BEFORE THE ENVIRONMENTAL APPEALS BOARD
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

In the Matter ExxonMobil Chemical Company Baytown Olefins Plant	)	Appeal No. PSD 13-___
	)	PSD Permit No. PSD-TX-102982-GHG

PETITION FOR REVIEW OF PREVENTION OF SIGNIFICANT DETERIORATION PERMIT ISSUED BY REGION VI FOR EXXONMOBIL CHEMICAL COMPANY, BAYTOWN OLEFIN PLANT

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I. INTRODUCTION AND STATEMENT OF FACTS

Pursuant to 40 C.F.R. § 124.19(a), the Sierra Club, petitions for review of the conditions of the Prevention of Significant Deterioration (PSD) Permit Number PSD-TX-120982, issued by the United States Environmental Protection Agency, Region 6 ("Region") for a proposed construction project to add an ethylene production unit at an existing major source. The facility, the Baytown Olefins Plant ("Baytown") is proposed by ExxonMobil Chemical Company ("Exxon" or "ExxonMobil") and would be located in Harris County, Texas. The permit from the Region is dated November 25, 2013, and notes that it becomes effective thirty days later unless review is requested pursuant to 40 C.F.R. § 124.19. A copy of the Final PSD permit is attached as Sierra Club Exhibit 1. The thirty day period in which to file this review ended on December 25, 2013, which is a holiday. This petition is therefore timely filed on the following business day, December 26, 2013. 40 C.F.R. § 124.20(c).

A. Greenhouse Gas Prevention of Significant Deterioration Permitting Process.

Regulation of greenhouse gases (GHG) under the PSD and Title V provisions of the Clean Air Act is relatively new. In 2007, the Supreme Court held that GHGs unambiguously qualify as an "air pollutant" under the Clean Air Act and are subject to regulation. *Massachusetts v. EPA*, 549 U.S. 497, 528–32, (2007). In 2010, EPA issued a final rule (75 FR 31514, June 3, 2010) that "tailors" the applicability provisions of the PSD and Title V programs to enable EPA and states to establish GHG permitting requirements for new stationary sources or major modifications (the "Tailoring Rule"). Effective July 1, 2011, the Tailoring Rule requires all sources that emit or have the potential to emit at least 100,000 tons per year ("tpy") of carbon-dioxide equivalent ("CO_2e") and that undertake a modification that increases net emissions of

GHGs by at least 75,000 tpy CO_2e to obtain a permit under the PSD requirements. 75 FR 31516, June 3, 2010.

For states or jurisdictions that have not issued approved state implementation plans ("SIP") for GHGs, EPA is the responsible agency for GHG PSD permitting.[1] In Texas, EPA Region 6 is the permitting authority for GHG PSD permits. Since 2011, the Region has received over 60 applications for GHG PSD permits from new sources or major modifications.[2] These permit applications represent tens of millions of potential GHG emissions each year. The Baytown facility alone, if the permit is finalized, would be allowed to emit more than 1.4 million tons of CO_2e each year. Other EPA regional offices, as well as local state permitting authorities, are currently considering similar applications for projects that collectively would result in tens of million to hundreds of millions of tons of new GHG emissions each year.

Lower natural gas prices have spurred a rush of new petrochemical production facilities in the United States, particularly along the Gulf Coast. These new facilities, like Baytown, will account for substantial GHG emissions, and it is critical that the Region and other responsible agencies ensure that GHG emissions are controlled to the greatest extent required by law. The PSD permitting process is vital to the development and implementation of technologies and practices that will limit the emissions of CO_2 and other GHGs. Yet the Region is still struggling with the implementation of effective permitting limits that will result in a meaningful application of the best available control technology ("BACT"). To date, the permits issued by the Region have focused on energy efficient processes as the basis for BACT. Energy efficiency is vital to

[1] Pursuant to a Federal Implementation Plan issued December 23, 2010, U.S. EPA is the PSD permitting authority for Greenhouse Gas emissions in Texas. 75 Fed. Reg. 81,874 (Dec. 29, 2010); *see also Texas v. EPA*, 726 F.3d 180 (D.D.C. 2013) (dismissing challenges to the federal implementation plan for Texas).

[2] http://yosemite.epa.gov/r6/Apermit.nsf/AirP

controlling GHG emissions and must be considered in the BACT analysis, but the potential emissions reductions achievable through add-on control technologies such as carbon capture and sequestration ("CCS") are much greater than efficiency alone. Typical CCS estimates assume that 90% of CO_2 can be removed from waste streams to be stored permanently underground. Given the tens of millions of tons of annual new GHG emissions currently undergoing permitting in Texas alone, the installation of CCS on even a fraction of those facilities would result in large GHG emission reductions.

The permitting of facilities in Texas and along the Gulf Coast also offers a unique opportunity to pursue the deployment of CCS technologies. A recent study completed by the U.S. Geological Survey concluded that the Gulf Coast, or "Coastal Plains" region, contains 65 percent of the country's estimated accessible carbon storage resources. (*See*, Ex. 2, Sierra Club Comment, July 8, 2013 ("SC Comments") at 2.)[3] New facilities in Texas, such as the Baytown Plant, have a unique opportunity to consider the development of these storage resources that could substantially lower their GHG emission profiles. The Region therefore has an obligation to thoroughly and accurately analyze CCS as a GHG control alternative in the BACT process. Unfortunately, the Region has fallen short of its obligations and has issued numerous draft and final GHG PSD permits that are based on faulty and incomplete BACT analyses. The Baytown permit is just one example of a permitting decision that falls short of the Clean Air Act's requirement to establish appropriate GHG emission limits.

Sierra Club filed this petition to request that the Environmental Appeals Board ("Board" or "EAB") grant review to consider this permit because it exemplified the Region's inadequate

[3] U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013, National assessment of geologic carbon dioxide storage resources—Results: U.S. Geological Survey Circular 1386, 41 p., http://pubs.usgs.gov/circ/1386/

implementation of the PSD permitting program in general for GHGs. Specifically, Sierra Club requests that the Board grant the petition to review Region's basis for rejecting CCS as a pollution control alternative. Sierra Club further requests remand of the final permit for the Baytown plant with instructions to the Region to conduct a full and appropriate analysis of CCS in the BACT analysis. Sierra Club is not asking the Board to determine at this time whether CCS is BACT for Baytown; rather, Sierra Club asserts that the record as it currently stands is inadequate to support the Region's determination that CCS is not BACT.

B. Procedural History

Exxon submitted its application to the Region for a PSD permit for Baytown on May 21, 2012 ("Application"). (Ex. 3.) On October 16, 2012, Exxon submitted supplemental information addressing, among other things, the GHG BACT analysis for CCS ("Oct. 16, 2012 Supplement"). (Ex. 4.) Exxon submitted various other documents and supplemental information responding to questions from the Region. (*See, e.g.*, Feb. 8, 2013 email to Aimee Wilson, Ex. 5..) On June 7, 2013, the Region issued the Draft Permit (Ex. 6) and the Statement of Basis ("SOB") (Ex. 7) for the Baytown project. Sierra Club submitted timely comments to the Region on July 8, 2013 ("SC Comment"). (Ex. 2.) Exxon submitted additional material to the Region responding to Sierra Club's comments and other issues, which are available on the Region's website.[4] On November 25, 2013, the Region issued the Final Permit (Ex. 1) and its Response to Comment ("RTC") (Ex. 8).

[4] http://yosemite.epa.gov/r6/Apermit.nsf/AirP

II. THRESHOLD PROCEDURAL REQUIREMENTS

Sierra Club satisfies the threshold requirements for filing a petition for review under Part 124. Sierra Club has standing to petition for review of the permit decision because Sierra Club and its members participated in the public comment period on the draft permit. 40 C.F.R. § 124.19(a). (Ex. 2, SC Comments.) The issues raised by Sierra Club below were raised with the Region during the public comment period or are directly related to the Region's response to other comments (and therefore not reasonably ascertainable during the comment period). Consequently, the Board has jurisdiction to hear Sierra Club's timely request for review.

III. ISSUES PRESENTED FOR REVIEW

Sierra Club respectfully requests Board review pursuant to 40 C.F.R. § 124.19 of the following issues:

1. Whether the Region clearly erred by rejecting CCS as economically infeasible based on a comparison to total project costs instead of a cost-effectiveness analysis. And, even if not clear error, whether the Board should grant review to correct an important misapplication of its prior authority implementing BACT for greenhouse gas emissions.

2. Whether the Region clearly erred by failing to adequately explain its decision to reject CCS as economically infeasible because the record lacks a design basis and other details necessary to evaluate costs of CCS. And, even if not clear error, whether the Board should review this issue because the level of detail required in cost-effectiveness analyses has important policy implication for implementing BACT for greenhouse gas emissions.

3. Whether the Region clearly erred by not following the methodology required by the NSR Manual and Control Cost Manual for CCS in Step-4 of the BACT analysis. And, even if not clear error, whether the Board should review this issue because it has important policy implication for implementing BACT for greenhouse gas emissions.

4. Whether the Region clearly erred by conflating two separate emission streams for the proposed CCS control in Step-4 of the BACT analysis. And, even if not clear error, whether the Board should review this issue because it has important policy implication for implementing BACT for greenhouse gas emissions.

