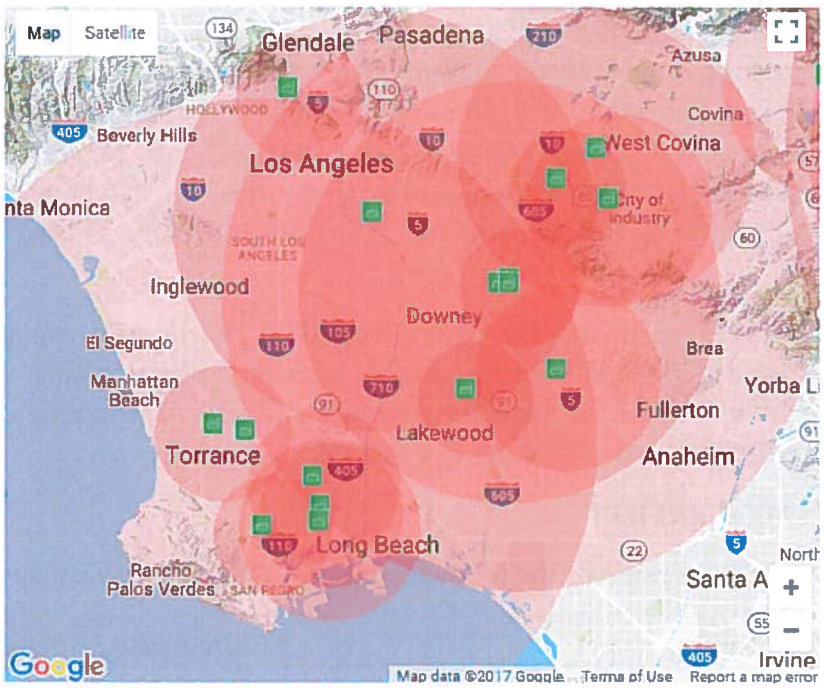
> "The EPA does not recommend legislative action from the Congress at this time to reduce the hazards associated with HF. The Agency believes that the legislative authorities already in place provide a solid framework for the prevention of accidental chemical releases and preparedness in the event that they occur."

If the District chooses to apply an EPA RMP consequence analysis ("hazards only") framework into its rulemaking process as it applies to both Torrance and Wilmington MHF Alkylation units, then as

[8] *See* EPA's "Hydrogen Fluoride Study Final Report. Report to Congress, Section 112(n)(6) Clean Air Act" as amended (1993).

part of the PR 1410 rulemaking the District must also evaluate the hazards associated with other RMP facilities that were required to do an WCS as part of their RMP submittal to EPA and/or the state. As would become readily apparent from undertaking this evaluation, there are many facilities within the South Coast Air Basin that have similar and larger planning areas and use more hazardous materials than HF.

Ignoring the potential for those facilities to have a consequential release at some unknown point in the future further illustrates the District's rush to judgement on MHF at the Torrance and Wilmington refineries. These other RMP facilities manage risk appropriately; are most likely heavily regulated; and are reporting their WCS using the same RMP guidelines as the refineries, yet District staff only target the refineries.



Map showing RMP WCS zones for chemicals within the greater Los Angeles area (See http://usactions.greenpeace.org/chemicals/map/)

Accordingly, TORC respectfully requests that its current RMP WCS information be removed from the discussion associated with the District's PR 1410 conceptual rulemaking framework or that the District expand its Rule 1410 rulemaking to address the potential hazards of every other permitted facility in the District's jurisdiction, as reported in their respective RMP WCS.

Slide 8 - INITIAL RULE CONCEPTS

In Slide 8, the District staff present the following tiered PR 1410 rulemaking conceptual approach:

- HF mitigation tiered at three different levels and with different timeline
  - Tier I Mitigation – Require existing mitigation with some enhancements
  - Tier II Mitigation – Above and beyond Tier I Mitigation (API recommendations)
  - Tier III Mitigation – Greatly enhanced protection (failsafe systems)
- Option to change to alternative technologies in lieu of Tier II and/or Tier III Mitigation

Despite the scope and scale of the existing safety and mitigation systems on Torrance Refinery's MHF Alkylation Unit, TORC has repeatedly indicated that it is willing to engage with the District along with API) to discuss the potential and timing for appropriate enhancements to the unit's safety systems that could be included in PR 1410 using API RP-751 as the framework. API RP-751 is "an industry document that communicates proven industry practices" that supports the safe operation of MHF/HF Alkylation Units. The API is recognized by the U.S. government and globally as the standards-setting organization for the petroleum industry and RP-751 is used by refining companies around the world.

However, before this engagement has even occurred so the District can get input on the cost, feasibility, and timing of potential Tier I, II, and/or III safety enhancements, the District has created this tiered approach as part of its currently proposed PR 1410 rulemaking conceptual framework. Below TORC provides detailed comments on each tier.

Slide 9 - TIER I MITIGATION

In slide 9, the District staff presents the following proposed Tier I safety enhancement categories:

• HF point sensors	• Emergency isolation block valves
• Alarm set points	• Backup power
• Open path monitors – 4 sided *(TORC and/or Valero would need to install)*	• Baffles *(TORC would need to install)*
• Video cameras + monitor screens in remote control room	• Acid settler pans
• HF sensitive paint	• Flange shrouds *(Valero would need to install)*
• Water mitigation *(TORC would need to install water curtain)*	• Pump barriers
• Acid evacuation system	• Safety audits

Attachment A
TORC's Comments and Responses
February 6, 2018

As referenced above, we are encouraged that District staff's presentation included a PR 1410 conceptual framework that focuses on enhancing safety. We look forward to working collaboratively with staff on Tier I. However, as is typically the case with regulations, one-size does not fit all in the context of safety enhancements, meaning Tier I safety mitigation systems that might be suitable for Torrance might be inappropriate for Wilmington, and vice versa.

As a reminder, the Refinery's MHF Alkylation Unit already has redundant release prevention, monitoring, and response systems ("safety systems"). District staff visited the Torrance Refinery on May 16, 2017 and toured the MHF Alkylation Unit to get a first-hand view and understanding of the unit's redundant release prevention, monitoring, and response systems ("safety systems") that protect Refinery employees, contractors, and the community. These existing safety systems already meet all of the Tier I requirements consistent with API RP-751, which include the following:

- **Preventive Safety Systems**
  - Specialized training and personal protective equipment required for all personnel entering the unit
  - Robust inspection and audit programs
    - Torrance Refinery follows API RP-751 for M/HF units
      - Recognized by OSHA and other government agencies globally
      - Followed by refineries worldwide
  - Two Operators stationed on unit each shift in contact with Console Supervisor
  - Eight surveillance camas with video playback
  - Emergency simulation drills
    - Joint TORC and Torrance Fire Department ("TFD") drills
    - TORC and TFD personnel are both Hazmat trained
  - MHF
    - Torrance Refinery MHF Alkylation Unit meets >50% Airborne Reduction Factor (ARF) per MHF chemistry on an annual basis as required the City of Torrance Consent Decree
    - Online MHF Analyzer
    - Samples taken once every shift
- **Emergency Response Safety Systems**
  - Redundant response systems allow rapid response and mitigation of any potential loss of containment
  - Barrier technology = passive mitigation
    - Increases total unit ARF to 89% in combination with MHF chemistry
      - Flange barriers
      - Settler belly pans
      - Acid circulation pump enclosures
  - Water Mitigation = active mitigation
    - Nine remotely controlled water cannons
    - Used in tandem with console cameras to target a specific release point
    - Local fire monitors
    - Deluge systems on major pumps

        - Fire sprays on vessels
    - 29 Point sensors located throughout unit and on perimeter
        - Detect HF down to 0.1 parts per million (ppm)
        - Alarms internally at 2 ppm
        - Reported directly to AQMD at 6 ppm
        - In the process of completing a similar alarming system to TFD
        - Line of Sight Laser (Open Path) system on unit perimeter
        - Detect HF down to 0.1 ppm per meter (ppm*m)
        - Alarm internally at 50 ppm*m and 75 ppm*m
    - Emergency evacuation system routes all acid from the main unit to a storage drum located behind a blast wall - active mitigation
        - 80% of acid is removed in ~2 min
        - The remaining 20% is transferred within 7 minutes after the system is activated
    - Automatic valves have battery backups that allow the valves to be operated in the event of a power disruption - active mitigation
    - All flanges and connections in acid services are coated with special MHF-sensing paint - active mitigation
        - Extremely sensitive - paint changes from yellow to red in the presence of trace amounts of MHF in the parts per billion (ppb) range
    - Alarmed safety showers

However, as noted above, for Tier I safety enhancements, <u>one-size does not fit all in the context of safety enhancements</u>. As explained below, Tier I safety enhancements that might be suitable for Torrance might be inappropriate for Wilmington, and vice versa.

