SOAH DOCKET NO. 582-22-0201
TCEQ DOCKET NO. 2021-0942-AIR

APPLICATION OF PORT ARTHUR LNG, LLC FOR NEW STATE AND PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY PERMITS NOS. 158420, GHGPSDTX198 AND PSDTX1572	**§**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

PROTESTANT PORT ARTHUR COMMUNITY ACTION NETWORK'S REPLY IN SUPPORT OF ITS EXCEPTIONS TO THE PROPOSAL FOR DECISION

Protestant Port Arthur Community Action Network (PA-CAN or Protestant) respectfully submits to the Texas Commission on Environmental Quality (TCEQ) this reply (Reply) in further support of its June 9, 2022 exceptions (Exceptions) to the Proposal for Decision (PFD) entered by the Administrative Law Judges (ALJs) regarding Port Arthur LNG, LLC's (Port Arthur LNG or Applicant) application for Air Quality Permit Nos. 158420, GHGPSDTX198 and PSDTX1572 (Application)[1] and related draft permit (Draft Permit) entered in the above-referenced contested case hearing before the State Office of Administrative Hearings (SOAH).[2]

I. SUMMARY OF ARGUMENT

PA-CAN has filed specific Exceptions to the PFD which reflect its position that the Draft Permit should be denied because of Applicant's failure to demonstrate the controls and/or limits in the Draft Permit constitute the Best Available Control Technology (BACT) for two emission sources, the refrigeration compression turbines and the thermal oxidizers.[3]

[1] Port Arthur LNG Application dated Sept. 2019 (Port Arthur LNG Application) at PAL_00001-00668 (PA-CAN Exh. 2).
[2] Draft Permit at AR 00061-00108 (Tab B).
[3] PFD at 72.

With respect to the largest emission source at issue, the refrigeration compression turbines, the ALJs correctly determined that the Application and the Draft Permit did not meet established BACT standards by EPA and TCEQ.[4] It is not just a question, as the Executive Director (ED) suggests in its exceptions,[5] of a permit reviewer agreeing with the Applicant or concluding without analysis that BACT has been met. Whether the Applicant uses EPA's Top-Down analysis, TCEQ's Three-Tier analysis, or both – and the parties all agree either method should reach the same result[6] – the analysis involves certain steps the Applicant and ED must take to reach the final determination.[7] Steps that the TCEQ's Permit Reviewer, Mr. Hansen, was repeatedly unable to recall at the contested case hearing, potentially impacting his credibility.[8] The Applicant's witness, Mr. Higgins, was similarly not credible with respect to his justifications of Applicant's multiple conflicting cost effectiveness analysis calculations, as the ALJs recognized.[9] The ALJs should be free to disregard evidence they determine to be not credible, giving it the weight it deserves. This PFD is consistent with such a reasoned determination based on the totality of the evidence presented at the hearing, not testimony cherry-picked by the Applicant.

Ultimately the ALJs determined that Applicant did not meet its burden to establish that its proposed higher emission limits for NO_x and CO on the refrigeration compression turbines merely

[4] PFD at 37.
[5] ED's Response and Exceptions to the PFD at 8-9, 10-11, 12 (refrigeration compression turbines), 14 (thermal oxidizers).
[6] PFD at 10; *see also* TCEQ APDG at 3 (PA-CAN Exh. 10).
[7] PFD at 10-11; *see also* PA-CAN Closing Argument at 9-15.
[8] *See* Transcript reflecting Hansen Testimony at 617:12-18 ("I didn't really tabulate that"); 618:6-8 ("I can't recall"); 619:6-10 ("I didn't do it at that level"); 638:24-639:1 ("I don't remember what information I reviewed"); 639:5-14 ("I don't remember what information I had"); 663:25-664:3 ("I am not prepared to say whether it is or not" (in answer to whether the Applicant's analysis of going from 9 ppm NO_x in to 5 ppm NO_x out is an incremental cost analysis). I need some time to sit down with it"); 664:8-12 ("I'm saying I don't remember"); 665:4-14 ("I'd have to go back over the application on that"); 665:21-25 ("I don't remember that they did an incremental analysis"); 666:6-7 ("I don't know whether it is a true statement" as to whether in the Application the Applicant considers DLN as one dominate alternative and SCR as another dominate alternative"); 666:21-667:2 ("I don't remember… whether they used this incremental analysis method").
[9] PFD at 36.

carried over from its earlier "behind BACT" Base Permit[10] (equating to more pollution) were BACT.[11] The arguments presented by both Applicant and the ED to overturn the PFD lack merit, and, to the extent raised in the proceeding, PA-CAN fully responded to these arguments in its Closing Argument.[12] The ALJs rejected them for good reason, and no different result is required now.

Finally, neither the ED[13] nor the Applicant[14] make convincing arguments with respect to the ALJs' correct determination that Applicant's proposed limits for the thermal oxiders did not meet BACT,[15] and, ultimately, the Applicant even concedes that the 0.053 lb/MMBtu NO_x limit for the thermal oxidizer is "within the operating range" and "can be accommodated" by Applicant.[16]

II. SPECIFIC RESPONSES TO APPLICANT'S AND ED'S SEPARATE EXCEPTIONS TO THE PFD

A. The ALJs rightly decided that PA-CAN has standing to participate in this hearing.

In Order No. 1, Administrative Law Judge Farhadi found that PA-CAN has standing to participate in this hearing because its member, John Beard, has personal justiciable interests in this matter unique from members of the general public.[17] The Judge correctly reached this finding after hearing testimony[18] from Mr. Beard[19] and three expert witnesses, Dr. Ron Sahu, an environmental permitting expert,[20] Dr. Loren Hopkins, Chief Environmental Science Officer, Chief of Data

[10] Permit Nos. 131769, PSDTX 1456, and GHGPSDTX134.
[11] PFD at 72.
[12] PA-CAN Closing Argument at 17-39 (Exh. 2 to this Reply).
[13] ED's Response and Exceptions to the PDF at 14.
[14] Applicant's Brief and Exceptions to PFD and Order at 28-29.
[15] PFD at 62.
[16] Applicant's Brief and Exceptions to PFD and Order at 2.
[17] SOAH Order No. 1 at 6.
[18] Preliminary Hearing ("PH") Transcript at 17:5-173:15.
[19] Declaration of John Beard ("Beard Declaration) (PA-CAN PH Exh. 1).
[20] Declaration of Ron Sahu ("Sahu Declaration") at ¶¶ 2-7 (PA-CAN PH Exh. 3).

Services, Data Science and Statistics for the City of Houston Health Department in Houston, Texas,[21] and Dr. Peter DeCarlo, Associate Professor in the Department of Environmental Health and Engineering at Johns Hopkins University.[22]

Critically, the Applicant's own modeling shows that emissions from the Port Arthur LNG will increase the levels of particulate matter and nitrogen oxides at Mr. Beard's residence.[23] Further, the Applicant predicts that Port Arthur LNG's nitrogen oxide impacts at Mr. Beard's residence would exceed TCEQ's and EPA's "Significant Impacts Level."[24] Modeled impacts above the agencies' own definition of "significant" must support standing in this case. The Applicant's assertion that Mr. Beard could only be affected if air modeling predicted violations of the National Ambient Air Quality Standards should be rejected. In making that argument, the Applicant attempts to supplant a full merits inquiry in place of the standing inquiry the ALJ properly decided.

Mr. Beard is affected here because Port Arthur LNG will increase pollution levels at his home by significant amounts.[25] Exposure to this elevated pollution will increase his risk of numerous negative health effects.[26] Further, the Applicant has underrepresented emissions and failed to model worst-case emissions scenarios, and the actual worst-case impacts at Mr. Beard's home from Port Arthur LNG are likely higher than the Applicant states.[27] These facts and expert opinions — and other evidence presented at the preliminary hearing — are highly relevant to determining affectedness according to the factors listed in 30 Tex. Admin. Code § 55.203. The

[21] Declaration of Loren Hopkins ("Hopkins Declaration") at ¶¶ 2-8 (PA-CAN PH Exh. 2).
[22] Declaration of Peter F. DeCarlo ("DeCarlo Declaration") at ¶¶ 2-6 (PA-CAN PH Exh. 4).
[23] Sahu Declaration at ¶ 18 (PA-CAN PH Exh. 3); Exhibit 1 to PA LNG's Response to Contested Case Hearing, Affidavit of Michael Meister ("Meister Affidavit") at ¶¶ 17-18 (PA-CAN PH Exh. 9).
[24] Hopkins Declaration at ¶ 14 (PA-CAN PH Exh. 2); Sahu Declaration at ¶ 18 (PA-CAN PH Exh. 3); Meister Affidavit at ¶ 18 (PA-CAN PH Exh. 9).
[25] *Id.*
[26] Hopkins Declaration at ¶ 12 (PA-CAN PH Exh. 2).
[27] Sahu Declaration at ¶ 20 PA-CAN PH (Exh. 3); DeCarlo Declaration at ¶¶ 14, 15 (PA-CAN PH Exh. 4).

Applicant's argument that the additional SB709 factors added to 55.203, including the merits of the underlying permit, somehow preclude this finding of standing is misguided, especially when the ALJs found the permit deficient on the merits for failing to require modern pollution control technology.

PA-CAN presented this evidence and briefing in support of its standing at the preliminary hearing, as the Commission's interim order contemplated. The record establishes Mr. Beard's affectedness and demonstrates that Judge Farhadi's decision is well supported. The Commission should adopt this decision and all related findings of fact and conclusions of law.

B. The ALJs correctly determined that the Applicant's proposed limit of 9 ppmvd NO_x for the refrigeration compression turbines did not meet BACT.

The ALJs agreed with PA-CAN that the Applicant failed to conduct a proper BACT analysis for NO_x and CO from the refrigeration compressor turbines. PA-CAN presented uncontroverted evidence that multiple similar plants, both permitted and operational, have more stringent emission limits for NO_x and CO from those turbines. And the Applicant offered no plausible justification for not selecting these more stringent limits. Therefore, there is no basis to reject these limits as BACT.

PA-CAN presented evidence that selective catalytic reduction (SCR) is both technically feasible and economically reasonable, which are the two prongs of a BACT analysis. On the first prong, the Applicant disputes the technical feasibility of achieving 5 ppmvd NO_x by (1) ignoring its own admission that SCR is technically feasible,[28] and (2) using an incorrect and unsupported definition of "demonstrated in practice" in an attempt to exclude damaging evidence. On the

[28] Port Arthur LNG Application at PAL_000201-06 (PA-CAN Exh. 2); Higgins Direct Testimony at 10:17-18 (App. Ex. 500); Transcript at 653:4-8 (Hansen).

second prong, the Applicant continues to defend its discredited costs analyses in an attempt to inflate the cost of SCR and make it appear too expensive. We address these in turn.

1. The Applicant and the ED continue to disregard the broad scope of what constitutes a technology that is technically feasible.

To constitute BACT, a proposed technology must be both technically feasible and economically reasonable. The Applicant and the ED are adamant that a NO_x emissions lower than 9 ppmvd for the refrigerator compression turbines is not BACT because such limits have not been "demonstrated in practice," and are therefore technically infeasible.[29] The Applicant is incorrect. First, because Cove Point LNG is operational and has achieved a limit of 2.5 ppmvd NO_x, it meets even the Applicant's tortured definition of demonstrated in practice and technically feasible.

Second, the Applicant mischaracterizes BACT guidance to arrive at this narrow definition. The Applicant and ED erroneously assert that as some of the similarly situated facilities permitted with lower NO_x emissions limits are not yet operational, their controls cannot constitute BACT.[30] This narrow interpretation of technical feasibility is not only contrary to the plain language guidance provided by both the EPA and TCEQ, but also in direct conflict with the well-known changing nature of BACT. Furthermore, PA-CAN provided evidence of an operational facility with NO_x emissions limit of 2.5 ppmvd, which Applicant acknowledged, rendering this argument moot.

While the ALJs recognize that determining the technical feasibility of an emissions control goes far beyond what is currently in operation,[31] for the other parties' benefit, PA-CAN reiterates the guidance provided by both the EPA and TCEQ in reference documents previously cited to by

[29] Applicant's Brief and Exceptions at 16-17; ED Response and Exceptions to the PFD at 8.
[30] *Id*.
[31] PFD at 61 ("And it may be inferred from the TCEQ guidance that a BACT-level control does not need to be demonstrated in practice for it to be considered in the BACT analysis.").

the Applicant and ED. There are two main mechanisms to determine whether a technology is technically feasible: if it is either (1) demonstrated in practice ***or*** (2) available and applicable.[32] If a technology is not yet "demonstrated in practice,"—that is, it is not yet installed or operated successfully on the type of source under review—it is still technically feasible if it can be obtained by an applicant through commercial channels and can reasonably be installed and operated on the source type under consideration.[33] The New Source Review (NSR) Manual states more than once that there is a presumption of technical feasibility if a control option is permitted, irrespective of whether or how long a control option has been in operation.[34] Similarly, TCEQ's guidance emphasizes the importance of current permits in determining what constitutes BACT and recognizes that it may be necessary to review ***recent permit applications*** for similar facilities within the same industry.[35] For example, in a Tier I review, an applicant's BACT proposal is compared to emission reduction performance levels accepted as BACT in ***recent NSR permit reviews for the same process and/or industry***.[36]

Any assertion that the only technically feasible control options are those that are "demonstrated in practice" or "operational" is simply false. The Applicant and the ED both provide fragments from guidance documents and testimony to advocate for this contention. For instance, the ED quotes the following from TCEQ's guidance: "…[t]he emission reduction option(s) should have been successfully demonstrated in Texas and the United States."[37] What the ED fails to do is quote the sentence immediately following, which states: "However, there may be cases when the

[32] New Source Review Manual (NSR Manual) at B.17, POWERS 128 (PA-CAN Exh. 8).
[33] *Id*. (PA-CAN Exh. 8).
[34] *Id*. at B.7, POWERS 118 (PA-CAN Exh. 8)("[A] permit requiring the application of a certain technology or emission limit to be achieved for such technology usually is sufficient justification to assume the technical feasibility of that technology or emission limit."); *see also id.* at B.18 ("A commercially available control option will be presumed applicable if it has been or is soon to be deployed [e.g., is specified in a permit] on the same or similar source type.")
[35] APDG-6110 at 16, POWERS 384 (PA-CAN Exh. 10).
[36] APDG-6110 at 12, POWERS 380 (PA-CAN Exh. 10).
[37] ED Response and Exceptions to PFD at 5 (citing APDG-6110 at 17, POWERS 385 (PA-CAN Exh. 10)).

applicant may be asked to consider options…that have not yet been successfully demonstrated."[38] Applicant resorts to quoting its own witness's interpretation, ignoring the plain language of the guidance documents.[39] If the Applicant's definition of "demonstrated in practice" and/or "operational" was the *only* standard to assess technical feasibility, the EPA and TCEQ's guidance documents would not contemplate or emphasize the importance of reviewing current permits for similar facilities.

The Applicant incorrectly focuses on the TCEQ definition of BACT, despite the undisputed fact that the federal BACT definition applies here.[40] The federal definition is more expansive does not require a specified technology already be in operation.[41] Further, the NSR Manual's definition of "demonstrated in practice" nevertheless includes *permitted* technologies.[42] The Applicant is wrong that a technology must be operational or demonstrated in practice to be BACT. Likewise, the Applicant's statements that SCR has not been proven operational or demonstrated in practice are also inaccurate.

PA-CAN provided overwhelming evidence of LNG facilities with NO_x emissions limits lower than 9 ppmvd for refrigerator compression turbines.[43] Contrary to the ED's and Applicant's claims, these are not just "proposed" limits, but actual *permitted* limits that are to be used in BACT analyses to determine technical feasibility. PA-CAN even offered evidence of an *operational* LNG

[38] APDG-6110 at 17, POWERS 385 (PA-CAN Exh. 10).
[39] *See, e.g.,* Applicant's Brief and Exceptions to PFD and Order at 14-15 (Applicant quoting its own witness, Mr. Hearn).
[40] Transcript at 655:18-25 (Hansen).
[41] 40 C.F.R. § 52.21(b)(12) ("Best available control technology means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source…").
[42] NSR Manual at B.11, POWERS 122 (PA-CAN Exh. 8)(advising "[t]echnologies which have not yet been applied to (or permitted for) full scale operations need not be considered available; an applicant should be able to purchase or construct a process or control device that has already been demonstrated in practice").
[43] Lake Charles (3.1 ppmvd); Golden Pass LNG (5.0 ppmvd); Driftwood LNG (5.0 ppmvd); Rio Grande LNG (5 ppmvd).

facility (Cove Point LNG) which has achieved a significantly lower NO_x emissions rate of 2.5 ppmvd for its refrigerator compression turbines, one that Applicant acknowledges limits its NO_x emissions to less than 9 ppmvd.[44] Accordingly, PA-CAN has more than satisfactorily identified technically feasible options which demonstrate that the Applicant's proposed limit of 9 ppmvd NOx is not BACT.

2. PA-CAN demonstrated that SCR is economically reasonable.

PA-CAN presented evidence that SCR is cost effective. Specifically, PA-CAN showed that, using the Applicant's own calculations with appropriate baseline and controlled values, the cost per ton of NO_x removed ranged from $7,381 to $10,265. These costs are below or within the range of cost effectiveness the parties, including the Applicant, presented at the hearing, of $10,000 to $15,000 per ton, demonstrating that SCR is cost effective for Port Arthur LNG.

In its Exceptions, the Applicant continues to cite its own discredited cost effectiveness calculations, which the ALJs determined were based on faulty assumptions.[45] The Applicant disputes only a single aspect of the ALJs' cost analysis: while the ALJs rightly found that 15 ppmvd is the appropriate SCR "upper boundary" baseline inlet concentration, the Applicant argues for 9 ppmvd. The ALJs properly rejected the Applicant's attempt to use a controlled concentration of 9 ppmvd – the same limit Applicant proposes as BACT – as the uncontrolled baseline concentration.

The record supports the ALJs' finding that 15 ppmvd is the correct baseline concentration, including numerous SCR cost analyses from other permit applicants using 15 ppmvd as the inlet concentration, while the Applicant is unable to point to a single cost analysis using 9 ppmvd. Even

[44] Applicant's Brief and Exceptions to PFD and Order at 15.
[45] Applicant's Brief and Exceptions to PFD and Order at 19-21.

the Applicant's own initial 2019 cost analysis used 15 ppmvd as the inlet concentration.[46] When the Applicant changed that concentration from 15 ppmvd to 9 ppmvd in 2020, despite the fact that its turbines had not changed, it was unable to justify that adjustment, as the PFD states:[47]

> In this case Applicant originally used 15 ppmvd in the cost analysis first submitted with the Application. However, when Applicant supplemented the cost analysis in 2020 to use the updated version of EPA's SCR cost effectiveness calculation methodology, Applicant modified the baseline emission rate to 9 ppmvd. Mr. Higgins testified as to why the change was made; however, none of his explanations proved valid upon cross examination. The ALJs find that the preponderance of the evidence demonstrated that while originally DLN had an emission rate of 25 ppmvd NO_x, the updated version has a baseline emission rate of 15 ppmvd NO_x.

The Applicant presented seven arguments for using 9 ppmvd, all of which were rightly discredited by the ALJs after cross examination. In its Exceptions, the Applicant continues to argue for a 9 ppmvd inlet concentration that is unsupported by any evidence in the record or any credible testimony. The Applicant's attempt to rehabilitate its witness' testimony in post-decision briefing must fail.

C. The ALJs correctly determined that the Applicant's proposed limit of 25 ppmvd CO for the Refrigeration Compression Turbines did not meet BACT.

Applicant's proposed limit for control of CO emitted by the refrigeration compression turbines was 25 ppmvd at 15 O_2.[48] PA-CAN could rebut the presumption favoring Applicant that this limit complied with BACT with evidence that "raise[s] a genuine issue of facts as to whether the Draft Permit would" violate a state or federal requirement.[49] TEX. GOV'T CODE § 2003.047(i-2)(2). As detailed in PA-CAN's Exceptions,[50] contrary to the erroneous finding in the PFD, PA-CAN did offer rebuttal evidence of a lower limit at Rio Grande LNG (which the ALJs cited in the

[46] Port Arthur LNG Application at PAL_000208 (PA-CAN Exh. 2).
[47] PFD at 36.
[48] PFD at 25; Transcript at 531:7-9 (Higgins).
[49] *Application by the City of Dripping Springs*, SOAH Docket No. 582-18-300, Proposal for Decision at 4, available at https://www.tceq.texas.gov/assets/public/comm_exec/agendas/comm/backup/Proposal-for-Decision/2017-1749-MWD-PFD.pdf.
[50] PA-CAN Exceptions at 6-7.

PFD)[51] and even lower limits at other facilities[52] that 25 ppm was not BACT, resulting in the ALJs determining a lower limit of 15 ppmvd was more appropriate given the factual evidence in the record.[53]

It was not, however, PA-CAN's burden, in order to rebut that Applicant's limit was not BACT, to prepare a cost effectiveness analysis of the oxidation catalyst using SCR on the refrigeration compression turbines.[54] All parties agreed that use of SCR technology for CO emission was technically feasible.[55] PA-CAN's expert was certain that that the oxidation catalyst would be reasonable and cost effective with SCR.[56] Thus, the cost effectiveness calculation for the oxidation catalyst would change if the Applicant had to use SCR on the refrigeration compression turbines and would likely be reasonable. Applicant's witness admitted as much.[57]

Yet that calculation was never made as part of the Draft Permit as presented to the ALJs, and if Applicant wanted evidence of cost effectiveness the oxidation catalyst to be considered as an unreasonable alternative *if it had selected SCR,* Applicant could have presented that evidence of cost effectiveness in the record. Applicant chose not to. Thus, Applicant cannot prevail on its argument that its draft permit for CO controls on the refrigeration compression turbines meet BACT. Because the PFD determined that SCR is cost effective for NO_x to control emissions from the refrigeration compression turbines,[58] the Applicant must re-evaluate the cost effectiveness of

[51] PFD at 38.
[52] Powers Direct Testimony at 49:10-11 (Cove Point LNG), 49:16-18 (Lake Charles LNG and Golden Pass LNG) (PA-CAN Exh. A).
[53] PFD at 39.
[54] PFD at 39.
[55] Higgins Direct Testimony at 26:23-25 (App. Exh. 400); *see also* Hansen Direct Testimony at 19:26-27 (ED Exh. ED-1) (Applicant eliminated the oxidation catalyst for CO and VOC control "due to economic unreasonableness").
[56] PA-CAN Closing Argument at 38-39 (citing Powers Direct Testimony at 49:10-18, 50:6 (PA-CAN Exh. A))(Exh 2 to this Reply).
[57] PA-CAN Closing Argument at 38-39 (citing Transcript at 502:7-20, 551:8-16 (Higgins); Higgins Direct Testimony at 26:34-38 (App. Exh. 400)); (Exh 2 to this Reply).
[58] PFD at 37.

using an oxidation catalyst to control CO. Further, the ALJs have already determined that lower limits can be met based on the evidence offered of limits at other permitted facilities.[59] Applicant's argument that the Rio Grande LNG's limit had not even been permitted at the time of its Application[60] is irrelevant. A BACT determination is not made until the permit is approved, which will be the possible result of this contested case process.[61] For these reasons, the ALJs properly admitted the evidence, specifically, PA-CAN Exhibit 72,[62] relating to Rio Grande LNG's amended permit in 2020,[63] and properly considered Rio Grande LNG's amended limit to support the PFD findings.

