**Bridget McCann**
Manager, Technical and Regulatory Affairs

November 6, 2018

Michael Krause
Manager, Planning and Rules
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Via e-mail at: mkrause@aqmd.gov

***Re: Estimation of future costs for equipment covered by SCAQMD Proposed Rule 1109.1, Refinery Equipment***

Dear Mr. Krause,

Western States Petroleum Association (WSPA) appreciates this opportunity to provide feedback on South Coast Air Quality Management District (SCAQMD or District) Proposed Rule 1109.1, Refinery Equipment. The District has stated that this proposed rulemaking is part of the District's larger project to transition facilities in the Regional Clean Air Incentives Market (RECLAIM) program to a command-and-control structure (i.e., the "RECLAIM Transition Project").

WSPA is a non-profit trade association representing companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in five western states including California. WSPA has been an active participant in air quality planning issues for over 30 years. WSPA-member companies operate petroleum refineries and other facilities in the South Coast Air Basin that are within the purview of the RECLAIM Program administered by the South Coast Air Quality Management District's (District or SCAQMD) and will be impacted by PR1109.1. We would like to comment on SCAQMD's past use of the Marshall & Swift equipment index (M&S Index) for the estimation of control costs for determining cost effectiveness.

California Health & Safety Code and SCAQMD rules for establishing Best Available Retrofit Control Technology (BARCT) standards require the District to demonstrate that a given standard is both technically feasible and cost effective.[1] Cost effectiveness is defined as the annual cost, in dollars, of the control alternative, divided by the annual emission reduction potential, in tons, of the control alternative.[2] If the cost per ton of emissions reduced is less than the established cost effectiveness threshold, then the control method is considered to be cost effective. Cost effectiveness evaluations consider both capital (including equipment, shipping, engineering, and installation) and operating (including expenditures associated with utilities, labor, and replacement) costs. SCAQMD has used a variety of cost effectiveness thresholds, but recently has been applying a cost effectiveness threshold to BARCT rulemakings of $50,000 per ton of $NO_X$ emissions reduced.

[1] California Health & Safety Code §40406, Best Available Retrofit Control Technology.

[2] California Health & Safety Code §40920.6.

**SCAQMD's use of non-industry specific M&S Index for Cost Estimation**

To estimate costs of control alternatives, SCAQMD has recently relied on the M&S Index. The M&S Index is intended to represent a trend estimate for installed equipment costs for the period of 1914 to present day. The M&S Index is updated quarterly and is based on the national average for 47 different industries, including: cement manufacturing, chemical manufacturing, paper manufacturing, petroleum, mining and milling, clay products, glass manufacturing, paint manufacturing, rubber manufacturing, electric power equipment, refrigeration, and steam power. Per the Core Logic Q4 2016 cost publication:

> "Costs representing industrial and manufacturing engineering, machinery, mechanical and electrical installation, office equipment, furniture, fixtures, hand tools, and other items are combined in the proportion to their average occurrence in each of the listed industries. These are additionally weighted by a factor representing the general business activity and status of the economy at the time of computation."[3]

According to SCAQMD Staff, the District has used the M&S Index for cost estimation for many years and previously would reference the index through its publication in the *Chemical Engineering* monthly journal. Publication of the M&S Index in that journal was eventually discontinued when Core Logic purchased the M&S Index. Per SCAQMD Staff, the District now regularly obtains M&S Index information through a comprehensive Core Logic report. While this reference contains cost indices for each of the specific industries covered by the M&S Index, SCAQMD Staff typically use the more general M&S Index covering all industry sectors when performing cost effectiveness analyses for BARCT or other purposes.[4]

In addition, we note that the M&S Index provides data on equipment only; it does not include an input for project labor costs. Thus, cost effectiveness analyses being conducted for the refinery/petrochemical sector have relied on this generalized index that is not industry-specific and provides limited cost data.

**Alternative Cost Indices for Industrial Cost Estimation**

For the refining sector, there are several alternative cost indices which could be used for estimation of potential control equipment project costs which would be more appropriate to the sector. These include:

- IHS Markit Downstream Capital Costs Index (DCCI): The DCCI tracks "the costs of equipment, facilities, materials and personnel (both skilled and unskilled) used in the construction of a geographically diversified portfolio of 40 refining and petrochemical construction projects."[5]

[3] Core Logic Q4 2016 Cost Publication obtained via personal communication on 9/11/18 between Yasmine Stutz, Ramboll and Tom Lee, SCAQMD Senior Air Quality Engineer, BACT Team.