For example, just because Wilmington's MHF Alkylation Unit has a water curtain does not mean that a water curtain is suitable for Torrance's MHF Alkylation Unit. Installing a water curtain without looking at overall protection provided by total water systems potentially increases risk.

For example, a QRA was performed for the Torrance Refinery as part of the City of Torrance Consent Decree process. Based on the QRA, the independent Court-appointed Safety Advisor determined that installing a water curtain at Torrance would be duplicative due to the presence of alternate water mitigations for each potential release area of the unit. Subsequent API RP-751 assessments of the Torrance's MHF Alkylation Unit determined the number, type, and placement of the unit's fire monitors provides appropriate coverage as required by API RP-751.

Similarly for baffles, Wilmington's Phillips ReVAP MHF Alkylation Unit design has internal baffles in the unit's settler tank because of the size and shape of the tank. However, Torrance's UOP MHF Alkylation Unit design has two smaller settler tanks that serve the function of internal baffles by allowing the volume of acid to be split between the two settler tanks. Therefore, if Torrance were required to install internal baffles in the settlers, we would have serious process safety concerns.

For open path lasers, as noted above, Torrance Refinery already has open path lasers monitoring the MHF Alkylation Unit's perimeter. Specifically, the MHF Alkylation Unit's open path laser detectors are placed around the unit's perimeter and located at optimal height to detect MHF in the unlikely event of a release. The laser system is designed to accurately measure HF concentrations at less than 1 ppm and to be unaffected by steam, fog, or other environmental conditions.

In Slide 16, District staff proposes that the Tier I safety enhancements that are not currently installed in the Torrance and Wilmington Refineries' MHF Alkylation Units be completed and operational within "6-12 months after [1410 rule] adoption". However, this timing may be infeasible depending on the type of Tier I enhancements the District requires. For example, if the District directs Torrance to install a water curtain and/or baffles, which as noted above are unnecessary, we would have to wait for a turnaround to install the baffles. This would take longer than 12 months as the next turnaround for the Torrance MHF Alkylation Unit is currently scheduled for 2020.

In Slide 9, District staff currently estimate the costs of potential Tier I safety enhancements to range between "$2.5 - $6 MM for mitigation not yet installed." However, the cost of any additionally-required Tier 1 enhancements such as water curtain, baffles, or other open path lasers Tier I costs may be understated and are currently unknown to TORC. TORC would need to do a detailed project cost analysis to understand the costs involved.

Accordingly, before these Tier I costs are incurred by TORC and Valero under PR 1410, the District must justify the need for additional safety mitigation systems and obtain detailed and legitimate cost estimates. Once these cost estimates are obtained, the District through its statutorily required "Socioeconomic Analysis" process must determine whether such enhancements are cost-effective, which will be difficult considering that there are no ongoing emissions from Torrance and Wilmington related to MHF.

In fact, this rulemaking is predicated on the concept that there is an unknown potential for a possible HF release that may or may not occur at some point in the future, despite the fact that the Torrance and Wilmington MHF Alkylation Units have been operating for more than 100 years combined, without an offsite release of the chemical, including 20+ and 10+ years using MHF, respectively.

Although installing additional Tier I safety enhancements may possibly lead to some incremental improvement in safety, the District fails to prove the current level of safety mitigation is inadequate, which (is / should be) a prerequisite for adopting new technology in any tier. As has been pointed out, just adding mitigation systems for the sake of adding them would be wasteful and possibly impair safety, especially when additional equipment would be unnecessary or inappropriate.

More importantly, the long list of safety mitigations systems that are already in place, combined with the fact neither the Torrance or Wilmington Alkylation Units has ever had an offsite release of the chemical in more than 100 years combined, brings into question the rationale and reasoning for a rule-making in the first place.

Just as importantly, references to "uncertainty" are a constant theme throughout the District's January 20th presentation and as detailed in our September 12th letter responding to the District's August 17th presentation, District staff is currently unable to fully understand the fundamentals of MHF chemistry, behavior, and processes.

Slide 10 - TIER II MITIGATION

In Slide 10, District staff present the following proposed Tier II safety enhancement categories:

- Automated systems: water mitigation, emergency block valves at alarm set points of HF sensors & open path monitors
- Increase the number of definition cameras and monitors
- Add more HF sensors to compensate for non-operating sensors
- Add more comprehensive barriers; e.g., enclosure around acid settler tanks

As TORC informed District staff on December 19, 2017 there are potential issues with automating De-inventory, Isolation and Water Mitigation systems. For example:

- De-inventory, Isolation and Water Mitigation systems have been automated in some refineries
  - Automatic De-inventory: ~5% of HF/MHF units
  - Automatic Water Mitigation Systems: ~15% of HF/MHF units
- Characteristics of current automated systems
  - May have a response delay to allow operator evaluation with a failsafe approach activating after 60-90 seconds
  - Water systems can be triggered immediately
  - May isolate inventories before de-inventorying is complete, potentially leaving the MHF in equipment instead of being drained
- An automated evacuation system may not provide any time advantage over a highly-trained operations approach
  - The February 2015 event saw operator response within 10 seconds
- For isolation, the system needs to accurately identify the leak point and distinguish between isolation break points in the piping/vessels
- Overall Threats
  - Spurious trips could destabilize unit operations
    - Automated systems could activate as a result of a false positive, jeopardizing operations
  - Adds complexity to system
  - Balancing "risk versus need"

The District recommends high definition cameras and the Torrance MHF Alkylation Unit's eight Video Cameras currently have the following features:

- Full HD video quality with remote pan/zoom, record/playback
- Retain one month's worth of recordings
- Cover strategic portions of the unit - reactor, settlers, fresh MHF storage, and MHF unloading zone
- One or more dedicated cameras cover each portion of the unit where water cannons used
- Are designed to work despite glare from the sun, thermal load, and moisture

- Provide remote viewing for MHF Alkylation Unit Console Supervisors who work in the refinery's Central Control Building
  - Console Supervisor on duty can view the MHF Alkylation Unit remotely on multiple large screens dedicated to the unit
  - Supervisors can remotely scan the unit and in the unlikely case a leak is identified. use the cameras to train the water cannons on the leaking MHF
- Minimum numbers of toggles per video

Regarding the suggestion that more HF sensors are needed to compensate for non-operating sensors, the Torrance MHF Alkylation Unit's current point HF sensors are placed strategically both inside and outside unit battery limits to allow accurate detection of any potential release. The sensors:

- Cover all areas with high volumes of HF: e.g., fresh MHF storage and unloading, reactors, acid settlers, pumps, acid evacuation/transfer, etc.
- Operate over a range of 0–10 ppm
- Are designed to have minimal interference from humidity
- Are periodically checked and calibrated
- Have an uninterruptible power supply
- Are sensitive below 1 parts per million ("ppm")

The MHF Alkylation Unit's point sensor alarm set-points are currently set at 2 ppm for internal notification and 6 ppm for automatic electronic District notification.

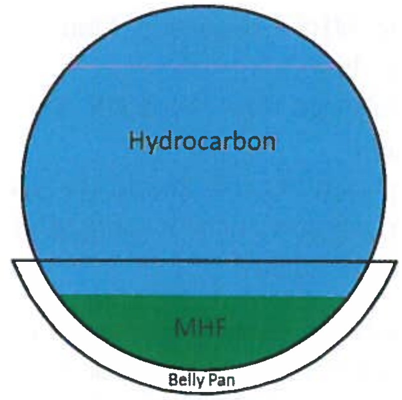
As an additional and redundant layer of detection and protection, the MHF Alkylation Unit's current open path lasers are placed strategically on and around the battery limits of the unit to allow accurate detection of any potential release. The lasers:

- Are placed and located at optimal height around the unit's perimeter.
- Are designed to accurately measure HF concentrations at less than 1 ppm and are unaffected by steam, fog, or other environmental conditions.
- Have an uninterruptible power supply

Importantly, in the event one HF point source detector needs to be taken offline for repair, maintenance, or replacement, a portable HF detector is used.

Regarding the District's suggestion that we add more comprehensive barriers to the enclosures around acid settler tanks, the MHF Alkylation Unit's settler belly pans already shield the surface area of the settler vessels where the acid phase is located, approximately the lower third of the vessels.