Here, the ALJs could rely on the evidence in the record that reflected that Rio Grande LNG had a lower limit for CO of 15 ppm at 15% O_2. The PFD reflects the ALJs reasoned decision here[64] subject to PA-CAN's Exceptions regarding their related findings on this issue overall that the limit should be in the range of 4 ppmvd at 15% O_2.[65]

D. Applicant voluntarily sought this consolidated permit for all four trains making its arguments about a "base permit" irrelevant at this stage.

In a desperate attempt to cling to its higher emission limits, Applicant tries to revive the Permit for Trains 1-2,[66] for which the related BACT analysis took place over seven years ago, as

[59] PFD at 39.
[60] Applicant's Brief and Exceptions to the PFD and Order at 26.
[61] NSR Manual at B.54, POWERS 165 (PA-CAN Exh. 8) (explaining "The BACT emission limit in a new source permit is not set until the final permit is issued. The final permit is not issued until a draft permit has gone through public comment and the permitting agency has had an opportunity to consider any new information that may have come to light during the comment period.)., Applicant supplemented its application on October 2020 in response to PA-CAN's Comments *after* the Rio Grande LNG Permit Amendment had been submitted to TCEQ.
[62] Rio Grande LNG Permit Amendment Source Analysis & Technical Review at POWERS 9083 (PA-CAN Exh. 72).
[63] TCEQ's counsel acknowledged at the hearing that the Amended Permit Application for Rio Grande LNG was omitted from the administrative record or as a product of requested discovery. Transcript at 198:15-18 (characterizing discussed omission as a "mistake"); *see also* Transcript at 196:18-197:14 (Powers testifying that the 2020 permit information was not included in the permit reviewer's files produced in discovery or administrative record based on his review).
[64] PFD at 39.
[65] PA-CAN Exceptions at 6-7.
[66] Permit Nos. 131769, PSDTX 1456, and GHGPSDTX134.

still relevant here.[67] Applicant has waived its ability to rely on this "base permit" as justification for higher emission limits for several reasons.

First, it is undisputed that the Application for Air Quality Permit Nos. 158420, GHGPSDTX198 and PSDTX1572 for Trains 1-4 at the facility supersedes the older permit at Applicant's choice.[68] The TCEQ confirmed this reality in its discovery responses,[69] and Applicant's witness, Thompson, testified consistently with this planned result at the hearing on the merits.[70] Thus, if the permit is issued, it becomes the only permit applicable to the facility.[71] Applicant's statements in its Exceptions to the Commission directly contradict sworn testimony by the Applicant's representative at the hearing.[72]

Second, it is undisputed that a new, updated BACT analysis was required for the Application for Trains 1-4 filed in 2019.[73] The prior analysis or limits from the Trains 1-2 only permit are not only outdated, but wholly irrelevant to this proceeding.

Third, keeping Applicant's limits the same as its "behind BACT" permit for Trains 1-2 puts the new facility behind other recently permitted facilities in Texas and in nearby Louisiana.[74] With respect to the refrigeration compressor turbines, Applicant may now be utilizing DLN1+, a newer technology,[75] but the limit it seeks is far from keeping up with BACT or the Rio Grande

[67] PH Transcript at 178:2-5 (App. Exh. 101)(Thompson testifying that Applicant submitted its permit application for Trains 1 & 2 in 2015).
[68] Transcript at 324:19-325:1 (Thompson).
[69] TCEQ's Responses to PA-CAN's First Set of Discovery Requests at RFA No. 13 (admitting that the new permit (Permit No. 158420) once issued will supersede any existing permit (Permit No. 131769 for the Port Arthur LNG Facility).
[70] Transcript at 324:19-325:1 (Thompson).
[71] TCEQ's Responses to PA-CAN's First Set of Discovery Requests at RFA No. 12 (admitting that if a new permit is issued (Permit No. 158420), it will be the new permit for the Port Arthur LNG Facility).
[71] Transcript at 324:19-325:1 (Thompson).
[72] Transcript at 324:19-325:1 (Thompson).
[73] Transcript at 325:2-11 (Thompson).
[74] PA-CAN Demonstrative Exhibit 1.
[75] Majeed Direct Testimony at 6:6-7 (App. Exh. 300).

LNG facility permitted by TCEQ at 5 ppm NO_x in 2020.[76] The ALJ's PFD leaves no doubt that PA-CAN definitely proved that other facilities have demonstrated better controls over NO_x through the use of SCR[77] or even DLN on the refrigerant compression turbines.[78]

Fourth, times have changed, and even Sempra Energy, parent company of PA LNG, realizes the industry is moving ahead. In direct contrast to the exceptions now filed by Applicant, Sempra recently suggested that Port Arthur LNG is "evaluating design changes that could reduce overall emissions, including electric drives, renewable power sourcing, and other technological solutions."[79] These exact same statements appear on Sempra Infrastructure's website talking about the proposed Port Arthur LNG facility.[80] Further, in January 2022, Cameron LNG, the site which Port Arthur LNG purportedly bases its Application on,[81] has already announced its intention to move to electric drive motors on its planned expansion for Train 4,[82] a much cleaner alternative to the technology proposed at Port Arthur LNG.[83] Thus, only confirming that the older "base permit" for Trains 1-2 is "behind BACT" and should also be left behind.

Finally, Port Arthur LNG's exceptions[84] only continue singing the refrain heard throughout this proceeding that "cost constraints" and its needs for external financing necessarily attaches limitations from funders regarding the proposed facility.[85] Because "BACT is required by law,"[86]

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[76] Rio Grande LNG Application (July 2020) at POWERS 9083 (PA-CAN Exh. 72).
[77] LNG Facilities using DLN + SCR include Driftwood LNG (5 ppm NO_x); Lake Charles LNG (3.1 ppm NO_x); Cove Point LNG (2.5 ppm NO_x); Jordan Cove LNG (2.0 ppm NO_x). PA-CAN Demonstrative Exh. 1.
[78] LNG facilities using DLN include Rio Grande LNG (5 ppm NO_x). PA-CAN Demonstrative Exh. 1; Rio Grande LNG Application (July 2020) at POWERS 9083 (PA-CAN Exh. 72).
[79] Sempra Energy, Form 10-Q Filing, U.S. Securities and Exchange Commission (September 30, 2021) at POWERS 6092 (PA-CAN Exh. 59).
[80] Transcript at 313:24-315:16 (Thompson).
[81] Majeed Direct Testimony at 5:31-6:7 (App. Exh. 300).
[82] Cameron LNG Amended Expansion Project Application at POWERS 9236 (Jan. 18, 2022) (PA-CAN Exh. 63).
[83] Cameron LNG Amended Expansion Project Application at POWERS 9332 (Jan. 18, 2022) (PA-CAN Exh. 63) (indicating that there will not be any NO_x emissions from electric drive motors based on the amended application).
[84] Applicant's Brief and Exceptions to the PFD at 2, 29-30.
[85] Majeed Direct Testimony at 19:4 (Applicant Exh. 300).
[86] NSR Manual at B.31, POWERS 142 (PA-CAN Exh. 8).

the "costs [of BACT] are integral to the overall cost of doing business and are not to be considered an afterthought."[87] The NSR Manual expressly precludes costs as a reason not to select a more efficient technology,[88] reminding us that "applicants generally should not propose elimination of the control alternatives on the basis of economic parameters that provide an indication of the affordability of a control alternative relative to the source."[89] On this point, the TCEQ agrees with PA-CAN, confirming distinctions between self-financed versus investor-financed projects are not part of the evaluation.[90]

Applicant's Hail-Mary attempt to hold onto "behind BACT" limits in its "Base Permit" that no longer comply with the federal Clean Air Act provide one more reason to just deny this permit altogether. Applicant has consistently demonstrated in this proceeding that it does not care about compliance—only its bottom line—at the direct expense of the environmental justice community of West Port Arthur living nearby.

III. EXCEPTIONS TO FINDINGS OF FACT AND CONCLUSIONS OF LAW

As a summary of its previously-filed Exceptions to the PFD's findings of fact and conclusions of law, PA-CAN has attached as Exhibit 1 to this Reply a "Summary of Requested Changes to the Judges' Proposed Order" for further consideration.

IV. CONCLUSION

As argued in PA-CAN's Exceptions, because the ALJs found that Port Arthur LNG failed to demonstrate that the controls for the refrigeration compression turbines and the thermal oxidizers in the Draft Permit constitute BACT, the TCEQ should deny the Draft Permit for failure

[87] *Id.* (PA-CAN Exh. 8).
[88] *Id.* (PA-CAN Exh. 8).
[89] *Id.* (PA-CAN Exh. 8).
[90] Transcript at 643:13 (Hansen); OPIC Closing Argument at 7.

comply with state and federal requirements. Here, the ALJs correctly determined that Applicant's proposed limits for NO_x and CO did not meet BACT for the refrigeration compression turbines, the primary issues on which the ED and Applicant except to the PFD.

In further support of its Exceptions, PA-CAN summarizes its requested alternative relief reflected in the proposed changes to the PFD reflected in the attached Summary of Requested Changes to the Judges' Proposed Order" (Exhibit 1) and stated concisely below:

(a) Using SCR as the selected control technology for the refrigeration compression turbines will result in a lower limit than NO_x controls of 5 ppmvd at 15% O_2 specified in the PDF. Based on other permitted LNG facilities using SCR, the BACT NO_x limit for this emission source using SCR should be 2 – 2.5 ppmvd at 15% O_2.

(b) Because PA-CAN established and the PFD confirmed the cost effectiveness of SCR for controlling NOx from the refrigeration compression turbines, an oxidation catalyst is the preferred control technology for CO and is also cost effective. Thus, BACT for CO from the refrigeration compression turbines should be 4 ppmvd at 15% O_2.

(c) Because the Applicant failed to distinguish its facility from similar sources with lower limits, and thus failed to conduct a proper Top-Down analysis, BACT limits on the power generation turbines should be 2 ppmvd for NO_x and 4 ppmvd for CO.

Finally, Protestant seeks any such other and further relief with respect to the Draft Permit or Application that the ALJs or TCEQ finds warranted considering the evidence presented and the ALJs' PFD.

Dated: June 20, 2022

Respectfully submitted,

LONE STAR LEGAL AID
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CERTIFICATE OF SERVICE

I certify that a copy of Port Arthur Community Action Network's Reply in Support of its Exceptions to the Proposal for Decision has been filed with SOAH and served on the following parties as reflected below on June 20, 2022:

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SOAH DOCKET NO. 582-22-0201
TCEQ DOCKET NO. 2021-0942-AIR

APPLICATION OF PORT ARTHUR LNG, LLC FOR NEW STATE AND PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY PERMITS NOS. 158420, GHGPSDTX198 AND PSDTX1572	**§**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

PROTESTANT PORT ARTHUR COMMUNITY ACTION NETWORK'S REPLY IN SUPPORT OF ITS EXCEPTIONS TO THE PROPOSAL FOR DECISION

EXHIBIT 1

SOAH DOCKET NO. 582-22-0201
TCEQ DOCKET NO. 2021-0942-AIR

APPLICATION OF PORT ARTHUR LNG, LLC FOR NEW STATE AND PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY PERMITS NOS. 158420, GHGPSDTX198 AND PSDTX1572	**§**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

PROTESTANT PORT ARTHUR COMMUNITY ACTION NETWORK'S SUMMARY OF REQUESTED MODIFICATIONS TO THE ALJS' PROPOSED ORDER

PA-CAN requests the Application by Port Arthur LNG, LLC for the Air Quality Permit Nos. 158420, PSDTX1572, and GHGPSDTX198 be denied.

PA-CAN further requests the following modifications to the Findings of Fact and Conclusions of Law in the proposed order:

I. FINDINGS OF FACT (74, 76, 78, 79, 85, 86)

Referred Issues

Issue F: Whether the controls proposed in the draft permit constitute Best Available Control Technology (BACT)

BACT for the Refrigeration Compression Turbines

74. To meet BACT, the Draft Permit should be revised so that the refrigeration compressor turbines are permitted with a NO_x emission limit of 5 ppmv at 15% O_2 on a 24-rolling hour average, except during periods of maintenance, startup, and shutdown (MSS).

PA-CAN's Proposed Modification: To meet BACT, the refrigeration compressor turbines must be permitted with a NO_x emission limit ranging from 2.0-3.1 ppmv at 15% O_2 on a 24-rolling hour average, except during periods of maintenance, startup, and shutdown.

76. Without the use of SCR, the use of oxidation catalyst to control CO emissions would cost an estimated $5,005 per ton of CO controlled.

PA-CAN's Proposed Modification: Strike and replace.

78. The most effective control for gas-fired refrigeration compressor combustion turbines that was not eliminated as technically infeasible or economically unreasonable is the use of good combustion practices to control CO emissions to 15 ppmv at 15% O_2.

PA-CAN's Proposed Modification: The most effective control for gas-fired refrigeration compressor combustion turbines that is both technically feasible and economically reasonable is the use of catalytic oxidation in conjunction with SCR technology to control CO emissions to 4 ppmv at 15% O_2.

79. To meet BACT, the Draft Permit should be revised so that the refrigeration compressor turbines are permitted with a CO emission limit of 15 ppmv at 15% O_2.

PA-CAN's Proposed Modification: To meet BACT, the refrigeration compression turbines must be permitted with a CO emission limit of 4 ppmv at 15% O_2.

BACT for the Power Generation Turbines

85. The evidence failed to demonstrate that reducing NO_x to 2-2.5 ppm or CO to 4 ppm is technically feasible.

PA-CAN's Proposed Modification: Strike and replace.

86. The Draft Permit meets BACT for NO_x and CO emissions from the proposed power generation turbines.

PA-CAN's Proposed Modification: Strike and replace.

Replace with the following:

76. The use of catalytic oxidation in conjunction with SCR technology to achieve a lower BACT emissions limitation for CO is both technically feasible and economically reasonable.

85. PA-CAN presented evidence of facilities similarly situated to PALNG that are permitted with lower NO_x and CO emissions levels from power generation turbines than those proposed by PALNG.

86. Under EPA's top down approach, PALNG failed to provide either technical or economic reasons why the lowest identified emissions limits for NO_x (2 ppm) and CO (4 ppmv) are not BACT for the power generation turbines.

[X]. The Draft Permit's proposed NO_x emissions limitation of 5 ppm and CO emissions limitation of 9 ppm from the power generation turbines are not BACT.

II. CONCLUSIONS OF LAW (26, 27, 30)

26. Consistent with Texas Health and Safety Code § 382.0518 and 30 Texas Administrative Code § 116.111(a)(2)(C), and with the addition of amendments requiring that: (1) the refrigeration compressor turbines be permitted with a NO_x emission limit of 5 ppm at 15% O_2 on a 24-rolling hour average, and a CO emission limit of 15 ppm at 15% O_2, except during periods of MSS; and (2) the thermal oxidizers achieve NO_x emission limits of 0.053 lb/MMBtu, the Facility will use

BACT, with consideration given to the technical practicability and economic reasonableness of reducing or eliminating emissions from the Facility.

PA-CAN's Proposed Modification: Strike and replace.

27. Consistent with Texas Health and Safety Code § 382.0518 and 30 Texas Administrative Code § 116.111(a)(2)(A), there is no indication that emissions from the Facility will contravene the intent of the TCAA, including the protection of the public's health and physical property.

PA-CAN's Proposed Modification: Strike and replace.

30. In accordance with Texas Health and Safety Code § 382.0518, the Application for Air Quality Permit Nos. 158420, PSDTX1572, and GHGPSDTX198 should be granted under the terms contained in the Draft Permit, with the following modifications:

- An amendment that requires the refrigeration compressor turbines be permitted with a NO_x emission limit of 5 ppmv at 15% O2 on a 24-rolling hour average, except during periods of MSS;
- An amendment that requires the refrigeration compressor turbines be permitted with a CO emission limit of 15 ppmv at 15% O2; and
- An amendment that requires the thermal oxidizers to achieve NO_x emission limits of 0.053 lb/MMBtu.

PA-CAN's Proposed Modification: Strike and replace.

Replace with the following:

26. Based on the standards set forth in Texas Health and Safety Code § 382.0518 and 30 Texas Administrative Code § 116.111(a)(2)(C), as well as the findings of fact, the Draft Permit is highly deficient, and the Facility's controls do not constitute BACT.

27. Based on the standards set forth in Texas Health and Safety Code § 382.0518 and 30 Texas Administrative Code § 116.111(a)(2)(A), as well as the findings of fact, there are clear indications that emissions from the Facility will contravene the intent of the TCAA.

30. In accordance with Texas Health and Safety Code § 382.0518, the Application for Air Quality Permit Nos. 158420, PSDTX1572, and GHGPSDTX198 should be denied considering the numerous exposed deficiencies in the Draft Permit.

SOAH DOCKET NO. 582-22-0201
TCEQ DOCKET NO. 2021-0942-AIR

APPLICATION OF PORT ARTHUR LNG, LLC FOR NEW STATE AND PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY PERMITS NOS. 158420, GHGPSDTX198 AND PSDTX1572	**§**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

PROTESTANT PORT ARTHUR COMMUNITY ACTION NETWORK'S REPLY IN SUPPORT OF ITS EXCEPTIONS TO THE PROPOSAL FOR DECISION

EXHIBIT 2

SOAH DOCKET NO. 582-22-0201
TCEQ DOCKET NO. 2021-0942-AIR

APPLICATION OF PORT ARTHUR LNG, LLC FOR NEW STATE AND PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY PERMITS NOS. 158420, GHGPSDTX198 AND PSDTX1572	**§**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

PROTESTANT PORT ARTHUR COMMUNITY ACTION NETWORK'S CLOSING ARGUMENT

Protestant Port Arthur Community Action Network (PA-CAN) respectfully submits this Closing Argument and requests that the honorable Administrative Law Judges issue a Proposal for Decision and a Proposed Order recommending that the Commissioners of the Texas Commission on Environmental Quality (TCEQ) deny the application for Air Quality Permit Nos. 158420, GHGPSDTX198 and PSDTX1572 (Application)[1] and related draft permit (Draft Permit).[2]

Applicant Port Arthur LNG, LLC (Port Arthur LNG or Applicant) has failed to demonstrate that the controls in the draft permit constitute Best Available Control Technology (BACT). As an alternative to denial, PA-CAN requests that the Application and Draft Permit be remanded to TCEQ for further review and analysis as necessary to comply with the relevant state and federal legal and technical requirements, including the requirements that (1) the Applicant conduct a proper BACT analysis and (2) the Applicant meet BACT limits for its emissions of

[1] Port Arthur LNG Application dated Sept. 2019 (Port Arthur LNG Application) at PAL_00001-00668 (PA-CAN Exh. 2).
[2] Draft Permit at AR 00061-00108 (Tab B).

nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM)/$PM_{2.5}$/ PM_{10}, sulfur dioxide (SO_2), sulfuric acid (H_2SO_4) and volatile organic compounds (VOC).