[4] Personal communication on 9/12/18 between Yasmine Stutz, Ramboll and Shah Dabiri, SCAQMD Program Supervisor.

[5] IHS Markit: https://ihsmarkit.com/Info/cera/ihsindexes/index.html

- Nelson Farrar (N-F) Cost Index: The N-F cost index was established in 1946, and was published in the *Oil and Gas Journal* through 2017. It has since been discontinued. The N-F cost index was heavily weighted towards the petroleum and petrochemical industries, and included individual indices for construction costs of pumps and compressors, electrical machinery, internal combustion engines, instruments, heat exchangers, miscellaneous equipment, materials component, labor component, and a refinery inflation index.

As explained above, these indices differ from the M&S Index in their industrial focus as well as the included cost components. Table 1 presents a comparison of each index's included cost components and whether it is specific to the refinery and/or petrochemical industry.

**Table 1: Cost Index Component Comparison**

| Index | Specific to Refinery/ Petrochemical Industry | Labor | Engineering and Supervision | Equipment | Materials |
|---|---|---|---|---|---|
| M&S Index | No | | | X | |
| DCCI | Yes | X | | X | X |
| N-F Construction Cost | Yes | X | | X | X |
| N-F Refinery Inflation | Yes | X | | X | X |

To understand how the cost projects from these different indices might differ, Ramboll gathered data for each of the above cost indices for 2000-2018 period, with the exception of the N-F cost index, which was not available after 2017.[6] Because the cost indices were established in different years, data was normalized to the year 2000. Results of the index comparisons are presented in Figure 1.

[6] DCCI data source: https://ihsmarkit.com/Info/cera/ihsindexes/index.html

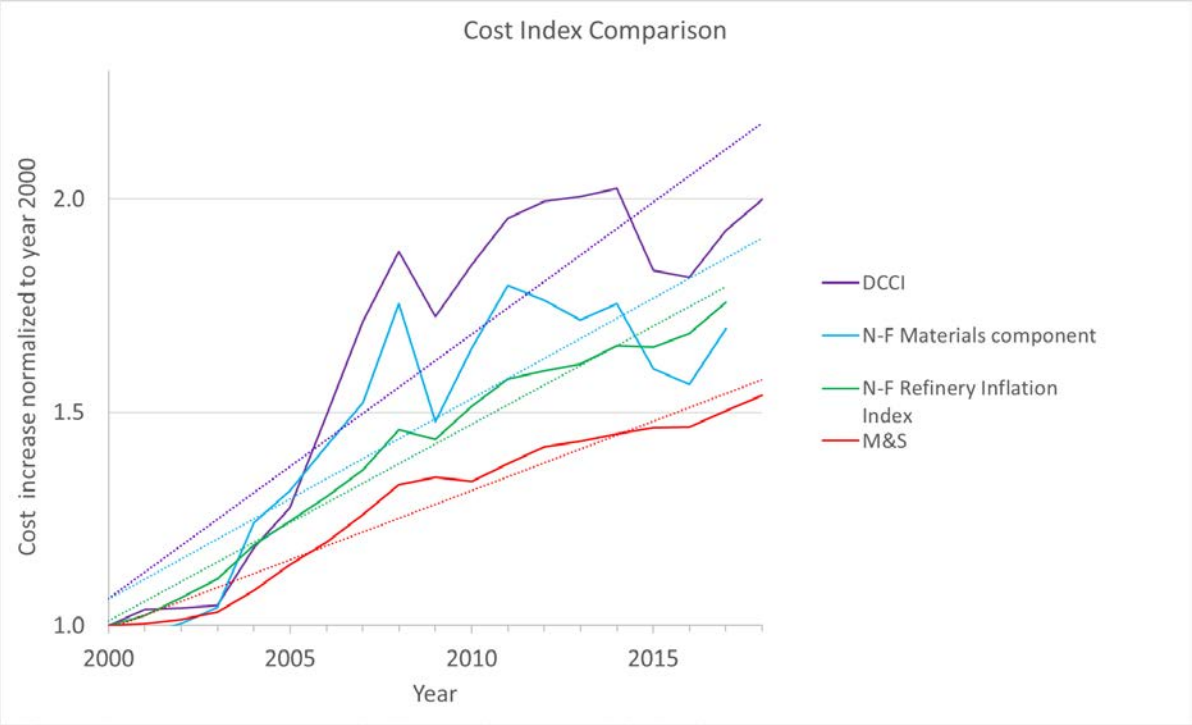
N-F data source: Subscription to Oil and Gas Journal https://www.ogj.com/index.html

https://www.ogj.com/articles/print/vol-110/issue-1a/processing/annual-refinery-construction.html