IV. ARGUMENT

A. Background on Establishing BACT Limits.

The Clean Air Act and U.S. EPA's implementing regulations require BACT emission limits for all new and modified pollution sources. 42 U.S.C. § 7475(a)(4); 40 C.F.R. § 52.21(j)(2). BACT is a limit based on the maximum degree of reduction achievable through, among other options, add-on controls. 42 U.S.C. § 7479(3) ("best available control technology" means an emission limitation based on the maximum degree of reduction of each pollutant… achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant"); *accord* 40 C.F.R. § 52.21(b)(12) (similar regulatory definition of BACT). The plain meaning of "maximum" is "the greatest quantity, number, or degree possible or permissible; the highest degree or point (of a varying quantity…) reached or recorded; upper limit of variation." Websters New World College Dictionary 837 (3rd Ed. 1997). Courts have thus instructed that the words "maximum" and "achievable" constrain the permitting agency's discretion in setting limits. *See Alaska Dept. of Envtl. Conservation v. EPA*, 540 U.S. 461, 485-89 (2004).

This Board has repeatedly instructed permitting authorities that "BACT determinations are one of the most critical elements in the PSD permitting process, must reflect the considered judgment on the part of the permit issuer, and must be well documented in the administrative record." *In re Mississippi Lime Co.*, 15 E.A.D. __, PSD Appeal No. 11-01, Slip Op. at 17 (EAB, Aug. 9, 2011) (citing *In re Desert Rock Energy Co., LLC*., PSD Appeal Nos. 08-03 thru 08-06, slip op. at 50 (EAB, Sept. 24, 2009); *In re Knauf Fiber Glass, GmbH*, 8 E.A.D. 121, 132 (EAB 1999); *In re Newmont Nev. Energy Inv., LLC*, 12 E.A.D. 429, 442 (EAB 2005); *In re Gen. Motors, Inc.*, 10 E.A.D. 360, 363 (EAB 2002)). The result is a limit set based on the maximum

achievable emission reduction with the best pollution control option that is "tailor-made" for that facility and that pollutant. *In re CertainTeed Corp.*, 1 E.A.D. 743, 747 (Adm'r 1982); NSR Manual at B.2 ("The reviewing authority then specifies an emissions limitation for the source that reflects the maximum degree of reduction achievable for each pollutant regulated under the Act.").

The list of control option types that must be considered when establishing a BACT limit includes both "add-on" controls that remove pollutants from a facility's emissions stream, and "inherently lower-polluting process or practices that prevent the pollutants from being formed in the first place. *In re Knauf Fiber Glass*, 8 E.A.D. at 129. The New Source Review Workshop Manual describes the categories as follows:

> Potentially applicable control alternatives can be categorized in three ways:
>
> - **Inherently Lower Emitting Processes/Practices**, including the use of materials and production processes and work practices that prevent emissions and result in lower "production specific" emissions; and
>
> - **Add-on Controls**, such as scrubbers, fabric filters, thermal oxidizers and other devices that control and reduce emissions after they are produced.
>
> - **Combination of Inherently Lower Emitting Practices and Add-on Controls**. For example, the application of combustion and post-combustion controls to reduce NOx emissions at a gas-fired turbine.

Office of Air Quality Planning and Standards, U.S. EPA, *New Source Review Workshop Manual* at B.10 (Draft, Oct. 1990) ("NSR Manual"); *see, also, PSD and Title V Permitting Guidance for Greenhouse Gas* at 25 (March 2011) ("GHG Guidance").

BACT is a site-specific determination resulting in the selection of an emission limitation that represents application of control technology or methods appropriate for the particular

facility. Any major stationary source or major modification subject to PSD must conduct an analysis to ensure the application of BACT. (NSR Manual at B.1.) The Region, in this case, employed the NSR Manual's recommended methodology known as that "top-down" method for determining BACT:

> The top-down process provides that all available control technologies be ranked in descending order of control effectiveness. The PSD applicant first examines the most stringent – or "top" – alternative. That alternative is established as BACT unless the applicant demonstrates, and the permitting authority in its informed judgment agrees, that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not "achievable" in that case.

(NSR Manual at B.2.) The first step requires the permitting authority to identify all "potentially" available control options. *Id*. at B.5. The second step is to eliminate "technically infeasible" options from the potentially available options identified at step 1. *Id*. at B.7. In step 3 of the top-down method, the remaining control technologies are ranked and then listed in order of control effectiveness for the pollutant under review, with the most effective alternative at the top. In the fourth step of the analysis, the energy, environmental and economic impacts are considered and the top alternative is either confirmed as appropriate or is determined to be inappropriate. *Id*. at B.29. Issues regarding the cost-effectiveness (i.e. $/ton) of the alternative technologies are considered under step 4. *Id*. at B.31-.46. The purpose of step 4 of the analysis is to validate the suitability of the top control option identified, or provide a clear justification as to why the top control option should not be selected as BACT. *Id*. atB.26. Finally, under step 5, the most effective control alternative not eliminated in step 4 is selected and the permit issuer sets as BACT an emissions limit for a specific pollutant that is appropriate for the selected control method. *Id.* at B.53; *see, generally, In re Prairie State Generating Co.*, 13 E.A.D. 1, 11 (EAB 2006).

In 2011, EPA issued its *PSD and Title V Permitting Guidance for Greenhouse Gas* ("GHG Guidance") to assist permitting authorities in addressing PSD and Title V permitting requirements for GHGs. Section III of the GHG Guidance addresses the BACT analysis. (GHG Guidance at 17-46.) The GHG Guidance directs permitting authorities to "continue to use the Agency's five-step 'top-down' BACT process to determine BACT for GHGs." *Id.* at 17. The GHG Guidance also notes that carbon capture and sequestration ("CCS") should be considered an available technology in step 1 of the BACT analysis, and any elimination of CCS requires full and detailed documentation in the record. *Id.* at 33-34 ("if the permitting authority eliminates [CCS] at some later point in the top-down analysis, the grounds for doing so should be reflected in the record with an appropriate level of detail.") With respect to step 4, the GHG Guidance acknowledges that the costs of CCS may be high in some cases, but permitting authorities must nevertheless explain any rejection of CCS in a well-documented permit record. *Id.* at 42.

B. The Region Improperly Rejected CCS as a Control Technology.

Sierra Club requests that the Board grant review of the Region's BACT analysis rejecting CCS as a pollution control alternative and remand the final permit with instructions to the Region to conduct a full and appropriate analysis of CCS in the BACT analysis. The CCS analysis must consider the cost-effectiveness of CCS, and it must include a detailed level of support on the record supporting the Region's conclusions. Cost-effectiveness means the dollars per ton of pollutant removed or avoided. (NSR Manual at B.36.)

The Region identified CCS as an available add-on control technology that is applicable for all of Baytown's affected combustion units. (Ex. 7, SOB at 8.) CCS is a process that removes CO_2 from flue gas where it is then transported to an appropriate storage location, most likely underground in a geological storage reservoir such as a deep saline aquifer or a depleted oil well

or coal seam. The Region identified CCS as a feasible control technology in step 2 of the BACT analysis. (Ex. 7, SOB at 9.) CCS is capable of removing approximately 90% of the CO_2 from the waste stream of the steam cracking furnaces, which could therefore result in up to 883,800 tons of CO_2 removed annually from the Baytown cracking furnaces.[5] (*See* Ex. 1, Final Permit, 7, Table 1.) In step 3 of the top-down BACT analysis, the Region ranked CCS as the most effective controls method. (Ex. 7, SOB at 9.) However, the Region rejected CCS in step 4 of the BACT analysis on the grounds that CCS would "increase the total capital project costs by more than 25%" and therefore "those costs are prohibitive in relation to the overall cost of the proposed project." (Ex. 7, SOB at 10.) The Region purportedly based this conclusion of economic infeasibility on the application and supplemental material provided by Exxon. However, as detailed below, the record does not support the Region's arbitrary determination that CCS would be economically infeasible.

Sierra Club is not requesting that the Board pre-determine whether CCS is BACT for the Baytown facility. Rather, the Board should grant review of this petition to consider the rationale and support for the Region's BACT analysis of CCS and remand the permit with instructions to perform a full and appropriate cost-effectiveness analysis. The record as it stands now is wholly inadequate to reject CCS as BACT. Eliminating the most effective technically feasible BACT technology is a high bar because the adverse impacts provisions in the top-down BACT analysis are intended only as a safety valve for when impacts unique to the facility make application of a technology inapplicable to that specific facility. *See* NSR Manual at B.31 ("BACT is required by law. Its costs…are not to be considered an afterthought"); *In re Columbia Gulf Transmission Co.*, 2 E.A.D. 824, 827 (Adm'r 1989) (holding that the collateral impacts provision of the BACT

[5] 982,000 tpy CO_2 * 0.90 = 883,800 tpy CO_2

top-down analysis operates primarily as a safety valve whenever unusual circumstances specific to the facility make it appropriate to use less than the most effective technology). The Region has not met this high bar for eliminating the most effective control technology.

1. The Region Clearly Erred By Rejecting CCS As Economically Infeasible Based On A Comparison To Total Project Costs Instead Of A Cost-Effectiveness Analysis.

The Region's determination that CCS is too expensive in relation to the total costs of the entire project is not a valid basis for rejection in step 4 of the BACT analysis. The Region's analysis concluded that the annualized cost of CCS "would increase total capital project costs by more than 25%." (Ex. 7, SOB at 10.) The NSR Manual expressly rejects this type of conclusion without more analysis. Cost considerations in determining BACT should be expressed in terms of average cost-effectiveness. NSR Manual at B.36; *see, also, Inter-Power of New York, Inc.,* 5 E.A.D. 130 at 136 (1994); GHG Guidance at 38. On its face, the Region's conclusion that costs of CCS would increase the estimated total project costs by 25% is an invalid basis for rejecting CCS as BACT in step 4 of the top-down BACT analysis. The Region admits that it did not consider cost-effectiveness of CCS in its BACT analysis, but it justifies this approach as being in line with PSD permitting requirements. (Ex. 8, RTC at 14 ("it is not necessary to further assess the cost-effectiveness of those disproportionately costly controls").) In its response to comments, the Region relied on the EAB's recent decision in *In re: City of Palmdale ("City of Palmdale"),* 15 E.A.D. __ , PSD Appeal No. 11-07, (Sep. 17, 2012) to support its decision to rely only on a comparison of total project costs rather than a cost-effectiveness calculation. (Ex. 8, RTC at 14.)

