THIRD PARTY REVIEW:
DRAFT SOCIOECONOMIC IMPACT ASSESSMENT FOR PROPOSED RULE 1109.1 – EMISSIONS OF OXIDES OF NITROGEN FROM PETROLEUM REFINERIES AND RELATED OPERATIONS

Submitted to:
South Coast Air Quality Management District

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INTRODUCTION AND PURPOSE OF THIS STUDY

The South Coast Air Quality Management District (South Coast AQMD or District) is responsible for regulating stationary sources of air pollution in the South Coast Air Basin of Southern California, which includes Los Angeles, Orange, Riverside, and San Bernardino counties, excluding less populated portions of Los Angeles, Riverside, and San Bernardino counties. The agency has regulated emissions at petroleum refineries and related facilities for over three decades. Since 1993, firms in these industries have been subject to the Regional Clean Air Incentives Market (RECLAIM) program, a market-based emissions reduction approach for facilities with Nitrogen Oxide (NOx) and Sulfur Oxide (SOx) emissions greater or equal to four tons per year.

Proposed Rule 1109.1, Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations (PR 1109.1), is intended to facilitate the transition of petroleum refineries and related facilities from the RECLAIM program to a command-and-control regulatory structure. The staff of the South Coast AQMD has conducted a socioeconomic impact analysis of PR 1109.1, the results of which are contained in the report, "Draft Socioeconomic Impact Assessment for Proposed Rule 1109.1–Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations," hereafter referred to as the Socioeconomic Impact Assessment Report or the SIA. The South Coast AQMD has engaged Kleinhenz Economics to serve as an independent reviewer of the socio-economic impact analysis contained in the SIA.

The present report summarizes the findings of the independent, third-party review of the SIA Report, as conducted by Kleinhenz Economics. The review examined the overall contents of the SIA Report with particular attention devoted to the data, assumptions, modeling, and the analytical results contained in the report.

GENERAL COMMENTS ON REPORT

The SIA Report includes the following components:

1. Describes the regulatory history and legislative mandates pursuant to the affected industries
2. Identifies affected industries, providing characteristics of these industries
3. Describes the operating assumptions used for the economic impact analysis of PR 1109.1
4. Evaluates the economic impact of PR 1109.1 on employment and the regional economy
5. Evaluates the potential impact of PR 1109.1 on emissions reduction and health benefits
6. Evaluates cost-effectiveness of alternatives to PR 1109.1

This third-party review is an assessment of items 3, 4, and 5 above, specifically the methodology, data and assumptions, and results associated with the economic impact analysis and health benefit calculations of PR 1109.1.

STRENGTHS AND WEAKNESSES OF THE STUDY

In general, the approach adopted in the SIA is reasonable, as are the results in terms of costs, jobs impact, and health benefits. The strengths of the study are as follows:

- There is a known number of affected firms in the industries affected by PR 1109.1, and the number of industries and firms is relatively small.
- Given the length of time, the affected industries have been subject to air quality regulations, there is substantial informationon both regulation and compliance costs.
- There is a well-established methodology for evaluating the economic impact of PR 1109.1 in terms of data, assumptions, and modeling.
- When policy changes are evaluated for their economic impact, input prices are typically assumed to be constant. This may be a reasonable assumption for most policy analysis, but PR 1109.1 is expected to generate downstream changes in fuel prices. Because the impact on input prices and fuel prices is of interest, the study extends its policy analysis by estimating impacts of PR 1109.1 on downstream input prices.
- Furthermore, in order to quantify the impact of PR 1109.1 on consumers and businesses in the South Coast Region, the South Coast AQMD commissioned a separate analysis that estimates the impact of PR 1109.1 on fuel prices, demand, and consumption in the South Coast region, which estimated a negligible impact on fuel prices.[1]

The SIA uses the REMI model to estimate the ripple or multiplier effect of capital expenditures and operating outlays associated with PR 1109.1 compliance. Of particular interest is the extent to which PR 1109.1 triggers job creation in the local economy that might otherwise offset potential job losses resulting from implementation of PR 1109.1 measures. In principle, industries that may experience job creation may include construction, maintenance, and to the extent that it is fabricated locally, emissions control equipment itself. SIA report Table 17 shows that job impacts in the affected industries will be minimal, that there will be substantial job generation in the construction industry, and that other industries will experience minimal job changes. This is expected, given that the refining and related industries subject to PR 1109.1 are capital intensive (less than 2,000 positions in a region with nearly 12 million jobs), and that construction costs associated with PR 1109.1 implementation account for 80% of total installed cost (TIC) estimates.

In all, the known features of the industry, the availability of historical industry and compliance data, and the study's enhancements to existing and well-established impact methodology presumably increase the reliability of the estimated equipment, compliance, and administrative costs that are associated with PR 1109.1.

The following elements in the study may require attention:

- Assumed target reduction in emissions to 7.83 tons per day
- The assumed inflation rate factor used in cost estimates
- The choice of discount rate
- The assumed lifespan of emissions control equipment across the affected industries

[1] "The Impact of PR 1109.1 on Fuel Prices and Demand in the South Coast," by E. Muehlegger (2021).

Each of these elements will be analyzed for their implications regarding projected compliance costs, estimated job impacts, and estimated health benefits associated with PR 1109.1.

Choice of Target Reduction in Emissions

The SIA established the target reduction in emissions as follows.

> The 7.83 ton per day emission reduction estimate represents staff's assumption regarding the units that would qualify to meet the Table 2 conditional limits with all other units meeting the Table 1 emission limits. (SIA v.7, p. 15)

For the purpose of the SIA, the emission reduction target is determined outside the analysis by the South Coast AQMD rules staff, hence is parametrically given in the SIA. Still, there is no context for this assumed target. While it would be excessive to include the referenced tables and provide a detailed discussion of their contents and relevance to the SIA, the SIA should briefly and concisely explain the rational for this target.

