October 15, 2012

Texas Commission on Environmental Quality
Office of the Chief Clerk, MC-105
P.O. Box 13087
Austin, Texas 78711-3087

Re: Request for a Contested Case Hearing on Proposed State Air Quality Permit Number 105710 and PSD Permit Number PSDTX1306 for the Emission of Air Pollutants from the Proposed Corpus Christi Liquefaction, LLC LNG Export Terminal near Gregory, Texas

Sierra Club, an affected person with regard to the applications of Corpus Christi Liquefaction, LLC, a subsidiary of Cheniere Energy ("Cheniere") for proposed air quality permit numbers 105710 and PSDTX1306, files the included public comments and requests a contested case hearing.

All contact with the Sierra Club in this matter should be through:

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I. Hearing Request

TCEQ's notice of receipt of the above application states "Unless a written request for a contested case hearing is filed within 30 days from this notice, the executive director may approve the application." As a threshold matter, TCEQ has not yet published a draft permit and it is premature to require public participation at this point. While the notice does not clarify what is meant by "approve the application," it is clear that TCEQ may not approve it at this time. The application is incomplete, so TCEQ may not make a completeness determination. Moreover, TCEQ must issue a draft permit based upon a complete application and provide the public with an opportunity to comment on the draft permit before issuing a final permit. Out of an abundance of caution, however, Sierra Club now requests a contested case hearing. TCEQ should hold any hearings at the appropriate time, after issuing the draft permit. If TCEQ holds a preliminary hearing, this should occur in close proximity to the most directly affected members of the public, and therefore in the Corpus Christi area (San Patricio and Nueces Counties).

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Based on the incomplete application itself, Sierra Club has identified numerous issues discussed in the comments below.

Sierra Club is an "affected person" for purposes of Cheniere's application and this request for a contested case hearing. Sierra Club's stated interests in the permit and proceeding are clearly germane to Sierra Club's purposes. 30 TEX. ADMIN CODE §55.205 (a)(2). The Sierra Club, founded in 1892 by John Muir, is the oldest and largest grassroots environmental organization in the country, with over 600,000 members nationwide. Sierra Club is a nonprofit corporation organized under California law, with offices, programs and numerous members in Texas. Sierra Club has the specific goal of improving outdoor air quality. Sierra Club and its members have a significant interest in ensuring that any air permit issued to Cheniere's proposed liquefied natural gas facilities near Corpus Christi comply with all applicable statutory and regulatory requirements.

Multiple Sierra Club members clearly have standing to request a hearing individually and would be considered affected persons as described by 30 TEX. ADMIN CODE §55.203. Sierra Club members own property, reside, and recreate near the proposed project site. One such Sierra Club member is Mr. Henry Suter. Mr. Suter joined the Sierra Club as a Life Member in 2003. He resides at and owns the property at 1002 Chamberlain St., Corpus Christi, TX 78404-2607. This property is roughly twelve miles from the proposed facility location, across Corpus Christi Bay. Mr. Suter enjoys sailing and fishing on the Corpus Christi Bay several times a year and often sails and fishes in waters close to the proposed facility. Mr. Suter is concerned about air emissions from the proposed plant, both on himself and especially their impact on his elderly mother who resides with him on Chamberlain Street.

Accordingly, Sierra Club is an affected person as understood in common law and Article III standing and as defined by 30 TAC §55.205(a)(1). No individual Sierra Club member's participation is required for Sierra Club to assert any claims or seek any relief in the contested case hearing or any other associated proceedings to consider the application and draft permit for Corpus Christi Liquefaction. 30 TEX. ADMIN CODE §55.205 (a)(3).

II. Public Comments

A. Legal Standard

Before constructing or modifying a facility that may emit air contaminants, like the Cheniere proposal, the project proponent must obtain a preconstruction air permit from TCEQ. To receive an air permit, Cheniere's application must demonstrate that the proposed new unit "will use at least the best available control technology, considering the technical practicability and economic reasonableness of reducing or eliminating emissions from the facility," and that there is "no indication that the emission from the facility will contravene the intent of [the Texas Clean Air Act], including protection of the public's health and physical property." TEX. HEALTH & SAFETY CODE § 382.0518(b)(1) & (2). In particular, the applicant must demonstrate that the project will not cause a violation of applicable air quality standards and increments. In addition, the TCEQ rules found in 30 TEX. ADMIN CODE Chapter 116 set forth requirements that an Applicant must meet prior to receiving a preconstruction permit.

