December 14, 1988

MEMORANDUM

SUBJECT: Review of Valero Hydrocarbons BACT Analysis

FROM: Allen C. Basala, Chief
Economic Analysis Section, ASB (MD-12)

TO: Anthony Wayne, Chief
Texas, New Mexico Enforcement Section (6T-ET)
Region VI

This memo is in response to your request of November 8. In our judgment, the Valero hydrocarbons BACT economic analysis is unacceptable. The employed methodology is not supported as valid for purposes of project budgeting and cost-effectiveness assessments. To remedy this deficiency, Valero should redo their analyses using more conventional techniques. Also, the BACT analysis fails to include other alternate control options which are potentially as effective as, and less costly than, those control techniques presented.

Frank Bunyard's detailed review is attached.

cc: G. McCutchen
F. Bunyard
E. Noble
D. Solomon

December 8, 1988

MEMORANDUM

SUBJECT: Review of Valero Hydrocarbons BACT Analysis

FROM: Frank L. Bunyard
Economic Analysis Section, ASB (MD-12)

TO: Allen C. Basala, Chief
Economic Analysis Section, ASB (MD-12)

Per your request of November 8, I have reviewed the subject document and prepared the following comments regarding my concerns on the economic issues of the BACT proposals offered by Valero. I have also coordinated our reviews with Eric Noble of the Noncriteria Pollutants Programs Branch for his technical insights in preparing these comments. In addition, I have discussed these thoughts at some length with Stanley Spruiell and Rick Bartley of EPA Region VI staff by phone earlier in this week.

My major concerns with the technical, cost and economic issues are summarized as follows:

(1) Inconsistent annualization methods to estimate cost- effectiveness

(2) Omission of analyses of alternatives, such as combined cycle steam generation for gas turbines and retrofitting dry controls on internal combustion engines (ICE)

(3) Questionable incorporation of downtime in the operating costs and unreasonable concerns regarding catalyst regeneration and/or disposal, brine disposal and water purification costs.

The following discussion will explore each of these points in detail. First, my chief concern is the annualization method used in the derivation of the cost-effectiveness figures that are the focus of the arguments presented by Valero.

The method, as discussed in Section 3, page 20, of the Valero BACT analysis, uses the sinking fund, or future value method, to determine cost-effectiveness. Standard cost estimating methodologies used by the Agency program offices are based on present value methods. All the criteria for EPA rulemaking, such as NSPS, and

NAAQS/PSD program implementation, such as RACT determinations and BACT determinations, employ this present value method. This philosophy is in agreement with both academicians and practitioners familiar with modern financial theory in capital budgeting and asset allocation activities.

The estimate of $14,724 per ton, which is derived from the future 10-year value of $53,947,000, is equivalent to a $5676 per ton NOX removed for Selective Catalytic Reduction (SCR) technology presented in Table 3, page 25. Similarly, the $5,865 for water injection in Table 2 is equivalent to $1545 per ton NOX removed; and, the $9,292 in Table 3 for SCR for the ICE engines is equivalent to $ $3,582 per ton. In short, the choice of a present value versus future value metric is a time preference issue that should not be an argument introduced into the test of reasonableness of BACT determinations. To repeat, Agency standardized procedures use the present value method.

I concur with Valero's concept for normalizing annualized costs for projects with nonuniform cash outlays, such as replacing catalyst. I also concur conceptually with most of the remaining line-by-line items, with the exception of specific items, such as those discussed below (e.g., lost production).

On the second point, Valero excludes discussion on alternative technical options, which would include: (1) operating some gas turbines in the combined cycle mode, (2) retrofitting existing ICE with new heads to meet the 2 gram NOX per horsepower-hour emission limit or,(3) purchase or rental of new simple cycle gas turbines capable of meeting the NOX limit with little or no water or steam injection.

Regarding the discussion on page 32 of the Valero analysis, Valero could have included a discussion on the viability of installing one or more combined cycle gas turbines rather than utilizing all simple cycle units. The addition of heat recovery steam generators and steam turbines would increase plant efficiency and, as a side benefit, make steam available for injection into the gas turbines. Steam improves the heat rate of the gas turbines and reduces the maintenance impacts associated with water injection. I understand that Solar Turbines was promoting this concept a few years ago.

Concerning the technical discussion of ICE's on page 47, Valero did not address retrofitting the ICF's with the new heads that would would achieve the desired emission limit of 2 gram NOX per hp-hr without further control. This would be cheaper and more reliable than SCR technology on existing ICE's in achieving the same environmental objective. Alternatively, newer model engines with new NOX control technology could possibly be rented.

On the third issue regarding inclusion of specific operating cost elements, we should not concur with the philosophy underlying the assumptions for downtime and associated lost production, brine disposal, and water purification problems. We believe the case for maintenance problems and including lost production as an out-of-pocket expense is overstated. We believe that expensing a full-time technician to monitor these turbines and engines should diminish potential downtime problems. Accordingly, adding an expense for lost production is a redundant item. Furthermore, enough experience should now be available on both wet controls and SCR to prevent, or at least be prepared for, potential maintenance problems. If not, then the source should consult with equipment manufacturers, users, and states for documentation of maintenance experience regarding SCR. As a minimum, EPA should request more analyses of dry controls in the Valero permit application.

As for brine disposal, this requirement is not unique to Corpus Christi. This is a problem common to all facilities producing steam, as well as gas turbines with water injection. Therefore, this is not an argument for unreasonableness. Likewise, catalyst regeneration is a routine recycling operation carried out by the catalyst manufacturer. Regarding the discussion on page 28, the concerns with handling the handling and disposition (recycling) of vanadium pentoxide as a hazardous waste is a legitimate issue; however, proper care of this material is a normal cost of doing business and should not be considered as an economic argument, without additional documentation.

The loss in efficiency attributed to water injection also seems to be excessive. The permit presumes (to meet a 42 ppm NO2 limit) a fuel penalty of at least 2.2% for a 0.62:1 water-to-fuel ratio. This is about 3 ½ times the impact reported in the background document for the gas turbine NSPS. Incidently, both the Solar and Allison gas turbines may be able to meet the 25 ppm limit with water injection at a water-to-fuel ratio less than 1.0.

In summary, Valero has not presented sufficient information to render the emission limits of 25 or 42 ppm for gas turbines and 2 grams per hp-hr for ICE inappropriate.