Furthermore, as a part of establishing the validity of the results contained in the SIA, it may be advisable to discuss within the SIA: a) whether the assumed emissions reduction is subject to modification, and b) if so, whether sensitivity analysis of results to changes in the assumed emission reduction target be considered. Minimally, there should be some mention of the extent to which the results of SIA are sensitive to the assumed or other values of emission reduction.

Inflation Factor Used

As a part of the determining the economic impact of PR 1109.1, various costs must be estimated, including estimates of total installed cost (TIC) for the equipment, costs of operations and maintenance (O&M), and costs administrative activities. These costs are incurred over a period of time which is assumed to be 25 years across all of the affected industries. Due to the unique specifications associated with retrofitting existing facilities with proposed pollution control equipment, costs were generally obtained directly from the refiners and supplemented as needed by information from other sources.

For the purpose of modeling the economic impact of PR 1109.1 in the REMI framework, all input costs must be adjusted to a common baseline time period. The year 2018 was selected as the base year for the analysis, and as stated in the report, "staff conservatively escalated all costs at 4% annual inflation rate to the 2018 dollar year" (SIA v.7, p. 14). Further, it is asserted that is a "conservative" assumption.

It is essential for the integrity of the impact analysis to use the appropriate inflation rate and substantiate its applicability to the task at hand. In that vein, the study should explain the rationale for the assumed inflation rate, whether it be 4% as shown in the study or any other rate to be used.

In fact, a 4% inflation rate seems high, given that most gauges of inflation have rarely exceeded three percent in recent memory. Therefore, one might compare the assumed inflation rate with

commonly cited inflation rates such as the CPI or GDP deflator, and explain why the assumed rate aligns with, exceeds, or falls short of the typical measures. This gives the reader a point of reference to better understand the inflation adjustments that were made in the study.

Finally, use of the term "conservatively" bears some elaboration, As described by staff, potential cost estimates will fall in a range that depend on the underlying assumptions used. There is a preference to use cost estimates in the high end of the range so as to avoid underestimating the costs to be borne by the affected industries. In this sense, "conservative" should be interpreted as the *likely high cost scenario* that has been identified from the range of possible cost scenarios. A clarification along these lines would help the reader to better comprehend how a given cost estimate was selected.

Choice of Discount Rate

As stated in various sections of the report, the SIA is predicated upon assumed discount rates of 1% and 4%. Earlier versions of the SIA reported TIC estimates under assumed discount rates of both 1% and 4%, but SIA v.7 presented summary results for each of the rates scenarios (Table 15, SIA v.7, p. 28), limiting reporting of detailed results for the eight equipment category exclusively to the 4% scenario. Health benefits are estimated using both discount rates.

No discussion is provided to establish the validity of the discount rates that were used in the analysis, nor is there any discussion of how sensitive the results of the analysis may be to different discount rates. Furthermore, as a part of establishing the validity of the results contained in the SIA, it is recommended that:

- The SIA include a general description of how discount rates affect calculated net present value (NPV), and how higher discount rates imply lower present values of future costs and benefits while lower rates imply higher present values.
- Justification be provided for the rates chosen in a concise, high-level discussion. This may include discussion of whether the same or different discount rates ought to be applied to NPV of benefits and NPV of costs.
- Address the matter of sensitivity analysis as it relates to changes in the discount rate. If the results are generally not sensitive to changes in the discount rate, a statement to that effect is sufficient. Similarly, if "the industry standard" implies a specific rate or range of rates are typically used in impact studies such as this, a statement to that effect accompanied by a brief explanation to describe the rationale behind the industry standard ought to be satisfactory.
- Consider whether the results of the analysis should be aligned so that the benefits and costs can readily be compared under the same assumed discount rate.

Assumed Lifespan of Emissions Control Equipment

The SIA analysis eight categories of equipment in terms of capital costs, operations and maintenance costs, and total costs. For each category, it is uniformly assumed that the lifespan of the equipment is 25 years. This assumption is useful because one can more easily align future costs

across equipment categories for comparison purposes. Still, one must explain whether it reasonably represents actual lifespans of the equipment to be regulated under PR 1109.1.

It seems plausible that different types of equipment have different estimated lifespans, depending on their application, the frequency of use, and other characteristics of the equipment, and conditions in their operating environment. Even if one can reasonably assume a uniform lifespan for the equipment, one must ask whether a 25-year horizon is appropriate. Finally, one must consider how sensitive the results are to reasonable changes in the time horizon, for example, whether it is cut to 20 years or increased to 30 years.

Justification for such an assumption should be discussed in the report. If these details are discussed elsewhere in source material related to PR 1109.1 or in a companion report, a high-level summary of this background information and the rationale behind a 25-year lifespan would enhance the validity of the SIA findings.

CONCLUSION

Any economic analysis relies heavily on working assumptions. Assumptions that are reasonable and are supported by sufficient background information increase the validity of the economic analysis and its implications. In the absence of sufficient background information, questions arise about the reliability of the results and their applicability. The above recommendations should serve to reinforce the validity of the SIA and its contents.

Finally, it is suggested that the South Coast AQMD include in the SIA a discussion of the relative costs and benefits of PR 1109.1 in comparison to other similar mitigation measures, to better understand more broadly, fundamentally, and transparently the "return on investment" associated with a dollar spent on PR 1109.1 versus a dollar spent on other mitigation measures.