As detailed below, the application is incomplete and fails to demonstrate that the proposed facilities would satisfy these requirements. The application is incomplete, because it lacks requisite modeling and a full project description. What little analysis is in the application is flawed because, among other reasons, it: (1) fails to consider the proposed liquefaction facility in aggregation with the concurrently proposed compressor stations and pipelines as a single source; (2) includes inadequate BACT

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determinations ; and (3) underestimated emissions of SO_2 and H_2S and thus inappropriately excluded them from PSD review.

TCEQ cannot "approve the application" as proposed. Instead, TCEQ must reject the application as incomplete. If and when a complete application is submitted, TCEQ must issue a draft permit supported by an adequate record that addresses these deficiencies, and then provide ample opportunity for public participation before issuing a final permit.

B. Disputed Issues

a. The Application Is Incomplete

Cheniere's application is incomplete, and does not provide sufficient information for TCEQ to develop a draft permit. For example, the application does not include a project description identifying the design of the facility or the composition of the incoming gas stream. The application also lacks the required air impacts modeling and additional impacts analysis, and therefore cannot purport to demonstrate compliance with all applicable air quality requirements. Finally, the application does not discuss how compliance will be demonstrated with the emissions that it estimated. This is particularly critical for SO2 and H2S, which were assumed to emit below the PSD significance thresholds, and to assure compliance with the NAAQSs. TCEQ must find that the application is incomplete because it omits this modeling and additional impacts analysis, and must provide the public with an opportunity to review on comment on such modeling and analysis prior to approving the application.

b. The BACT Analysis for Gas Turbines Is Incomplete and Inadequate

The application proposes to construct eighteen gas fired turbines, six for each of three proposed liquefaction trains. Application 7-1. These turbines will be "used to drive compressors for refrigeration of natural gas." *Id.* The application's NOx, CO, VOC, and PM (PM10, PM2.5) BACT analyses are deficient because they fail to consider the use of electrically powered turbines or fewer, larger and more efficient turbines, and because they improperly reject various control technologies that are both technically feasible and cost effective for the proposed eighteen-gas-turbine design.

i. The BACT Analyses Must Consider Alternatives to The Proposed Eighteen Gas-Fired Turbines

As a threshold matter, the project could do away with compression turbines entirely by using electrical compression. Electrically driven compression, powered by the grid, is a feasible alternative. At least two pending applications for construction of domestic LNG export terminals propose to use this option. Freeport LNG Developlment, L.P., *et al.*, FERC Dkt. No. CP-12-509, *Application for Authorization under Section 3 of the Natural Gas Act*, 8 (Aug. 31, 2012) (proposing "electric motor-driven refrigeration and other compressors, expanders, and pumps"),[1] Jordan Cove Energy Project, L.P., DOE/FE Dkt. No. 12-32-LNG, *Application of Jordan Cove Energy Project, L.P. for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Nations*, 4 (March 23, 2012) (proposing "electrically driven

[1] http://elibrary.ferc.gov/IDMWS/common/OpenNat.asp?fileID=13057428

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liquefaction equipment").[2] Existing LNG export terminals in Norway, Indonesia, Africa and Saudi Arabia use electrical compression. Siemens Energy, *Pushing the Limits of Productivity: The all-electric liquefaction plant concept*, 9, 11 (2008).[3] Electrically driven compression and refrigeration is therefore an available alternative. This alternative would have vastly lower air emissions. Electric motor drivers have more efficient turndown characteristics for variable output operations, they can be sized to allow more efficient design, they generate no waste heat, and are not affected by the weather. (Turbines lose efficiency as temperatures and humidity deviate from design, a major issue for the Texas Gulf Coast, where high temperatures and humidity are present much of the year.) For these and other reasons, electric compression has lower emissions of conventional and greenhouse gas pollutants, even when emissions associated with upstream electricity production are considered. Electric compression and refrigeration therefore must be considered in the BACT analyses.