City of Palmdale does not stand for the proposition - asserted by the Region - that permitting agencies may indefinitely forgo or ignore cost-effectiveness analyses for GHG add-on controls. (Ex. 8, RTC at 14.) The Board in *City of Palmdale* held that a fully documented

analysis was not necessary on the particular record in that case because the record clearly showed that even if a full cost-effectiveness analysis had been undertaken, such analysis would nevertheless have confirmed that the CCS control technology would be rejected. *In re: City of Palmdale* 15 E.A.D. __, 55. The Board should grant review to clarify that, absent extraordinary circumstances, cost-effectiveness is the appropriate metric for evaluating adverse economic impacts in the top-down BACT analysis.

In practice, the Region and other permitting authorities across the country have misinterpreted or misapplied *City of Palmdale* to hold that cost-effectiveness analyses can be avoided or ignored in nearly all circumstances. The Region has repeatedly asserted in a variety of cases that add-on GHG controls may be rejected in step 4 of the top-down BACT analysis without any consideration for the average or incremental cost-effectiveness of the control. In **every** GHG PSD draft or final permit issued since the Tailoring Rule went into effect, the Region based its rejection of CCS on a comparison to total project costs; none of the Region's BACT determinations were based on cost-effectiveness, even when such data was available. The Region's repeated reliance on the comparison of control costs to total project costs is an inherently arbitrary metric because it determines BACT based on the total cost of the underlying project or modification rather than on the effectiveness of the pollution control measure in minimizing GHG emissions and the cost per ton of reducing those emissions.

The requirement to consider cost-effectiveness on a $/ton basis makes sense. It allows permitting authorities to require a consistent approach to evaluating the economic impact of potential control options. Otherwise, if the total project cost is relied on, then similarly situated projects may result in completely different BACT determinations merely because the total project costs differ. For example, if a particular natural gas turbine frame could accommodate a

standard add-on pollution control at the exact same cost at two different facilities, the BACT determination under the Region's logic could vary depending on whether the underlying project was a $50 million modification, or a $1 billion greenfield project.

a) The Region has Repeatedly Demonstrated a Practice of Failing to Consider the Cost-Effectiveness of CCS as a Pollution Control.

Rather than applying a total cost comparison in some extreme cases, as suggested by *City of Palmdale*, the Region has applied total cost comparison in **every** GHG BACT analysis that it has issued since the GHG Tailoring Rule went into effect in 2011. The Region has applied the "exception" to the consideration of cost-effectiveness cited in *City of Palmdale* to cases where CCS costs range from only 25 percent of total project costs – such as Exxon's Baytown facility – to costs up to 400 percent of total project costs. There is apparently no boundary or rationale for when and how the Region determines that a GHG control technology is economically infeasible compared to total project costs, and the complete lack of cost-effectiveness data prevents an apples-to-apples comparison of similarly situated projects. The following table illustrates the Region's repeated use of the total cost comparison in all of the permits and draft permits that it has issued under the GHG PSD permitting regime (19 total):

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Project Name	**Permit No.**	**Region's Asserted % of CCS costs compared to total project costs**	**cost-effectiveness ($/ton of CO2) of CCS[6]**	**pg # of SOB that addresses CCS costs[7]**
Air Liquide Bayou Plant	PSD-TX-612-GHG	> 400%	$42/ton[8] $47/ton	13
Celanese Clear Lake Plant	PSD-TX-1296-GHG	> 25%	$101.39/ton[9]	11-12
Copano Processing Houston Central Gas Plant	PSD-TX-104949-GHG	~ 100%	Not included	12
Diamond Shamrock Valero McKee Refinery	PSD-TX-861-GHG	> 180%	Not included	7-8
DCP Midstream NGL Fractionation Plant	PSD-TX-110557-GHG	17% (capital cost) 53% (annual cost)	Not included	9-10
El Paso Electric Co. Montana Power Station	PSD-TX-1290-GHG	> 50%	$256/ton	13
Equistar Chemicals Channelview North Plant	PSD-TX-1272-GHG	60% - 70%	Not included	9

[6] In some instances, Sierra Club is aware of cost-effectiveness estimates included by the applicant in the record for these permits. Cost-effectiveness estimates may also be included in the applications or materials of other permits, but the Region did not include those estimates in the Statements of Basis or base its BACT determinations on such figures.

[7] The statements of basis and permitting materials for other facilities are not part of the administrative record for the Exxon Baytown permit at issue here. However, Sierra Club offers this information here to illustrate the trend the Region is following rather than to provide information upon which the Region should have relied in making its BACT determination for the Baytown facility. Furthermore, all of the permits or draft permits listed in the table were issued by Region 6 itself, and therefore the Region was certainly aware of this information. Permits and Supporting Material Available at: http://yosemite.epa.gov/r6/Apermit.nsf/AirP

[8] Estimate provided by applicant. Oct.14, 2013 Supplemental Comments to PSD-TX-612-GHG.

[9] Estimate provided by applicant. Nov. 18, 2013 Supplemental Information Regarding Celanese Clear Lake Plant Permit No. PSD-TX-1296-GHG.

Project Name	**Permit No.**	**Region's Asserted % of CCS costs compared to total project costs**	**cost-effectiveness ($/ton of CO2) of CCS[6]**	**pg # of SOB that addresses CCS costs[7]**
Olefins Expansion				
Equistar Chemicals La Porte Complex	PSD-TX-752-GHG	25% - 50%	Not included	12-13
ExxonMobil Baytown Olefins Plant	PSD-TX-102982-GHG	> 25%	Not included	10
ExxonMobil Chemical Mont Belvieu Plastics Plant	PSD-TX-103048-GHG	> 25%	Not included	11-12
Freeport LNG Liquefaction Plant	PSD-TX-1302-GHG	50-60%	Not included	14-15
INVISTA Victoria Site	PSD-TX-812-GHG	400% (capital cost) 150% (annualized cost)	Not included	11
KM Liquids Terminal	PSD-TX-101199-GHG	158%	Not included	11
La Paloma Energy Center	PSD-TX-1288-GHG	> 100%	Not included	11-12
Occidental Chemical Corp, NG Fractionation Facilities, Ingleside Chemical Plant	PSD-TX-1292-GHG	> 50%	Not included	9-10
ONEOK Hydrocarbon Mont Belvieu NGL Fractionation Plant	PSD-TX-106921-GHG	35%	Not included	11
PL Propylene LLC	PSD-TX-18999-GHG	> 50%	Not included	8
Targa Gas Processing Longhorn Gas Plant	PSD-TX-106793-GHG	100%	Not included	10-11
Targa	PSD-TX-	35%	Not included	9-10

Project Name	Permit No.	Region's Asserted % of CCS costs compared to total project costs	cost-effectiveness ($/ton of CO2) of CCS[6]	pg # of SOB that addresses CCS costs[7]
Midstream Services Mont Belvieu Plant	101616-GHG			

In every single BACT determination, the Region rejected CCS on the grounds that it was economically infeasible. A handful of permit applicants provided cost-effectiveness information on a $/ton basis, but the Region rarely included that information in any of the SOBs and did not make its BACT determination on the basis of cost-effectiveness for any project, even when the data was available.

Other permitting authorities have followed suit. EPA Region 4 recently issued a GHG PSD permit for a natural gas plant in Florida. Region 4 rejected CCS on the grounds that "the cost of CCS will be approximately 54 percent of the total cost of the Project."[10] Region 4, like Region 6, noted in its response to comments on that facility that it was following the Board's precedent in *City of Palmdale* and because "there is not a wealth of GHG cost-effectiveness data…"[11] This is the same excuse used by Region 6, which stated in response to comments for the Baytown facility that "we believe that it is reasonable at this time to evaluate the economic impacts of CCS as a percentage of the overall project costs until more data from similar permitting actions becomes available." (Ex. 8, RTC at 14.) There will never be more data available if permitting agencies continue to refuse to require site-specific cost-effectiveness

[10] Preliminary Determination & Statement of Basis Prevention of Significant Deterioration Permit PSD-EPA-4014 for Greenhouse Gas Emissions, Sept. 2013. Available at: http://www.epa.gov/region4/air/permits/ghgpermits/tecopolkpower/TECO_Draft_PD-SOB_09-23-2013_Public_Notice_Copy.pdf

[11] *Response to Comments*, PSD-EPA-4014, Dec. 18, 2013. Available at: http://www.epa.gov/region4/air/permits/ghgpermits/tecopolkpower/TECO_RTC_12-18-2013.pdf

analyses that follow consistent cost methodologies. The Region has had 19 permitting opportunities within its own jurisdiction to develop a base of data on the cost-effectiveness of CCS systems, yet it has never even considered cost-effectiveness as part of its BACT determination.