As previously explained and shown in the following diagram, the two acid settlers contain the liquid acid in the bottom section of the vessels and hydrocarbons in the upper section of the settlers, above the acid. Consequently, any potential breach in the blue section shown below would be predominately hydrocarbons. An acid release can only originate from the bottom of the vessel that is protected by the belly pan, if there is acid present. In addition to their momentum reduction function, the presence of settler belly pans effectively renders an upward-momentum release impossible.



The acid phase lies in the green portion of the settler vessel. The belly pans physically prevent an upward- or horizontally-oriented MHF release from occurring. The belly pans extend above the acid level for the complete length and width of the settler vessel.

Additionally, the solid steel settler pans/pump shrouds are inspected twice per shift by Unit Operators to ensure the equipment's integrity and functionality

As mentioned above, we are encouraged that District staff have included a PR 1410 conceptual framework that focuses on enhancing safety in its presentation. We look forward to working collaboratively with staff on Tiers II. As previously mentioned, <u>one-size does not fit all in the context of safety enhancements</u>, meaning improvements that might be suitable for Torrance might be inappropriate for Wilmington, and vice versa. To account for this, we recommend that Tier II recommendations include the requirement for both refineries to submit individual safety enhancement plans to the District that present enhancements that are feasible, improve safety, reduce risk and cost-effective for the respective refineries. These enhancements, as indicated in staff's presentation, would be consistent with API RP-751.

In Slide 16, District staff proposes that the Tier II safety enhancements that are not currently installed in the Torrance and Wilmington Refineries' MHF Alkylation Units be completed and operational within "2-3 years after [1410 rule] adoption" or "alternative technology". However, this timing may be infeasible depending on the type of Tier II enhancements are required, particularly if the enhancements involve CEQA analyses, permitting, design, engineering, long lead items, and/or turnaround(s). *See* discussion below on Slide 16 – POTENTIAL TIMING FOR IMPLEMENTATION.

Also in Slide 10, District staff estimate the costs of Tier II safety enhancements to be between "\$50 - \$100 MM". However, the cost of any additionally-required Tier II enhancements may be understated and are currently unknown to TORC. TORC would need to do a detailed project cost analysis to understand the costs involved.

Accordingly, before Tier II costs are incurred by TORC and Valero under PR 1410, the District must justify the need for additional safety mitigation systems and obtain detailed and legitimate cost estimates. Once these cost estimates are obtained, the District through its statutorily required "Socioeconomic Analysis" process must determine whether such enhancements are cost-effective, which will be difficult considering that there are no ongoing emissions related to MHF associated with the Torrance and Wilmington refineries.

As discussed above, the District needs to demonstrate that the current level of safety in the Torrance and Wilmington MHF Alkylation Units is inadequate before creating a PR 1410 rulemaking framework indicating that Tier II safety enhancements are required. At the very least, the District should present a fundamental basis that explains why these enhancements are necessary, including what safety benefits they actually provide, before incorporating them into a rulemaking process. Right now, without any quantitative basis for Tier II safety enhancements above what the refineries' have in place consistent with AP RP-751, "a qualitative feel good" lacks a credible basis for rulemaking.

Slide 11 - TIER III MITIGATION (POTENTIAL APPROACHES)

In Slide 11, District staff presents the following proposed Tier III safety enhancement categories:

- Complete, full enclosure of alkylation unit with roll-up doors, comprehensive water spray (worker safety), sensors & drainage capabilities
  - Possibly build whole new containment system parallel to existing unit to reduce downtime
  - Need to address potential "unintended secondary consequences" (e.g., flammable gases)
- Negatively pressured enclosure venting to scrubber with drainage
  - Fully automated systems including acid evacuation at alarm set points
  - Underground storage (acid dump tank, fresh storage, etc.)

While recognizing the District proposed Tier III mitigation concepts as "potential approaches" and "are out there," we are deeply concerned with the District's Tier III mitigation concepts. Considering the safety enhancements that are already in place, as well as any potential additions TORC may consider adding under Tiers I and II, we are uncertain what, if any, additional safety benefits could be derived from the implementation of Tier III.

In fact, the Tier III options as currently presented are likely to introduce more risks than any safety benefit. Currently, the options appear to suggest an enclosure that would "cover" the entire MHF Alkylation Unit or some portion of the unit. Because MHF Alkylation Units process light hydrocarbons equivalent to LPGs, an enclosure of any kind in the scope and scale suggested by the District will create a massive confined space in which released hydrocarbons could accumulate, creating a highly explosive and flammable environment. This environment would magnify and increase personnel and process safety risks for working in an Alkylation Unit, as well as heightened risks for the community.

The Tier III options related to enclosures were originally considered by API as a potential safety enhancement for API RP-751. However, due to many of safety concerns as discussed above, an enclosure was eliminated from further consideration.

Specifically, some of the challenges that must be considered when evaluating an enclosure include:

- Flammable mixtures
  - Unit processes light gases equivalent to propane and butane
  - Accidentally released gases could accumulate and explode inside the enclosure
- Emergency response
  - Impact on incidents – fires, releases, etc.
- Structural concerns
  - Design and construction of the dome
  - Need for scrubbers
  - PPE required for entry
  - Lifting over live equipment to construct the structure
  - Time required to complete the structure
- Construction, Operations, and Maintenance access
  - Entry into the unit is questionable – uncertain how personnel, equipment, materials, could gain access to the unit
  - Determining external and overhead boundaries
  - Determining whether to dome the entire unit or "acid-only" areas
- Dome concept was discussed at length as possible mitigation during unit design
- Safety hazards increase the risk for personnel and process safety" issues versus safety benefit

Notably, staff's presentation is unclear as to whether Tier III is a menu of options or if all options would have to be completed, which are all conceptual. We are unaware of any of these "approaches" ever having been installed on and/or constructed as part of any Alkylation Unit.

In fact, the District's proposed Tier III "approach" again fails to prove the current level of safety mitigation on the Torrance and Wilmington MHF Alkylation Units is inadequate and falls short of justifying the need for additional and conceptual safety enhancements, which (is / should be) a prerequisite for adopting new technology in any tier.

Accordingly, before proceeding with this Tier III "approach," the District must thoroughly vet the dome and undergrounding vessels to make sure these concepts are feasible, improves safety, reduces risk, and are cost-effective. This vetting process should include a quantitative risk process that establishes the Tier III risk baseline. This will assist the District in determining if any Tier III options provide additional safety benefits to the refinery workforce and community.

In addition to the inherent danger of these Tier III concepts based on District staff's presentation, if the Tier III ideas fail to provide feasible, safety improvement, risk reduction safety enhancement options, and cost-effective options, there would be no options to choose from. Consequently, as currently proposed by staff, without these options the Torrance and Wilmington Refineries would be forced to phase-out MHF by adopting an Alternative Alkylation technology, which is currently an unworkable, undesirable, and unjustified outcome of this rulemaking process.

As explained throughout this document, District staff has failed to justify the need for additional Tier I, II, or III safety enhancements, and have not scientifically or technically justified a phase-out of

MHF. There are no real options to phase-out to for either refinery, for various reasons, including lack of viable alternatives.

Both the Torrance and Wilmington Refineries use MHF, a safe, proven and District permitted Alkylation technology that remains the most recent advance in commercially viable alkylation catalysts. In addition to MHF, both units feature redundant passive and active safety systems, per API-751. Furthermore, the Torrance Refinery is legally required to use MHF to comply with the Court-issued Consent Decree that is still in effect.

As has been readily proven and substantiated by District staff permitting both Alkylation Units, and the voluminous MHF testing, analyses, and modeling information in the District's files and provided by TORC, the combination of MHF technology and existing safety systems prevents flash atomization, promotes rainout, and significantly reduces the potential for an MHF release with off-site consequences.

The only other commercially viable Alkylation technology, Sulfuric Acid, is not safer than MHF, will increase emissions and energy consumption, could have a highly negative and uncompetitive economic impact on the Torrance and Wilmington Refineries individually, and is cost-prohibitive. Switching from MHF to Sulfuric Acid will cost Torrance Refinery approximately $900 million, including a spent acid regeneration unit. This estimate is based on California construction costs and labor rates, which are significantly higher than the Gulf Coast estimates District staff included in their presentation. More importantly, when the District permitted the Valero Wilmington Refinery MHF Alkylation Unit, the District determined that Sulfuric Acid Alkylation was an infeasible alternative to MHF for Wilmington.

In slide 16, District staff proposes that the Tier III safety enhancements that are not currently installed in the Torrance and Wilmington Refineries' MHF Alkylation Units be completed and operation within "8 years after [1410 rule] adoption" or "alternative technology". However, this timing is unsupported and potentially infeasible, depending on the type of Tier III enhancements the District requires, particularly if the enhancements involve CEQA, permitting, design, engineering, long lead items, and/or turnaround(s). *See* discussion below on Slide 16 – POTENTIAL TIMING FOR IMPLEMENTATION.