M&S data source: 2000 – 2005 data extracted from graphics at https://www.google.com/search?rlz=1C1NHXL_enUS761US761&biw=1821&bih=841&tbm=isch&sa=1&ei=3lGdW-ypD6vU5gK2oLJY&q=marshall+and+swift+cost+index&oq=marshall+%26+swift&gs_l=img.3.3.0i30l2j0i8i30l6j0i24l2.43535.48549..52253...0.0..0.234.2265.0j15j1.....1....1..gws-wiz-img.....0j0i67j0i5i30.cAir3q5noBs

2006-2018 data provided via personal communication on 9/11/18 from Tom Lee, SCAQMD Senior Air Quality Engineer, BACT Group

**Figure 1: Comparison of Industrial Project Cost Indices, Normalized to Year 2000**




As indicated in Figure 1, the projected range in the cost inflation differs considerably among the various applicable indices. Table 2 shows a comparison of the various cost indices values in 2018, normalized to 2000. The percent difference between the various cost indices 2018 values and the M&S 2018 value is included in the table. Note that because no 2018 cost index was available for N-F, costs were projected for this index based on a trendline.

The M&S Index which has been used by SCAQMD for BARCT cost effectiveness is on the low end of the distribution and there is a large discrepancy between the M&S Index when compared to the DCCI and N-F cost indices. This outcome may be due to the fact that, as noted above, the M&S Index does not include an input for project labor costs and is not specific to the refinery or petrochemical sectors.

**Table 2: Comparison of 2018 Cost Indices Relative to 2000**

| Cost Index | 2018 Value Normalized to Year 2000 | Percent Difference vs M&S Index |
|---|---|---|
| M&S | 1.5 | --- |
| DCCI | 2.0 | 30% |
| N-F Materials Component | 2.0 | 28% |
| N-F Refinery Inflation | 1.8 | 19% |

**Representative Cost Index for Industrial Cost Estimation**

The DCCI and N-F cost indices are actually constructed to reflect project costs in the U.S. refining/petrochemical industries, whereas the M&S Index is a general index not specific to the refining/petrochemical industries. As shown above, the DCCI and N-F cost indices indicate that the cost of refinery construction is likely 20–30% higher than would be suggested by an estimate using the M&S Index. For this reason, we believe the M&S Index should not be used for SCAQMD cost effectiveness estimates for refinery sector projects. Given that the N-F index has recently been discontinued, the DCCI index is thus the most representative current index of project costs in the refining/petrochemical industries.

Additionally, we note that the DCCI index is a national scale index and does not necessarily reflect the higher labor costs in the State of California. California refinery project costs are potentially impacted by requirements imposed under California Senate Bill 54.[7] The US Bureau of Labor Statistics May 2017 report shows that the annual mean wage for Construction and Extraction Operations in California was 16% higher than the nationwide value.[8] We therefore recommend that this locational factor should also be considered when determining the cost effectiveness of refinery emissions control projects in Southern California.

We recommend that the DCCI index, and the location factor when possible, be used where cost escalation is needed to estimate project cost effectiveness for refinery emissions control projects.

WSPA appreciates the opportunity to provide comments related to PR 1109.1. We look forward to continued discussion of this important rulemaking. If you have any questions, please contact me at (310) 808-2146 or via e-mail at bridget@wspa.org.

Sincerely,

Cc: Dr. Philip Fine, SCAQMD
Heather Farr, SCAQMD
Tom Umenhofer, WSPA
Patty Senecal, WSPA

[7] California Health & Safety Code §25536.7.

[8] US Department of Labor, Bureau of Labor Statistics May 2017 National and State Occupational Employment and Wage Estimates, Occupation code 47-0000, Construction and Extraction Occupations. (National Data: https://www.bls.gov/oes/current/oes_nat.htm#47-0000; California State Data: https://www.bls.gov/oes/current/oes_ca.htm)