The GHG Guidance anticipates that as permitting develops, permitting authorities will be able to make an apples-to-apples comparison by looking at the cost-effectiveness numbers for controls like CCS. (GHG Guidance at 43, n.112 "For consistency purposes, cost-effectiveness for GHG control options should be based on dollars per ton of CO_2e removed").) The GHG Guidance clearly indicates that the relevant metric for determining cost-effectiveness should be the estimate of $/ton of CO_2e removed or avoided. The Board should therefore remand the Baytown permit and direct the Region to support its BACT determination based on a $/ton cost-effectiveness analysis that is fully documented in the record.

b) Basing BACT Determinations on a Comparison to Total Project Costs is Arbitrary and Misleading.

The Region has determined in every single GHG PSD permitting instance that CCS costs ranging from as high as 400% of total project costs to as low as 25% of total project costs are economically infeasible. This approach is completely arbitrary because it depends entirely on the cost of the underlying project rather than the amount of pollution the facility generates. There is no evidence that project costs bear any relationship to the amount of pollution emitted or the cost of controlling it. Cost-effective GHG controls must be required regardless of whether the permit applicant proposes to build an expensive project (such as a large greenfield power plant) or whether it proposes only to construct a relatively cheaper project (such as a modification at an existing source). The Region must consider the cost per ton of pollution reduced.

NSR review is equally as applicable to entirely new construction as it is to major modifications. The total cost of the underlying project is not determinative of the control technology. (NSR Manual at.B.45; GHG Guidance at 38 ("The emphasis should be on the cost of control relative to the amount of pollutant removed, rather than the economic parameters that provide an indication of the general affordability of the control alternative relative to the source").) Under the Region's logic of comparing total costs, the BACT determination could change dramatically depending on the cost of the underlying project without any regard to the amount of pollution or the cost of controlling that pollution. In past decision, the Board has not allowed a project to avoid a BACT determination merely because the underlying project is a relatively cheaper modification compared to a more expensive project. The relevant metric is the cost per ton of pollutant removed. For example, in a recent enforcement case, *Tennessee Valley Authority*, 9 EAD 357, 403-04 (EAB 2000), the cost of major modifications triggering NSR ranged from $2.5 million to $57 million, yet the Board upheld a compliance order that would have required SO_2 scrubbers or NO_x controls that cost hundreds of millions. Similarly, construction projects at Ohio Edison's Sammis plant between 1984 and 1999 ranged in costs from $250,000 to about $4 million, or aggregated into projects occurring during the same outage, in the $1-30 million range. *United States v. Ohio Edison Co.*, 276 F. Supp. 2d 829, 840-49 (S.D. Ohio 2003); i*d*. at 856. Yet pollution controls on the units were ultimately estimated at more than $1 billion in settlement.[12] Clearly those decisions were not determined by comparing the cost of the pollution control to the total cost of the project. These examples illustrate that even projects

[12] *U.S. Announces Settlement of Landmark Clean Air Act Case Against Ohio Edison - Utility will spend $1.1 billion to reduce air pollution by 212,500 tons per year*, March 18, 2005. Available at: http://yosemite.epa.gov/opa/admpress.nsf/31f0470aec334c5c852572a000655938/11e00336eca5561e85256fc8005470fc!OpenDocument

with relatively modest underlying costs may result in comparatively expensive pollution controls if those controls are cost-effective based on the amount of pollution removed or avoided.

In the case of the Baytown permit – and all of the Region's GHG PSD permits for that matter – a determining factor in rejecting CCS as BACT was the cost of the underlying project. Relying on this calculation of control costs compared to total project costs means that the same costs to remove the same amount of CO_2 from similarly situated projects (i.e. the numerator) may result in different determinations merely because the underlying project cost (i.e. the denominator) is different. The arbitrariness of relying on total project costs to determine BACT is precisely why the NSR Manual directs permitting agencies to avoid this method in favor of cost-effectiveness (i.e. $/ton). The NSR Manual specifically cautions against the process employed by the Region: "For example, the capital cost of a control option may appear excessive when presented by itself or as a percentage of the total project costs. However, this type of information can be misleading." (NSR Manual, B.45.) The GHG Guidance provides a similar warning: "The emphasis should be on the cost of control relative to the amount of pollutant removed, rather than the economic parameters that provide an indication of the general affordability of the control alternative relative to the source." (GHG Guidance, 38.)

The Board's decision in *City of Palmdale* does not alter the premise that step-4 BACT determinations should be made on the basis of cost-effectiveness. The available data in *City of Palmdale* indicated that CCS would be more than "twice the annual cost of the entire project." *City of Palmdale,* 15 E.A.D. at 54. The Board in that decision recognized that "[c]ost effectiveness it typically calculated as the dollars per ton of pollutant emissions reduced," but it nevertheless found the permitting authorities comparison to total project costs permissible in that particular instance because "the cost of CCS would be so high…that it would clearly be cost

prohibitive." *Id.* Although the language of the decision suggests that it is an exception to be applied only in extreme cases, the Region and other permitting agencies have misconstrued the Board's holding to create an exemption for CCS from cost-effectiveness analysis in all GHG PSD permitting actions. The Board could not have intended such a broad interpretation of *City of Palmdale* because the wholesale rejection of the cost-effectiveness metric for GHG permitting would undermine the entire BACT analysis. Therefore, the Board should grant review to reaffirm that the limited holding in *City of Palmdale* does not exempt CCS (or any other control option) from a cost-effectiveness analysis in PSD permitting.

c) The Facts of *City of Palmdale* are Distinguishable from Baytown.

In this case, the Region has not demonstrated that the cost of CCS at Baytown is "so high…that it would clearly be cost prohibitive." Even if Exxon's CCS cost estimates are accepted, which Sierra Club disputes, the cost of CCS would be 25% of the total annual costs of project, not the overall facility (Ex. 7, SOB at 11-12.) On this issue, the Baytown permit is distinguishable from *City of Palmdale* because (1) it is not an obvious conclusion on this record that CCS at Baytown "would clearly be cost prohibitive," (2) the comparison in Baytown was made to total project costs (i.e. cost of the modification) rather than total facility costs (i.e. costs of the entire Palmdale natural gas plant), and (3) the relative impact to project costs (25% compared to 200%) is much smaller.

In addition to all of the factors distinguishing Baytown from *City of Palmdale*, and setting aside the inherent arbitrariness of making a BACT determination based on a comparison to underlying project costs, if the CCS cost analysis for Baytown were corrected using proper control cost methodology and site-specific data, discussed in more detail in Sierra Club's comments and below, the fractional cost of CCS at Baytown compared to total modification

costs would be even lower than 25%. The Region acknowledged that the annual cost of CCS could be offset by as much as $32 million annually through the use of enhanced oil recovery ("EOR") plus up to an additional $24 million annually offset through tax credits. (Ex. 8, RTC at 10-11.) Combined, these offsets could reduce CCS by up to $56 million each year, reducing the annual CCS costs to $150 million, which in turn would be approximately 18% of the total project costs.[13]

Regardless of the fraction of total project costs, it was improper for the Region to eliminate CCS solely on the basis of a comparison to total project cost. The EAB clearly stated in *City of Palmdale* that "permit issuers typically consider two economic criteria: average and incremental cost-effectiveness" and "[c]ost effectiveness is typically calculated as the dollars per ton of pollutant emissions reduced." *City of Palmdale*, 15 E.A.D. at 54 (internal quotations omitted). The *City of Palmdale* decision then went on to point out that the costs were so high that *if* the costs/ton were determined, the conclusion would still show that CCS was not cost-effective. In other words, the Board concluded on that record that it was not necessary to actually go through the steps to calculate the costs/ton in that specific case. Here, the Region ***did*** have available the costs/ton of CCS—but it then failed to use that cost/ton figure in the manner required by a the NSR Manual in a top-down BACT analysis (i.e. to determine whether the cost for this facility is disproportionate to other facilities using CCS). NSR Manual at B.31.

The Region's refusal to consider cost-effectiveness data is not limited to the Baytown permit. The Region has gone so far as to refuse to consider cost-effectiveness data even when an

[13] The Region estimated CCS annual costs at $205 million. (Ex. 7, SOB at 10.) 56/205 = 27.3% potential reduction from offsets. 25% *(1-0.273) = 18.175%. Sierra Club does not suggest that this is the appropriate method for determining adverse economic impacts. It is included here only to demonstrate that CCS costs are not as high as asserted by Exxon and the Region, and therefore the Region cannot credibly argue that cost of CCS are "clearly cost prohibitive."

applicant has requested a decision based on cost-effectiveness. An applicant recently commented on its own draft permit: "In considering the cost-effectiveness of Carbon Capture and Sequestration (CCS) as a control technology, Air Liquide recommends that EPA rely on a cost per ton analysis." (Ex. 9, Response to Comments, Permit No. PSD-TX-612-GHG at 4.) Despite having available a cost-effectiveness analysis provided by the applicant that included a detailed calculation of the cost of CCS in dollars per ton, the Region rejected this approach:

> We appreciate Air Liquide providing these cost/ton figures. Cost information in this form has been provided by applicants and is part of the record in several recently conducted Region 6 permitting actions where CCS has been studied as an available option. However, pending further progression and experience in the permitting of sources of GHGs, we would not agree that our evaluation of economic impacts should be based solely on this cost metric.

(Ex. 9 at 5.)[14] The Region's logic is indefensible. Rather than attempting to even consider available cost-effectiveness data, the Region continues to rely on a comparison to total project costs. The Region's response also shows that its decisions that CCS is "clearly cost prohibitive" are arbitrary. The Air Liquide application and supplemental material estimated that CCS combined with enhanced oil recovery would cost $42 /ton of CO_2 removed, or $47 /ton with geological sequestration. (Ex. 9 at 4.) Aside from demonstrating that applicants are capable of providing a detailed cost-effectiveness analysis, the Air Liquide analysis shows that the cost-effectiveness estimate for CCS is relatively low. At $42 /ton, the estimated cost of CCS for the Air Liquide project is within EPA's estimates for the social cost of carbon.[15] Yet the Region did

[14] Although the Region states that it would not "solely" base its decision on cost-effectiveness, the decision in that case was, like other PSD permitting decisions, made entirely on the basis of a comparison to total project costs and did not appear to consider cost-effectiveness at all.