In the event there are ultimately no feasible Tier III options due to the concerns discussed above, as detailed below, this timing is infeasible for the phase-out of MHF.

In Slide 11, District staff estimate the costs of these categories of Tier III safety enhancements to be between "$50 – $150 MM (based on chlorine gas containment and handling facility)". However, Tier III costs could be understated as they are currently unknown to TORC what the cost of any additionally required Tier III enhancements would be. TORC would need to do a detailed project cost analysis before it could know the potential costs involved, particularly when none of the currently proposed Tier III conceptual options has even been installed on or in an Alkylation unit.

However, there is also some potential the District could very well be underestimating Tier III costs, which are currently unknown to TORC, particularly when none of the currently proposed Tier III conceptual options has even been installed on or in an Alkylation unit. Before TORC could estimate potential costs involved in replacing the Alkylation Unit the District would need to do a preliminary, detailed project cost analysis. In the event there are ultimately no feasible Tier III options due to the concerns discussed above, a "$50 – $150 MM" cost significantly underestimates the potential costs associated with a phase-out of MHF.

Accordingly, before TORC or Valero incur any Tier III costs, including those associated with a MHF phase-out, the District must obtain detailed and legitimate cost estimates. After these cost estimates are obtained, the District through its statutorily required Socioeconomic analysis process must determine whether such enhancements or MHF phase-out are cost-effective, which will be difficult considering there are no ongoing emissions from Torrance or Wilmington.

Slide 14 - COMPARISON OF ALTERNATIVES TO HF

In slide 14, District staff presents the following table as potential alternatives to HF.

Catalyst Type	**Sulfuric Acid**		**Solid Acid**	**Ionic Liquid**
Technology Name (Manufacturer)	CDAlkyR® (CB&I)	ConvEx^{SM} (DuPont/STRATCO)	AlkyClean® (CB&I)	ISOALKY™ (Chevron & UOP)
Cost	Less than conventional sulfuric acid unit (30–50% less acid consumption)	~40–60% less than a grassroots sulfuric acid unit	Information not available	Information not available
Associated Hazards	Sulfuric acid	Sulfuric acid	No known hazard	No known hazards
Commercial Applications/Status	One US Gulf Coast refinery start-up in 2020 at comparable capacity (23,000 b/d) and 13 refineries worldwide	None, new technology	Petrochemical plant in China at lower capacity (2,700 b/d)	Chevron Salt Lake City HF alkylation retrofit, with planned start-up in 2020 at lower capacity (5,000 b/d)

First, we note that Torrance Refinery's Alkylation Unit uses MHF and not HF as the District presentation seems to imply, which is an oft-repeated mistake, including the title of the rulemaking, because both refineries phased-out HF many years ago.

Second, the District should clarify whether the reference to "Sulfuric Acid" in the District's table is related to Sulfuric Acid alternative conversion technologies.

Third, the District staff in this slide fails to fully explain the current status of other emerging Alternative Alkylation technologies, which have been topics at various Working Group meetings over the past year.

As TORC has repeatedly stated to District staff both privately and publicly, PBF has been evaluating Alternative Alkylation technologies since announcing the acquisition of the Torrance Refinery in September 2015. For example, to explore alternatives to alkylation, PBF and TORC have met separately with experts from Honeywell/UOP, Stratco/DuPont, Burns & McDonnell ("B&McD"), KBR, and CB&I, as well as independent Alkylation experts, to explore Alkylation alternatives.

To date the result of these technological evaluations, meetings, and discussions is that there is no commercially viable, cost-effective, or safer Alternative Alkylation technology available today. Nothing in any of the presentations by the licensors of exiting Sulfuric Acid and Alternative Alkylation technologies at the August 2nd fourth Working Group and August 23rd fifth Working Group meetings has changed this view.

For example, at the August 2nd fourth Working Group meeting, CB&I and Chevron presented on their Alternative Alkylation technologies. TORC's take away from CB&I's presentation[9] regarding its CDAlky® and AlkyClean® technologies follows:

- There is only one small unit in a chemical plant in China - 2,700 barrels per day ("BPD").
- CB&I confirmed there is **NO** commercial plant in the U.S.
- CB&I confirmed that AlkyClean® technology is the first and only commercialized solid acid alkylation technology in the world.[10]
- Operating details, product quality, run length and turnaround interval, catalyst regeneration, and feedstocks are currently unknown.
- CB&I confirmed that all units on their "Commercial Experience List" are Sulfuric Acid Alkylation units.
- CB&I conceded that no pilot or demonstration units for an HF/MHF conversion exist.
- CB&I indicated that they may be able to design an HF/MHF conversion.
- CB&I conceded such a conversion would be a little more expensive than a conventional Sulfuric Acid conversion, but definitive cost information is currently unknown.

---

[9] CB&I's Presentation – "Advanced Alkylation Technologies: CDAlky® and AlkyClean®" (August 2, 2017).

[10] During District "Refinery Committee Investigative Hearing" on April 1, 2017 in Torrance, California, the District's Consultant Mr. Jenkins of Bastleford Engineering and Consultancy claimed that an unnamed UK refinery had successfully converted an existing HF Alkylation Unit to Solid Acid Alkylation Technology. The CB&I presentation irrefutably contradicts this and TORC would like the District to correct the record so that it is clear to the public, elected officials, and the District Governing Board members that this never occurred so they are no longer misinformed on this important issue.

TORC understands that Bastleford Engineering and Consultancy has recently gone into receivership/bankruptcy and the company's domain name was for sale.

- Testimony at April 1st District Hearing about European refinery converting to Solid Acid Catalyst ("SAC") has been proven to be false via multiple sources in the UK, including labor.
- On August 9, 2017, one week after that Working Group meeting, CBI announced the sale of the company's technology business, which is responsible for alkylation processes.[11]
- On February 2, 2018, Valero announced their plans to build the first U.S. model of CB&I's CDAlky® unit at their St. Charles refinery. It reportedly will be a 25,000 BPD unit at $400MM based on Gulf Coast pricing, which is equivalent to the costs to build a grass roots Sulfuric Acid Unit on the West Coast.
- Based on the foregoing, TORC remains convinced there is no commercially viable, cost-effective, or safer solid acid (SAC) catalyst technology, including CB&I's technologies, currently available or expected to be available in the foreseeable future.

TORC's take-away from Chevron's presentation ("Isoalky™ Technology: Next Generation Alkylate Gasoline Manufacturing Process Technology" (August 2, 2017)) regarding its Isoalky™ technology follows:

- Chevron stressing that its existing HF Alkylation Unit at its Salt Lake City Refinery had not had any safety issues, injuries, or offsite impacts associated with the unit's operation
- Chevron technology is still only in demonstration phase
- plans to design and build a 5,000 BPD unit at its Salt Lake City Refinery in 2020 – "Model No. 1, Serial No. 1"
  - The Torrance MHF Alkylation Unit is ~6x larger at ~30,000 barrels per day
- In response to a question, Chevron provided limited information regarding its proven capability to scale up to the size of the Torrance Refinery's MHF Alkylation Unit, and referred to the licensor, UOP, for this information
- Chevron indicated that technology cost would likely be on par with conventional Sulfuric Acid Alkylation
- Chevron's representative clarified that although their technology is "commercially available," the process has not been commercially proven and would not be commercially proven until the 5,000 BPD unit in Salt Lake City was built and operated for some indeterminate period of time.
  - TORC believes that two turnarounds cycles are needed to determine if the technology is safe and reliable, which is consistent with UOP's, the licensor of this technology, letter to the District dated September 18, 2017.
  - Chevron conceded that a refinery would need additional plot space for the unit.
- Chevron indicated that although it believes its technology is safer than Sulfuric Acid Alkylation, the company has no plans to convert its two Sulfuric Acid Alkylation units in California using this technology.

---

[11] *See* http://cbi2016ir.q4web.com/news/press-release-details/2017/CBI-Announces-Intent-to-Sell-Technology-Business/default.aspx.

- Based on the foregoing, TORC is convinced there is no commercially viable, cost-effective, or safer Ionic Liquid Acid technology, including Chevron's technology, currently available or expected to be available in the foreseeable future.