Relatedly, Cheniere has not explained why, if gas turbines are to be used, Cheniere must use six small simple cycle gas turbines per liquefaction train rather than other feasible configurations. As a general rule, larger gas fired turbines and configurations with heat recovery are more efficient and have lower emissions per unit of power output than smaller turbines.[4] Accordingly, the BACT analysis must consider use of fewer, larger more efficient turbines, or explain why such a design is infeasible.

ii. The BACT Analysis Must Consider NOx, CO, and VOC Control Technologies that Can Be Applied to the Proposed Eighteen Turbine Design

Even if the existing design of six small gas turbines per liquefaction train is preserved, Cheniere improperly rejected available NOx, CO, and VOC control technologies in its top down BACT analyses.

Beginning with NOX, Cheniere wrongly concluded that selective catalytic reduction (SCR) was technically and economically infeasible. Application 9-3 to 9-5. As to technical feasibility, Cheniere rejected SCR because of a purported lack of "industry experience with the design, installation and operation of LNG liquefaction trains with SCRs applied as an emission control technology for gas turbines." *Id.* 9-3. Although this may be true, Cheniere ignores the fact that SCR is regularly used on gas turbines that drive *compressors* in other industries, such as natural gas pipelines.[5] Regardless, the Texas and federal Clean Air Acts require consideration of potential technology transfer from other industries as part of the BACT analysis. Here, Cheniere has not demonstrated that using a turbine to drive a compressor in a liquefaction train precludes use of control technologies applied to gas turbines that drive compressors in other contexts or those applied to gas turbines that generate electricity. In light of the fact that SCR is used in other compressor scenarios, Cheniere's assertion that using SCR on gas turbines that drive compressors at liquefaction plants is more complicated than using SCR on gas turbines used for "power

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[2] http://www.fossil.energy.gov/programs/gasregulation/authorizations/2012_applications/12_32_LNG_Application.pdf

[3] http://www.energy.siemens.com/us/pool/hq/industries-utilities/oil-gas/applications/lng/Pushing%20the%20limits%20of%20productivity_EN.pdf

[4] Dr. Sib Akhtar, Driver Selection for LNG Compressors, December 14, 2004

[5] Wilson Chu, *NOx Control for Stationary Gas Engines*, Advances in Air Pollution Control Technology MARAMA Workshop, May 19, 2011, pdf 24, *available at* http://www.marama.org/presentations/2011_ICACAdvancesCT/Chu_051911.pdf. *See also* http://www.gaselectricpartnership.com/dmiratech.pdf, http://ect.jmcatalysts.com/pdfs-library/jm_scr_brochure_012909m.pdf.

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generation," 9-4, is irrelevant. As a final argument about technical infeasibility, Cheniere asserts that "[i]t would be very difficult to fit the SCRs into this design because of their size and weight." Application 9-4. Because this proposal concerns a greenfield facility, this contention is entirely unpersuasive: even if it would be difficult to fit SCR into the proposed design, Cheniere has not demonstrated that an alternative design is infeasible.

As a final argument about technical infeasibility, Cheniere asserts that "[i]t would be very difficult to fit the SCRs into this design because of their size and weight." Application 9-4. Because this proposal concerns a greenfield facility, this contention is entirely unpersuasive. Further, the weight and size of an SCR is small compared to the gas turbines that would be controlled, rendering this argument without merit. Even if it would be difficult to fit SCR into the proposed design, Cheniere has not demonstrated that an alternative design is infeasible.

Cheniere's alternative argument, that SCR is not economically feasible, is equally unsupported and without merit. Application 9-4 to 9-6, Appendix E. First, Cheniere asserts that costs will be high because "Utilizing SCRs in this application would be a 'first of its kind,' which would make financing of the entire project problematic and more expensive." Application 9-5. Because SCR has already been used for gas turbines driving compressors, and Cheniere has failed to demonstrate how compressors in liquefaction trains present insurmountable challenges that would prevent financing. In fact, financing issues are not considered in a top-down BACT cost effectiveness analysis.