I. INTRODUCTION

Applicant is requesting a permit for a proposed liquefied natural gas (LNG) facility to be constructed in Port Arthur, Texas.[3] The principal pollutants of concern related to the proposed facility are NO_x and VOC, both of which are precursors for ozone.[4] The Applicant projects total NO_x emissions of 1,914 tons per year (tpy) and total VOC emissions of 207 tpy.[5] The principal emitting sources of NO_x and VOCs at Port Arthur LNG are[6]:

Emission Unit	**NO_x Emissions (tpy)**	**VOC Emissions (tpy)**
Combustion turbines for refrigeration compression	1,117	85.8
Combustion turbines for electric power generation	254	35.1
Ground flare	422	30.1
Thermal oxidizers	82	7.4
Marine flare	26	0.7
Fugitives	0	43.3

Port Arthur LNG is one of many proposed LNG terminals that have sought air permits from regulatory agencies for the purposes of exporting LNG overseas.[7] In seeking air quality permits, nearby LNG facilities in Texas and Louisiana have sought approval for permits for their

[3] Port Arthur LNG Application at PAL_000001 (PA-CAN Exh. 2).
[4] PA-CAN Comments on Application dated Oct. 2020 (PA-CAN Comments) at PACAN 027 (PA-CAN Exh. 3).
[5] Port Arthur LNG Application at PAL_000095 (Site-Wide Annual Emissions Summary) (PA-CAN Exh. 2).
[6] Port Arthur LNG Application at PAL_000095 (Site-Wide Annual Emissions Summary) (PA-CAN Exh. 2); *see also* Draft Permit at AR 00088-101 (Tab B) (stating maximum allowable emission rates for each emission source).
[7] FERC, North American LNG Export Terminals (Dec. 2021) at PACAN 151-153 (PA-CAN Exh. 11).

projects from both the state environmental regulatory agency, such as TCEQ, and the Federal Energy Regulatory Commission (FERC).[8] The emissions projected by many of these proposed LNG facilities along the Gulf Coast are lower than the NO_x and VOC emissions proposed by Port Arthur LNG.[9] Port Arthur LNG's emissions for other pollutants—namely, CO—are also higher than at other facilities in Texas and elsewhere.[10]

PA-CAN is a not-for-profit community-based organization that advocates for solutions that reduce or eliminate environmental and other public health hazards in the City of Port Arthur, an environmental justice community.[11] Port Arthur LNG's proposed facility is near homes owned by PA-CAN members, local schools, wildlife management areas, and recreational areas used by PA-CAN members, including its President John Beard, Jr.[12] Members of PA-CAN are especially concerned about the impacts of breathing the additional pollution that Port Arthur LNG proposes to release into their community.[13] Some of PA-CAN's members have health conditions, including respiratory conditions, which make them particularly sensitive to increased air pollution.[14]

II. PROCEDURAL BACKGROUND

On September 12, 2019, Port Arthur LNG applied to TCEQ for state and federal Prevention of Significant Deterioration (PSD) permits to begin construction of a LNG plant in Port Arthur, Jefferson County, Texas.[15] On August 2, 2021, TCEQ published Draft Permit Nos. 158420,

[8] FERC, North American LNG Export Terminals (Dec. 2021) at PACAN 152 (PA-CAN Exh. 11).
[9] PA-CAN Demonstrative Exhibit 1 (summarizing emission limits at other LNG facilities identified in PA-CAN Exhibits 12-20, 63, 67, 72, 73).
[10] Powers Direct Testimony at, 49:10-11, 49:16-18, 51:14-16, 51:17-52:2 (PA-CAN Exh. A),
[11] PA-CAN Comments on Application dated Sept. 2020 (PA-CAN Comments) at PACAN 017, 019 (PA-CAN Exh. 3).
[12] PA-CAN Comments at PACAN 017-018 (PA-CAN Exh. 3).
[13] PA-CAN Comments at PACAN 019 (PA-CAN Exh. 3).
[14] PA-CAN Comments at PACAN 022-023 (PA-CAN Exh. 3); Beard Declaration at ¶¶ 75-79 (Preliminary Hearing PA-CAN Exh. 1)
[15] Port Arthur LNG Application at PAL_000001 (PA-CAN Exh. 2)

GHGPSDTX198 and PSDTX1572.[16] PA-CAN timely submitted comments and requested a contested case hearing concerning Port Arthur LNG's application.[17] On October 21, 2020, Port Arthur LNG amended its application and submitted a revised BACT cost analysis.[18]

In March 2021, TCEQ issued the Executive Director's Response to Comments on the Draft Permit.[19] On August 2, 2021, TCEQ issued the Executive Director's Response to Hearing Requests and Requests for Reconsideration.[20] On August 25, 2021, the TCEQ Commissioners considered PA-CAN's request for a contested case hearing, determined that PA-CAN's comments raised disputed issues of fact relevant to the issuance of Port Arthur LNG's application, and referred PA-CAN's request for hearing to SOAH for a preliminary determination as to whether PA-CAN member John Beard, Jr. qualified as an affected person.[21] If such determination occurred, the TCEQ Commissioners referred ten issues regarding the draft permit to SOAH:[22]

A) Whether the proposed permit will be protective of the health and safety of the requestors;

B) Whether the proposed emissions will cause or contribute to exceedances of the National Ambient Air Quality Standards;

C) Whether the proposed emissions will cause nuisance conditions violating 30 TAC § 101.4;

D) Whether the Air Quality Analysis complies with TCEQ rules and guidance;

E) Whether the proposed plant will be protective of welfare, including wildlife and the environment in the surrounding area;

F) Whether the controls proposed in the draft permit constitute Best Available Control Technology;

G) Whether the emissions rates in the draft permit were accurately calculated using the appropriate methodology;

[16] Draft Permit at AR 00061-00108 (Tab B).
[17] PA-CAN Comments at PACAN 16-45 (PA-CAN Exh. 3).
[18] Port Arthur LNG Supplement to Application dated Oct. 2020 at PAL_001566-001628 (PA-CAN Exh. 4).
[19] TCEQ Response to Comments at AR 00112-00130 (PA-CAN Exh. 5).
[20] PA-CAN Preliminary Hearing Exhibit 7 at 1-12.
[21] TCEQ Interim Order at AR 00001-00003 (Tab A).
[22] TCEQ Interim Order at AR 00003 (Tab A).

H) Whether the quantity of emissions from the project will exceed allowable Prevention of Significant Deterioration Increments;

I) Whether the proposed permit contains adequate monitoring and reporting requirements; and

J) Whether cumulative impacts were appropriately evaluated for the project pursuant to applicable TCEQ rules and guidance.

On November 16, 2021, Administrative Law Judge Farhadi held a preliminary hearing during which TCEQ, the Applicant, and PA-CAN appeared and provided evidence concerning PA-CAN member John Beard's status as an affected person.[23] Judge Farhadi determined that Mr. Beard qualifies as an affected person and that PA-CAN met the requirements for associational standing; and, therefore, granted PA-CAN party status in the proceeding.[24]

Judges Farhadi and Hunziker presided over a hearing on the merits from February 22-24, 2022.[25] At the hearing, PA-CAN's air permitting expert, Mr. William E. Powers testified that deficiencies in the Application and Draft Permit, particularly regarding the analysis and selection of BACT, render the permit inadequate to comply with the standards of the Texas and federal Clean Air Acts.[26] PA-CAN now submits this closing brief in accordance with Order No. 5.[27]

III. APPLICABLE LAW

A. Standard of Review

As the party moving for approval of its application and issuance of a permit, Port Arthur LNG bears the burden of demonstrating by a preponderance of the evidence that its application satisfies all applicable legal requirements. 30 TEX. ADMIN. CODE. §§ 80.17(a)-(b). To be granted a permit, an application must demonstrate that emissions from the facility proposed to be permitted

[23] ALJ Order No. 1 at 3-4.
[24] ALJ Order No. 1 at 6.
[25] ALJ Order No. 2 at 3.
[26] Powers Direct Testimony at 1-73 (PA-CAN Exh. A); Transcript at 20:19-285:21; 302:19-303:10 (Powers).
[27] ALJ Order No. 5 at 1.

will "comply will all rules and regulations of the TCEQ and with the intent of the Texas Clean Air Act, including protection of the health and property of the public." 30 TEX. ADMIN. CODE § 116.111(a)(2). Before a permit may be granted, "Best Available Control Technology (BACT) must be evaluated for and applied to all facilities." 30 TEX. ADMIN. CODE § 116(a)(2)(C). For facilities subject to the federal PSD permitting program, like Port Arthur LNG, the federal definition of BACT at 40 C.F.R. § 52.21(b)(12) applies.[28]

The filing of documents comprising the administrative record creates a *prima facie* demonstration that the Draft Permit complies with "all state and federal legal and technical requirements." TEX. GOV'T CODE § 2003.047(i-1). This presumption is rebutted by evidence that "raise[s] a genuine issue of facts as to whether the Draft Permit would" violate a state or federal requirement.[29] TEX. GOV'T CODE § 2003.047(i-2)(2).

PA-CAN has provided evidence that Port Arthur LNG's Application fails to evaluate adequately Best Available Control Technologies and the Draft Permit fails to require BACT for air pollutants from the following emission sources:[30]

Emission Unit
Combustion turbines for refrigeration compression
Combustion turbines for electric power generation
Ground flare
Thermal oxidizers

[28] "All facilities with pollutants subject to regulation under the Federal Clean Air Act (FCAA), Title I, Part C shall evaluate and apply BACT as defined in §116.160(c)(1)(A) of this title (relating to Prevention of Significant Deterioration Requirements)." 30 TEX. ADMIN. CODE §116.111(a)(2).
[29] *Application by the City of Dripping Springs*, SOAH Docket No. 582-18-300, Proposal for Decision at 4, available at https://www.tceq.texas.gov/assets/public/comm_exec/agendas/comm/backup/Proposal-for-Decision/2017-1749-MWD-PFD.pdf.
[30] Powers Direct Testimony at 7:14-17 (PA-CAN Exh. A).

Marine flare
Fugitives

The burden is therefore on Port Arthur LNG to demonstrate by a preponderance of the evidence that its Draft Permit satisfies legal requirements, including: (a) that the Application includes an adequate BACT analysis and (b) that the Draft Permit complies with emission limits at least as stringent as BACT. TEX. GOV'T CODE § 2003.047(i-3).

B. Clean Air Act

The federal Clean Air Act (CAA) required the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards for six "criteria pollutants." 42 U.S.C. § 7409; 40 C.F.R. Part 50. Those areas of country in which ambient air quality meets the NAAQS are designated "attainment," whereas areas that do not meet the NAAQS are designated "nonattainment." 42 U.S.C. § 7501(2). Jefferson County, the site of Port Arthur LNG's proposed facility, is presently in attainment with the NAAQS.[31] The PSD provisions of the CAA are intended to prevent air quality in attainment areas from deteriorating and "to provide an added margin of health protection, preserve clean air for future development, and prevent firms from gaining a competitive edge by 'shopping' for clean air to pollute."[32] As a result of these protective regulations, air quality should continue to improve even with new development, and recent national data has shown long-term improvements in air quality because of these regulations.[33]

The Act's PSD provisions require new major sources of air pollution in attainment areas to obtain a PSD permit prior to construction. 42 U.S.C. §7475(a)(4). Applications for such permits

[31] Transcript 58:3-5 (Powers); Port Arthur LNG Application at PAL_000020 (PA-CAN Exh. 2).
[32] Congressional Review Service, *The Clean Air Act: A Summary of the Act and its Major Requirements* (updated Jan. 19, 2022), available at https://sgp.fas.org/crs/misc/RL30853.pdf.
[33] U.S. EPA, Flier on Our Nation's Air at POWERS 7466 (PA-CAN Exh. 7).

must include a BACT analysis, and PSD permits themselves must assure that pollution will be controlled at least to the levels achievable by applying BACT. 42 U.S.C. § 7475(a)(4). The federal PSD regulations define "Best Available Control Technology" as follows:

> [BACT is] an *emissions limitation* (including a visible emissions standard) *based on the maximum degree of reduction* for each pollutant subject to regulation under the [Clean Air] Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 C.F.R. parts 60 and 61. . . "

40 C.F.R. § 52.21 (emphasis added).

BACT requires a comprehensive analysis of all potentially available emission control measures, expressly including input changes such as use of clean fuels, process and operational changes, and the use of add-on control technology. Additionally, it requires that a new source comply with emission limits that correspond to the most effective control measures achievable.

Congress created the BACT concept in order "to minimize emissions." S. Rep. No. 95-127 at 29 (1977). One of the core aims of the 1977 Amendments to the Act was to compel the "rapid adoption of improvements in technology as new sources are built." *Id.* at 18. The PSD program is technology-forcing and intended to become more stringent over time as control technologies improve and new cleaner processes are introduced. Congress intended BACT as "[p]ossibly [the] most important" of the 1977 Act's many technology fostering measures. *Id.* This technology-forcing philosophy was "fundamental" to Congress's adoption of the BACT requirement and congressional efforts throughout the 1977 amendments "to accentuate technological innovation in the control of air pollutants." *Id.* at 10.

The CAA allows states to seek approval from EPA to administer their state's PSD permitting program. Approvable state programs must be incorporated into a State Implementation Plan (SIP) and must "include enforceable emission limitations and other control measures, means, or techniques . . . as may be necessary or appropriate to meet the applicable [CAA] requirements." 42 U.S.C. § 7410(a)(2)(A). EPA approved the Texas PSD permitting regulations and incorporated into the Texas SIP in 1989. 54 Fed. Reg. 52,823 (Dec. 22, 1989). TCEQ's current regulations and the approved SIP incorporate by reference the federal PSD rules including the federal definition of BACT, federal rules regarding technology reviews, and federal rules regarding source impacts analysis. *See* 30 TEX. ADMIN. CODE §§ 116.160(c)(2)(A)-(B); 40 C.F.R. § 52.2270; *see also* 30 TEX. ADMIN. CODE §§ 116.111(a)(2)(c).[34] The Texas SIP also binds Texas to the interpretations and guidance made by EPA with regard to PSD. 54 Fed. Reg. at 52,824.[35]

1. EPA's Top-Down Methodology

To lend consistency and a framework to BACT determinations being made by permit issuing authorities such as TCEQ, EPA has issued a guidance document that is widely used in PSD reviews, the New Source Review Workshop Manual (NSR Manual).[36] EPA recommends the NSR

[34] "Prior to evaluation of BACT under the TCAA, all facilities with pollutants subject to regulation under the Federal Clean Air Act (FCAA), Title I, Part C shall evaluate and apply BACT as defined in §116.160(c)(1)(A) of this title (relating to Prevention of Significant Deterioration Requirements)."

[35] "[A]ction by the EPA to approve this PSD program as part of the SIP will have the effect of requiring the state to follow EPA's current and future interpretations of the Act's PSD provisions and EPA regulations, as well as EPA's operating policies and guidance (but only to the extent that such policies are intended to guide the implementation of approved state PSD programs). Similarly, EPA approval also will have the effect of negating any interpretations or policies that the state might otherwise follow to the extent they are at variance with EPA's interpretation and applicable policies." EPA, Approval and Promulgation of Texas PSD, 54 Fed. Reg. 52,823, 52,824 (Dec. 22, 1989) (to be codified at 40 C.F.R. Part 52). Texas' regulatory agency committed "to implement the PSD SIP approved program in compliance with all of the EPA's statutory interpretations and operating policies, stating "you may be assured that the position of the agency is, and will continue to be, to implement EPA requirements relative to programs for which we have received State Implementation Plan approval, and to do so as effectively as possible." 54 Fed. Reg. at 52,825. The EPA found Texas sufficiently committed to conduct the PSD program in accordance with the Federal requirements as set forth in the CAA, applicable regulations, and as further clarified in the EPA's statutory and regulatory interpretations, including the proper conduct of BACT analyses, such as the "Top-Down" approach." 54 Fed. Reg. at 52,825.

[36] U.S. EPA, New Source Review Workshop Manual (1990) (PA-CAN Exh. 8).

Manual's use as a means for applying the BACT regulatory criteria in a manner that should yield defensible BACT determinations. *See In re Maui Elec. Co.*, 8 E.A.D. 1, 4-5 (EAB 1998); *In re Kawaihae Cogeneration Project*, 7 E.A.D. 107, 112-13 (EAB 1997). The NSR Manual summarizes the steps in the BACT analysis as follows:[37]

Step 1: IDENTIFY ALL AVAILABLE CONTROL TECHNOLOGIES.

- List is comprehensive (LAER included)

Step 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

- A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emission unit under review.

Step 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

Should include:

- control effectiveness (percent pollutant removed);
- expected emission rate (tons per year);
- expected emission reduction (tons per year);
- energy impacts (But/kWh);
- environmental impacts (other media and the emissions of toxic and hazardous air emissions); and
- economic impacts (total cost effectiveness, incremental cost effectiveness).

Step 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

- Case-by-case consideration of energy, environmental, and economic impacts.
- If top option if not selected as BACT, evaluate next most effective control option.

Step 5: SELECT BACT.

- Most effective option not rejected is BACT.

The first step requires the permitting authority to comprehensively identify all "potentially" available control options.[38] The categories of controls that must be considered include: (1) inherently lower emitting process/practices, (2) add-on controls, and (3) different combinations of inherently lower emitting practices and add-on controls.[39] "Technologies required under lowest

[37] NSR Manual at B.6, POWERS 117 (PA-CAN Exh. 8); Powers Direct Testimony at 15:16-16:5 (PA-CAN Exh. A).
[38] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8); Powers Direct Testimony at 31:2-3 (PA-CAN Exh. A).
[39] NSR Manual at B.10, POWERS 121 (PA-CAN Exh. 8).

achievable emission rate (LAER) determinations are available for BACT purposes and must also be included as control alternatives and usually represent the top alternative."[40] The NSR Manual notes that combinations of inherently lower-polluting processes and add-on controls are likely to yield a more effective means of emission control than either approach alone and that combinations of lower polluting processes and add on controls should be identified in step one.[41] While an applicant is not always required to consider control options or combinations that would "redefine" the source, the permit issuer should take a 'hard look' at the applicant's claim that a control alternative would redefine the source "in order to discern which design elements are inherent for the applicant's purpose and which design elements may be changed to achieve pollutant emission reductions without disrupting the applicant's basic business purpose for the proposed facility, . . ." *In re Desert Rock Energy Co.*, PSD Appeal No. 08-03 *et al*., 14 E.A.D. 484, 530 (EAB 2009) (internal quotations omitted). If the control alternative or combination of controls does not substantially alter the purpose or basic design of the proposed facility it should be considered in the BACT analysis. *See In re Desert Rock Energy*, 14 E.A.D at 530 (stating "[t]he permit applicant initially defines the proposed facility's end, object, aim, or purpose – that is the facility's basic design, although the applicant's definition must be for reasons independent of air permitting").

The second step is to eliminate "technically infeasible" options.[42] "[I]f the control technology has been installed and operated successfully on the type of source under review, it is demonstrated, and it is technically feasible."[43] A permit requiring application of a certain

[40] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[41] NSR Manual at B.14, POWERS 125 (PA-CAN Exh. 8).
[42] NSR Manual at B.7, POWERS 118 (PA-CAN Exh. 8); Powers Direct Testimony at 16:1 (PA-CAN Exh. A).
[43] NSR Manual at B.17, POWERS 128 (PA-CAN Exh. 8).

technology or emission limit to be achieved for such technology usually is sufficient justification to assume technical feasibility of that technology or emission limit.[44]

The third step is to rank the array of remaining control technology alternatives in order of control effectiveness for the pollutant under review.[45] The lowest previously permitted limit for a control technology should be utilized as the control effectiveness in the absence of a showing of differences between the proposed source and the previously permitted source.[46] Further, a control technology that is eliminated from consideration for adverse economic impacts at its highest level of performance should be considered at a lesser level of performance.[47]

The fourth step is to evaluate those control technology options, starting with the most effective, and consider the energy, environmental, and economic impacts.[48] This step involves the elimination of control options based on an evaluation of collateral impacts, including cost.[49] If the most effective control is rejected, the rationale for the rejection must be clearly documented.[50] There is a presumption that "sources within the same category are similar in nature and that cost and other impacts that have been borne by one source of a given source category may be borne by another source of the same source category."[51]

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[44] NSR Manual at B.7, POWERS 118 (PA-CAN Exh. 8).
[45] NSR Manual at B.7-B,8, POWERS 118-119 ((PA-CAN Exh. 8); Powers Direct Testimony at 16:2-3 (PA-CAN Exh. A).
[46] NSR Manual at B.24, POWERS 135 (PA-CAN Exh. 8).
[47] NSR Manual at B.24, FN 1, B.24-B.25, POWERS 135-136 (PA-CAN Exh. 8).
[48] NSR Manual at B.6, POWERS 117 (PA-CAN Exh. 8).
[49] Powers Direct Testimony at 16:4 (PA-CAN Exh. A).
[50] NSR Manual at B.8-B.9, POWERS 119-120 (PA-CAN Exh. 8).
[51] NSR Manual at B.29, POWERS 140 (PA-CAN Exh. 8); *see also* NSR Manual at B.31, POWERS 142 (PA-CAN Exh. 8) ("where a control technology has been successfully applied to similar sources in a source category, an applicant should concentrate on documenting significant cost differences, if any, between the application of the control technology on those other sources and the particular source under review."); B.44 ("It is important to keep in mind that BACT is primarily a technology-based standard. In essence, if the cost of reducing emissions with the top control alternative, expressed in dollars per ton, if on the same order as the cost previously borne by other sources of the same type in applying that control alternative, the alternative should initially be considered economically achievable, and therefore acceptable as BACT. . . where unusual factors exist that result in cost/economic impacts beyond the range normally incurred by other sources in that category, the technology can be eliminated provided the applicant had adequately identified the circumstances, including the cost or other analyses, that show what is significantly different about the proposed source.").

Finally, in step 5, the most effective control option not eliminated in step 4 is proposed as BACT.[52]

The BACT analysis is one of the most critical elements of the PSD permitting process. As such, it should be well documented in the administrative record.[53] A decision to eliminate potential control options must be adequately explained and justified.[54] The burden of proof is on an applicant to justify why the proposed source is unable to apply the best technology available.[55]

EPA emphasizes the importance of consistency in BACT decisions made on the basis of cost or economic considerations and therefore directs that the EPA's OAQPS Air Pollution Control Cost Manual be followed in conducting PSD cost analysis.[56] The applicant should document the basis for equipment cost estimates with data from equipment vendors or with referenced sources such as the EPA Cost Control Manual.[57] Any unusual costing assumptions must be documented.[58]

The NSR Manual describes two methods of cost effectiveness analysis: average cost effectiveness and incremental cost effectiveness.[59] Average cost effectiveness is the total annualized costs of control divided by the annual emission reductions (the difference between the

[52] NSR Manual at B.9, POWERS 120 (PA-CAN Exh. 8); Powers Direct Testimony at 16:5 (PA-CAN Exh. A).
[53] NSR Manual at B.8-B.9, POWERS 119-120 (PA-CAN Exh. 8) (explaining that "[i]n the event that the top candidate is shown to be inappropriate, due to energy, environmental or economic impacts, the rational for this finding should be documented for the public record.").
[54] *See In re Masonite Corp*., 5 E.A.D. 551, 566 (EAB 1994) (remanding PSD permit decision in part because BACT determination for one emission source was based on an incomplete cost-effectiveness analysis); *In re Pennsauken Cnty., N.J., Res. Recovery Facility*, 2 E.A.D. 667, 672 (Adm'r 1988) (remanding PSD permit decision because "[t]he applicant's BACT analysis * * * does not contain the level of detail and analysis necessary to satisfy the applicant's burden" of showing that a particular control technology is technically or economically unachievable); *Columbia Gulf Transmission Co.*, 2 E.A.D. 824, 830 (Adm'r 1989) (permit applicant and permit issuer must provide substantiation when rejecting the most effective technology).
[55] U.S. EPA Policy Memorandum on BACT Determinations at 5 (April 23, 1987), available at https://archive.epa.gov/airquality/ttnnsr01/web/pdf/p8_15.pdf (stating "[t]he burden of proof always rests on the applicant to demonstrate why a generally accepted and established control option is unacceptable for the proposed project.,. . . In most cases, a source simply should not be granted a permit if financing is inadequate for proper controls.").
[56] NSR Manual at B.33, POWERS 144 (PA-CAN Exh. 8).
[57] NSR Manual at B.33, POWERS 144 (PA-CAN Exh. 8).
[58] NSR Manual at B.35, POWERS 146 (PA-CAN Exh. 8).
[59] NSR Manual at B.36, POWERS 147 (PA-CAN Exh. 8).

baseline emission rate and the controlled emission rate).[60] Baseline emissions represent the realistic upper boundary of uncontrolled emissions for the source.[61] The baseline when calculating the cost effectiveness of adding post-process emission controls to inherently lower polluting processes may be the emissions from the low polluting process itself.[62] It is important to remember, however, that a control technology that is eliminated from consideration for adverse economic impacts at its highest level of performance should be considered at a lesser level of performance.[63]

An incremental cost effectiveness calculation compares the costs and emissions performance level of a control option to those of the next most stringent option.[64] An incremental cost analysis should be examined in combination with the total cost effectiveness.[65]

Incremental cost effectiveness calculations should focus only on differences between dominant alternatives.[66] The EPA explicitly warns, however, that incremental costs alone cannot be used to argue for one alternative over another.[67] Further, an applicant must take care when calculating cost-effectiveness to ensure that the assumptions made are "reasonable and supportable," to avoid inflating the cost-effectiveness figures.[68]

Rejection of a more effective technology based on cost must be supported by a reasoned explanation, based on objective economic data, which includes consideration of average cost-effectiveness.[69]

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[60] NSR Manual at B.36, POWERS 147 (PA-CAN Exh. 8).
[61] NSR Manual at B.37, POWERS 148 (PA-CAN Exh. 8).
[62] NSR Manual at B.37, POWERS 148 (PA-CAN Exh. 8).
[63] NSR Manual at B.24-B.25, POWERS 135-136 (PA-CAN Exh. 8).
[64] NSR Manual at B.41, POWERS 152 (PA-CAN Exh. 8).
[65] NSR Manual at B.41, POWERS 152 (PA-CAN Exh. 8).
[66] NSR Manual at B.41, POWERS 152 (PA-CAN Exh. 8).
[67] NSR Manual at B.43, POWERS 153 (PA-CAN Exh. 8).
[68] NSR Manual at B.44, POWERS 154 (PA-CAN Exh. 8).
[69] NSR Manual at B.45, POWERS 155 (PA-CAN Exh. 8); *see also In re Inter-Power of N.Y., Inc.*, 5 E.A.D. 130, 136 (EAB 1994) ("[A] cost-effectiveness evaluation (both average and incremental) must be based on 'objective' economic data taken from other facilities and . . . the analysis must be sufficiently detailed to support the determination."); *see also In re Steel Dynamics, Inc*., 9 E.A.D. 165, 202-207 (EAB 2000) (remanding permit due to incomplete cost-effectiveness analysis); *In re Masonite Co.*, 5 E.A.D. 551, 564-69 (EAB 1994) (remanding permit

2. Texas BACT Methodology

While Texas has its own distinct "Three Tier" guidance for determining BACT, application of that guidance must be consistent with and as rigorous as EPA's top-down approach.[70] Regardless of whether the Texas or EPA methodology is used, the BACT determination must be the same.[71] Further, BACT is technology-forcing or technology-driving, and, as a result, BACT determinations made over time should tend to be more stringent.[72] TCEQ's BACT guidance document states, "[n]ew technical developments may offer greater performance levels resulting in greater emission reductions than those accepted in recent permit reviews."[73]The outcome of correctly implemented BACT methodology should result in the same BACT, whether it is determined via Texas or EPA methodology.[74]

IV. REFERRED ISSUES

A. Issue F: The BACT Analysis In This Case Is Fatally Flawed And The Proposed Controls And Resulting Emission Limits Do Not Constitute BACT.