[15] Depending on the discount rate, EPA currently estimates the social cost of carbon (2015$) at $12-61. http://www.epa.gov/climatechange/EPAactivities/economics/scc.html

not make any attempt to consider this lower cost-effectiveness estimate, nor did it explain why CCS should still be rejected in spite of a relatively low cost-effectiveness estimate.

The Air Liquide permit is not at issue here; however, it shows a trend by the Region of ignoring cost-effectiveness calculations even when such information should have prompted a more detailed review. Sierra Club asserts that, if done properly, other recent and future PSD permits would similarly show a trend of decreasing price estimates for CCS. However, unless and until permitting authorities require and carefully consider cost-effectiveness data, those agencies will never have the information to make an informed decision about the appropriateness of add-on controls for GHG emissions.

The Board should accept review and remand the Baytown permit if for no other reason than to clarify its decision in *City of Palmdale*. The Board in *City of Palmdale* allowed an exception to the "typical" cost-effectiveness calculation on the grounds that "it may be appropriate in **some cases** to assess the cost-effectiveness of a control option in a less detailed quantitative (or even qualitative) manner." *City of Palmdale,* 15 E.A.D. at 54. (emphasis added). However, the Region has interpreted this narrow exception so broadly that it has eliminated all cost-effectiveness analyses from its GHG PSD permitting decisions.

d) The Region Failed to Adequately Explain its Decision Rejecting CCS as Economically Infeasible Based on a Comparison to Total Project Costs

The Region rejected CCS on the grounds that a purported 25% increase in total annual project costs would render the project economically infeasible. (Ex. 7, SOB at 10 ("those costs are prohibitive in relationship to the overall cost of the proposed project"); Ex. 8, RTC at 15 ("we reasonably believe that such increases would make the project economically unviable").) Aside from the arbitrariness of basing its step-4 BACT analysis on a comparison of total project costs, this conclusion is also incomplete because the Region failed to provide an adequate

explanation on the record to support its decision that a 25% increase in total project costs would render the project economically infeasible. *See In re Gen. Motors, Inc.*, 10 E.A.D. 360, 379 (EAB 2002)("a failure to provide a certain level of detail and analysis to substantiate a claim that a particular control technology is technically or economically unachievable is fatal to a BACT analysis")(citing NSR Manual at B.26-29).

There is no evidence that an increase of 25% to total project costs would render the Baytown project uneconomic. The Region relied completely on Exxon's assertion that it estimated the cost of CCS to be 25% of the total project cost. (Ex. 5, Feb. 8, 2013 email to Aimee Wilson.) This conclusory statement did not take into account the cost-effectiveness of CCS, nor did the Region provide any rationale for why 25% of total project costs is an economically infeasible increase. The Board must therefore remand this issue and instruct the Region to provide a sufficient analysis to support its rejection of CCS as a BACT control. *In re Gen. Motors, Inc.*, 10 E.A.D. 360, 379 (EAB 2002)(remanding where the permitting authority failed to demonstrate that the rejection of a more effective technology was truly justified by the economic impacts or other costs); *see* NSR Manual at B.26-29; *see, also, In re Steel Dynamics, Inc.* 9 E.A.D. 165 (EAB 1999); *Alaska Dep't of Envtl. Conservation v. E.P.A.*, 540 U.S. 461, 498 (2004). The collateral impacts provision of the BACT top-down analysis (including cost-effectiveness) "operates primarily as a safety valve whenever unusual circumstances specific to the facility make it appropriate to use less than the most effective technology." *In re Columbia Gulf Transmission Co.*, 2 E.A.D. 824, 827 (Adm'r 1989). The most effective control technology is presumed to be BACT; the burden falls on the Region to demonstrate on a fully documented public record that the most effective control technology should be rejected due to adverse economic impacts. "In the event that the top candidate is shown to be inappropriate, due to

energy, environmental, or economic impacts, the rationale for this finding needs to be fully documented for the public record." NSR Manual at B.26-29.

Even assuming an arbitrary BACT determination based on total costs without any consideration of cost-effectiveness ($/ton) analysis is appropriate in this case, which it is not, the Region has not provided any evidence to support its assertion that a purported 25% increase in project costs is "prohibitively expensive" or would render the project "economically unviable." Nothing in the record demonstrates that the Baytown project would be "prohibitively expensive" if it included CCS. The only "evidence" that CCS would cost 25% of total project costs or that such an expense would make the entire project economically infeasible is a three-sentence email from Exxon stating that the CCS cost would "likely" make the project infeasible:

> The total annual cost of CCS is estimated at $204,600,000 per year as noted in our October 16, 2012 submittal. The final project costs are not yet determined; however, the addition of CCS is expected to increase the total capital project costs by more than 25%. That cost likely exceeds the threshold that would make the project economically viable.

(Ex. 5, Feb. 8, 2013 email to Aimee Wilson.) There is no evidence in the record about what the total project costs would be, what the impact would be on the competitiveness of Exxon's products from the plant, or what the "threshold" is that would render the project economically unviable. Absent such a showing, there is no credible rationale for the Region to avoid a thorough cost-effectiveness analysis. *Alaska Dep't of Envtl. Conservation v. E.P.A.*, 540 U.S. 461, 498-99 (2004) ("No record evidence suggests that the mine, were it to use SCR for its new generator, would be obliged to cut personnel or raise zinc prices. Absent evidence of that order,

[the agency] lacked cause for selecting Low NOx as BACT based on the more stringent control's impact on the mine's operation or competitiveness").[16]

e) Sierra Club's Comments and the Region's Response.

Sierra Club clearly raised the issue that the Region improperly compared cost of CCS in relation to the total costs of the entire project. (Ex. 2, SC Comments at 5-8.) Sierra Club's comments included numerous references to the NSR Manual and prior EAB decisions noting that the cost-effectiveness metric is essential to a proper BACT analysis. The Region completely rejected Sierra Club's comments on this issue. (Ex. 8, RTC at 14-15.) Although the Region acknowledged that EPA's GHG Guidance document cautions against "looking only at affordability relative to the source" (Ex. 8, RTC at 14), it then dismissed this concern by relying on the EPA GHG Guidance document's statement that "in some cases" it may be appropriate "to assess cost-effectiveness in a less quantitative (or even qualitative) manner." (Ex. 8, RTC at 14 (citing GHG Guidance at 42).) However, the Region did not provide any explanation as to why this particular case warranted such an exception. The Region also relied heavily on this Board's recent decision *City of Palmdale* (Ex. 8, RTC at 14), which was discussed above in more detail.

Overall, the Region simply rejected the premise of Sierra Club's comment that cost-effectiveness must form the basis of its determination to reject CCS as economically infeasible in step 4 of the BACT analysis. "We therefore disagree with the commenter and continue to believe that our rejection of CCS as GHG BACT in Step-4, based on its prohibitively high cost in

[16] Upon remand and a thorough BACT analysis, the Region may ultimately determine that CCS is economically infeasible for the Baytown facility. However, the record as it stands today cannot support such a determination. *See* Alaska Dep't of Envtl. Conservation v. E.P.A., 540 U.S. 461, 501-02 (2004)(upholding remand to require permitting authority to endeavor to develop an "appropriate record" supporting its rejection of the most effective BACT control technology).

comparison to the overall project cost, was appropriate and in accordance with guidance and with EAB precedent." (Ex. 8, RTC at 14.) The Region concluded, "we reasonably believe that [a 25 percent increase in project costs] would make the project economically unviable...it is not necessary to further address the comment regarding cost-effectiveness of CCS for this project." (Ex. 8, RTC at 15.)

The Board should grant review and remand the permit to correct the Region's repeated and inappropriate practice of rejecting the admittedly most effective control technology based on a blind comparison of the annual cost of CCS to the total annual cost of the facility. This issue raises serious nation-wide policy considerations because of the demonstrated and repeated practice of permitting agencies ignoring proper cost-effectiveness analyses.

2. The Region Failed to Adequately Explain Its Decision to Reject CCS as Economically Infeasible Because the Record Lacks a Design Basis and Other Details Necessary to Evaluate Costs.

The record does not contain sufficient data to support the Region's conclusion that CCS is economically infeasible. Even setting aside the issues above addressing the appropriate standard for rejection of the most effective control technology on the basis of a cost-effectiveness BACT analysis, the cost estimates submitted by Exxon and the Region have not been presented in a way that can be relied upon in a BACT analysis. *See In re Gen. Motors, Inc.*, 10 E.A.D. 360, 378 (EAB 2002); *In re Steel Dynamics, Inc.*, 9 E.A.D. 165 (EAB 2000). CCS is clearly the top candidate – by a large margin – for control of GHGs, yet the Region's analysis of costs to install CCS at Baytown relies on unsupported or generic cost estimates. The methodology the Region used does not follow the EPA's Control Cost Manual, nor does it reflect the level of detail necessary in a BACT analysis. While it is possible, upon remand and careful analysis, that the Region may ultimately reject CCS as economically infeasible for this project, the record as it

stands now is wholly inadequate to support this determination.[17] The Board must therefore remand the permit to the Region in order to complete an adequate cost-effectiveness analysis. *See In re Steel Dynamics, Inc.*, 9 E.A.D. 165 (EAB 2000) (remanding permit due to incomplete cost-effectiveness analysis); *Alaska Dep't of Envtl. Conservation v. E.P.A.*, 540 U.S. 461, 501-02 (2004)(upholding remand with direction to permitting authority to develop an appropriate record).

a) The Region Failed to Adequately Support Its Rejection of CCS.