The cost analysis in the application dramatically overestimates the cost effectiveness of SCR, i.e., claims it is much higher ($18,106/ton) than it actually is. The analysis deviates significantly from standard methodology that has long been used for BACT analyses. For example, the analysis assumes only 80% NO_x control while SCRs are routinely designed and operated to remove 90% of the NO_x. This underestimates NO_x emission reductions, overestimating the cost per ton to control NO_x. The analysis also uses an excessively high interest rate (10%); an unreasonably short SCR lifetime (20 years); and significantly higher operating and maintenance costs than actually have been experienced in hundreds of similar installations.

As to CO, the application rejects the use of an oxidation catalyst as technically infeasible, asserting that "The selected gas turbines (GE LM2500+G4), or equivalent, are simple cycle applications with an exhaust temperature of over 900 °F", Application 9-5, and that these temperatures "are outside the acceptable operating temperature range for the Oxidation Catalyst (450-850 °F)," *id.* at 9-10. Even a cursory online search reveals that available oxidation catalysts can handle temperatures of "up to 1150 °F for simple cycle [gas turbines]."[6] This is exceeds Cheniere's predicted highest stack exit temperatures of 940.73 °F, Application Table 1(a) page 11, and the general exhaust temperatures of Cheniere's chosen GE LM2500+G4 turbines, which are generally below 1000 °F.[7] Accordingly, Cheniere's conclusion that use of an oxidation catalyst is technically infeasible is not only unsupported but technically incorrect.[8]

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[6] http://emerachem.com/product/co/, describing the EmeraChem ADCAT CO/VOC oxidation catalyst.

[7] GE Energy, *GE's LM2500+G4 Aeroderivative Gas Turbine for Marine and Industrial Applications* (Sept. 2005), *available at* http://site.ge-energy.com/prod_serv/products/tech_docs/en/downloads/ger4250.pdf

[8] We note that use of an oxidation catalyst to remove CO and VOC increases immediate CO2 emissions. The BACT analyses must consider the tradeoffs between these pollutants, and in this

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As to VOC, the only VOC control technology the application considers for emissions from turbines is use of good combustion practices. Application 9-17. Oxidation catalysts simultaneously remove both VOCs and CO through the same mechanisms and are commonly guaranteed by vendors to remove both.[9] Accordingly, use of an oxidation catalyst must be considered as part of the VOC BACT analysis.

c. The Application Assumes Unrealistically High Combustion Efficiency for Flares

The proposed source includes numerous flares, including a "marine flare . . . used to control ship loading emissions" and "wet/dry gas flares" used to control malfunction, startup, and shutdown emissions. Application 7-3. Cheniere contends that these flares will achieve "destruction efficiency for C1-C3 compounds [of] 99% and . . . destruction efficiency for other VOCs and H_2S [of] 98%." *Id.* 7-3, 7-4. The BACT analysis fails to consider all feasible control methods. Further, the Application contains no support that the assumed high destruction efficiencies can be achieved in practice and no discussion of how they would be demonstrated. Many studies have demonstrated that flares frequently do not achieve the assumed control efficiencies, resulting in much higher emissions than claimed. High wind velocities, common in the project area, can significantly reduce flare destruction efficiencies. Controls are available to mitigate wind impacts, but were not identified in the BACT analysis or required as part of flare design.

This overestimate in destruction efficiency is especially important with regard to the marine flare, where Cheniere chose flaring over various other control options, including a vapor recovery unit, a thermal oxidation system, a carbon adsoption system, and submerged loading. Application 9-20 to 9-21. The BACT analysis must consider whether, in light of the lower real-world control efficiency of flares, one of these alternatives is superior. Further, the overestimation of flarying efficiency also could result in violations of national ambient air quality standards or trigger PSD review for H_2S. Finally, the Application is incomplete without explaining how the applicant will demonstrate compliance with the assumed destruction efficiencies.

d. The BACT Analysis for Fugitive VOC Emissions Must Consider Equipment to Reduce Emissions

Cheniere predicts that piping and related components will have 17.5 tpy of fugitive VOC emissions. Application 7-5, Table 1(a). The application's VOC BACT analysis for fugitives states that "It is infeasible to capture emissions from fugitive sources such as pipeline leaks." Application 9-21. Instead, Cheniere proposes to reduce fugitive emissions solely "by utilizing a leak detection and repair (LDAR) program." Application 9-21.