Port Arthur LNG's initial Application, submitted on September 12, 2019, selected the following controls and emission limits as BACT:

due to incomplete cost-effectiveness analysis); *In re General Motors, Inc.*, PSD Appeal No. 01-30, 10 E.A.D 360, 360 (EAB 2002) (stating "MDEQ offers no explanation of how it considered average cost-effectiveness. Therefore, the Board concludes that the cost-effectiveness analysis is incomplete and MDEQ has failed to provide an adequate explanation on the record of its decision to reject the top control alternatives identified in its BACT determination. Accordingly, the Board remands this issue for further analysis.")

[70] Powers Testimony at 17:17-18 (PA-CAN Exh. A); TCEQ, APDG-6110 at POWERS 379 (PA-CAN Exh. 10); Texas LNG SOAH Decision (Feb. 19, 2020) at POWERS 6144 (PA-CAN Exh. 9).

[71] Powers Testimony at 17:17-18:1; 19:13-15 (PA-CAN Exh. A); TCEQ, APDG-6110 at POWERS 379 (PA-CAN Exh. 10).

[72] Powers Testimony at 20:4-9 (PA-CAN Exh. A); TCEQ, APDG-6110 at POWERS 379 (PA-CAN Exh. 10).

[73] TCEQ, APDG-6110 at POWERS 379 (PA-CAN Exh. 10).

[74] The first tier of TCEQ's process "involves a comparison of the applicant's BACT proposal to emission reduction performance levels accepted as BACT in recent permit reviews." TCEQ, APDG 6110 at 3 (PA-CAN Exh. 10). The second tier "involves consideration of controls that have been accepted as BACT in recent permits for similar air emission streams in a different process or industry." TCEQ APDG 6110 at 3 (PA-CAN Exh. 10). The third tier is the same as EPA's top-down process for determining BACT. *Compare* TCEQ, APDG 6110 at 4 (PA-CAN Exh. 10)(listing five steps of Tier III) *with* NSR Manual at B.6, Table B-1, POWERS 117 (PA-CAN Exh. 8)(listing the steps in EPA's top-down BACT process).

Emission Unit	Control	Emission Limit
Combustion turbines for refrigeration compression[75]	DLN	9 ppm NO_x at 15% O_2 25 ppm CO at 15% O_2
Combustion turbines for electric power generation[76]	SCR Oxidation Catalyst	5 ppm NO_x at 15% O_2 9 ppm CO at 15% O_2
Thermal oxidizers[77]	DLN	0.06 lb/MMBtu
Ground flare[78]	Comply with 40 C.F.R. § 60.18	0.1380 lb/MMBtu NO_x
Marine flare[79]	Comply with 40 C.F.R. § 60.18	0.1380 lb/MMBtu NO_x
Fugitives[80]	TCEQ LDAR 28VHP monitoring protocol	

Following comments made by PA-CAN identifying a multitude of flaws in Port Arthur LNG's initial Application,[81] Port Arthur LNG submitted to TCEQ reply comments and a supplement to its Application (hereafter Supplement) in which Port Arthur LNG reworked some of its BACT cost-effectiveness calculations for NO_x from the refrigeration turbines but kept its ultimate determinations as to BACT controls and emission limits.[82] Both Port Arthur LNG's initial and supplemental applications failed to evaluate potentially applicable control alternatives and combinations of alternatives, failed to properly evaluate and document economic impacts and costs, and failed to provide support for rejecting lower emission limits achieved at other similar LNG facilities in and outside of Texas as summarized in PA-CAN Demonstrative Exhibit 1:

[75] Port Arthur LNG at PAL_000086-87 (PA-CAN Exh. 2).
[76] Port Arthur LNG at PAL_000087-88 (PA-CAN Exh. 2).
[77] Port Arthur LNG at PAL_00088-89 (PA-CAN Exh. 2).
[78] Port Arthur LNG at PAL_000091 (PA-CAN Exh. 2).
[79] Port Arthur LNG at PAL_000090-91 (PA-CAN Exh. 2).
[80] Port Arthur LNG at PAL_000093 (PA-CAN Exh. 2).
[81] PA-CAN Comments at PACAN 027-035 (PA-CAN Exh. 3).
[82] *See* Port Arthur LNG Supplement to Application at PAL_001578-001580 (PA-CAN Exh. 4); Powers Direct Testimony at 7:17-8:2 (PA-CAN Exh. A).

EVOLUTION OF BEST AVAILABLE CONTROL TECHNOLOGY (BACT)
FOR LNG FACILITIES ON GAS TURBINES FOR REFRIGERATION COMPRESSORS

DATE	LNG FACILITY	STATE	TYPE OF GAS TURBINE	BACT	NO_X EMISSIONS	STATUS
2022 APPLICATION	Cameron LNG Expansion (Train 4)	LA	Electric motor drive	N/A	0	Amended Application for Expansion for Train 4 only
2020 PERMIT	Texas LNG	TX	Electric motor drive	N/A	0	Construction start 2022
2019 PERMIT	Freeport LNG Phase II Expansion	TX	Electric motor drive	N/A	0	Train 4 planned 2022
2019 PERMIT	Driftwood LNG	LA	aero derivative gas turbines	DLN + **SCR**	5.0 ppmvd	First LNG planned 2023
2019 APPLICATION	**Port Arthur LNG**	**TX**	**GE Frame 7EA gas turbines**	**DLN Proposed**	**9.00 ppmvd**	**AT ISSUE**
2018 PERMIT	Rio Grande LNG	TX	GE Frame 7EA gas turbine	DLN	9.0 ppmvd → 5.0 ppmvd	2020 permit modification; First LNG planned 2023
2016 PERMIT	Golden Pass LNG	TX	GE Frame 7EA gas turbine	**SCR**	**2.5 ppmvd**	Train 1 planned 2024
2015 PERMIT	Lake Charles LNG	LA	aero derivative gas turbines	DLN +**SCR**	3.1 ppmvd	Cleared site 2016; Extension until 2028
2014 PERMIT	Cameron LNG (Trains 1-3)	LA	GE Frame 7EA gas turbine	DLN	15.0 ppmvd	Train 1 (2019); Train 2 (2020); Train 3 (2020)
2014 PERMIT	Freeport LNG	TX	Electric motor drive	N/A	0	Trains 1 (2019); Train 2 (2020); Train 3 (2020)
2013 PERMIT	Cove Point LNG	MD	GE Frame 7EA DLN1 gas turbines	DLN + **SCR**	**2.5 ppmvd**	Operating since 2018
2013 APPLICATION	Jordan Cove LNG	OR	GE Frame 7EA DLN1 gas turbines	**SCR**	**2.0 ppmvd**	Application W/D 2021
2013 PERMIT	Corpus Christi LNG – Stage 1 and 2	TX	GE LM2500 G4+ gas turbines	Water Injection	25 ppmvd	Train 1 (2018); Train 2 (2019); Train 3 (2021)

Despite these deficiencies raised by PA-CAN from the outset,[83] TCEQ included these emission limits in the Draft Permit approved by the ED.[84]

i. Refrigeration Compressor Turbines

1) The BACT analysis for NO_x from the refrigerant compressor turbines is incomplete, inaccurate and failed to identify the BACT level emission limit for NO_x.

Port Arthur LNG proposes a NO_x BACT emission limit of 9 ppm for its refrigerant compressor turbines even though several LNG terminals permitted in the last five years have achieved significantly more stringent limits.[85] Collectively, the eight refrigerant compressor

[83] PA-CAN Comments at PACAN 027-035 (PA-CAN Exh. 3).
[84] Draft Permit at AR 00088-00101 (Tab B).
[85] Port Arthur LNG Application at PAL_000086-87 (PA-CAN Exh. 2); Draft Permit at 00063-64, 00088-92 (Tab B).

turbines are the largest source of NO_x emissions at the plant, authorized to release a total of 1,117 tons of NO_x per year.[86]

Port Arthur LNG proposes to meet this 9 ppm limit using Dry-Low NO_x Burners (DLN). DLN technology works by manipulating the stoichiometric and temperature profiles of the combustion process, controlling and cooling the exhaust gas, resulting in lower emissions of NO_x.[87]

A survey of other permitted LNG terminals shows that much lower NO_x emission limits have been permitted and achieved at multiple similar plants.[88] These lower limits are typically achieved using a combination of DLN and Selective Catalytic Reduction (SCR). SCR removes NO_x by mixing the exhaust stream with ammonia gas before routing it through a catalyst bed where the NO_x is converted into nitrogen and water (vapor).[89]

Permitted facilities with lower limits include:

- Cove Point LNG has achieved a NO_x emission limit of 2.5 ppm on its refrigerant compressor turbines using DLN and SCR.[90] Cove Point LNG was permitted in 2013 and has been operating since 2018 utilizing the same GE Frame 7EA turbines in refrigerant compressor service as proposed for Port Arthur LNG.[91]
- Lake Charles LNG, permitted in 2015 and amended in 2020, has a permitted NO_x limit of 3.1 ppm on its refrigerant compressor turbines using DLN and SCR.[92]

[86] Draft Permit at AR 00063-65, 00089-92 (Tab B).
[87] Majeed Direct Testimony at 17:21-26 (Applicant Exh. 300).
[88] PA-CAN Demonstrative Exhibit 1.
[89] Powers Direct Testimony at 34:9-12 (PA-CAN Exh. A).
[90] Powers Direct Testimony at 38:10-13 (PA-CAN Exh. A).
[91] Powers Direct Testimony at 38:10-13 (PA-CAN Exh. A); (PA-CAN Exh. 31).
[92] Lake Charles LNG Permit Renewal and Modification at 2 (PA-CAN Exh. 68).

- Golden Pass LNG has a permitted NO_x limit of 5.0 ppm on its refrigerant compressor turbines using DLN and SCR.[93] Golden Pass LNG was permitted in 2016 utilizing the same GE Frame 7EA turbines in refrigerant compressor service as proposed for Port Arthur LNG.[94]
- Driftwood LNG, permitted in 2019, has a permitted NO_x limit of 5 ppm on its refrigerant compressor turbines using DLN and SCR.[95]
- Rio Grande LNG has a permitted NO_x limit of 5 ppm on its refrigerant compressor turbines using DLN.[96] Rio Grande LNG amended its permit in 2020 and utilizes the same GE Frame 7EA turbines in refrigerant compressor service as proposed for Port Arthur LNG.[97]

While these facilities have NO_x limits ranging from 2.5 ppm to 5 ppm, the Applicant proposes a 9 ppm limit.[98] The Applicant's proposed limit results in more than three times as much NO_x pollution as Cove Point LNG, about three times as much as Lake Charles LNG, and 80% more NO_x pollution than Driftwood LNG, Golden Pass LNG, and Rio Grande LNG.

Further, all simple-cycle combustion turbines over 20 MW permitted in Texas since 2017 in power generation service have been equipped with SCR to control NO_x and have achieved NO_x

[93] Port Arthur LNG Supplement to Application, Table 1 - Recent BACT/LAER Determinations for Compressor Drive Combustion Turbines at PAL_001571 (PA-CAN Exh. 4).
[94] Powers Direct Testimony at 35:20-36:2 (PA-CAN Exh. A).
[95] Port Arthur LNG Supplement to Application, Table 1 - Recent BACT/LAER Determinations for Compressor Drive Combustion Turbines at PAL_001571 (PA-CAN Exh. 4).
[96] Rio Grande LNG Permit Amendment Source Analysis & Technical Review at POWERS 9083 (PA-CAN Exh. 72); Rio Grande Air Permit Application at POWERS 4901 (PA-CAN Exh. 14).
[97] *Id.*
[98] Port Arthur LNG Application at PAL_000086-87 (PA-CAN Exh. 2).

emission rates as low as 2 ppm.[99] In fact, Freeport LNG uses the same GE Frame 7EA turbine in electric generation service with a NO_x limit of 2 ppm.[100]

These lower limits are critical to this dispute because identifying limits and control option at similar plants is central to BACT. As discussed above, in determining BACT, the lowest previously permitted limit for a control technology should be considered BACT in the absence of a showing of differences between the proposed source and the previously permitted sources.[101] Here, where multiple sources have achieved significantly lower permitted limits and the Applicant has failed to show meaningful differences between these sources and its proposed plant, BACT must be the lower limit of 2 to 2.5 ppm.

In addition to being technically feasible—including being permitted and operated at similar facilities on similar and identical turbines—using SCR to control NO_x is also economically reasonable. When properly calculated in accordance with EPA guidance, SCR is cost effective for the refrigerant compressor turbines and is therefore BACT.[102] The following table shows the incremental cost-effectiveness of SCR for Port Arthur LNG's refrigerant compressor turbines.[103] Mr. Powers performed these calculations based on the Applicant's 2020 supplemental cost analysis using correct inlet and outlet values.[104] The incremental cost of NO_x control using SCR at Port Arthur LNG varies from $4,517 to $10,265 per ton of NO_x removed, depending on the inlet and outlet values chosen, and whether the turbine utilizes heat recovery.[105] This cost is well under the

[99] Powers Direct Testimony at 34:19-20 (PA-CAN Exh. A); TCEQ: Issued Air Permits for Gas Turbines with Electric Output Rater 20 MW or Greater at POWERS 423-6 (PA-CAN Exh. 30).
[100] Powers Direct Testimony at 10:12-13 (PA-CAN Exh. A).
[101] NSR Manual at B.24, POWERS 135 (PA-CAN Exh. 8).
[102] Powers Direct Testimony at 45:5-7, 45:12-14 (PA-CAN Exh. A); Powers Table 4 at POWERS 7471 (PA-CAN Exh. 34).
[103] *Id.*
[104] *Id.*
[105] *Id.*

$12,500 per ton threshold that TCEQ has used in the past.[106] It is also under the "low teens" threshold that TCEQ's expert testified to as a trigger for requesting more information.[107] It is also under or at the low end of the $10,000 to $15,000 per ton range that was determined to be economically reasonable for Texas LNG.[108] And all but one of the calculations is below $10,000 per ton, which the Applicant testified is the threshold for economic reasonableness.[109] SCR is thus cost effective for the refrigerant compressor turbines at Port Arthur LNG.

[106] Powers Direct Testimony at 45:17-20 (PA-CAN Exh. A).
[107] Transcript at 624:20-625:3 (Higgins).
[108] SOAH Proposal for Decision, Rio Grande LNG, Docket No. 582-19-6261 at POWERS 6167 (PA-CAN Exh. 9)
[109] Higgins Direct Testimony at 17:33-35 (Applicant Exh. 500).

SCR NOx Cost-effectiveness Values for NOx Inlet Concentrations of 25 ppm and 15 ppm

Configuration	SCR inlet NO_x ((ppm @ 15% O2)	SCR outlet NO_x (ppm @ 15% O2)	NO_x reduction (tons/year)	SCR annual cost[1] ($/year)	SCR cost-effectiveness ($/ton)
Heat recovery	25	5	308.6	1,419,532 + 152,905	5,095
	25	2	354.9	1,419,532 + 183,486	4,517
No heat recovery	25	5	308.6	1,521,097 + 314,280	5,947
	25	2	354.9	1,521,097 + 377,136	5,349
Heat recovery	15	5	154.3	1,419,532 + $30,581	9,398
	15	2	200.6	1,419,532 + $61,162	7,381
No heat recovery	15	5	154.3	1,521,097 + 62,856	10,265
	15	2	200.6	1,521,097 + 125,712	8,209

Because achieving a NO_x limit of 2 – 2.5 ppm using SCR on the refrigerant compressor turbines is both technically feasible and economically reasonable at Port Arthur LNG, it meets the definition of BACT—the maximum degree of reduction achievable, considering energy, environmental, and economic impacts and other costs.[110] 40 C.F.R. § 52.21(b)(12).

[110] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).

The Applicant contends that meeting an emission limit lower than 9 ppm using SCR is not cost-effective in this case, but the two cost analyses it offers to support this position are deeply flawed and based on incorrect assumptions.

a) The Applicant's initial cost analysis is flawed.

The Applicant's initial SCR cost analysis evaluated the cost-effectiveness of controlling NO_x from 15 ppm to 5 ppm.[111] This initial analysis was based on outdated EPA methodology from 2003 despite the availability of an updated EPA methodology published several months prior to the date of the Application.[112] The Applicant claims that the updated 2019 methodology was not available when it performed the initial cost analysis, but the 2019 methodology was published three months before the Applicant submitted its Application.[113]

The Applicant further misapplies this outdated methodology by substituting installed capital cost in place of equipment cost, substantially driving up the cost of SCR.[114] The Applicant defends its incorrect use of these values by referencing the need to build an above-grade, concrete and steel mezzanine and to sink pilings 160 feet into the ground, as well as complying with safety regulations and hurricane force winds.[115] However, the Applicant admits that it must build a mezzanine, drive deep pilings, and build a structure that can withstand hurricanes regardless of whether it installs SCR.[116] The Applicant fails to show that SCR would substantially increase the cost of the infrastructure it already plans to build and fails to explain how SCR would increase the cost of safety compliance. Further, the initial cost analysis already accounted for these costs with

[111] Application at PAL_000212 (PA-CAN Exh. 2)
[112] EPA SCR Air Pollution Cost Estimation Spreadsheet (June 2019) (Applicant Exh. 504).
[113] *Id.*
[114] Transcript at 471:23- 472:7 (Higgins).
[115] Higgins Direct Testimony at 14:23-15:11 (Applicant Exh. 500).
[116] Transcript at 473:11-22 (Higgins).

line items for "foundation and supports" and "contingencies."[117] The Applicant similarly fails to distinguish its plant from Golden Pass LNG, which sits on the same channel approximately two miles away from Port Arthur LNG's proposed location and has a permitted BACT NO_x limit of 5.0 ppm on its GE Frame 7EA refrigerant compressor turbines using SCR.[118] Golden Pass LNG faces the same construction conditions Port Arthur LNG discusses and still proposes to install SCR.[119]

Finally, the Applicant also uses baseline and controlled emission values that underestimate the pollution removal effectiveness of SCR and lead it to appear less cost effective. The baseline or inlet NO_x concentration (the amount of pollution *going into* the SCR) and controlled or outlet concentration (the amount of pollution *coming out of* the SCR) are critical inputs in the cost analysis. These inputs determine how much NO_x is removed by the SCR, which has a significant impact of the price per ton of NO_x removed. Using incorrect values, as the Applicant does here, can dramatically inflate the cost of SCR by lowering the total amount of NO_x removed and raising the price per ton of that removal.[120] As discussed above, baseline emissions are "essentially uncontrolled emissions" and "represent the realistic upper boundary of uncontrolled emissions for the source."[121]

The correct baseline concentration for a gas turbine is 25 ppm NO_x. The most basic DLN combustor package for combustion turbines limits NO_x to 25 ppm.[122] Cove Point LNG based its

[117] Transcript at 474:6-19 (Higgins); Application Table 7.1-3, Cost Effectiveness Evaluation for SCR at PAL_000210 (PA-CAN Exh. 2).
[118] Port Arthur LNG Supplement to Application, Table 1 - Recent BACT/LAER Determinations for Compressor Drive Combustion Turbines at PAL_001571 (PA-CAN Exh. 4); Powers Direct Testimony at 35:20-36:2 (PA-CAN Exh. A).
[119] Golden Pass LNG Export Project, Final Environmental Impact Statement (July 2016) at POWERS 7541-7544 (PA-CAN Exh. 18).
[120] Transcript at 123:8-17 (Powers).
[121] NSR Manual at B.37, POWERS 148 (PA-CAN Exh. 8)
[122] Powers Direct Testimony at 42:17 (PA-CAN Exh. A).