At the August 23rd fifth Working Group meeting, DuPont presented their ConvEx℠ HF Alkylation Conversion Technology. TORC's take away from DuPont's presentation ("DuPont Clean Technologies" (August 23, 2017)) regarding this conversion technology follows:

- Merely a concept.
- They have only completed paper case studies. No pilot or field testing. No conversion has ever been undertaken.
- Cost estimate based on Gulf Coast pricing. Only an order of magnitude cost estimate, not based on detailed engineering.
- Cost estimate does not include scale-up or outside the battery limit ("OSBL") costs for critical refinery systems such as utilities; e.g., electric power, sewers, etc.
- Cost estimate excludes spent acid regeneration. A separate or third-party unit would be needed to regenerate sulfuric acid, process based on incineration.
- Additional plot space and metallurgy changes would be required.
- A lot of infrastructure required (i.e., cooling, utilities, etc.).
- Possibly need new refrigeration unit with large compressors.
- More than double the acid consumption of an HF/MHF unit.
- TORC feedstocks require higher acid consumption for similar amounts of alkylate product.
- Based on the foregoing, TORC still believes there is no commercially viable, cost-effective, ConvEx℠ technology currently available or expected to be available in the foreseeable future.

The ability to question CB&I and Chevron representatives at the August 2nd fourth Working Group meeting and DuPont representatives at the August 23rd fifth Working Group meeting about their respective emerging technologies was helpful, TORC concurs with Valero that the following information should be provided by CB&I, Chevron, and DuPont as well as other licensors of emerging Alternative Alkylation Catalyst technologies the District may be investigating, in order for the District and the targeted regulated entities – TORC and Valero – to understand the fundamental viability, safe operating envelope, evolutionary status, impacts, and costs of these technologies:

1. Name of Licensor
2. Name of process technology
3. Date an existing unit was put into operation
4. Location of existing alkylation unit
5. Regardless of definition, does the location have a parallel alkylation process of equal or greater size
6. Definition of unit -- demonstration unit, bench scale, pilot scale, intermediate scale, full scale, etc.
7. Olefin feed rate to unit
8. Iso-Butane (or other paraffin consumed) feed rate to unit
9. Alkylate product rate from unit

10. Type of acid catalyst used and supplier
11. Specific feed composition (C4= only, specific C4=, C3=, C5=, other limits)
12. Type of feed pre-treatment used
13. If no specific feed treatment is implemented, what are the acceptable feed contaminant levels such as water, sulfur, diolefins, other
14. Corrosion history of equipment
15. Special materials – high grade alloy piping, construction requirements, long lead time equipment, etc.
16. Alkylate product quality: RON, MON, sulfur, EP, etc.
17. Special product treatment for any product streams such as propane, butane, alkylate
18. Does the unit include acid regeneration?
    a. If so, how is that performed?
    b. If not, how is the catalyst regenerated?
    c. Can the catalyst be regenerated onsite?
    d. What is the cost of regeneration?
    e. How often does the "spent" acid need to be replaced?
19. What is the plot space for the largest existing unit you have built?
20. What is the estimated plot space for a unit of approximately 30 MBPD of alkylate production, including any complementary regeneration facilities, utility substations, etc.?
21. What are the results of any Process Hazard Analysis (PHA), QRA, and/or Societal Risk Index Analysis conducted on the unit?
22. Were environmental impact reviews performed in connection with permitting the unit? If so what were the results of that review?
23. What is the energy consumption associated with the unit -MMBTU/per barrel of alkylate, or similar measure?
24. What waste streams / material are generated from the unit and do they require special treatment and/or disposal
25. What has the run length been between required / scheduled Maintenance and Inspection? Is this consistent with projected Turnaround cycles?
26. What is the estimated cost for a 30,000 BPD (alkylate production) unit, if the unit was built in Southern California having to meet local regulatory requirements and at California union labor rates (i.e., prevailing wage)?

As TORC stated in its August 1st, August 23rd, and September 20th letters, and re-emphasized here, before even considering transitioning from MHF Alkylation to an Alternative Alkylation technology at the Torrance Refinery, the new, emergent technology must be commercially viable in scope and scale to the Torrance Refinery's existing MHF Alkylation Unit, and must be inherently safer than MHF Alkylation. From our point of view, these technologies:

- Are many years away from being commercially proven, safe/reliable, and available
- These technologies' environmental impacts and process safety operations are unknown
- Will cost as much as, and perhaps more than, a conventional, new grassroots Sulfuric Acid Alkylation Unit

A switch from MHF to any unproven Alternative technology, or one that has no additional safety benefits, such as Sulfuric Acid, make no sense on many fronts. There are no other commercially viable, proven Alternative Alkylation technologies at this time. As explained in detail by Gordon Schremp, California Energy Commission, at PR 1410 Working Group meeting #6, both the Torrance and Wilmington refineries could be economically harmed if forced to phase-out MHF in favor of an Alkylation technology that offers no real safety advantage, is not commercially viable or proven, and cost-prohibitive. To be considered commercially viable, at a minimum, the emerging Alternative Alkylation Catalyst technologies need to be constructed at scale and run at California standards through two four-year turnaround cycles, which will establish baseline operating and reliability data, before their commercial viability can be determined.

Slide 15 – CONVERSION

In slide 15, District staff presents the following table regarding the cost of replacing MHF with Sulfuric Acid.

Cost Range	Conditions	Reference
\$100 – \$200 MM	US Gulf Coast cost; Alkylation unit only	Norton Engineering (2016)
\$210 – \$330 MM	US Gulf Coast & Midwest costs; Alkylation unit (~23,000 b/d) and acid regeneration	DuPont (2018)
\$600 – \$900 MM	TORC cost; Alkylation unit and acid regeneration	Burns & McDonnell (2017)

The District staff, in this slide, continue to present the Norton Engineering Study ("Norton Study") as representing the potential, realistic cost of a Sulfuric Acid Alkylation Unit. However, the Norton Study has been debunked and proven to significantly underestimate the cost of replacing MHF with Sulfuric Acid. The obvious shortcomings of the Norton Study are convincingly shown by the B&McD "Report Brief Alkylation Study & Estimate" (July 2017) that TORC provided to the District on July 26th. This report features a point-by-point assessment, as well as testimony given by DuPont, owner of Stratco, the world-leading **Sulfuric Acid Alkylation** licensor, at the August 23, 2017 fifth PR 1410 Working Group meeting. At this meeting, DuPont informed District staff, Working Group members, and the public that Stratco experts analyzed the estimates used in Norton's Study, noting these estimates were based on Gulf Coast pricing and excluded scale-up or outside the battery limit costs for critical refinery systems, including utilities. *See* TORC letter to District Executive Officer Wayne Nastri, entitled, "Norton Engineering Alkylation Technology Study, related to the use of Hydrofluoric Acid in Refinery Alkylation Units" dated December 8, 2016.

As the District is aware that the B&McD's Report Brief concluded that the total installed cost to build an equivalent capacity Sulfuric Acid Alkylation unit at the Torrance Refinery would be approximately $600MM.[12] As the District was informed on July 26th and also noted in TORC's August 1st and August 23rd letters, B&McD's Report Brief excluded the cost of spent sulfuric acid regeneration. However, TORC understands from discussions with an industry consultant that the cost of a new grassroots spent acid regeneration plant of sufficient capacity to serve a Sulfuric Acid Unit at the Torrance Refinery or upgrading an existing third-party spent acid regeneration facility could cost up to another $300MM, inflating the total estimate to approximately $900MM.

Similarly, during DuPont's presentation introducing their ConvEx℠ HF Alkylation conversion technology at the August 23rd fifth Working Group meeting, DuPont testified that cost estimates for this technology were also based on Gulf Coast pricing and excluded scale-up and outside the battery limit costs for critical refinery systems like utilities. DuPont also noted that additional plot space and metallurgy changes would have to be considered to utilize this technology, while offering no cost estimate for an equivalent-sized unit.

The District must take into consideration the consistent, serious flaws involving costs and feasibility in each of the presentations on alternative alkylation technologies before conducting a Socioeconomic analysis as part of the rulemaking. Otherwise, the District's analysis will suffer the same underestimation of the compliance cost and overstate the benefits of PR 1410, especially if a MHF phase-out is part of the rule.