Exxon's cost calculations for CCS lack any meaningful detail and preclude the public, or EPA for that matter, from conducting any careful analysis to determine whether the cost estimates are reasonable. The Region's response to comments failed to address this deficiency, and instead only reiterated the broad and unspecific narrative description of a generic CCS system without providing any real, site-specific details. The Region waived away Sierra Club's critique by asserting that "a less detailed analysis may be appropriate in certain circumstances." (Ex. 8, RTC at 17.) The Region did not provide any further explanation as to why, in this circumstance, the top-performing control technology and the only identified add-on control technology for an entire class of pollutants does not warrant a detailed analysis.

The cursory analysis in the record clearly deviated from the requirements specified in the NSR Manual, and the Region provided no additional or supplemental detail, nor did it explain its rationale for this lack of detail. NSR Manual at B.32 ("Before costs can be estimated, the control

[17] The Region also noted that energy impacts and secondary environmental impacts were considered in its analysis. (Ex. 7, SOB at 10.) However, the Region explicitly did not base its rejection of CCS on those secondary impacts: "since energy impacts are not the basis for EPA's elimination of the CCS option in this case, we need not and do not reach a judgment here as to whether the energy consumption demands from applying CCS to ExxonMobil's project would be significant or unusual in the context of this permit or as a general matter." (Ex. 8, RTC at 25.)

system design parameters must be specified); *In re Gen. Motors, Inc.*, 10 E.A.D. 360, 366 (EAB 2002) ("in evaluating the rationality and defensibility of BACT determinations by permitting authorities, the Board has required an analysis that reflects a level of detail in the BACT analysis comparable to the methodology in the NSR Manual"); *In re Knauf*, 8 E.A.D. at 134 n. 25 ("A strict application of the methodology described in the NSR Manual is not mandatory, but we expect an analysis that is as sufficiently detailed as the model in the NSR Manual"); *id*. at 129-30 n.14 ("We would not reject a BACT determination simply because the permitting authority deviated from the Draft NSR Manual, but we would scrutinize such a determination carefully to ensure that all regulatory criteria were considered and applied appropriately").

The broad, unsupported, and generic review of the Exxon application does not constitute an adequate BACT analysis. The Region therefore failed to adequately explain its rationale for rejecting CCS as economically infeasible because the cost analysis underlying that rejection was incomplete.

b) Sierra Club's Comments and the Region's Response.

Sierra Club specifically identified the lack of design basis in its comments. (Ex. 2, SC Comments at 8-9.) Sierra Club cited directly to the NSR Manual's requirement that the analysis include "the control system design parameters" (Ex. 2, SC Comments at 8 (emphasis added) (citing NSR Manual at B.33).) Sierra Club's comments went on to specify that Exxon's cost analysis did not contain any "design basis, battery limits, a list of each piece of equipment and its cost, or the source of the proffered lump-sum cost data for the capture and compression plants." (Ex. 2, SC Comments at 9.) The complete lack of detail in the design basis and cost estimates of

the control system (i.e. the CCS system)[18] precludes any meaningful review by the public of the BACT cost analysis.

Comment 9 in the Region's response to comments (Ex. 8, RTC at 17-18) does not provide any additional information supporting the design basis of the CCS system. The Region merely asserted that "cost analyses often vary in complexity and specificity" and "EPA has acknowledged that a less detailed analysis may be more appropriate in certain instances." (Ex. 8, RTC at 17 (emphasis added).) However, the Region made no attempt to explain what circumstances are present that counsel against a basic design analysis in the case of CCS for the proposed Baytown facility. Instead, the Region claimed that "ExxonMobil's permit application and supplemental responses to EPA on October 16, 2012 clearly reflected the design basis and equipment that would be needed to install a CCS system." (Ex. 8, RTC at18) This assertion is simply incorrect.

The Region did not provide any specific citations to the application (Ex. 3) or the referenced October 16, 2012 supplement (Ex. 4) that address the design basis that Sierra Club identified as lacking. Sierra Club re-reviewed both those documents and could find no evidence of any battery limits, a list of necessary equipment, or vendor documented costs for such equipment. There is no mention of process flow diagrams and design drawings; heat, energy and material balances; type and amount of amine; and temperatures, pressures, flow rates, and specific chemical species in the gas streams to be treated. All of this information is necessary to make an informed analysis of the CCS control system. Sierra Club even provided a document to

[18] The application and supporting material include information on the overall project design, but those details do not include the potential development of a CCS control system or other add-on technology.

the Region showing an example of design details for a CO_2 recovery project. (Ex. 2, SC Comments at 9, n.26.)[19]

The only discussion of CCS design and costs can be found in the application at pages 4-4 through 4-8 (Ex. 3) and in the October 16, 2012 supplement at pages 22-25 (Ex. 4). Those pages contain primarily narrative descriptions of CCS technology in general. They do not include any site-specific analyses or data. The October 16, 2012 supplement claims that, "[a] carbon capture and compression plant was specified with cost estimates by an ExxonMobil Research and Engineering Team specializing in CCS technologies" (Ex. 4, at 22), but there is no documentation of this study in the record, no vendor information to support its conclusions, and no details of the system Exxon's team purportedly reviewed. *In re Steel Dynamics,* 9 E.A.D. 165 (EAB 2000) ("As we have stated in the past, the regulations governing PSD permitting decisions require that material relied upon in making a permit decision be included in the record")(quoting *In re Hawaiian Elec. Light Co*., 8 E.A.D. 66, 102 (EAB 1998)). The only supporting materials cited by Exxon for the entire CCS analysis are general footnote references to a 2010 DOE/NETL study and a 2010 *Report of the Interagency Task Force on Carbon Capture and Storage*, which only provide generic cost estimates for a combined-cycle natural gas facility. (*See, e.g.*, Ex. 3, Application at 4-6 to 4-8, n.2-4, n.5, n.8-10.) Thus, even setting aside the issue of the appropriate costing method addressed in Sierra Club's Comment, there is no basis at all in the record to support any claim of cost-effectiveness because the total CCS cost estimate is unsupported.

[19] A copy of this document was also provided to the Region through a file-sharing cite at the time Sierra Club submitted its comments.

c) The Failure to Conduct a Thorough Cost Analysis Raises Important Policy Implications.

The failure of the Region to provide adequate record support for its cost methodology also raises important policy implications for the development of GHG add-on control technologies. EPA's *PSD and Title V Permitting Guidance for Greenhouse Gases* lamented the lack of available data for GHG BACT analyses: "given that there is little history of BACT analyses for GHG at this time, there is not a wealth of GHG cost-effectiveness data from prior permitting actions for a permitting authority to review and rely upon when determining what cost level is considered acceptable for GHG BACT." (GHG Guidance at 43.) Nevertheless, the GHG Guidance includes the optimistic assumption that, "[a]s the permitting of sources of GHG progresses and more experience is gained, additional data to determine what is cost-effective in the context of individual permitting actions will become known and should be included in the RBLC." (GHG Guidance at 43.) However, the development of more detailed data and experience with permitting for GHG add-on controls will never happen if permitting agencies are allowed to continue issuing unspecific and meaningless economic analyses in every single permitting decision.

It is critical that permitting agencies conduct thorough and accurate analyses of add-on GHG controls so that permitting agencies, industry, and the public can develop a base of knowledge upon which to make informed BACT decisions. Following the NSR Manual and the methodology laid out in the Cost Control Manual ensures that an acceptable level of detail is included in permitting decisions. However, the Region and other permitting agencies are doing just the opposite. The BACT analyses for CCS controls have thus far relied only on generic data from sources like the 2010 DOE/NETL study or the *2010 Report of the Interagency Task Force on Carbon Capture and Storage*. While those reports are incredibly helpful in assessing the

reasonableness of site-specific analyses, the continued reliance on historic, generic, outdated data as the sole source of information will not move the body of knowledge forward on the development of CCS or other add-on control technologies for GHG. The paucity of cost-effectiveness data currently available counsels in favor of requiring a more detailed analysis of GHG BACT controls, not a less detailed analysis as the Region suggests.

The Board should remand the Exxon PSD GHG permit and require a more detailed cost analysis that meets the level of detail required by the NSR Manual.

3. The Region Committed Clear Error Because It Did Not Follow the Methodology Required By the Control Cost Manual for CCS in Step-4.

From what little analysis is included in the BACT analysis of CCS as a control alternative, it is clear that the Region did not follow the methodology required by the NSR Manual and the EPA Control Cost Manual.[20] The Region in its response to comments rejected the Control Cost Manual completely. "In this context, we would consider application of the Control Cost Manual or its methodology to CCS to potentially run counter to the stated consistency objective…" (Ex. 8, RTC at 19) This wholesale rejection of the Control Cost Manual as part of the BACT analysis threatens the integrity and consistency GHG BACT permitting and demonstrates clear error on the part of the Region.