NO_x control efficiency calculations on an uncontrolled emission rate of 25 ppm from a Frame 7EA turbine being operated in simple cycle mode (the same way Port Arthur LNG intends to operate its refrigerant compressor turbines).[123] Rio Grande LNG also based its NO_x control efficiency calculations on an uncontrolled emission rate of 25 ppm from a Frame 7EA turbine operating in simple cycle mode.[124] The ED acknowledges that 25 ppm is the peak-end range of the ppm values for refrigeration compressor turbines in Texas.[125] Tellingly, the Applicant uses 25 ppm NO_x as the DLN baseline in its cost analysis for SCR on its power generation turbines, where it came to the correct conclusion that SCR is cost effective.[126] This baseline of 25 ppm is equally applicable to turbines in refrigerant compressor service.[127]

But instead of using a 25 ppm uncontrolled emission rate as the baseline concentration, the Applicant uses 15 ppm. The Applicant's justifications for using 15 ppm as the baseline concentration are faulty.

First, the Applicant states that achieving a controlled NO_x concentration of 2 ppm to 5 ppm would be at the outer expected control efficiency for an SCR with an uncontrolled turbine exhaust NO_x concentration of 25 ppm.[128] While going from 25 ppm to 2 ppm is at the outer expected control efficiency of approximately 90%, going from 25 ppm to 5 ppm reflects a control efficiency of 80%, firmly in the middle of the Applicant's stated range of SCR efficiency of 70% - 90%.[129] Here the Applicant is undermining the control efficiency of SCR from both sides. By using 15

[123] Transcript at 184:2-5 (Powers); Order No. 86372, In the Matter of Dominion Cove Point at 68 (PA-CAN Exh. 73).
[124] Rio Grande Application Table 5-2: Simple Cycle Gas Turbines - Top Down BACT Analysis for NOX, CO, PM10/PM2.5, VOC, and GHG (GE Frame 7 EA – Simple Cycle Natural Gas-Fired Turbine) at POWERS 4903-5 (PA-CAN Exh. 14).
[125] See Exhibit ED-1 at 19 ("A review of the RBLC and recently issued permits for refrigeration compression turbines indicates NO_x BACT ranging from 5 to 25 ppm.")
[126] Application PAL_000107-108 (PA-CAN Exh. 2)
[127] Powers Direct Testimony at 48:2-3 (PA-CAN Exh. A).
[128] Higgins Direct Testimony at 15:20-23 (Applicant Exh. 500).
[129] Transcript at 480:12-23 (Higgins).

ppm as the baseline and 5 ppm as the controlled emissions, the Applicant calculates cost effectiveness for a 66.7% control efficiency.[130] This 66.7% control efficiency is lower than the lowest stated value in the Application, where the Applicant specifies SCR has a control efficiency 70% to 90%.[131]

Second, the Applicant states, without further support, that Frame 7EA turbines are no longer commercially available in a 25 ppm configuration.[132] The Applicant claims that 15 ppm is now highest emitting model available because New Source Performance Standard subsection KKKK specifies a maximum emission rate of 15 ppm NO_x from gas-fired turbines.[133] But EPA guidance is clear that New Source Performance Standard requirements are not considered in calculating the baseline emissions, which the Applicant acknowledges.[134] Not only is subpart KKKK irrelevant for computing baseline emissions, the Applicant further admits that 15 ppm DLN is not even necessary to comply with KKKK.[135] For example, a turbine equipped with 25 ppm DLN and SCR is also a valid method to comply with KKKK 15 ppm NO_x limit.[136]

These three errors—using cost calculations nearly two decades out of date, using installed cost in place of equipment cost, and using a low baseline concentration and a high controlled concentration—combine to inflate the cost of SCR and make it appear economically unreasonable.

In response to PA-CAN's comments detailing the deficiencies in its initial cost analysis, the Applicant submitted a supplemental cost analysis, which is also flawed.

[130] Transcript at 481:2-8 (Higgins).
[131] Transcript at 481:9-13 (Higgins).
[132] Higgins 15:27-34 (Applicant Exh. 500).
[133] Higgins 15:27-34 (Applicant Exh. 500).
[134] NSR Manual at B.37, POWERS 148 (PA-CAN Exh. 8); Transcript at 482:1-11 (Higgins).
[135] Transcript at 483:13-23 (Higgins).
[136] *Id.*

b) The Applicant's supplemental cost analysis uses an incorrect, unsupported baseline concentration of 9 ppm to increase the cost of SCR.

The Applicant's supplemental cost analysis is based on EPA's up-to-date 2019 SCR cost calculation methodology and shows that SCR would be significantly less expensive compared to the Applicant's initial cost analysis.[137] When appropriate baseline and controlled concentrations are used, the calculations show the SCR is cost effective.[138] But the Applicant again provides incorrect inputs in an attempt to show that SCR is not cost effective.

Rather than using an uncontrolled baseline rate of 25 ppm, or even 15 ppm from the initial cost analysis, the Applicant's supplemental costs analysis assumes a baseline rate of 9 ppm.[139] This choice means 9 ppm is simultaneously the emission rate the Applicant proposes as BACT *and* the emission rate the Applicant proposes as the uncontrolled baseline emission rate. This selection is contradictory on its face, and the Applicant's justifications for using 9 ppm do not withstand scrutiny.

The Applicant offers multiple deficient reasons for using 9 ppm NO_x as the baseline uncontrolled emission rate:

The Applicant's first reason for using 9 ppm NO_x as the baseline uncontrolled rate is that 9 ppm is BACT in the permit for trains 1 and 2 of Port Arthur LNG, as originally permitted in 2016.[140] Again, this argument is contrary to the NSR Manual that specifies that the baseline rate should reflect uncontrolled emissions.[141] The NSR Manual is also explicit that "the application of controls, including other controls necessary to comply with State or local air pollution regulations,

[137] Port Arthur LNG Supplement to Application at PAL_001624 (PA-CAN Exh. 4).
[138] Powers Direct Testimony at 45:5-7, 45:12-14 (PA-CAN Exh. A); Powers Table 4 at POWERS 7471 (PA-CAN Exh. 34).
[139] Port Arthur LNG Supplement to Application at PAL_001589-1628 (PA-CAN Exh. 4).
[140] Higgins Direct Testimony at 16:18-20 (Applicant Exh. 500).
[141] NSR Manual at B.37, POWERS 148 (PA-CAN Exh. 8).

are not considered in calculating the baseline emissions."[142] Yet this is exactly what the Applicant proposes: to consider the application of controls necessary to comply with an earlier permit in calculating baseline emissions.[143] The fact that 9 ppm was BACT in an earlier permit is evidence that it is *not* an appropriate level to use as the uncontrolled baseline in this cost analysis.[144]

The Applicant's second reason for using 9 ppm as the baseline rate is that controlling NO_x from 9 ppm to 5 ppm requires less catalyst compared to controlling from 15 ppm to 5 ppm, making SCR cheaper and thus more cost-effective.[145] This second reason is demonstrably misleading. The Applicant admits that lowering the baseline rate from 15 ppm to 9 ppm actually increases the cost of SCR per ton of NO_x removed because it reduces the total amount of NO_x removed, rendering it significantly less cost-effective.[146]

The Applicant's third reason for using 9 ppm as the baseline rate is that SCR is only effective in a specific temperature range.[147] But the Applicant admits that the baseline concentration has nothing to do with the exhaust temperature of the turbine.[148] The issue of exhaust temperature is exactly the same regardless of whether the baseline concentration is 25, 15, or 9 ppm.[149] And while exhaust temperature can affect the cost of SCR, this cost can be accounted for in the cost analysis.[150] And this cost has been accounted for in the cost analysis, as reflected by the different cost calculations for turbines with and without heat recovery.[151] Heat recovery and

[142] NSR Manual. B.37 at POWERS 148 (PA-CAN Exh. 8).
[143] Transcript at 484:14-24 (Higgins).
[144] TCEQ, ADPG 6110 at POWERS 387 (PA-CAN Exh. 10).
[145] Higgins Direct Testimony at 16:22-25 (Applicant Exh. 500).
[146] Transcript at 498:14-17 (Higgins).
[147] Higgins Direct Testimony at 16:27-38 (Applicant Exh. 500).
[148] Transcript at 516:7-20, 517:3-12 (Higgins).
[149] *Id.*
[150] Transcript at 493:16-22 (Higgins).
[151] Powers Table 4 at POWERS 7471 (PA-CAN Exh. 34); Port Arthur LNG Supplement to Application at PAL_001589-97 and PAL_001607-15 (for Calculations with Heat Recovery), PAL_001598-1606 and PAL_001616-24 (for Calculations without heat recovery)(PA-CAN Exh. 4).

exhaust temperature are, by the Applicant's own admission, not an issue concerning baseline concentration, and therefore not a valid reason to use 9 ppm as the baseline uncontrolled emission rate.[152]

The Applicant's fourth reason for using 9 ppm as the baseline rate is that the EPA calculation does not account for the cost of operating DLN.[153] But the Applicant admits that it will operate DLN regardless of whether or not it installs and operates SCR.[154] DLN is thus not a cost of using SCR and is rightly excluded from SCR cost calculations.

The Applicant's fifth reason for using 9 ppm as the baseline rate is that 9 ppm DLN is the "base case of controls for the turbines reviewed in the BACT analysis."[155] As with the Applicant's first reason, above, this argument is contrary to the NSR Manual that specifies that the baseline rate should reflect uncontrolled emissions.[156] The NSR Manual is also explicit that "the application of controls, including other controls necessary to comply with State or local air pollution regulations, are not considered in calculating the baseline emissions."[157] Yet this is exactly what the Applicant proposes to do: to consider the "controls" in other permits in calculating its baseline emissions.[158] The fact that 9 ppm was BACT in other permits is evidence that it is not an appropriate level to use as a baseline in this cost analysis.[159] Further, after correcting Rio Grande LNG's BACT limit to 5 ppm NO_x, five of the seven refrigerant compressor BACT/LAER determinations discussed in the Applicant's supplemental cost analysis have limits ranging from 2.5 ppm to 5 ppm.[160] The two facilities owned by Sempra are the outliers with limits of 9 ppm and

[152] Transcript at 516:7-20, 517:3-12 (Higgins).
[153] Higgins Direct Testimony at 17:1-2 (Applicant Exh. 500).
[154] Transcript at 494:13-24 (Higgins).
[155] Higgins Direct Testimony at 17:4-12 (Applicant Exh. 500).
[156] NSR Manual, B.37 at POWERS 148 (PA-CAN Exh. 8)
[157] *Id.*
[158] Transcript at 495:11-22 (Higgins).
[159] TCEQ, ADPG 6110 at POWERS 387 (PA-CAN Exh. 10).
[160] Port Arthur LNG Supplement to Application at PAL_001571 (PA-CAN Exh. 4).

15 ppm.[161] So not only is using the "base case of controls" inappropriate as a baseline concentration, 9 ppm is not actually the base case of controls.

The Applicant's sixth and final flawed reason for using 9 ppm as the baseline rate is that maintaining a NO_x concentration level of 2 ppm to 5 ppm "would be at the outer expected control efficiency for an SCR (i.e., 80% - 90%) with an uncontrolled turbine exhaust NO_x concentration of 25 ppmvd."[162] This reason appears to have been copied verbatim from the Applicant's justification for using 15 ppm instead of 25 ppm.[163] Even assuming this argument was valid as first offered for using 15 ppm instead of 25 ppm, the Applicant provides no additional justification for further lowering the baseline rate from 15 ppm to 9 ppm.[164] Controlling NO_x from 9 ppm to 5 ppm—the Applicant's preferred calculation—is a control efficiency of only 45%, far below the stated efficiency of SCR of 70% - 90%.[165] The Applicant underestimates the control efficiency of SCR to make it appear less cost-effective.

For these reasons, Applicant's attempts to provide a supplemental cost analysis using 9 ppm as the baseline rate must fail as efforts to improperly inflate the cost of SCR.

c) A Frame 7EA turbine equipped with 9 ppm DLN is not an inherently lower emitting process.

At the hearing on the merits, the Applicant advanced the additional theory that its proposed BACT limit of 9 ppm NO_x using DLN reflects use of an inherently lower polluting process.[166] While the NSR Manual does allow the Applicant to use the emissions rate from an inherently lower polluting process as the baseline emissions, a turbine equipped with 9 ppm DLN is not an

[161] *Id.*
[162] Higgins Direct Testimony at 17:14-22 (Applicant Exh. 500).
[163] Transcript at 500:7-14 (Higgins).
[164] *Id.*
[165] Transcript at 581:2-11 (Higgins).
[166] Transcript at 485:2-4 (Higgins).

inherently lower-emitting process.[167] SCR, DLN, and Water Injection are examples of different processes.[168] And DLN is an inherently lower polluting process compared to Water Injection.[169] However, alternate control efficiencies of DLN are not in themselves inherently lower polluting processes.[170] The Applicant understands this concept, as shown in the table where it lists SCR, DLN, and Water Injection as control technologies it considered.[171]

By contrast, the control the Applicant proposes, called the "DLN1+ technology" is described as an add-on to the Frame 7EA turbine: "Baker Hughes has designed an extender kit for the combustion chamber of the 7EA Gas turbines where the flow of air is increased to certain sections of the combustion chamber to cool the exhaust temperature of the gas turbine."[172] And "the Frame 7EA combustion turbines will be equipped with dry low emissions combustors (DLN1+), that maintains the NO_x emission to a maximum of 9 ppm."[173]

DLN has a range of control efficiencies. The Frame 7EA turbine equipped with DLN has a NO_x emission rate ranging from 25 ppm at the upper boundary, to 4 ppm at the lower boundary.[174] Therefore, a limit of 9 ppm is not inherent to the Frame 7EA turbine. And the Applicant admits that 9 ppm is not inherent to the Frame 7EA turbine.[175] Rather, the Applicant's Frame 7EA turbines will be "equipped" with "extender kit[s]" to achieve a 9 ppm NO_x emission rate.[176]

[167] NSR Manual, B.37 at POWERS 148 (PA-CAN Exh. 8).
[168] Transcript at 122:6-19 (Higgins).
[169] *Id.*
[170] *Id.*
[171] Higgins Direct Testimony at 11:7 (Applicant Exh. 500).
[172] Majeed Direct Testimony at 16:17-18 (Applicant Exh. 300).
[173] Majeed Direct Testimony at 11:1-3 (Applicant Exh. 300).
[174] Transcript at 574:16-20 (Higgins); Transcript at 184:2-5 (Powers).
[175] Transcript at 575:4-10 (Higgins).
[176] Majeed Direct Testimony at 11:1-3, 16:17-18 (Applicant Exh. 300).

The NSR Manual states that the baseline emissions rate should be the "realistic scenario of upper boundary uncontrolled emissions," which for DLN is 25 ppm.[177] The baseline inquiry is generic for the control technology, not specific to a model of turbine.[178] *Arguendo*, if 25 ppm DLN were fact no longer available, the upper boundary would be 15 ppm.[179] But the Application itself shows that 25 ppm DLN is available for gas turbines.[180] And the Applicant offers no evidence that 9 ppm is the upper boundary of emissions from a turbine equipped with DLN. On the contrary (and setting aside for the moment the availability of 25 ppm NO_x DLN for the Frame 7EA), the Applicant corroborates that is not the case when it states that a "15 ppm NO_x combustion system for Frame-type combustion turbines is typically the maximum NO_x concentration available to customers in the U.S. market."[181]

Further, the Applicant admits that nothing about its proposed combustion system changed between the time it prepared it initial cost analysis that used a baseline concentration of 15 ppm and its supplemental cost analysis using a baseline rate of 9 ppm.[182]

The Applicant proposes 9 ppm baseline concentration in order to make SCR appear economically unreasonable. This option places the Applicant in the untenable position of selecting what it claims is a lower emitting technology that results in hundreds of tons of additional NO_x pollution each year when compared to using SCR for NO_x control.

The Applicant's BACT analysis is inadequate for failing to consider other combinations of DLN and SCR in use at other LNG plants, including DLN with 25 ppm and 15 ppm baseline NO_x

[177] Transcript at 122:10-13 (Powers).
[178] Transcript at 122:10-19 (Powers).
[179] *Id.*
[180] Application PAL_000107-108 (PA-CAN Exh. 2).
[181] Higgins Direct Testimony at 15:30-32 (Applicant Exh. 500).
[182] Transcript at 582:17-18 (Higgins).

emission rates. SCR is cost-effective at either a 25 ppm or a 15 ppm baseline emission rate, and thus BACT for the refrigerant compressor turbines.

d) The Applicant fails to distinguish Port Arthur LNG from other LNG facilities with lower NO_x emission limits.

The Applicant offers additional reasons in an attempt to differentiate between its proposed plant and the many plants that have achieved lower limits, but these differences fail to support the Applicant's position that SCR is economically unreasonable.

1. Limits required as LAER must be considered in the BACT analysis.

Cove Point LNG is currently operating with the same Frame 7EA turbines in the same configuration that Port Arthur LNG.[183] Cove Point is using DLN and SCR to achieve a NO_x emission limit of 2.5 ppm on its refrigerant compressor turbines.[184] The Applicant attempts to distinguish this facility on the grounds that Cove Point LNG is located in a nonattainment area and subject to LAER. However, this difference concerns only the cost analysis.[185] Because Cove Point LNG is subject to LAER, it could not take costs into account when selecting refrigerant compressor turbine NO_x control technology.[186] But the NSR Manual is explicit that "[t]echnologies required under lowest achievable emission rate (LAER) determinations are available for BACT purposes and must also be included as control alternatives and usually represent the top alternative."[187] So the Applicant must consider Cove Point LNG in its analysis and cannot dismiss this example simply because it is subject to LAER.[188] Cove Point LNG has achieved an emission rate of 2.5 ppm using SCR on the same turbines in the same service at the same type of facility that the

[183] Powers Direct Testimony at 38:10-13 (PA-CAN Exh. A).
[184] *Id.*
[185] Higgins Direct Testimony at 20:4-15 (Applicant Exh. 500).
[186] Powers Direct Testimony at 38:19 - 39:5 (PA-CAN Exh. A).
[187] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[188] *Id.*

Applicant proposes.[189] SCR is thus demonstrated in practice and technically feasible.[190] The only remaining question is whether SCR is economically reasonable, which is discussed above. If a SCR-controlled limit of 2.5 is economically reasonable, then it must be BACT for Port Arthur LNG's refrigerant compressor turbines.

2. Simple cycle mode is not an obstacle to SCR on the GE Frame 7EA turbine.

The Applicant attempts to distinguish Cove Point LNG and Golden Pass LNG because they operate in "combined cycle" mode - they are equipped with heat recovery steam generators that use waste heat from the turbine exhaust stream to make steam.[191] Port Arthur LNG, by contrast, will not use heat recovery steam generators, but will use waste heat recovery systems to heat oil on four of its eight refrigerant compressor turbines.[192]

Contrary to the Applicant's representations, the presence or absence of waste heat recovery systems is not an obstacle to SCR, and not a meaningful difference between Cove Point LNG, Golden Pass LNG, and Port Arthur LNG.[193] The only relevant difference the Applicant articulates is the difference in exhaust temperature when using any type of waste heat recovery.[194] Exhaust temperature is not an obstacle to SCR.[195] The Applicant states that the optimal turbine exhaust temperature range for SCR is 500 to 1000 degrees Fahrenheit.[196] For the four turbines equipped with waste heat recovery at Port Arthur LNG, the exhaust temperature is 590 degrees, which the Applicant admits is well within the range of SCR.[197] For the four turbines without waste heat

[189] Powers Direct Testimony at 38:10-13 (PA-CAN Exh. A).
[190] *Id.*
[191] Higgins Direct Testimony at 23:30-32 (Applicant Exh. 500).
[192] Port Arthur LNG Application at PAL_000200 (PA-CAN Exh. 2).
[193] Powers Direct Testimony at 40:3-6 (PA-CAN Exh. A).
[194] Higgins Direct Testimony at 13:3-16 (Applicant Exh. 500).
[195] Powers Direct Testimony at 40:3-6; Transcript at 206:22-207:19 (Powers).
[196] Higgins Direct Testimony at 40:37 (Applicant Exh. 500).
[197] Transcript at 492:2-4 (Higgins).

recovery, the exhaust temperature is 1,019 degrees,[198] which is too high for standard SCR catalyst.[199] However, there are two time-tested solutions to hot exhaust gas—use of air tempering or use of a high temperature catalyst.[200] Air tempering, also called air injection, is a simple method of injecting cool air into the exhaust stream before it enters the SCR, cooling the air to the appropriate temperature.[201] High temperature catalyst is a catalyst designed to be used at higher temperatures on simple cycle turbines.[202]

The additional cost of either of these methods can be factored into the SCR cost analysis.[203] And in fact, the cost difference of SCR for turbines with or without heat recovery is reflected in both the Applicant's supplemental cost analysis and Mr. Powers' cost analysis, which is why each analysis presents separate pricing with and without heat recovery.[204]

Lake Charles LNG provides further evidence that simple cycle operation is not an obstacle to SCR—it will operate in simple cycle mode using the same type of waste heat recovery system to heat oil that the Applicant plans for four of its refrigerant compressor turbines, and it will use SCR to meet a NO_x limit of 3.1 ppm.[205]

3. Mechanical drive and aero-derivative turbine types are comparable.

The Applicant attempts to distinguish Driftwood LNG and Lake Charles LNG because they use aero-derivative turbines instead of heavier non-aeroderivative turbines like the Frame

[198] Port Arthur LNG Supplement at PAL_001626 (PA-CAN Exh. 2).
[199] Higgins Direct Testimony at 16:32-34 (Applicant Exh. 500).
[200] Powers Direct Testimony at 40:3-6; Transcript at 206:22-207:19 (Powers).
[201] Transcript at 207:7-13; 208:8-18 (Powers).
[202] Transcript at 206:22-207:6 (Powers).
[203] Transcript at 493:16-22 (Higgins).
[204] Powers Table 4 at POWERS 7471 (PA-CAN Exh. 34); Port Arthur LNG Supplement to Application (For Calculations with Heat Recovery PAL_001589-97 and PAL_001607-15; Calculations without heat recovery PAL_001598-1606 and PAL_001616-24) (PA-CAN Exh. 4).
[205] Transcript at 205:9-206:2 (Powers); Lake Charles Air Permit Application at 1-2 (PA-CAN Exh. 67).