TORC has specifically commented to the District on multiple occasions that use of Sulfuric Acid as a replacement for MHF presents its own challenges and impacts that run counter to the District's air quality goals, including increased emissions versus MHF. These issues have been previously documented to the District, and are reiterated here:

- Replacing MHF Alkylation technology with Sulfuric Acid Alkylation technology would be a complex undertaking and cost prohibitive.
- Sulfuric Acid Alkylation introduces a set of risks and impacts that the District must fully evaluate, including:
    - Direct and indirect increases in emissions of greenhouse gases and criteria pollutants based on the need to incinerate spent acid during the regeneration process
    - Community risk
    - Exponential increases in truck traffic if regeneration takes place offsite

---

[12] The report specifically states:

> "The total installed cost for the new alkylation unit and associated infrastructure (outside the battery limits - OSBL) is estimated at nominally $600 MM, including an owner's cost of $50 MM provided by PBF. This cost is comprised of $56 MM in direct bare equipment cost, $270 MM in additional direct costs associated with labor and materials and $226 MM in indirect costs. Indirect costs include engineering, construction management, escalation, contingency, and contractor fee. The contingency for this estimate was set at $110.6 MM which represents 20% of the total project cost."

This cost information must be included and thoroughly considered as part of the District's PR 1410 CEQA and Socioeconomic analyses.

- Disruptions of state and local gasoline supply based on extensive outages required for demolition, construction, and start-up and break-in of a new process unit.

- In comparison to Sulfuric Acid Plants, MHF Alkylation Units "alkylate" a wider range of feedstocks such as propylene (C3=) and amylene (C5=). These process "streams" increase acid consumption and lower alkylate product quality and yield when processed through Sulfuric Acid Alkylation units, including octane, which is becoming ever more important as automakers introduce higher compressions engines to increase miles per gallon. TORC's MHF Alkylation Unit converts a high percentage of C3= into alkylate for blending into CARB gasoline.

- Due to Sulfuric Acid Alkylation's high consumption of acid, these units require acid regeneration external to the processing unit, while MHF Alkylation regenerates the acid within the existing unit. Plot space requirements for Sulfuric Acid Alkylation Units and regenerating facilities are significant; sufficient plot space may not be available at existing refineries and/or may require demolition of existing process units and/or structures.

- Sulfuric Acid Alkylation Units require onsite storage of as much as 200 times more catalyst than HF alkylation units. If there is insufficient plot space to construct an onsite acid regeneration plant, conversion of an MHF Alkylation unit to sulfuric acid alkylation would increase local truck traffic from six trucks per month to approximately 1,440 truck trips per month, an increase of ~240 times compared to current MHF Alkylation Unit requirements. This would involve the delivery of fresh sulfuric acid and shipping spent acid for regeneration/re-use. Increased truck traffic would result in corresponding increases in mobile source emissions unaccounted for in the study, as well as increased risks to the community along the transport route.

- If such additional truck traffic is unacceptable to the community due to mobile source emissions and increased transport risks, then the transport of fresh and spent sulfuric acid would have to be done via new pipelines to separate newly-built regeneration facilities and/or existing regeneration facilities, which would have to be upgraded to handle the increased acid for regeneration. Despite activist's claims, there are no available sulfuric acid pipelines between Torrance and the regional regeneration plant, and obtaining permits and rights-of-way to build a new line represents a multi-year effort with virtually no chance of success.

- Sulfuric Acid Alkylation Units have higher energy demand than MHF Alkylation Units, which would require higher emissions of criteria pollutants and greenhouse gases from equipment used to generate power. MHF Alkylation has lower power needs due to its unique design -- no refrigeration compressors and fewer pumps/mixers.

- Assuming permits would be granted for a new, grass-roots Sulfuric Acid Unit, to actually build a new unit would require extended refinery outages to complete.

As discussed with the District on July 26th and further emphasized in TORC's August 1st, August 23rd, and September 20th letters, and also detailed in this letter, the cost of a new grass root Sulfuric Acid Alkylation Unit at the Torrance Refinery would be cost prohibitive, approximately between

$600MM to $900MM depending on whether a new spent acid regeneration unit would be constructed on site or an existing, third party spent acid regeneration facility must be upgraded.

In its July 26, 2017 presentation entitled, "Transportation Supply Issues," the California Energy Commission ("CEC") communicated their analysis of the threat posed by PR 1410, noting that: "Issues are highlighted that have the potential to impact supply and availability of transportation fuels over the near to midterm period. In support of its analysis, the CEC states:

- If an HF ban were compelled it is uncertain if either or both companies would elect to make such changes to their facilities
  - Alkylation process unit projects are extremely expensive
    - A recent project approved for the Valero Houston refinery is estimated to cost $300MM for an Alkylation unit with a capacity of 13,000 barrel per calendar day
    - These Alkylation Unit capacities at the Torrance and Wilmington refineries are each nearly twice this capacity, meaning the potential costs for such projects at the two California refineries could, at a minimum, easily approach or exceed $500MM per facility
  - These estimated costs for such a replacement project could be at or near the value of the refinery when one considers that ExxonMobil sold the entire Torrance Refinery to PBF Energy for $537.5MM
    - It would therefore be uncertain as to whether such an expenditure could be justified by either or both companies should an HF alkylation ban ultimately be approved by the District

Importantly, there is no guarantee that all permits needed to build a new Sulfuric Acid Alkylation Unit would be issued by the various regulatory agencies and jurisdictions. Even if they could be obtained, going through the CEQA process, obtaining other governmental or jurisdictional permits, meeting the District's New Source Review ("NSR") and Prevention of Significant Deterioration ("PSD") requirements, could take many, many years before design or construction could commence.

In the same July 26, 2017 presentation previously referenced, the CEC addresses the vagaries, complexities, and unpredictability of successfully obtaining permits projects in the state: "Before replacement work (for a MHF Alkylation Unit) could commence, refiners would need to obtain all necessary permits through the CEQA process". CEC also notes:

- Outcome of this process is uncertain
- It is possible that such permits will ultimately be denied
  - Valero Benicia crude-by-rail permit denial recent example
- Even uncertainties if permits are granted, timeline could be extensive
- Chevron Richmond refinery modernization permit approval, 9+ years
  - Initially submitted to City of Richmond during 2006
  - Final approval received April 2015

The District should keep in mind that through the City of Torrance Consent Decree process, the Court determined that "the modified HF catalyst (including mitigation) presents no greater risk than a sulfuric acid alkylation plant producing a comparable amount of alkylate," only after MHF testing and modeling were completed that proved to the Court-appointed independent Safety Advisor that "… the catalyst as modified would not form an aerosol or dense vapor cloud upon release." As a result, building a grass roots Sulfuric Acid Alkylation unit would contradict the Consent Decree and does NOT make environmental, process safety, or economic sense, especially in light of more than 100 years of combined operations without any offsite release of HF for both the Torrance and Wilmington refineries.

Moreover, the District has already determined through CEQA that Sulfuric Acid Alkylation is not a feasible alternative when compared to MHF Alkylation:

"ALTERNATIVES REJECTED AS INFEASIBLE"

> "**Sulfuric Acid Alternative**: Sulfuric acid alkylation is an alternative to HF alkylation. Under this alternative, the Ultramar Inc. – Valero Wilmington Refinery would need to construct a completely new alkylation unit and eliminate the existing alkylation unit, because sulfuric acid alkylation is an entirely different processing using a different technology.
>
> The other option is to construct a sulfuric acid alkylation unit within the existing Refinery. To make space for this, the existing unit would have to be shutdown and demolished. This and construction of a new alkylation would require approximately one year. This shutdown would effectively eliminate the ability of the Refinery to produce fuels in compliance with California reformulated fuels requirements, eliminating it as a major source of gasoline for the California market. Current California refining capacity is barely adequate to meet the state's gasoline demands. Eliminating the Refinery's ability to produce California reformulated gasoline for one year would lead to potential spot shortages and adverse economic effects in the region.

See District's "Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Final EIR", Chapter 6, pp. 6-1 – 6-2, (SCH #20030536, certified December 16, 2004).

Fast forward to 2017 - current District staff is contradicting its prior analysis and decision, while at the same time failing to justify their belief that Sulfuric Acid Alkylation Unit is now a feasible alternative. Again, nothing has changed regarding the feasibility of Sulfuric Acid as a replacement for MHF since the District completed its CEQA analysis for the Valero ReVAP project in 2004.

As to the comparative risk of MHF versus Sulfuric Acid, a QRA following industry best practices was conducted as part of the City of Torrance Consent Decree process for the use of MHF at the Torrance Refinery, which commenced in 1997. The independent Court-appointed Safety Advisor reviewed, confirmed, and validated the conclusion of the QRA that MHF was as safe or safer than Sulfuric Acid for a similarly sized Alkylation Unit[13]. This finding was included in the Safety

[13] See Documents 21 "Modified Hydrofluoric Acid Alkylation Process Assessment of the Off-Site Risk Impacts Associated with Modifications/Changes in the MHF Process" (March 1998) and 37A/B "Modified Hydrofluoric Acid Alkylation Risk Assessment" (October 1994) disclosed to the District on May 4, 2017 under Trade Secrets/Confidential Business Information.