The Board has repeatedly found that BACT analyses must reflect a level of detail comparable to the methodology in the NSR Manual. *In re Gen. Motors, Inc.*, 10 E.A.D. 360, 2002 WL 373982, 366 (EAB 2002); *In re Knauf Fiber Glass*, 8 E.A.D. 121, 134 n. 25 (EAB 1999) ("We would not reject a BACT determination simply because the permitting authority

[20] *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA/452/B-02-001, January 2002. Section 1 of the Control Cost Manual attached as Exhibit 10. Cited by Ex. 2, SC Comments at 9, n.27 and referenced in Ex. 2, SC Comments at 9-13.

deviated from the Draft NSR Manual, but we would scrutinize such a determination carefully to ensure that all regulatory criteria were considered and applied appropriately"). The NSR Manual specifically directs that the Cost Manual be followed. (NSR Manual at B.33.) While the NSR Manual does not have the same binding authority as legal precedent or an agency regulation, it is nevertheless a key component of the BACT analysis. Without a consistent, accurate approach to cost analysis, permitting agencies cannot determine that the costs of a specific control technology are beyond "the cost borne by other sources of the same type in applying that control alternative." (NSR Manual at B.44.)

The Region must perform a thorough cost-effectiveness analysis of CCS technology, document its findings, submit those findings to public review, and consider and respond to significant public comments in its documentation of the final permit decision. *In re Steel Dynamic*, 9 E.A.D. 165 (EAB 2000). This process must be consistent, and it must allow the public and other permitting authorities to make rational and defensible determinations regarding the rejection of a technically feasible control technology – such as CCS – on economic grounds.

a) Sierra Club Comments and the Region's Response

Sierra Club's comments specifically noted the Region's cost analysis was incorrect because it used the wrong methods to calculate (1) overnight costs, and (2) annualized capital costs. (Ex. 2, SC Comments at 10-11.) With respect to overnight costs, the Cost Manual procedures specify the use of the overnight costing method, rather than the "all-in" method. (Ex. 2, SC Comments at 10.) The costs in the application and the pipeline estimates in the supplemental responses to the Region used the "all-in" costing method. In the overnight method, the costs quoted by the vendor are used as the overnight capital cost, with no adders for inflation, escalation, allowance for funds used during construction (AFUDC), owners' costs, and other

similar adders. The overnight method explicitly excludes adders that have a high degree of uncertainty and generally inflate costs indiscriminately. (*Id.*) Sierra Club further noted that the generic costs in the 2010 DOE/NETL study relied on did not use the "overnight" method and were therefore invalid to form the only basis for the Region's BACT analysis. (*Id.*)

The Region did not address these methodological issues, but rather argued in its response to Comment 10 that the Control Cost Manual does not apply to "new and emerging" technologies and "the Control Cost Manual predates the era of GHGs becoming newly subject to regulation and did not anticipate the considerations that might apply to its permitting." (Ex. 8, RTC at 19.) The Region went on to claim that, "[s]ince most cost development for CCS is not contemplated by the Control Cost Manual, many applicants addressing PSD for GHGs have sensibly utilized the best available information on costs for CCS technology [such as the 2010 DOE/NETL study]." (Ex. 8, RTC at 19.) The Region therefore wholly rejected the applicability of the overnight cost methodology. (Ex. 8, RTC at 20 ("we note that overnight capital cost does not take into account financing costs or escalation, and hence is not an actual estimate of construction cost").)

b) The Region Erred By Rejecting Overnight Costs Methodology

As a preliminary matter, the Region's statement that the Control Cost Manual does not apply to "new and emerging" technologies is wrong. There are two types of information in the Control Cost Manual: (1) the front end (Section 1) sets out a general methodology, the overnight method, to estimate cost-effectiveness and (2) the back end (Sections 2-7) consists of individual chapters on developing actual costs for well-developed add-on pollution controls. (Ex. 10, Control Cost Manual Excerpt.) It is true that none of the add-on controls in sections 2-7 are relevant to the GHG add-on control cost analysis. However, there is nothing in the Manual that

says the methodology in the front part does not apply to "new and emerging technologies." The Region's reference to new and emerging technologies can be found at page 1-3 of the Control Cost Manual, which states that "generally" new and emerging technologies are not within the scope of the manual. (Ex. 10.) This is a reference to the specific technologies in sections 2-7; it is not a rejection of the cost methodologies – such as overnight costs – that should be applied by permitting authorities.

A better statement of the purpose of the cost manual is found on the following page: "The objectives of this Manual are two-fold: (1) to provide guidance to industry and regulatory authorities for the development of accurate and consistent costs (capital costs, operating and maintenance expenses, and other costs) for air pollution control devices, and (2) to establish a standardized and peer reviewed costing methodology by which all air pollution control costing analyses can be performed." (Ex. 10, Control Cost Manual at 1-4.) If there is to be consistency in GHG BACT permitting cost analyses, then permitting authorities must use a standard method for estimating those costs. The methodology may differ from "typical energy industry" methods such as levelized cost of energy (LCOE) (Ex. 8, RTC at 20), but that does not mean that the Control Cost Manual should be completely abandoned.

To the contrary, courts have specifically required the energy industry to use the overnight costing methodology from the Control Cost Manual in other regulatory contexts specifically because it allows easy comparison between projects.

> The [Best Available Retrofit Technology ("BART")] guidelines say that states should follow the [Control Cost] manual's methodology so that projects can be more easily compared. The EPA said that OG&E should have used the "overnight" costing methodology. Instead, OG&E and others incorrectly assume that BART cost-effectiveness should be based on the "all-in" cost method, which includes all of the costs of a financial transaction, including interest, commissions, and any other fees from a

> financial transaction up to the date that the project goes into operation, as of the assumed commercial operating dates of the scrubbers

Oklahoma v. U.S. E.P.A., 723 F.3d 1201, 1213 (10th Cir. 2013). The Region Haze Rule and BART determinations at issue in *Oklahoma v. EPA* are distinct from the NSR program BACT analysis requirements, but the cost-effectiveness calculations are identical. Both BART and BACT analyses involve an economic component to determine the appropriateness of pollution controls. The Control Cost Manual is therefore applicable to both because it "establish[es] a standardized and peer reviewed costing methodology by which all air pollution control costing analyses can be performed." (Control Cost Manual at 1-4.) In fact, the BART Guidelines stipulate that "cost estimates should be based on the OAQPS Control Cost Manual, where possible." 70 FR 39166 (July 6, 2005). There is no demonstration in the record for Baytown that it is not possible to use the Control Cost Manual in this case, nor is there an adequate explanation for why the Control Cost Manual should not be used.

The Region conceded in its response to comments that it explicitly included financing costs and escalation in its analysis. (Ex. 8, RTC at 20.) This clearly deviates from the Control Cost Manual and therefore will result in non-standard cost-effectiveness analyses. The Board should therefore reject this approach and remand the permit with instructions to the Region to follow the methodology in the Control Cost Manual.

c) The Region Erred by Using an Incorrect Annualized Capital Cost Rate.

Sierra Club's comments criticized Exxon's cost analysis for CCS because it relied on a capital recovery factor of approximately 0.2 (i.e. 20%). (Ex. 2, SC Comments at 11.) Sierra Club explained that the Control Cost Manual requires the use of a capital recovery factor that is calculated from the social rate of interest and the expected equipment lifetime. (Ex. 2, SC

Comments at 11.) The Control Cost Manual provides: "The interest rate employed in this Manual differs from that used in non-governmental financial analyses. It represents a social interest rate established by the Office of Management and Budget (OMB) for the comparison of public policy issues." (Ex. 10, Control Cost Manual at 2-12.)[21] The most recent social interest rate is 0.8% in 2013$ over a 20 year term.[22] Sierra Club calculated that this equates to a capital recovery factor of 0.0543 (i.e. 5.43%). (Ex. 2, SC Comments at 11, n.33.) This one change to the cost methodology reduces the cost-effectiveness calculation from $245.7/ton to $122/ton and the total annual cost as a percent of total project cost from 25% to 12%. If the Region then applied the potential offsets of up to $32 million for EOR and $24 million in tax credits (*see* Ex. 8, RTC at 10-11), the cost per ton would drop to as low as $66 /ton, or approximately 6% of total project costs.

The Region's response to comments (Comment 11) rejected the premise of Sierra Club's calculation. (Ex. 8, RTC at 20.) The Region did not disagree with Sierra Club's calculations, but instead asserted that the methods detailed in the Control Cost Manual simply did not apply. The 19 percent capital charge rate was reasonable, the Region asserted, because "ExxonMobil utilized a higher interest rate (14 percent) for the BOP project due to uncertainty in return on a major venture of this nature as compared to those of the commercial bond market…" (Ex. 8, RTC at 20.) The Region noted this interest rate was actually higher than other interest rates used in recent permitting decisions issued in Texas, but the Region overlooked this difference: "[i]t

[21] In 2002, the Control Cost Manual noted that the then-current interest rate was set at 7%. Cost Control Manual at 2-13. OMB revises the discount rate for cost effectiveness analyses each year in Circular A-94, Appendix C. (Ex. 11.)("These real rates are to be used for discounting constant-dollar flows, as is often required in cost-effectiveness analysis"). Available at: http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c

[22] See 20-year real treasury interest rate, in 2013$. Circular A-94, Appendix C. (Ex. 11.)

must be emphasized that there is no requirement that ExxonMobil utilize the same or "similar calculations" [as other recent permits]." (Ex. 8, RTC at 20.)

The Region's logic is confusing. In its response to the prior Comment 10, the Region stated, "[w]e acknowledge that consistency in decision making is a primary objective of the BACT analysis" (Ex. 8, RTC at 19). It then proceeded to ignore this objective by arguing on the following page that Exxon can essentially use whatever interest rate it wants because CCS is a "first-of-its-kind" project.[23] This was clear error on the part of the Region because (1) it directly conflicts with the direction of the Control Cost Manual to use the social interest rate, and (2) it is diametrically opposed to the purpose of the Control Cost Manual and the BACT cost analysis to provide "a standardized and peer reviewed costing methodology by which all air pollution control costing analyses can be performed." (Ex. 11, Control Cost Manual at 1-4.) The Region's own response to comments noted that Exxon used a capital recovery factor of 19% while other recently permitted projects used capital recovery factors of 14-17%. Sierra Club asserts that all of these estimates are too high, but this discrepancy nevertheless demonstrates the risk of allowing applicants to choose their own interest rate and escalation factors. The Control Cost Manual avoids this type of discrepancy because it relies on a standardized rate to determine cost-effectiveness.