7EA in mechanical drive service.[206] Yet, again, the differences are minimal and immaterial. The only real difference the Applicant identifies between aero-derivative turbines and "Frame" turbines is size: aero-derivative turbines have approximately 65% less exhaust gas than mechanical drive (Frame 7EA) turbines.[207] The Applicant contends that this size difference makes aero-derivative turbines unsuitable for large LNG terminals, but this position is undercut by the fact that Lake Charles LNG has been permitted to use aero-derivative turbines equipped with SCR using the same C3MR liquefaction process as Port Arthur LNG.[208] Further, Lake Charles LNG is permitted at a higher LNG production capacity than Port Arthur LNG's original permit, demonstrating that aero-derivative turbines are appropriate for large LNG terminals.[209]

4. Variable operation is not an obstacle to SCR.

The Applicant also states that refrigerant compressor turbines have a more variable load compared to electric generation turbines, and that this is a technical obstacle to using SCR at Port Arthur LNG.[210] Variable operation is not an obstacle to SCR on refrigerant compressor turbines, as evidenced by the fact that four of the six LNG export facilities (excluding Port Arthur LNG) that are included in the Applicant's supplemental response RBLC search of refrigerant compressor turbine NO_x controls use SCR with NO_x limits ranging from 2.5 ppm to 5.0 ppm to control NO_x.[211]

As discussed in this section, the Applicant attempts to distinguish its proposed refrigerant compressor turbines from other LNG terminals using SCR. In doing so, the Applicant makes

[206] Higgins Direct Testimony at 24:26-31 (Applicant Exh. 500).
[207] Higgins Direct Testimony at 25:5-13 (Applicant Exh. 500).
[208] Majeed Direct Testimony at 14:36-37; Transcript at 201:18-202:18 (Powers); Lake Charles Air Permit Application at 1-2 (PA-CAN Exh. 67).
[209] Transcript at 202:8-14 (Powers).
[210] Port Arthur LNG Supplement to Application at PAL-001570 (PA-CAN Exh. 4); Higgins Direct Testimony at 20:25-32 (Applicant Exh. 500).
[211] Powers Direct Testimony at 40:9-15 (PA-CAN Exh. A).

mountains out of minor differences to avoid the fact that SCR has been permitted and operated on refrigerant compressor turbines for years, and multiple permitted plants intend to use it as well.

e) The Applicant failed to consider lower emitting DLN.

In addition to failing to consider adequately different combinations of DLN and SCR, the Applicant's BACT analysis is deficient for failing to consider lower-polluting forms of DLN. The Applicant claims that controlling NO_x to lower than 9 ppm at Port Arthur LNG would require additional controls beyond DLN.[212] But Rio Grande LNG has a permitted NO_x limit of 5 ppm on its refrigerant compressor turbines using DLN using the same GE Frame 7EA turbines in refrigerant compressor service as proposed for Port Arthur LNG. [213] The 2020 Rio Grande LNG application included a vendor guarantee in the form a "Baker Hughes Gas Turbine Data Sheet" which showed the Frame 7EA capable of meeting a NO_x emission rate "less than 5 ppm" using only DLN.[214] The Applicant should have considered the better performing DLN in its BACT analysis.

Here again Port Arthur attempts to thread a needle: selecting a DLN-controlled emission rate that is 80% more polluting than the best permitted DLN NO_x limit at Rio Grande LNG while simultaneously claiming their process is so low-polluting that SCR is not cost effective.

In summary, SCR is technically feasible and economically reasonable to control NO_x from the refrigeration compressor turbines. Multiple facilities use SCR on the same or similar turbines in the same refrigerant compressor service. The Applicant is unable to meaningfully distinguish its proposed plant from the numerous LNG plants with lower NO_x limits on the refrigerant compressor turbines. And the Applicant's cost analyses use incorrect inputs to inflate the cost of

[212] Transcript at 571:13-18 (Higgins).
[213] Rio Grande LNG Permit Amendment Source Analysis & Technical Review at POWERS 9083 (PA-CAN Exh. 72); Rio Grande Air Permit Application at POWERS 4901 (PA-CAN Exh. 14).
[214] Transcript at 578:15-580:14 (Higgins).

SCR and make it appear economically unreasonable. Mr. Power's calculations show that with the correct inputs, SCR *is* cost effective, ranging from $4,517 to $10,265 per ton of NO_x removed, well below the NO_x cost-effectiveness threshold of $12,500 per ton. Therefore, BACT for NO_x on the refrigerant compressor turbines is an SCR-controlled emission rate of 2 – 2.5 ppm.

For these reasons, the Applicant's BACT analysis for NO_x on its refrigerant compressor turbines is deficient. And this deficiency results in an enormous increase in pollution compared to similar LNG plants. The refrigerant compressor turbines are the largest source of NOx at Port Arthur LNG, with a combined emission limit of 1,117 tons per year.[215] The difference between the Applicant's proposed limit of 9 ppm, and a BACT limit of 2 ppm is 864 tons of NOx per year.[216]

2) The BACT analysis for CO from the refrigerant compressor turbines is inadequate and failed to require BACT levels of control for CO.

The Applicant's proposed 25 ppm CO emissions limit does not constitute BACT for the refrigerant compressor turbines. Other similar LNG facilities have set much stricter CO emissions limits using oxidation catalyst on their compressor turbines. Fully operational GE Frame 7EA refrigerant compressor turbines at Cove Point LNG use catalytic oxidation to limit CO emissions to 4 ppm.[217] Further, Golden Pass and Lake Charles LNG have permitted BACT emission rates of 6 and 10 ppm CO respectively, also using catalytic oxidation.[218]

The Applicant claims that installing standalone oxidation catalyst for CO in the absence of SCR for NO_x is not cost-effective.[219] However, as discussed above, SCR for NO_x is BACT for

[215] Port Arthur LNG Application at PAL_000095 (Site-Wide Annual Emissions Summary) (PA-CAN Exh. 2); see also Draft Permit at AR 00088-101 (Tab B) (stating maximum allowable emission rates for each emission source).
[216] Powers Table 3 at POWERS 7470 (PA-CAN Exh. 33) (Showing NOx reduction *per turbine* for each of the eight refrigerant compressor turbines.).
[217] Powers Direct Testimony at, 49:10-11 (PA-CAN Exh. A).
[218] *Id.* at 49:16-18.
[219] Transcript at 502:7-10 (Higgins).

Port Arthur LNG. Because the Applicant must install SCR for NO_x, it must also re-evaluate the cost of using oxidation catalyst to control CO. The Applicant acknowledges that installing SCR would change the cost of oxidation catalyst, potentially rendering it cost effective.[220]

A CO oxidation catalyst can be integrated with SCR on the refrigerant compressor turbines proposed at Port Arthur LNG.[221] Since SCR is cost-effective as BACT, a CO oxidation catalyst can simply be installed in conjunction with the SCR on the compressor turbines in the same manner demonstrated at Cove Point LNG and planned for Golden Pass LNG and Lake Charles LNG.[222] The Applicant must therefore use the demonstrated-in-practice limit of 4 ppm CO on its refrigerant compressor turbines.

ii. Power Generation Turbines

1) The proposed control and resulting emission limits for the electric power generation turbines do not constitute BACT.

The Applicant proposes to operate nine 34 MW simple cycle electric power generation turbines utilizing low-NO_x burners and SCR to limit their NO_x emissions and oxidation catalyst and good combustion practices to limit CO emissions.[223] The emission limits for these power generation turbines should be 2.0 ppm NO_x at 15% O_2 and 4 ppm CO at 15% O_2 rather than the proposed limits of 5 ppm NO_x and 9 ppm CO. Numerous permitted and operational facilities in Texas and elsewhere have power generation turbines with NO_x and CO limits of 2.0 to 2.5 ppm and 4 ppm, respectively. The Applicant offers no sufficient technical or cost-based reasoning to differentiate itself from the many facilities with lower NO_x and CO emissions limits on the power generation turbines.

[220] Transcript at 502:12-20 (Higgins).
[221] Powers Direct Testimony at 50:6 (PA-CAN Exh. A).
[222] *Id.* at 50:7-9
[223] Port Arthur LNG Application at PAL_000087, PAL_000197 (PA-CAN Exh. 2).

2) The proposed NO_x control and resulting emission limits for the electric power generation turbines do not constitute BACT.

In proposing a BACT limit of 5 ppm for NO_x from its power generation turbines, the Applicant fails to explain why it cannot meet the lower limits achieved at other facilities. Freeport LNG operates a combustion turbine for power generation which is permitted at 2 ppm NO_x and 4 ppm CO.[224] In order to achieve these emissions limits, Freeport LNG uses the same control technology as proposed by Port Arthur LNG. Freeport LNG began operations in 2019;[225] and, thus, Freeport LNG is a well-established example of a TCEQ permitted LNG export facility operating its power generation turbines at lower emissions levels. In addition, El Paso Electric Company received a permit in January 2014 to operate simple cycle power generation turbines with limits of 2.5 ppm NO_x and 4 ppm CO.[226]

The Applicant's own RBLC search—provided in its Application—identified a number of other facilities operating power generation turbines with NO_x limits as low as 2 or 2.5 ppm.[227] In fact, the RBLC search results submitted by Port Arthur LNG show no less than 14 facilities with a NO_x limit of 2 or 2.5 ppm.[228] Additionally, the Applicant references TCEQ's "Turbine List."[229] This list, as of November, 2021, shows most combustion turbines with an electric output of 20 MW or greater permitted in recent years to have NO_x emissions lower than 5 ppm.[230] Nearly every turbine with an output of 50 MW or less and permitted within the last decade has a NO_x emission limit lower than 5 ppm.[231]

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[224] Powers Direct Testimony at 51:14-17 (PA-CAN Exh. A).
[225] Article on Freeport LNG at POWERS 770 (PA-CAN Exh. 38).
[226] Powers Direct Testimony at 51:17-51:4 (PA-CAN Exh. A).
[227] Port Arthur LNG Application at PAL_000333– PAL_000341 (PA-CAN Exh. 2).
[228] Port Arthur LNG Application at at PAL_000333– PAL_000341 (PA-CAN Exh. 2).
[229] Higgins Direct Testimony at 27:22-24 (Applicant's Exh. 500).
[230] TCEQ, Gas Turbines Rated 20 MW and Greater Electric Output (Nov. 1. 2021) at POWERS 423-426 (PA-CAN Exh. 30).
[231] TCEQ, Gas Turbines Rated 20 MW and Greater Electric Output (Nov. 1. 2021) at POWERS 423-426 (PA-CAN Exh. 30).

The Applicant fails to provide any technical or cost-based justifications for why Port Arthur LNG cannot economically achieve lower NO_x and CO emissions from its power generation turbines.[232] In testimony, the Applicant's witnesses offered insufficient reasoning in their attempts to differentiate the Applicant's power generation turbines from these numerous other facilities.

First, the Applicant dismisses BACT limits for electric generation turbines permitted under Texas' Standard Permit based on that fact alone—that the Standard Permit process is different than the Applicant's BACT process.[233] There is no support, and Mr. Higgins offered no support, for dismissing an entire class of power generation turbines because they are permitted differently. The EPA's NSR Manual makes clear that "all" available options must be considered.[234] This includes examining the "most stringent—or top—alternative."[235] This alternative "is established as BACT unless the applicant demonstrates . . . that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not 'achievable' in the Applicant's case.[236] And the NSR Manual makes clear options cannot be eliminated on the basis that they are required under another permitted scheme. For example, the NSR Manual states LAER demonstrations are "available" for BACT purposes.[237] Absent a demonstration that the limits achievable by facilities permitted under the Standard Permit are not achievable by Port Arthur LNG, Port Arthur LNG cannot dismiss those power generation turbines and their emission limits.

Second, the Applicant improperly dismisses lower limits at other facilities because they are permitted under different circumstances. Regarding the ProEnergy Services LLC project in Harris County, Texas, Mr. Higgins offered speculative testimony that the facility adopted its BACT limit

[232] Powers Direct Testimony at 52:2-4 (PA-CAN Exh. A).
[233] Higgins Direct Testimony at 30:1-11 (Applicant's Exh. 500).
[234] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[235] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[236] NSR Manual at B.2, POWERS 113 (PA-CAN Exh. 8).
[237] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).

of 2 ppm NO_x in order to qualify for a standard permit and avoid nonattainment new source review permitting.[238] Again, the Applicant offers no support for dismissing a facility and its emission limits on the grounds that it was not determined by a BACT analysis. Regarding Freeport LNG's lower limits of 2 ppm NO_x and 4 ppm CO, Mr. Higgins attempts to distinguish these limits on the grounds that Freeport LNG was subject to LAER.[239] As noted previously, limits used as LAER *must be included in a BACT analysis and usually represent the top alternative.*[240] There must be sufficient additional justification to dismiss a limit achieved as LAER.[241] The Applicant provides no such justification.

The Applicant also attempts to distinguish Freeport LNG's limit of 2 ppm on the grounds that Port Arthur LNG's simple cycle turbines will have a higher exhaust temperature than Freeport LNG's combined cycle turbines, such that "catalyst efficiency, catalyst life and capital cost" are affected.[242] However, the Applicant offers no actual evidence in either its Application or its rebuttal case of any technical and/or economic impacts of these differences. Conversely, when asked if reducing NO_x emissions by 92% (25 ppm at the inlet to 2 ppm at the outlet) would place "strain" on Port Arthur LNG's SCR, Mr. Powers testified that such a reduction is within SCR's "performance envelope" and could be achieved without strain.[243] Mr. Powers also testified that it would require more catalyst than reducing NO_x emissions to 5 ppm, but that it would not require more maintenance nor more frequent cleanings and removals of catalysts.[244] The Applicant admits that SCR can achieve 90% reduction of NO_x emissions.[245] The Applicant provides no technical or

[238] Higgins Direct Testimony at 30:30-31:2 (Applicant's Exh. 500).
[239] Higgins Direct Testimony at 31:25-33 (Applicant's Exh. 500).
[240] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[241] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[242] Higgins Direct Testimony at 31:13-24 (Applicant's Exh. 500).
[243] Transcript at 132:8-12 (Powers).
[244] Transcript at 132:13-21 (Powers).
[245] Higgins Direct Testimony at 28:24-28 (Applicant's Exh. 500).

cost-based justifications for selecting a 5 ppm NO_x limit rather than a lower limit in either its discussion of EPA's Top-Down method[246] or its discussion of TCEQ's Three Tier Method.[247]

Lastly, the Applicant suggests that Port Arthur LNG's prior permit somehow supports the proposed limits in this case,[248] but this erroneous position contradicts TCEQ guidance: "[i]t is not sufficient argument for an applicant to state that a current project represents BACT simply because the previous project, at the same facility and/or a similar facility at the site, was recently approved as BACT with the proposed controls."[249]

3) The proposed CO control and resulting emission limits for the electric power generation turbines do not constitute BACT.

In proposing a BACT limit of 9 ppm for CO from its power generation turbines, the Applicant fails to explain why it cannot meet the lower limits achieved at other facilities. For example, Freeport LNG operates electric generation turbines with a CO emissions limit of 4 ppm.[250] And El Paso Electric Company recently permitted electric generation turbines with that same BACT limit of 4 ppm.[251] Similar to its Top Down and Three Tier BACT analyses for NO_x emissions, the Application provides no technical or cost-based justification for proposing a CO limit of 9 ppm rather than the lower limit of 4 ppm permitted and achieved elsewhere.[252] As stated previously, distinctions based on LAER or a Standard Permit are not justification for higher limits.[253] Rather, they support the availability of those options as BACT.[254]

[246] Port Arthur LNG Application at PAL_000227-PAL_000231 (PA-CAN Exh. 2).
[247] Port Arthur LNG Application at PAL_000088 (PA-CAN Exh. 2).
[248] Higgins Direct Testimony at 29:10-32 (Applicant's Exh. 500).
[249] APDG 6110 at POWERS 387 (PA-CAN Exh. 10) (emphasis original).
[250] Powers Direct Testimony at 51:14-16 (PA-CAN Exh. A).
[251] Powers Direct Testimony at 51:17-52:2 (PA-CAN Exh. A).
[252] Port Arthur LNG Application at PAL_000232-PAL000234, PAL_000287 (PA-CAN Exh. 2); Powers Direct Testimony at 52:2-4 (PA-CAN Exh. A).
[253] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[254] *See* Powers Direct Testimony at 38:17-39:5 (PA-CAN Exh. A).

The Applicant's BACT analysis for NOx and CO from the electric generation turbines is inadequate because the Applicant fails to offer any technical or economic justification that it cannot achieve the lower limits permitted and achieved at similar facilities. The Applicant fails to explain why it should be allowed to emit twice as much pollution as Freeport LNG or El Paso Electric Company. In the absence of this justification, BACT for the electric generation turbines is a NO_x limit of 2 to 2.5 ppm and a CO limit of 4 ppm.

iii. Flares

1) The proposed controls and resulting 0.1380 lb/MMBtu NOx emission limits for the ground flares do not constitute BACT.

Although the ground flare is BACT generally for NO_x and VOC emissions from waste gas combustion at LNG export terminals, the Applicant's BACT analysis for its proposed ground flare does not differentiate between the NO_x emissions performance of multi-point ground flares compared to enclosed ground flares.[255] The proposed 0.1380 lb/MMBtu ground flare NO_x emission rate for the Port Arthur LNG facility is not BACT.[256] An enclosed ground flare can achieve a NO_x limit of 0.025 lb/MMBtu compared to the 0.1380 lb/MMBtu proposed by Port Arthur LNG.[257] An enclosed ground flare should be identified as NO_x BACT for the ground flare source.[258]

In conducting its BACT Analysis, Applicant should have surveyed the range of potentially available control options for flaring.[259] There are two types of ground flares within the general category of "ground flares."[260] The first type is a multi-point ground flare, which consists of many

[255] Powers Direct Testimony at 11:5-6 (PA-CAN Exh. A).
[256] Powers Direct Testimony at 11:5-9 (PA-CAN Exh. A).
[257] Powers Direct Testimony at 11:7-8 (PA-CAN Exh. A).
[258] Powers Direct Testimony at 11:8-9 (PA-CAN Exh. A).
[259] NSR Manual at B.11, POWERS 122 (PA-CAN Exh. 8).
[260] Powers Direct Testimony at 54:9-10 (PA-CAN Exh. A).

burners distributed at ground level, typically over a large area.[261] The flares are surrounded by a barrier fence.[262] This multi-point ground flare is the type proposed by Port Arthur LNG.[263] The second type is an enclosed ground flare, with the burner(s) contained at the base of a vertical, silo-like stack.[264] The stack shields the enclosed ground flare burner flame from crosswinds, thereby helping maintain a higher destruction removal efficiency (DRE) rate.[265] At the hearing, Mr. Powers clarified that although a multi-point ground flare may be enclosed within a high fence or tall walls, usually with a large perimeter, it does not make the multi-point flare an enclosed ground flare.[266] The multiple feed lines going into the "multi-point ground flare" is the distinguishing feature.[267] PA-CAN Exhibit 43 has photographs representative of the two types of flares discussed for illustration.[268]

The enclosed ground flare alternative should have been evaluated as NO_x BACT for the ground flare at Port Arthur LNG.[269] In reviewing flares, the Application only distinguished between ground flares and marine flares, and not between different types of ground flares.[270] The Application only specifically references the RBLC database and recently permitted flares as identifying "good combustion practices" as the only available control technology to minimize flare emissions.[271] Based on the Application, Port Arthur LNG conducted no further review of what

[261] Powers Direct Testimony at 54:9-10 (PA-CAN Exh. A); *see* Photograph of Multipoint Flare at POWERS 991 (PA-CAN Exh. 43).
[262] Powers Direct Testimony at 54:11-13 (PA-CAN Exh. A).
[263] Majeed Direct Testimony at 20:34-38 (Applicant Exh. 300)(describing a multi-point ground flare that will be surrounded by 50-foot-high walls on all four sides to limit exposure and heat radiation).
[264] Powers Direct Testimony at 54:9-10 (PA-CAN Exh. A); *see* Photograph of Totally Enclosed Ground Flare at POWERS 990 (PA-CAN Exh. 43).
[265] Powers Direct Testimony at 54:16-17 (PA-CAN Exh. A).
[266] Transcript at 26-2:24 (Powers).
[267] Transcript at 21:3-10 (Majeed).
[268] *Compare* Photograph of Multipoint Flare at POWERS 991 *with* Photograph of Totally Enclosed Ground Flare at POWERS 990 (PA-CAN Exh. 43).
[269] NSR Manual at B.11, POWERS 122 (PA-CAN Exh. 8).
[270] Port Arthur LNG Application at PAL_000293 (PA-CAN Exh. 2).
[271] Port Arthur LNG Application at PAL_000293 (PA-CAN Exh. 2).

either technology could achieve beyond "good combustion practices" and compliance with 40 C.F.R. § 60.18.[272] These same limitations are the only requirements reflected in the Draft Permit.[273]

Other facilities use enclosed ground flares to achieve a NO_x limit of 0.025 lb/MMBtu, a much stricter limitation than the NO_x limit the Applicant proposes.[274] In September 2018 after surveying "non-refinery flares", South Coast Air Quality Management District (SCAMD) published a report finding that (1) "most non-refinery flares in current operation today are enclosed ground flares" and (2) those enclosed ground flares can achieve NO_x emissions of less than 0.025 lb/MMBtu.[275] A state-of-the art enclosed ground flare therefore limits NO_x to 0.025 lb/MMBtu, less than one-fifth Applicant's proposed NO_x limit of 0.1380 lb/MMBtu.[276]

Further, ExxonMobil's Baytown Olefins Plant uses multi-point ground flares,[277] the same type of ground flare that Applicant proposes, to limit VOC emissions to a greater degree than Applicant's proposed DRE of 98%.[278] The multi-point ground flares in Baytown come with a hydrocarbon DRE guarantee of 99.8%.[279] This multi-point ground flare was manufactured specifically for the Baytown Plant by John Zink Hamworthy, a reputed vendor and manufacturer.[280] Hamworthy's technical marketing brochure states that this ground flare achieves a hydrocarbon DRE of greater than 99.5%.[281]

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[272] Port Arthur LNG Application at PAL_000293 (PA-CAN Exh. 2).
[273] Draft Permit at AR 00062-00063, 00088 (Tab B).
[274] Powers Direct Testimony at 11:6-8 (PA-CAN Exh. A).
[275] Powers Direct Testimony at 55:2-5 (PA-CAN Exh. A); SCAQMD Report at POWERS 1013 (PA-CAN Exh. 41).
[276] Powers Direct Testimony at 56:1-3 (PA-CAN Exh. A).
[277] Powers Direct Testimony at 55:16-17 (PA-CAN Exh. A); ExxonMobil Baytown Olefins Plant, NSR Application (Nov. 2012) at POWERS 960 (PA-CAN Exh. 42).
[278] Port Arthur LNG Supplement at PAL_001583 (PA-CAN Exh. 4).
[279] Powers Direct Testimony at 55:16-17 (PA-CAN Exh. A); ExxonMobil Baytown Olefins Plant, NSR Application (Nov. 2012) at POWERS 960 (PA-CAN Exh. 42); Transcript at 138:4-7 (Powers).
[280] Powers Direct Testimony at 55:18 (PA-CAN Exh. A).
[281] Powers Direct Testimony at 56:1-3 (PA-CAN Exh. A); John Zink Hamworthy Brochure at POWERS 983 (PA-CAN Exh. 44).