Advisor's report to the Court, which approved the use of the MHF technology at the Torrance Refinery. Therefore, the MHF technology is a safer or safer than Sulfuric Acid, so if the District's concern is with the hazards associated with Alkylation technologies, then forcing a phase-out to an Alternative that is not any safer is illogical and unsupportable, based on the work that went into the Court's decision.

Slide 16 – POTENTIAL TIMING FOR IMPLEMENTATION

The District presents the following potential timeline for the tiered PR 1410 rulemaking conceptual framework.

- 2018 – Rule adoption
- 6 - 12 months after adoption – Require Tier I Mitigation measures
- 2 - 3 years after adoption – Require Tier II Mitigation or alternative technology
- 2021 – Alternative technology assessment completed
- 8 years after adoption – Require Tier III Mitigation or alternative technology

We currently believe that staff significantly underestimates the time needed for appropriately implementing each tier and note they have failed to justify their estimates. If any of the tiers require significant unit modifications or construction, CEQA, permitting, long lead items, and/or turnaround(s), then each tier could take multiple years to complete. If no Tier III mitigation option is available, this could result in a phase-out of MHF to a currently unproven Alternative Technology requiring an extended timeline involving the proving-out of the emergent technology, which if successful would then require an agreement to implement the new alkylation technology, permitting, financing, design, and construction. We already addressed the uncertainty involved in permitting, and provide the following for consideration:

- Design/Engineering – New safety system enhancements could, and a new Alkylation process unit the scope and size of TORC's would, take 12 to 24 months to design and engineer.

- CEQA – Project-specific CEQA analysis can only begin after the owner decides to invest in alternative technology and the project is defined. Accordingly, the Design/Engineering phase must be completed first. Because of the scope, complexity, and potential environmental impacts involved in new safety system enhancements, and particularly, a new Alkylation process unit equivalent to TORC's MHF Alkylation Unit, the project would require an Environmental Impact Report (EIR). An EIR could take 18 to 24 months to complete, particularly if it becomes a controversial project, which is possible given the nature of the activist community in California. Case in point: Tesoro's recent Integration and Compliance Project (*see* District's Tesoro Los Angeles Refinery, Integration and Compliance Project Final Environmental Impact Report, SCH No. 2014091020 (May 2017)), which included a new Spent Sulfuric Acid unit.

  What will the District do if in the course of the CEQA project-specific analysis that MHF Alkylation is shown to be safer, or has fewer emissions, or produces less toxics than Sulfuric Acid Alkylation, or some other alternative technology; i.e., an Environmentally Superior

Alternative? Will there be a predetermined outcome because of an ill-conceived, unsupported, and illogical phase-out that is already in place due to a previously adopted Rule 1410?

- Permitting – The District cannot issue a permit until the CEQA process has been completed and an alternative has been justified. Historically, the District has taken much longer than several months if not years to review and approve complex refinery permits such as what could be required here. Just as importantly, the District is only one of multiple government entities and jurisdiction that requires, reviews, denies and/or issues permits for such a complex project. In addition to uncertainty over timing of the District's permit review process, other agencies' timing is currently unknown.

  For District permitting, Torrance and Wilmington are Title V facilities, and any permit would be subject to EPA review and public comment. Additionally, a new Alkylation process unit would trigger both the District's NSR and a PSD determination, which applies to new major sources or major modifications at existing air pollution sources. Under NSR, a new Refinery process unit would be subject to Best Achievable Control Technology (BACT) requirements, emission offsets, and air dispersion modeling. Also, under Rule 1401, the applicant is required to complete a toxics analysis.

  A new Sulfuric Acid Alkylation Unit would trigger all of these regulatory requirements. An Alternative technology may trigger some or all of these, but whether they would or not is unknown because there is no commercially viable/proven Alternative Alkylation technology available today.

  Going through the CEQA process, meeting the District's NSR, PSD, and BACT requirements, obtaining offsets, and conducting air dispersion modeling and toxics analysis could take several years to complete in order to obtain permits before any construction could occur. In addition, the District must complete a Socioeconomic Analysis of the project. However, as noted by the CEC last July and again at Working Group #6 in September, there is no guarantee that permits may ultimately be issued for conversions, replacements, and/or new units, considering the community concerns that could be raised about Sulfuric Acid or Alternative Alkylation technologies through this process.

  Among other questions, will the District waive certain requirements and allow the Torrance and Wilmington Refineries to receive an expedited permit without having to comply with BACT, emissions offsets, air dispersion modeling, and toxics analysis in order to meet an unsupported and unrealistic phase-out timeline? Will other state and federal agencies do the same with their permit processes?

- Procurement, Fabrication, and Delivery – Whether new safety system enhancements or a complete new Alkylation process unit is required, a large majority of the piping, vessels, valves, pumps, motors, etc., would be custom-built, rather than "off the shelf" items, requiring long-lead items that could take two or more years to procure, fabricate, and deliver. This would have to be coordinated with workloads of existing vendors that are capable of designing and manufacturing equipment for such a large project, as they would also be handling other projects for other clients, which could result in long delays.

- Logistics – New safety system enhancements may have to be scheduled to coincide with a major turnaround, which could take years to complete. A new Alkylation process unit would take a major turnaround involving the entire Refinery, which would take place in the future based on current schedules, and then take as long as nine months to a year to complete. Turnaround coordination for a project like this takes into account the status of numerous Refinery process units and equipment that would be involved in replacing the MHF Alkylation Unit, which could take more than one refinery-wide turnaround cycle to complete.

- Testing / Prove Out – A new Alternative Alkylation technology would take at least two turnaround cycles to prove out, which would take six to eight years, as both TORC and Valero, as well as the licensors, have previously informed the District. This needs to be done before any of the previous steps above are initiated in order to prove the technology is commercially viable, as well as safe.

Of course, if the District requires a phase-out, both companies would have to review their options before any of these steps could or would be taken. At the District's Working Group #6 meeting on September 20, 2017, CEC representative Gordon Schremp provided the agency's analysis of the "Likelihood of Alkylation Replacement" in his presentation:

- It goes against sound business principles that the Valero and PBF board of directors would agree to spend an amount of capital on two refinery assets that would be greater than the valuation of the facilities and would incur a negative internal rate of return (IRR)
- Conclusion –if the HF ban is approved, the two Southern California refineries would likely cease operations some time prior to the effective deadline
- Therefore the particulars regarding the amount of time necessary to obtain all permits, complete engineering, demolish the existing alkylation units, and construct the new process units would be less relevant

If either company decides to transition from MHF Alkylation to a catalyst other than Sulfuric Acid at the Torrance Refinery, the new technology has to be commercially viable in scope, scale, and reliability to the Torrance Refinery's existing MHF Alkylation Unit, and must be inherently safer than MHF Alkylation, based on a QRA which is a structured approach to identifying and understanding the risks associated with hazardous activities such as the operation of an alkylation unit. TORC is confident the Torrance Refinery's MHF Alkylation Unit safety systems protect Refinery employees and the community while reliably producing CARB gasoline, which is reflected in its performance. Specifically, since using MHF in the Refinery's Alkylation Unit starting in 1997, there has never been an offsite release of HF from the Torrance Refinery. Additionally, the Torrance Refinery used HF in the Alkylation Unit without any HF offsite release from 1966 when the unit was commissioned until 1997 when the unit was modified to use MHF. This 50+ year record includes thousands of earthquakes, including the Northridge and Sylmar quakes that registered more than 6.5 on the Richter scale.

As TORC has previously stated to the public, we will continue to evaluate emerging Alternative Alkylation Catalyst technologies. However, there is currently no scientific or technical justification for including these concepts in the PR 1410 conceptual rulemaking framework because no commercially viable alternatives exist at this time. Again, since 1997, the Torrance Refinery has been safely using MHF without an offsite release. Additionally, the Torrance Refinery used HF in the Alkylation Unit without any HF offsite release from 1966 until 1997. Therefore, there is no basis for a potential timeline for the phase-out of MHF based on the potential for a future, albeit unknown release with offsite consequences that may or may not ever occur.

Despite the MHF testing, modeling, District permit approvals, and reliable unit performance at both refineries, District staff forge ahead and ignores precedent in its apparent rush to judgement against MHF by presenting a potential phase-out timeline of approximately eight years, without providing any sound scientific basis or justification based on credible evidence for such an unrealistic and infeasible deadline.