The results of the Region's arbitrary interest rate and capital recovery factor are staggering: the cost-effectiveness calculation ($/ton) more than doubles when a 14% interest rate

[23] Sierra Club also notes that CCS on an ethylene cracking furnace is not remarkable compared to other application of CCS. The primary factor affecting the different application of CCS is the amount of CO_2 in the combustion streams. The installation of CCS depends largely on the CO_2 content of the waste stream; however, the record does not contain any information on the gas stream composition data, which is required to make the argument that CCS on the cracking furnaces is a "new" application of the technology. The data on stream composition is also necessary to serve as a basis for costs, and the lack of that data further emphasizes the overall shortcomings of the CCS cost effectiveness analysis.

is used compared to the prescribed real treasury interest rate of 0.8%. Such a wild swing in cost-effectiveness calculation opens up the entire BACT analysis to the risk of accounting gimmicks. The risk of such manipulation is precisely the reason that the Control Cost Manual relies on standardized methodologies and reliable, third-party benchmarks such as the real treasury interest rate. Otherwise applicants can simply cook the books on their accounting of controls to ensure that their cost-effectiveness analysis appears economically infeasible. The Board cannot condone this type of gaming if it ever hopes to see rational and defensible analyses for add-on GHG controls.

4. The Region Committed Clear Error By Combining Its BACT CCS Cost Analysis for Separate Emission Units.

The Region committed clear error by conflating two separate emission streams for the proposed CCS control: (1) the ethylene cracking furnaces, and (2) a hypothetical boiler that would purportedly be required to power a CCS system. (Ex. 2, SC Comments at 12.) Combining the CCS analysis for these two, separate, emissions streams overstates the cost of CCS for the project because the waste stream from the cracking furnaces is a higher purity CO_2 stream and therefore easier and cheaper to capture and control.[24] Step 1 of the top-down BACT analysis requires the permitting authority to "identify, for the emissions unit in question (the term 'emissions unit' should be read to mean emission unit, process, or activity), all 'available' control options." (NSR Manual at B.5 (emphasis added and parenthetical in original).) The GHG Guidance similarly provides: "EPA has generally recommended that permit applicants and permitting authorities conduct a separate BACT analysis for each unit." (GHG Guidance at 22.)

[24] Notably, the record does not contain data on CO_2 content of waste streams from either the cracking furnace or the proposed utility boiler. This omission on its own is fatal to a complete cost-effectiveness analysis of CCS.

The Region properly identified the steam cracking furnaces as an emission unit and identified CCS as an available add-on technology for those units. (Ex. 7, SOB at 8.) Section IX in the Region's SOB was completely dedicated to the 5-step BACT analysis specific to the steam cracking furnaces. However, as noted in Sierra Club's comments, in step 4 of the BACT analysis for CCS on the cracking furnaces, the Region combined the waste streams from both the cracking furnaces and the hypothetical boiler unit. This combined analysis was improper because it combined the flue gas from two separate emission units, thus raising the total cost of the CCS system by requiring it to also capture a lower-purity and more expensive waste stream. If an additional boiler really is necessary to operate CCS – an assertion that Sierra Club disputes – then the identification of alternatives should have included (1) CCS capture from only the cracking furnaces, (2) CCS capture from only the boiler, and (3) CCS capture from both the cracking furnaces and the boiler. Separately identifying each emission unit and considering the costs of CCS for each unit would result in different amounts of CO_2 being captured, but it also would have resulted in different CCS cost-effectiveness values. To the extent that capturing a lower purity CO_2 stream from the hypothetical boiler made CCS more expensive on a $/ton basis, then the Region should have considered whether it would be cost-effective to capture the waste stream from only the cracking furnaces. (GHG Guidance at 24.) Even if this latter alternative did not control as much total CO_2 from the entire project, and would therefore be ranked lower in step 3, it would still likely result in more CO_2 emission controlled compared to the next-best alternative the BACT analysis.[25]

[25] In other words, even if uncontrolled CO_2 emissions from the boiler offset the effectiveness of CCS on the cracking furnaces from 90% removal to something less, it would still likely be the most effective control technology.

a) Sierra Club's Comments and the Region's Response.

Sierra Club provided comments addressing this issue. "This [hypothetical boiler] stream would have a lower concentration of CO_2 (4 vol%) than the cracking furnaces (8 – 12 vol%). From both a cost and design perspective, ExxonMobil should not combine these two streams and instead should analyze each process separately." (Ex. 2, SC Comments at 12.)

The Region failed to provide any substantive response to Sierra Club's comment related to the combined streams. (Ex. 8, RTC at 23.) The Region dismissed the significance of the comment by asserting that Sierra Club "appears to selectively advocate for CCS from the cracking furnaces, but does not appear to advocate for CCS for CO_2 capture from a utility plant that is necessary to generate power to operate a CCS system…" (Ex. 8, RTC at 23.) The Region further asserted that it was within its discretion to ignore an analysis of the cost to control only the cracking furnace stream. "We have elected to treat the entire CCS system from carbon capture, energy needs, compression, and storage in the overall economic or cost consideration for BACT." (Ex. 8, RTC at 23.)

b) The Region Clearly Erred by Combining Its Analysis of CCS for the Cracking Furnaces and the Hypothetical Boiler.

The Region's response misstates Sierra Club's position. Sierra Club advocated for a complete BACT analysis that properly identified control alternatives <u>for the emission unit in question</u>, which should have been the cracking furnaces. (NSR Manual at B.5.) The boiler is part of the proposed control system for the cracking furnaces. If the hypothetical utility plant also creates a CO_2 stream, then the Region should <u>also</u> look at control alternatives for that emission unit, which include options other than CCS. However, the Region cannot dilute the cost-effectiveness of the most effective control alternative for the cracking furnaces by only looking at a CCS system that captures both the cracking furnace stream and the hypothetical boiler

stream. Those are two separate questions that should be addressed separately in the BACT analysis. The Region's response essentially ignored Sierra Club's comment, and therefore constituted a failure to respond to significant comments. *In Re: Rockgen Energy Ctr.*, 8 E.A.D. 536, 557 (EAB 1999)("The rules providing for public comments and requiring that the permit issuer respond to those comments contemplate that the permit issuer will be informed by and give serious consideration to public comments"). The Region must consider the cost analysis of CCS on the cracking furnaces separately from the hypothetical boiler.

In a footnote, the Region asserted that Exxon in its CCS cost study did not base its costs on a lower concentration stream coming from the hypothetical utility plant. (Ex. 8, RTC at 23, n.23.) However, following the reference in that footnote leads to Exxon's own analysis indicating that the two processes are different. Page 22 of Exxon's October 16, 2012 supplemental response explains that the "Furnace Section CO_2 Capture Plant" was designed to remove 92 tons of CO_2 per hour. In the following paragraph, Exxon states that the "Utility Plant CO_2 Capture Plant" was designed to remove 26 tons of CO_2 per hour. (Ex. 4 at 22) The details of what constitutes the "Furnace Section CO_2 Capture Plant" compared to the "Utility Plant CO_2 Capture Plant" are completely absent from the record. Therefore it is impossible to understand the different engineering designs, capital costs, and operating costs of those two apparently separate units. However, it is clear that the "Furnace Section CO_2 Plant" is designed to capture CO_2 at more than 3.5 times the rate as the "Utility Plant CO_2 Capture Plant."[26] This difference would suggest that assuming equal capital costs, the "Furnace Section CO_2 Plant" is much more efficient and therefore more cost-effective. This is exactly the point that Sierra Club raised in its comments.

[26] 92 tons of CO_2 per hour versus 26 tons of CO_2 per hour.

At a minimum, the Board should remand the permit and direct the Region to include the design details and costs of the "Furnace Section CO_2 Capture Plant" and the "Utility Plant CO_2 Capture Plant" in the record and allow an opportunity for public review and comment. The Board should also direct the Region to separately analyze the cost-effectiveness of CCS on the "Furnace Section CO_2 Capture Plant" and on the "Utility Plant CO_2 Capture Plant" to determine whether it is economically feasible to require CCS on one component of the facility, if not both.

V. CONCLUSION

The Region's BACT analysis is flawed for several reasons. It fails to properly consider and document the cost-effectiveness of emission reductions achievable by the application of CCS. The Board must remand the permit to the Region with instructions to (1) provide further analysis of the cost-effectiveness component of its BACT analysis for CCS, and (2) follow the methodologies identified in the Cost Control Manual or, in the alternative, provide a thorough record that demonstrates a comparable level of detailed analysis.

Respectfully submitted, this 26th day of December, 2013.

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Statement of Compliance

The foregoing complies with 40 C.F.R. § 124.19(d)(1)(iv) and (3). The length is 12,782 words, using the word count function in Microsoft Word.

Travis Ritchie

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document, PETITION FOR REVIEW OF PREVENTION OF SIGNIFICANT DETERIORATION PERMIT ISSUED BY REGION VI FOR EXXONMOBIL CHEMICAL COMPANY, BAYTOWN OLEFIN PLANT upon the following parties by FedEx:

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Dated at San Francisco, CA, this 26th of December of 2013.

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