For these reasons, the NO_x emission limit for the Port Arthur LNG ground flare should reflect the emissions performance available for ground flares whether they are enclosed ground flares or multi-point ground flares.

2) The proposed controls and resulting emission limits for the elevated marine flare do not constitute BACT for NO_x or VOC.

A multi-point ground flare with a hydrocarbon DRE guarantee is BACT at 99.5%, not 98% as is the case for elevated flares.[282] There is not elevated flare design that has been demonstrated to achieve 98% under all operating conditions.[283] In addition to a higher DRE, ground flares have the potential to emit less NO_x than elevated flares.[284] The following evidence demonstrates why Port Arthur LNG could emit less NO_x utilizing only ground flares (of whatever kind) than its proposed combination of a ground flare and an elevated marine flare.[285]

a) Marine flares are no longer necessary with vapor recovery systems that eliminate vapor emissions, and ground flares are preferred at most other, newer LNG facilities.

The Applicant plans to use the proposed 135-foot elevated marine flare[286] in two instances: (1) to handle boil-off gases (BOG) in the unlikely event that all of the liquefaction trains are not operating[287] and (2) for vessel purging.[288] In first situation, the BOG could be recovered instead of flared as proposed at Rio Grande LNG.[289] Rio Grande uses only ground flares and will recover marine vapors in a vapor recovery system that eliminates vapor emissions.[290] For this reason, there

[282] Port Arthur LNG Application at PAL_000090 (PA-CAN Exh. 2); Powers Direct Testimony at 59:12-14 (PA-CAN Exh. A).
[283] Powers Direct Testimony at 59:15-18 (PA-CAN Exh. A).
[284] Powers Direct Testimony at 54:17-18 (PA-CAN Exh. A).
[285] Port Arthur LNG Application at PAL_000293 (PA-CAN Exh. 2).
[286] Port Arthur LNG Supplement to Application at PAL_001583 (PA-CAN Exh. 4).
[287] Port Arthur LNG Application at PAL_000082 (PA-CAN Exh. 2).
[288] Majeed Direct Testimony at 12:28-31 (Applicant Exh. 300).
[289] Powers Direct Testimony at 58:16-59:3 (PA-CAN Exh. A); Rio Grande LNG Application to FERC (Sept. 2017) at POWERS 4878, 4884 (PA-CAN Exh. 14).
[290] Powers Direct Testimony at 58:16-59:3 (PA-CAN Exh. A); Rio Grande LNG Application to FERC (Sept. 2017) at POWERS 4880, 4884 (PA-CAN Exh. 14).

is no elevated marine flare proposed for Rio Grande LNG.[291] If a vapor recovery system were utilized at Port Arthur LNG, the waste gas from the purged marine vessel vapors could also be routed to the vapor recovery system, eliminating the need for the elevated marine flare.[292]

Many operational, permitted, and planned LNG export terminals in Texas and other regions of the U.S. now use, or will use, enclosed ground flares, demonstrating they are technically practicable and economically reasonable as a control for flare emissions.[293] Mr. Majeed, Port Arthur LNG's engineer even testified that the "[m]ajority of the LNG plants use ground flares," not elevated flares.[294] "Only the very old—the ones permitted a long time back, they may be using, you know, the elevated flares."[295] For example, the Rio Grande LNG facility will utilize a ground flare that is 6 feet high, enclosed in approximate 67-foot-high vertical wall for heat protection and to avoid visibility from outside the facility.[296] Additionally, and as discussed above, Mr. Powers has identified vendor guarantees for ground flares permitted for use at a facility in Baytown, Texas, and within the South Coast Air Quality Management District in California demonstrating that ground flares can and do achieve higher than the 98% DRE assumed as BACT for Port Arthur LNG's elevated flare.[297] Port Arthur LNG's witness even acknowledged that typically most manufacturers are striving for a 99% DRE for an enclosed ground flare.[298] In such case, an enclosed ground flare would be BACT as the marine flare would be unnecessary.[299]

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[291] Powers Direct Testimony at 58:16-59:3 (PA-CAN Exh. A); Rio Grande LNG Application to FERC (Sept. 2017) at POWERS 4880, 4884 (PA-CAN Exh. 14); Rio Grande LNG Application to FERC (Sept. 2017) at POWERS 4878 (PA-CAN Exh. 14); *see also* Rio Grande LNG, Overall Site Plan at POWERS 5756 (PA-CAN Exh. 45) (showing layout for three ground flares planned for facility).
[292] Powers Direct Testimony at 12:2-3 (PA-CAN Exh. A).
[293] Powers Direct Testimony at 55:14-16 (PA-CAN Exh. A).
[294] Transcript at 409:16-23 (Majeed).
[295] Transcript at 409:16-23 (Majeed).
[296] Rio Grande LNG Application to FERC (Sept. 2017) at POWERS 4878 (PA-CAN Exh. 14).
[297] Powers Direct Testimony at 56:1-3, 55:2-5 (PA-CAN Exh. A).
[298] Transcript at 410:14-18 (Majeed).
[299] Powers Direct Testimony at 12:2-3 (PA-CAN Exh. A).

b) Ground flares outperform elevated flares with a higher DRE.

Even ground flares presumed to meet only 98% DRE will meet this assumed DRE more regularly than an elevated marine flare at Applicant's facility.[300] While elevated flares have been demonstrated to achieve a 98% DRE under relatively calm conditions,[301] many factors reduce destruction efficiency in elevated flares.[302] For example, crosswinds may affect performance.[303] The Application fails to evaluate the impact of crosswinds in Port Arthur, Texas on the DRE of the elevated flare and evaluate using an enclosed ground flare as an alternative.[304] Enclosed ground flares can be readily monitored at the stack to verify DRE performance, which elevated flares have no stack to monitor.[305] Other non-optimal conditions such as malfunction events can also substantially reduce flare efficiency.[306] Neither the Application nor the Supplement discusses these potential events in terms of maintaining flare efficiency or performance[307] other than noting that these events could cause visible emissions that are detectable.[308] Port Arthur LNG further acknowledges that it would be in violation of its permit if there were visible emissions from the flare for more than a total of five minutes during any two consecutive hours.[309]

Significant crosswinds and an elevated flare is generally outside the envelope of any testing that has been done.[310] TCEQ's flare guidelines establishing the minimum elevated flare DRE of

[300] Powers Direct Testimony at 59:15-60:2 (PA-CAN Exh. A); PA-CAN Comments at PACAN 033 (PA-CAN Exh. 3).
[301] Powers Direct Testimony at 59:15-18 (PA-CAN Exh. A).
[302] Powers Direct Testimony at 59:18-60:1 (PA-CAN Exh. A).
[303] Powers Direct Testimony at 60:1 (PA-CAN Exh. A).
[304] Powers Direct Testimony at 11:13-15 (PA-CAN Exh. A).
[305] Powers Direct Testimony at 11:17-18 (PA-CAN Exh. A).
[306] Powers Direct Testimony at 60:1-2 (PA-CAN Exh. A).
[307] Port Arthur LNG Application at PAL_000090 (PA-CAN Exh. 2); Port Arthur LNG Supplement at 001583 (Exh. 4).
[308] Port Arthur LNG Supplement at 001583 (PA-CAN Exh. 4).
[309] Port Arthur LNG Supplement at 001583 (PA-CAN Exh. 4).
[310] Transcript at 265:11-16 (Powers).

98% and related 2011 report[311] rely on a Flare Efficiency Study performed in 1983 by the EPA.[312] The EPA Flare Efficiency Study only reflects the performance of flares at or below 5 mph.[313] At wind velocities exceeding 5 mph, testing was found infeasible.[314] Therefore, the assumption of 98 percent minimum DRE derived from this test data is not necessarily applicable to periods when crosswinds exceed 5 mph at the flare tip.[315] There's little data on the performance of flares under substantial crosswind conditions.[316] Port Arthur LNG has even acknowledged that a high crosswind velocity can cause a flame to be impacted, a term called "wake-dominated" (i.e., the flame is bent over the downwind side of a flare and imbedded in the wake of the flare tip).[317]

More recently, studies compiled in a 2012 EPA report have found that elevated flare performance may degrade when wind speed reaches 22 mph.[318] In particular, flame modeling cited to by EPA shows a simulated flame being "almost completely extinguished at crosswind velocities of 22 miles per hour."[319] In fact, one study profiled in the 2012 EPA report chronicled that all test runs and resulting observations were made when winds were less than 3.6 miles per hour.[320] At Applicant's proposed facility, the flare tip elevation will be subject to Port Arthur's substantial crosswinds at the 41-meter (135 feet) flare height;[321] and, therefore, the marine flare will not continuously achieve the 98 percent overall DRE assumed in the Draft Permit.[322]

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[311] TCEQ, 2010 Flare Study Final Report (Aug. 2011) (PA_CAN Exh. 49).
[312] Powers Direct Testimony at 60:4-5 (PA-CAN Exh. A)(referencing EPA, Flare Efficiency Study (July 1983) (PA-CAN Exh. 46)).
[313] EPA, Flare Efficiency Study at POWERS 2344 (PA-CAN Exh. 46).
[314] EPA, Flare Efficiency Study at POWERS 2344 (PA-CAN Exh. 46); Powers Direct Testimony at 61:12-15 (PA-CAN Exh. A).
[315] Powers Direct Testimony at 61:15-16 (PA-CAN Exh. A).
[316] Transcript at 265:20-21 (Powers).
[317] Port Arthur LNG Supplement at 001583 (PA-CAN Exh. 4).
[318] Powers Direct Testimony at 62:4-6 (PA-CAN Exh. A); EPA, Parameters for Properly Designed and Operated Flares (April 2012) at POWERS 5541, 5600, 5604 (PA-CAN Exh. 48).
[319] Powers Direct Testimony at 62:4-6 (PA-CAN Exh. A); EPA, Parameters for Properly Designed and Operated Flares (April 2012) at POWERS 5541, 5600, 5604 (PA-CAN Exh. 48).
[320] Transcript at 267:10-18 (Powers)(referencing EPA 2012 Study at POWERS 5566 (PA-CAN Exh. 48).
[321] *See* Wind Speeds at 40m at POWERS 6266 (PA-CAN Exh. 47).
[322] Powers Direct Testimony at 11:15-17 (PA-CAN Exh. A); Draft Permit at AR 00062-63, 00088 (Tab B).

In contrast, ground flares are not impacted by crosswinds like elevated flares.[323] Ground flares are enclosed in cylindrical stack or barrier fence structures of varying heights, so that destruction efficiency is not affected by cross winds.[324] For example, the multi-point ground flare has a barrier fence around the ground flare that protects the burner flame from crosswinds.[325] Similarly, the enclosed ground flare consists of a burner and a vertical stack, with the flame contained within the stack.[326] The stack shields the enclosed ground flare burner flame from crosswinds.[327]

TCEQ's own 2010 Flare Efficiency Study found that there are numerous operating conditions in conformance with 40 CFR § 60.18 at which elevated flares do not comply with the assumed DRE of 98 percent.[328] These non-optimal operating conditions can substantially reduce elevated flare efficiency.[329] For example, a steam-assisted elevated flare that was operating in compliance with 40 CFR § 60.18 had a DRE as low as approximately 60 percent, with many points in the range of 70 to 90 percent DRE.[330] These findings regarding operating conditions and flare DRE are separate from the impacts of crosswinds, as the studies were not designed to evaluate the effect of crosswinds on flare DRE.[331] All of these events suggest that the elevated flare's performance cannot achieve the same DRE as commercially available ground flares in the same conditions.[332]

[323] Powers Direct Testimony at 64:1-3 (PA-CAN Exh. A).
[324] Powers Direct Testimony at 64:1-3 (PA-CAN Exh. A).
[325] Powers Direct Testimony at 54:12-13 (PA-CAN Exh. A).
[326] Powers Direct Testimony at 54:16-17 (PA-CAN Exh. A).
[327] Powers Direct Testimony at 54:16-17 (PA-CAN Exh. A).
[328] Powers Direct Testimony at 62:15-63:2 (PA-CAN Exh. A).
[329] Powers Direct Testimony at 62:15-63:2 (PA-CAN Exh. A).
[330] Powers Direct Testimony at 62:15-63:2 (PA-CAN Exh. A).
[331] Powers Direct Testimony at 62:7-63:2 (PA-CAN Exh. A).
[332] Powers Direct Testimony at 62:1-63:2 (PA-CAN Exh. A).

c) Monitoring elevated flares is not feasible to ensure compliance.

In addition to a higher DRE, ground flares have the potential to emit less NO_x than elevated flares.[333] They are also easier to monitor. Each side's witnesses agree that there's really no way to directly test the emissions from an elevated flare.[334] Currently, there are no commercially available monitoring options to corroborate that the elevated flare DRE limits are being met.[335] Port Arthur LNG admits that a visibly detectible "wake-dominated" flame for more than five minutes over two consecutive hours would be a permit violation, so mere observation or continuous monitoring is not sufficient to ensure performance of an elevated flare once vessel purging has begun regardless of how few hours it planned to operate the flare.[336] Conversely, an enclosed ground flare can readily be monitored at the stack for DRE performance.[337] Even a multi-point ground flare can also be monitored using modified conventional stack testing techniques (e.g., an extended sampling probe) to determine DRE performance.[338]

d) Nuisance impacts from elevated flares are why ground flares are preferred in urban areas.

Ground flares also have reduced visual impacts compared to elevated flares. One advantage to a ground flare is there are no direct visible emissions that occur with an elevated flare.[339] Port Arthur LNG's engineer testified that an elevated flare poses light and heat radiation impacts, which is a safety concern and can be a concern to the surrounding area.[340] Port Arthur LNG's marine flare is an elevated flare,[341] and Mr. Majeed acknowledged that this flare will have these identified

[333] Powers Direct Testimony at 54:17-18 (PA-CAN Exh. A).
[334] Transcript at 265:6-10 (Powers); 410:2-5 (Majeed).
[335] Powers Direct Testimony at 63:3-5 (PA-CAN Exh. A).
[336] Port Arthur LNG Supplement at 001583 (PA-CAN Exh. 4).
[337] Powers Direct Testimony at 11:17-18 (PA-CAN Exh. A).
[338] Powers Direct Testimony at 63:16-18 (PA-CAN Exh. A).
[339] Transcript at 269:21-24 (Powers).
[340] Majeed Direct Testimony at 21:21-22 (Applicant Exh. 300); Transcript at 406:4-9 (Majeed).
[341] Application at PAL_000066 (PA-CAN Exh. 2).

nuisance impacts.[342] For example, Mr. Majeed agreed that the elevated flare at 135 feet (or 14 stories tall) would be able to be seen from far away given its height.[343] Thus, while the marine flare was operating up to 388 hours a year, the flame will be able to be seen from the West Port Arthur neighborhood only 5 miles away.[344] When in operation, the elevated marine flare would be visible both during the day and at night.[345] Mr. Majeed also acknowledged that elevated flares make more noise than enclosed ground flares when the flow rates are very large.[346]

For all of these reasons, enclosed ground flares are an alternative flare technology that represents BACT for flare NO_x and VOC emissions and should have been identified as BACT as opposed to the elevated marine flare.

iv. Thermal Oxidizers

1) The proposed controls and resulting emission limits for the thermal oxidizers do not constitute BACT.

The Applicant proposes a NO_x emissions limit of 0.06 lb/MMBtu for its thermal oxidizers.[347] This figure is simply the upper end of the range listed in TCEQ BACT Guidance published in the year 2000, over 20 years ago.[348] Current TCEQ BACT guidance requires a NO_x limit of 0.06 lb/MMBtu ***or less***.[349] As mentioned previously, TCEQ's Tier 1 BACT requirements are subject to change through case-by-case evaluations and should consider "***any*** new technical developments [] which may indicate that additional emission reductions are economically or technically reasonable."[350] EPA's NSR Manual makes clear that the controls considered "should

[342] Transcript at 406:19-407:1 (Majeed).
[343] Transcript at 407:2-7 (Majeed).
[344] Transcript at 408:7-15 (Majeed).
[345] Transcript at 408:21-409:6 (Majeed).
[346] Transcript at 407:8-11 (Majeed).
[347] Port Arthur LNG Application at PAL_000088 (PA-CAN Exh. 2); Draft Permit at AR 00065, 00098-99 (Tab B).
[348] Transcript at 46:8-11 (Powers) (referencing TRNCC, Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, RG-109 (Draft) (Oct. 2000) at 14).
[349] TCEQ, BACT Guidelines for Thermal Oxidizers at POWERS 8763 (PA-CAN Exh. 50) (emphasis added).
[350] *See* TCEQ, APDG-6110 at POWERS 380 (PA-CAN Exh. 10) (emphasis added).

include not only existing controls for the source category in question, but also (though technology transfer) controls applied to similar source categories and gas streams, and innovative control technologies." [351] The NSR Manual also clarifies that "[m]anufacturer's data, engineering estimates and the experience of other sources provide the basis for determining achievable limits."[352] If an applicant selects as BACT something less that the best achievable limit, "the basis for choosing the alternate level (or range) of control in the BACT analysis must be documented in the application."[353]

Generally, emission reduction options should be successfully demonstrated in Texas and the United States, and these options may have been successfully demonstrated for the same industry or different industries with similar emissions streams. [354] The record in this case demonstrates that John Zink Hamworthy, a leading manufacturer based in the United States, manufactures burners for thermal oxidizers that can achieve a 0.01 lb/MMBtu NO_x limit.[355] There is also a chemical facility operating in Louisiana with a thermal oxidizer NO_x limit of 0.025 lb/MMBtu.[356] In addition, two LNG facilities recently proposed NO_x limits for thermal oxidizers in respective permit applications of 0.049 lb/MMBtu (Rio Grande LNG)[357] and 0.035 lb/MMBtu (Lake Charles LNG).[358]

The Applicant attempts to distinguish these other facilities because they were eventually permitted with higher limits than those requested in their applications. The fact that Rio Grande LNG represented in its permit application that it could achieve an emission limitation of

[351] NSR Manual at B.5, POWERS 116 (PA-CAN Exh. 8).
[352] NSR Manual at B.24, POWERS 135 (PA-CAN Exh. 8).
[353] NSR Manual at B.24, POWERS 135 (PA-CAN Exh. 8).
[354] TCEQ, APDG 6110 at POWERS 385 (PA-CAN Exh. 10).
[355] Powers Notes at POWERS 4853 (PA-CAN Exh. 51).
[356] Powers Direct Testimony at 68:4-10 (PA-CAN Exh. A); RBLC Pollutant Information, Shintech Louisiana LLC Plaquemine PVC Plant at POWERS 5457 (PA-CAN Exh. 55); RBLC Search Results (PA-CAN Exh. 53).
[357] Rio Grande LNG Application to FERC at POWERS 4900, 4928 (PA-CAN Exh. 14).
[358] Transcript at 275:4-13 (Powers).

0.049 lb/MMBtu NO_x is relevant.[359] Similarly, Lake Charles LNG voluntarily applied for an emissions limit of 0.035 lb/MMBtu NO_x.[360] The fact that the facilities proposed significantly lower limits than the 0.060 lb/MMBtu NO_x proposed by Port Arthur LNG, together with the emission representations by leading thermal oxidizer manufacturers, are certainly relevant and required Port Arthur LNG to justify why lower limits were not BACT for its facility.[361]

Furthermore, the record shows that the Shintech facility is operating a thermal oxidizer in Louisiana with a significant lower limit than that proposed by Port Arthur LNG. The Shintech facility has a limit of 0.025 lb/MMBtu NO_x.[362] The Applicant and TCEQ both attempt to distinguish this facility on the composition of its waste stream, arguing that Port Arthur LNG will have a higher sulfur content. However, even the Applicant's witnesses agree that sulfur will be removed from Port Arthur LNG's waste stream before it reaches the thermal oxidizer.[363] The Applicant further contends that Shintech is distinguishable because of the high temperature exhaust; but, as has been made clear, the temperature of the exhaust can easily be controlled via air tempering.[364]

A case-by-case BACT analysis requires the examination of any potentially applicable technology that may result in the reduction of emissions.[365] The Applicant spoke with Baker Hughes and GE regarding thermal oxidizers, but the Applicant did not provide any notes or

[359] Rio Grande LNG Application to FERC at POWERS 4900, 4928 (PA-CAN Exh. 14).
[360] Powers Direct Testimony at 68:1-3, FN44 (PA-CAN Exh. A) (explaining calculation); Transcript at 276:19-24); Lake Charles Title V PSD Application Revised (July 2014), LDEQ-EDMS Document 9404342, at Page 15 of 349 (PA-CAN Exh. 67).
[361] *See* Transcript at 153:6-8 (Powers).
[362] Powers Direct Testimony at 68:4-10 (PA-CAN Exh. A); RBLC Pollutant Information, Shintech Louisiana LLC Plaquemine PVC Plant at POWERS 5457 (PA-CAN Exh. 55).
[363] Majeed Direct Testimony at 7:17-8:7 (Applicant Exh. 300)(explaining that sulfur is removed from the waste stream); Transcript at 151:5-19; 277:23-280:13 (Powers); *see also* Applicant Exh. 301 (process flow diagram).
[364] Transcript at 207:7-19 (Powers).
[365] NSR Manual at B.5-B.7, POWERS 116-118 (PA-CAN Exh. 8).

information regarding the conversations it had with Baker Hughes and GE representatives.[366] In surveying potentially applicable technologies, the Applicant should have conducted a more thorough search just as Protestant has. Mr. Powers, for instance, spoke with John Zink Hamworthy, a manufacturer and vendor of thermal oxidizers, who advertises thermal oxidizers with single digit NO_x performance using the RMBTM ultra-low NO_x burner, a technology used in a number of thermal oxidizers in operation within the United States.[367] Hamworthy's technology was not considered by either the Applicant or TCEQ in making their BACT determinations. Pursuant to TCEQ's own guidance, "***any*** new technical developments [] which may indicate that additional emission reductions are economically or technically reasonable," is to be examined in the case-by-case analysis.[368] Such a requirement is especially pertinent given the fact that TCEQ's NO_x emission limit standard of 0.06 lb/MMBtu is over 20 years old.[369] Both TCEQ and Applicant failed by not conducting a thorough examination of the applicable thermal oxidization technology.

v. Fugitive Emissions

1) The proposed controls and resulting emission limits for the fugitive emissions do not constitute BACT.