In Slide 16, District staff proposes that by "2021 – Alternative technology assessment be completed". TORC is unclear as to why this is included as part of staff's proposed PR 1410 tiered approach, particularly as soon as year 2021, before Tier III enhancements, or if not feasible, a MHF phase-out. If the "Alternative technology assessment" at 2021 shows that Alternative Alkylation technologies have failed to achieve commercially viability or are still several years away from a legitimate technical assessment, or if ever becoming viable, would the District use this assessment to delay its currently proposed eight-year MHF phase-out? Is this assessment also intended to review the status of feasible and safe Tier III enhancement options the refineries may propose as part of the negotiation process, particularly for consistency with API-751?

TORC requests that any "Alternative technology assessment" included in a PR 1410 rulemaking framework must not conflict, be inconsistent, or add any additional burdens to what refineries are currently required to comply with under existing state regulations. For example, California refineries are already required to look at inherent safety measures under the recently enacted Process Safety Management ("PSM") regulations (Title 8 California Code of Regulations ("CCR") §5189.1(l)) adopted by the California Occupational Safety and Health Standards Board ("CalOSHA") and new California Accidental Release Prevention ("CalARP") Program 4 regulations (Title 19 CCR §2762.13) adopted by the Office of Emergency Services ("OES").

Both of these recently-enacted regulations have mirror requirements for refineries to conduct a Hierarchy of Hazard Control Analysis ("HCA"). Under these regulations, there are five triggers when refineries are required to conduct an HCA: (1) existing processes; (2) Process Hazards Analysis ("PHA") scenarios that may result in a major incident; (3) recommendations that result from a major incident investigation; (4) Method of Change review of a major change; and (5) during the design and review of new processes, new process units or facilities, and related process equipment.[14, 15]

[14] *See* 8 CCR § 5189.1(l)(1), (2).
[15] *See* 19 CCR § 2762.13(a), (b)(1)-(4).

Perhaps most significantly, both of these regulations establish risk reduction targets that must be assessed through an HCA. Specifically, the HCA requires refineries to develop recommendations to eliminate risks posed by process safety hazards "to the greatest extent feasible" using first and second order inherent safety measures.[16, 17] Any remaining risks must be reduced using passive, active, or procedural safeguards.[18, 19]

TORC emphasizes the first and second order inherent safety measure evaluation that is embedded in the HCA. According to the new PSM and CalARP Program 4 regulations, inherent safety[20, 21] is defined as:

> An approach to safety that focuses on eliminating or reducing the hazards associated with a set of conditions. A process is inherently safer if it eliminates or reduces the hazards associated with materials or operations used in the process, and this elimination or reduction is permanent and inseparable from the material or operation. A process with eliminated or reduced hazards is described as inherently safer compared to a process with only passive, active and procedural safeguards. The process of identifying and implementing inherent safety in a specific context is known as inherently safer design.
>
> - First Order Inherent Safety Measure. A measure that eliminates a hazard. Changes in the chemistry of a process that eliminate the hazards of a chemical are usually considered first order inherent safety measures; for example, by substituting a toxic chemical with an alternative chemical that can serve the same function but is non-toxic.
> - Second Order Inherent Safety Measure. A measure that effectively reduces a risk by reducing the severity of a hazard or the likelihood of a release, without the use of add-on safety devices. Changes in process variables to minimize, moderate and simplify a process are usually considered second order inherent safety measures; for example, by redesigning a high-pressure, high-temperature system to operate at ambient temperatures and pressures.

As part of the HCA, refineries must review and analyze a broad range of information related to first and second order safety measures and passive, active, or procedural safeguards. The refineries must develop risk-relevant data, identify process safety hazards, and review "all" inherent safety measures and safeguards for each identified process safety hazard.[22, 23] The refineries must also review

[16] *See* 8 CCR § 5189.1(l)(4)(E). Note that under the new PSM regulations "feasible" is defined as "[c]apable of being accomplished in a successful manner within a reasonable period of time, taking into account health, safety, economic, environmental, legal, social and technological factors." *See* 8 CCR § 5189.1(c).
[17] *See* 19 CCR § 2762.13(f)(1)-(3). Note that under the new CalARP Program 4 regulations "feasible" is defined as "[c]apable of being accomplished in a successful manner within a reasonable period of time, taking into account health, safety, economic, environmental, legal, social and technological factors." *See* 19 CCR § 2735.3(v).
[18] *See* 8 CCR § 5189.1(l)(4)(E).
[19] *See* 19 CCR § 2762.13(f)(1)-(3).
[20] *See* 8 CCR § 5189.1(c).
[21] See 19 CCR § 2735.3(cc)
[22] *See* 8 CCR § 5189.1(l)(4)(C).
[23] *See* 19 CCR § 2762.13(e)(3).

"publicly available information on inherent safety measures and safeguards."[24, 25] This review must include inherent safety measures and safeguards that have been "achieved in practice" by the refining or a related industry, as well as measures required or recommended by a federal, state, or local California agency in a regulation or report.[26, 27]

Accordingly, as detailed above, through the HCA process under the new PSM and CalARP Program 4 regulations, all California refineries, which by default includes Torrance and Wilmington, will be required to implement feasible inherent safety measures to address hazards. Through this process, at the required triggers, TORC and Valero will be required to review MHF Alkylation to determine if there are feasible alternatives (i.e., safety measures and safeguards).

Therefore, if any "Alternative technology assessment" concept is included in a PR 1410 rulemaking framework, the District's framework should be consistent with the new PSM and CalARP Program 4 HCA requirements. To this end, to avoid conflicts, inconsistencies, or additional burdens, TORC recommends that the District defer to the HCA process for any "Alternative technology assessment". Since CalOSHA and OES are the expert agencies related to PSM and hazards analysis and response, the District should defer to these agencies for any assessment of technology that address safety or hazards. We also note that API-751 is used throughout the U.S. and globally to promote safe operation of M/HF Alkylation Units, and the API is beginning to update this recommended practice.

In slide 16, District staff also indicates a "2018 – Rule adoption" for PR 1410. Moreover, the District's February 2, 2018 Rule and Control Measure Forecast currently shows PR 1410 going to the Governing Board for potential consideration in July 2018.[28]

Based on the extensive comments that TORC, Valero, and other Working Group members have provided to the District to date, and the lengthy and complex CEQA and Socioeconomic processes that will be required for the PR 1410 rulemaking effort, TORC finds it difficult to imagine how the District will be positioned to draft and release for public review and comment the following statutorily required rulemaking steps by the previously-announced July 7, 2018 target date or even by even the end of this year:

- Draft rule language
- CEQA Notice of Preparation/Initial Study;
- Draft Staff Report;
- Draft EIR;
- Draft Socioeconomic Report; and
- Revised rule language.

---

[24] *See* 8 CCR § 5189.1(l)(4)(D). A CalOSHA representative has tentatively stated that this information is limited to information in English from the United States.
[25] *See* 19 CCR § 2762.13(e)(3).
[26] *See* 8 CCR § 5189.1(l)(4)(D).
[27] *See* 19 CCR § 2762.13(e)(3).
[28] *See* http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2018/2018-feb2-018.pdf?sfvrsn=6.

Attachment A
TORC's Comments and Responses
February 6, 2018

Considering the complexity of these regulatory requirements, especially the CEQA and Socioeconomic Report, that are needed to address the District's current PR 1410 conceptual rulemaking structure, the current schedule seems infeasible. Nevertheless, TORC confirms through these comments that we are prepared to review the tiered "approach" with District staff on February 7th, in keeping with the spirit of Governing Board Chair Burke's and Refinery Committee Chair Parker's direction at the end of the January 20th Refinery Committee meeting.

In summary, we have taken this opportunity to comment on the District's January 20th presentation and reintroduce technical information that supports the efficacy of MHF Alkylation in advance of TORC's meeting with District staff on February 7, 2018. TORC feels this is even more important after its Refinery Manager was only allowed two minutes at the January 20th to comment on staff's presentation.

We are committed to engaging in good faith with all parties involved in the PR 1410 rulemaking process to set the stage for a potential amicable resolution, following on the direction from both Chairs at the January 20th meeting. In addition to the February 7th meeting, we are also planning to meet with the activist group, TRAA, sometime in the very near future.

To put the continuing discussions into the appropriate positive context, we recommend that TORC and District staff meet as soon as practicable to resolve outstanding, unresolved, and unaddressed technical issues primarily associated with the District's "uncertainty" about the efficacy of MHF, despite the fact that both refineries operate under District permits that were issued more than 20 years ago for TORC and ten years plus for Wilmington, without either refinery ever having had an offsite HF release in 100 years of combined operations.