Fugitive emissions are leaks and other irregular releases of gases or vapors as a result of from piping components and associated equipment including, but not limited to valves, connectors, pumps, agitators, compressor seals, relief valves, process drains, and open-ended lines.[370] In its

[366] Transcript at 282:2-13 (Majeed).
[367] Powers Notes at POWERS 4853 (PA-CAN Exh. 51).
[368] TCEQ, APDG 6110 at POWERS 380 (PA-CAN Exh. 10).
[369] Transcript at 46:8-11 (Powers) (referencing TRNCC, Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, RG-109 (Draft) (Oct. 2000) at 14)(stating 0.06 lb/MMBtu limit for NOx); *see also* TCEQ, BACT Guidelines for Thermal Oxidizers at POWERS 8763 (PA-CAN Exh. 50) (prescribing "limit of 0.06 lb/MMBtu NO_x or less", which was last updated in 2011).
[370] TCEQ, APDG 6422v2 at POWERS 5476 (PA-CAN Exh. 58); *see also* 30 TEX. ADMIN. CODE § 101.1 (defining fugitives as "any gaseous or particulate contaminant entering the atmosphere that could not reasonably pass through a stack, chimney, vent, or further functionally equivalent opening designed to direct or control its flow."); Majeed Direct Testimony at 23:2-5 (Applicant Exh. 300); Application at PAL_000085 (PA-CAN Exh. 2).

Application, Port Arthur LNG identified fugitive emissions of 43.3 tpy of VOC for the proposed project.[371] Applicant failed to properly evaluate and document more stringent alternatives for fugitive emissions or other available technology;[372] and, thus, the Application failed to meet BACT requirements for this source of VOC emissions.[373]

The Executive Director has determined that a "Leak Detection and Repair" (LDAR) program satisfies BACT for these fugitive emissions.[374] LDAR programs are used to inspect fugitive components to identify leaks either by using instruments or in limited cases, by physical inspections.[375] Specifically, TCEQ requires use of LDAR on facilities with an uncontrolled fugitive VOC emissions potential at or above 10 tpy.[376] TCEQ applies LDAR 28VHP to facilities with the potential emit more than 25 tpy of VOCs.[377] Here, the "28VHP" LDAR program was selected as BACT by the Executive Director.[378]

But LDAR 28VHP is simply a monitoring protocol used to detect hydrocarbon vapor leaks[379] and not a technology-based BACT determination for components that have the potential to leak VOCs;[380] therefore, it should not be considered VOC BACT for the projected 43.3 tpy of potential fugitive emissions at Port Arthur LNG.[381] Moreover, there are several different LDAR

[371] Port Arthur LNG Application at PAL_000095 (Site-Wide Annual Emissions Summary) (PA-CAN Exh. 2); *see also* Draft Permit at AR00101 (Tab B).
[372] Port Arthur LNG Application at PAL_000200, 000269-000272 (PA-CAN Exh. 2).
[373] Powers Testimony at 12:11-13:4 (PA-CAN Exh. A).
[374] Draft Permit at AR 00067-71, 001001 (Tab B); Transcript at 636:4 (Hansen).
[375] TCEQ, APDG 6422v2 at POWERS 5482 (PA-CAN Exh. 58).
[376] TCEQ, Current Tier 1 BACT Requirements: Chemical Sources (Oct. 1, 2018) at 0501 (Exh. ED-10); Powers Testimony at 68:14-15 (PA-CAN Exh. A).
[377] TCEQ, Current Tier 1 BACT Requirements: Chemical Sources (Oct. 1, 2018) at 0501 (Exh. ED-10); Powers Testimony at 68:15-16 (PA-CAN Exh. A).
[378] Transcript at 636:4 (Hansen).
[379] Powers Testimony at 68:13-14 (PA-CAN Exh. A).
[380] Powers Testimony at 69:6-8 (PA-CAN Exh. A).
[381] Powers Testimony at 69:6-8 (PA-CAN Exh. A).

programs utilized by TCEQ, and there was no differentiation between these programs in the Application.[382]

a) Leakless components is a better control to reduce fugitive emissions.

Fugitive VOC emissions can be reduced or eliminated most effectively by the use of "leakless" components.[383] Leakless technology would satisfy VOC BACT without a LDAR program according to TCEQ fugitive emission control guidance.[384] Leakless technology should be technically feasible for all fugitive components involved in the Port Arthur LNG project.[385] Thus, if there are areas at the facility that for whatever reason cannot utilize leakless technology, Port Arthur LNG should identify those in an evaluation as opposed to making a blanket statement that implies utilizing leakless technology is an "all-or-nothing" situation.[386] And as Mr. Powers testified in response to Port Arthur LNG's counsel's question about the relative costs of using leakless technology, "there was no cost analysis prepared by Port Arthur LNG looking at leakless versus leaking."[387]

First, 32.7 tpy of the VOC emissions, about 75 percent of the 43.3 tpy total VOC emissions, are emitted from flanges and connectors.[388] During the hearing, Mr. Majeed, Port Arthur LNG's engineer, admitted that a major source of fugitive emissions at LNG facilities is from flanged piping systems or leakage from control valves.[389] Welded flanges and connectors eliminate VOC emissions from threaded fittings.[390] This simple, low-technology step would eliminate 75 percent

[382] TCEQ, APDG 6422v2 at POWERS 5483, 5502-03 (PA-CAN Exh. 58)(listing various LDAR Programs).
[383] Powers Testimony at 71:1-20 (PA-CAN Exh. A).
[384] Powers Testimony at 71:1-2 (PA-CAN Exh. A).
[385] Powers Testimony at 71:3-20 (PA-CAN Exh. A).
[386] Transcript at 283:5-16 (Powers).
[387] Transcript at 27:8-16 (Powers).
[388] Port Arthur LNG Application at PAL_000163-000167 (calculation of emissions from flanges/connectors sources), PAL_000095 (Site-Wide Annual Emissions Summary) (PA-CAN Exh. 2).
[389] Transcript at 410:19-411:1 (Majeed); *see also* Port Arthur LNG Application at PAL_000085 (PA-CAN Exh. 2).
[390] Powers Direct Testimony at 69:14-16 (PA-CAN Exh. A).

of the projected fugitive VOC emissions at Port Arthur LNG.[391] Other LNG facilities, like Driftwood LNG, plan to use welded pipes and minimize flanged connections.[392] Specifically, where there are metal flanges, Driftwood LNG has committed to use spiral-wound gaskets that keep the flange tightly sealed.[393] Mr. Majeed testified that these flexible gaskets were feasible to create a tight seal and prevent leaks.[394] Further, Mr. Majeed testified that it was also possible to connect the piping with welded connections and test those connections to minimize leaks.[395] These are both recommendations made by Mr. Powers, which Port Arthur LNG acknowledged at the hearing were feasible practices. Moreover, Mr. Majeed committed that Port Arthur LNG would use welded pipes and minimize flanged connections at the facility.[396] However, the Application[397] and Draft Permit[398] do not memorialize the Applicant's "objective to have zero leaks"[399] and similar verbal commitments to reduce leaks made by Applicant in the hearing. There simply is an absence of specificity in the draft permit of what affirmative measures that the Applicant will ultimately take to reduce fugitive emissions, which is PA-CAN's primary complaint regarding the non-specific statements in the Application and the lack of alternative technologies discussed as required by a proper BACT analysis.[400]

[391] Powers Direct Testimony at 69:15-16 (PA-CAN Exh. A).
[392] Driftwood LNG Website at POWERS 7470 (PA-CAN Exh. 19).
[393] Driftwood LNG Website at POWERS 7470 (PA-CAN Exh. 19).
[394] Transcript at 414:3-14 (Majeed).
[395] Transcript at 412:16-18, 412:21-413:2 (Majeed). Majeed Direct Testimony at 24:13 (Applicant Exh. 300).
[396] Transcript at 414:8-16 (Majeed).
[397] Application at PAL_000271-000272 (PA-CAN Exh. 2).
[398] Draft Permit at AR 00067-00071 (Tab B).
[399] Transcript at 421:18-24 (Majeed).
[400] Port Arthur LNG Supplement to Application at PAL_001587 (PA-CAN Exh. 4) (Port Arthur LNG will use "leakless components (such as welded flanges) or low-leak technology" "to the extent practicable in the design of the facility consistent with safety, efficacy and reliability reasons.").

Second, 5 tpy of the VOC emissions are emitted from valves and pumps.[401] Common leakless valves include bellows valves and diaphragm valves.[402] Common sealless pumps are diaphragm pumps, canned motor pumps, and magnetic drive pumps.[403] There are readily available leakless alternatives for these components.[404] Again, the Application fails to evaluate these options.[405] Instead, Mr. Majeed verbally committed during the hearing that when Port Arthur LNG finds a damaged or leaking valve that may be emitting natural gas or a VOC in excess of 500 ppm, it would commit to tag, repair and replace the valve.[406] Further, Port Arthur LNG stated in the hearing that Sempra was using redundant relief valves at all its facilities and would follow the API 622 requirements for leakage.[407] These assurances are not in the Application.[408] There is no evidence in the record that Port Arthur LNG examined any other options to control leaks from pumps or valves.

b) There are more stringent monitoring protocols available to reduce fugitive emissions, and the Applicant did not analyze the cost effectiveness of any compared to LDAR 28VHP.

The LDAR 28VHP monitoring protocol or work practice is not the most effective option to detect leaks, yet there was no analysis of cost effectiveness done to determine if a more stringent LDAR requirements would be cost-effective for Applicant. The Bay Area Air Quality Management District (BAAQMD) LDAR program applicable to existing fugitive VOC-emitting sources in the San Francisco Bay area of California is even more stringent than LDAR 28VHP.[409]

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[401] Powers Direct Testimony at 69:12-13 (PA-CAN Exh. A); Port Arthur LNG Application at PAL_000095 (Site-Wide Annual Emissions Summary) (PA-CAN Exh. 2).
[402] Powers Direct Testimony at 69:17-18 (PA-CAN Exh. A).
[403] Powers Direct Testimony at 69:18-20 (PA-CAN Exh. A).
[404] Powers Direct Testimony at 71:19-20 (PA-CAN Exh. A).
[405] Application at PAL_000271-000272 (PA-CAN Exh. 2).
[406] Transcript at 418:9-16 (Majeed); *see also* Application at PAL_000271-000272 (PA-CAN Exh. 2).
[407] Transcript at 418:17-419:6 (Majeed).
[408] Application at PAL_000271-000272 (PA-CAN Exh. 2).
[409] Powers Direct Testimony at 69:11-15 (PA-CAN Exh. A); BAAQMD Regulation 8, Rule 18 (PA-CAN Exh. 56).

The leak threshold for valves and connectors under BAAQMD Regulation 8, Rule 18 LDAR for the Bay Area is one-fifth that of LDAR 28VHP.[410] Mr. Powers created Table 6 to show a comparison of the monitoring requirements of BAAQMD 8-18 and LDAR 28VHP:[411]

Table 6.

Comparison of Leak Detection Requirements in BAAQMD Regulation 8-18 and LDAR 28VHP

Standard	Leak threshold for valves and connectors (ppm)	1st Repair Attempt	Leak Repaired
BAAQMD Regulation 8-18	100	24 hours	7 days
LDAR 28VHP	500	5 days	15 days

The Draft Permit memorializes the requirements to comply with LDAR 28VHP protocols,[412] but there is not showing by the Applicant or TCEQ that other monitoring protocols were even considered, much less deemed cost effective. The Applicant must provide detailed information concerning any comparison or reasoning as to why one technology or work practice was chosen, particularly where other "more stringent" technologies have been used.[413] The Executive Director's witness, Dr. Hansen, does not know when the 28VHP LDAR program was developed or how long it has been considered BACT, but he is aware it was BACT at least as far back as 2013, when Dr. Hansen started work at TCEQ.[414] TCEQ's BACT Guidance for fugitives explains that 28VHP was developed in 1993, and there are additional programs that have since been

[410] Powers Direct Testimony at 69:16-20 (PA-CAN Exh. A).
[411] Powers Table 6 (PA-CAN Exh. 57).
[412] Draft Permit at AR00067-71 (Tab B).
[413] TCEQ, APDG 6110 at POWERS 387 (PA-CAN Exh. 10).
[414] Transcript at 672:11-14 (Hansen).

developed for control of fugitive emissions since this time in response to changes in regulations.[415] Dr. Hansen is aware that the TCEQ Commission recently ordered an applicant to use Optical Gas Imaging to augment the 28VHP LDAR system to comply with BACT.[416] But, here, the ED staff made no effort to conduct a meaningful BACT analysis for the fugitive emissions, beyond applying the old 28VHP leak detection program:[417]

> Q: So what did you do in this case to determine, you know, to look at any sort of technical improvements in monitoring for leaks since, let's say, 2013?
>
> A (Hansen): No, I didn't perform that type of analysis in this case.

There has not been any showing that a more stringent LDAR program is not available or applicable; and, thus, no discussion of not being technically feasible.[418] It is not a sufficient argument for an applicant to state that a current project represents BACT simply because the previous project, at the same facility and/or a similar facility at the site, was recently approved with the proposed controls.[419]

2) The Applicant did not consider other control technology such as Optical Gas Imaging as part of its BACT analysis for fugitives.

The Application and Draft Permit are further deficient for failing to consider Optical Gas Imaging (OGI) as part of the BACT analysis for controlling fugitive emissions. OGI is an effective way to spot the otherwise invisible leaks from pipes, valves, and flanges.[420] BACT is technology-forcing; it is not stagnant.[421] Yet, despite that, and despite knowing that OGI is being used to enhance leak detection so that repairs can be made swiftly, the Executive Director failed to

[415] TCEQ, APDG 6422v2 at POWERS 5503 (PA-CAN Exh. 58)(describing 28VHP and other newer, available LDAR programs).
[416] Transcript at 674:8-15 (Hansen).
[417] Transcript at 672:19-23 (Hansen).
[418] EPA, NSR Manual at B.17, POWERS 128 (PA-CAN Exh. 8).
[419] TCEQ, APDG 6110 at POWERS 387 (PA-CAN Exh. 10)(emphasis original).
[420] Transcript at 283:21–284:15 (Powers).
[421] TCEQ. APDG 6110 at POWERS 384 (PA-CAN Exh. 10).

consider OGI as part of the BACT analysis for fugitive leaks. Moreover, Mr. Powers testified that other LNG facilities, such as Driftwood LNG, are utilizing OGI technology to detect leaks.[422] Acknowledging that "OGI is one method of detecting,"[423] Mr. Majeed testified that gas detectors were already in Port Arthur LNG's design and committed to deploying gas detectors through the Port Arthur LNG facility to serve as early warning devices in the event of a hydrocarbon leak.[424] These verbal commitments, however, are not reflected in the Application, nor do they include OGI.[425] Had the Application properly considered OGI, then the Draft Permit would include OGI to improve and modernize the LDAR program that was improperly selected as BACT or required as actions in the Draft Permit.[426]

Moreover, there was no explanation provided as to why Port Arthur LNG would not use OGI, an identified feasible technology to detect gas leaks, or any demonstration that OGI was not cost effective for this LNG facility despite being utilized at other LNG facilities, like Driftwood LNG, and also at the Jupiter facility in Brownsville, Texas.[427] Mr. Majeed admitted that Port Arthur LNG would – at some unspecified time in the future – be willing to consider the use of OGI.[428] Otherwise, there was simply a general commitment by the Applicant to use the "best technology or the best equipment that is suited for specific areas of the plant."[429] Similarly, there

[422] Driftwood LNG Website at POWERS 7470 (PA-CAN Exh. 19); Transcript at 283:17–284:19 (Powers).
[423] Transcript at 416:11-24 (Majeed).
[424] Transcript at 414:17-415:10 (Majeed).
[425] Application at PAL_000271-000272 (PA-CAN Exh. 2).
[426] Draft Permit at AR 00067-71 (Tab B).
[427] Transcript at 674:8-19; 677:15-680:7 (Hansen); TCEQ Order Approving Final Permit for Jupiter Brownsville (Oct. 22, 2022) at Concl. of Law No. 14 (stating "[c]onsistent with Texas Health & Safety Code § 382.0518(b)(1) and 30 Texas Administrative Code § 116.111(a)(2)(C), and with the addition of amendments requiring that (1) all heaters be permitted with the same NO_x emission limit of 0.015 lb/MMBtu (1-hour average) and 0.010 lb/MMBtu (annual average); and (2) OGI be required to augment the 28VHP LDAR system for controlling fugitive emissions, the Facility will use BACT, with consideration given to the technical practicability and economic reasonableness of reducing or eliminating emissions from the Facility"), available at https://www.tceq.texas.gov/assets/public/comm_exec/agendas/comm/backup/Proposal-for-Decision/2020-1080-AIR-PFD.pdf.
[428] Transcript at 415:4–417:5 (Majeed).
[429] Transcript at 416:11-24 (Majeed).

were no demonstrations that Port Arthur LNG was not able to make more frequent inspections than quarterly with a gas analyzer to check for leaks. The TCEQ permit reviewer even acknowledged that more frequent inspections and faster plugging of any leaks would be better for emissions reductions.[430]

The Applicant contends that Texas is not required to incorporate regulations into its permits from other states or local authorities. However, in EPA's Top-Down BACT analysis, Step 1 actually requires the surveying of "all demonstrated and potentially applicable control technology alternatives."[431] So, while Texas may not be required to incorporate regulations into its permits from other states or local authorities, when determining BACT, technology implemented from other jurisdictions or at other LNG facilities like Driftwood LNG should be examined.[432] Further, Port Arthur LNG conducted an EPA Top-Down analysis in its initial application, indicating its awareness of this requirement;[433] therefore, an examination and comparison of other technology alternatives outside of Texas should have been included in the Application. Because the Applicant failed to evaluate properly and document more stringent alternatives for fugitive emissions, it failed to meet BACT requirements for this source of VOC emissions.

B. Other Referred Issues

The TCEQ Commissioner's Interim Order included nine additional issues (Issues A-E, G-J) listed above.[434] While Section 2003.047(f) of the Texas Government Code limits the scope of the hearing to the issues referred by the Commission,[435] the scope may be further limited, as in

[430] Transcript at 681:11-682:5 (Hansen).
[431] NSR Manual at B.11, POWERS 122 (PA-CAN Exh. 8).
[432] NSR Manual at B.11, POWERS 122 (PA-CAN Exh. 8).
[433] Port Arthur LNG Application at PAL_000195 (PA-CAN Exh. 2).
[434] TCEQ Interim Order at AR 00003 (Tab A).
[435] TEX. GOV'T CODE § 2003.047(f).

this case by the issues that the Protestant elects to raise at the hearing.[436] Nothing in the statute requires the Protestant to rebut all referred issues or present evidence on all referred issues.[437]

Here, PA-CAN focuses its direct case on referred Issue F. Other parties may decide to brief other referred issues if they desire, but PA-CAN's rebuttal case relates to Issue F.

V. TRANSCRIPT COSTS

The hearing on the merits lasted three days for a total of just over 19 hours. PA-CAN's total costs for the hearing transcript totaled $3,433.77. For the following reasons and equities, PA-CAN requests that its transcript costs be allocated to and paid by Applicant.

PA-CAN presented a narrow, focused case on Issue F, utilizing one qualified,[438] expert witness, Mr. William E. Powers, who knowledgeably testified regarding BACT and the emissions limits for various sources at the proposed Port Arthur LNG facility.[439] PA-CAN's case remained consistent with its original comments on the Application,[440] which both TCEQ and the Applicant had notice of since 2020. Although Applicant knew by October 2020 that TCEQ had asked for a supplemental BACT analysis based on PA-CAN's comments, the Applicant failed to adjust its Application to ensure that it complied with state and federal requirements. PA-CAN rested its case before 10 am on the second day of the hearing.

In rebuttal, the Applicant and TCEQ presented eight witnesses who testified over the remainder of the two days of hearing. The Applicant designated two fact witnesses (Majeed and Thompson) and three experts (Hearn, Higgins, and Urban). One out of the five Applicant witnesses did not directly relate to PA-CAN's case on Issue F (Urban), but appeared offered to rebut

[436] TEX. GOV'T CODE § 2003.047(i-2) (stating "A party may rebut a demonstration under Subsection (i-1)").
[437] *Id.*
[438] Powers Resume (PA-CAN Exh. 1); Powers Direct Testimony at 1-73 (PA-CAN Exh. A).
[439] Powers Direct Testimony at 1-73 (PA-CAN Exh. A); Transcript at 20:19-285:21; 302:19-303:10.
[440] *See* PA-CAN Comments at PACAN 027-035 (PA-CAN Exh. 3).

testimony on affected person status from the preliminary hearing after the ALJ had decided the issue.[441] TCEQ designated three purported experts; two (Davies and Aniagu) provided no testimony related to PA-CAN's focused case on Issue F. TCEQ designated Davies to testify regarding air dispersion modeling for the proposed facility[442] and Dr. Stanley Aniagu to testify regarding health effects of diesel emissions associated with the proposed LNG project.[443] These additional witnesses, who offered testimony unrelated to the disputed Issue F, added attorney time and costs to the proceeding, including additional costs for the transcript to record this testimony.

VI. CONCLUSION

Because Port Arthur LNG has failed to demonstrate that the controls in the draft permit constitute BACT, PA-CAN respectfully requests that the ALJs deny the Application. As an alternative to denial, PA-CAN requests that the Application be remanded to TCEQ for further review and analysis as necessary to comply with the relevant state and federal legal and technical requirements, including the requirements that (1) the Applicant conduct a proper BACT analysis and (2) the Applicant meet BACT limits for its emissions of nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM)/ $PM_{2.5}$/ PM_{10}, sulfur dioxide (SO_2), sulfuric acid (H_2SO_4) and volatile organic compounds (VOC).

Dated: March 16, 2022

[441] Urban Direct Testimony at 4:9-18:23(Applicant Exh. 200); Transcript at 332:13-360:21 (Urban); ALJ Order No. 1 at 6.
[442] Davies Direct Testimony at 6:19-7:2 (Exhibit ED-18).
[443] Aniagu Direct Testimony at 8:1-12:38 (Exhibit ED-32).

Respectfully submitted,

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CERTIFICATE OF SERVICE

I certify that a copy of this Closing Argument of Protestant Port Arthur Community Action Network has been served on the following counsel via email delivery on March 16, 2022:

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