Despite Cheniere's apparent assertion to the contrary, for many pumps, flanges, and similar equipment, "leakless" and less-leaky designs are available, and the BACT analysis must consider use of such equipment. For example, one PSD permit application for a proposed petroleum refinery and integrated gasification combined cycle power plant, in discussing BACT for piping and other equipment leaks, observed that "For certain service applications, components with inherently leakless design features are

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regard, TCEQ must coordinate with EPA's review of the related PSD permit application for greenhouse gases.

[9] See note 6, *supra*.

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available. These components reduce VOC emissions, regardless of the quality or frequency of LDAR activities." Hyperion Energy Center, *PSD Permit Application submitted to S. Dakota Dept. of Environmental Review and Natural Resources*, 88 (Dec. 2007).[10] These include various leakless pumps and designs that fully weld, rather than bolt, connections between components. *Id.* Where leakless designs are available, they achieve 100% control efficiency. Even where truly "leakless" designs are unavailable, there may be available alternatives with inherently lower fugitive emission rates. The BACT analysis must explore these opportunities.

Where leakless components are not available, an LDAR program must be adopted. Cheniere proposes to meet TCEQ's 28VHP LDAR standard. The BACT analysis must consider alternative, and potentially more effective, LDAR regimes, such as the Bay Area Air Quality Management District's Regulation 8, Rule 18 standards for equipment leaks.[11]

e. PSD Review Is Required for SO_2 and H_2S

The application asserts PSD review is not required for SO_2 and H_2S as their estimated emissions are less than PSD significance thresholds of 40 ton/yr and 7 ton/yr, respectively. Application 9-2. Instead, a Texas BACT review is provided, which does not satisfy PSD requirements. The emission calculations underestimate both SO_2 and H_2S. For example, the calculations assume that 100% of the H_2S in flared gases is converted to SO_2, rather than the assumed destruction efficiency of the flare, underestimating H_2S. The H_2S emission calculations also exclude all fugitive sources, which are a major source of H_2S. Finally, the application fails to disclose and the calculations fail to consider the maximum potential H_2S that may be present in raw gases.

C. TCEQ Must Consider The Terminal and Concurrently Proposed Compressor Stations As A Single Source

Cheniere's instant application seeks a permit encompassing various facilities at the site of the proposed terminal. Application 1-1. Operation of this project is contingent on construction of additional facilities, however, including a gas pipeline and compressor stations near Sinton and Taft, Texas. Indeed, Cheniere has filed a concurrent application for a separate PSD permit regarding construction of the Sinton compressor station. Proposed State Air Quality Permit Number 105696 and PSD Permit Number PSDTX1304. These collected facilities are a single source for purposes of the Clean Air Act.

A preconstruction permit is required for every "major stationary source" of air pollution. The Texas Clean Air Act explicitly adopts the Federal Clean Air Act's definition of a major stationary source. TEX. HEALTH & SAFETY CODE § 382.003(7). A "major stationary source," for PSD purposes, is a "stationary source" that emits or has the potential to emit a certain quantity of pollutants. 42 U.S.C. §§ 7479(1), 7602(j). In turn, a "stationary source" is "any building, structure, facility, or installation which emits or may emit a regulated ... pollutant." 40 C.F.R. § 51.166(b)(5). The regulations define "[b]uilding, structure, facility, or installation" as "all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person...." *Id.* § 51.166(b)(6). "Adjacent" structures need only be in "physical proximity" to one

[10] http://denr.sd.gov/Hyperion/Air/20071220HyperionApplication.pdf
[11] http://baaqmd.gov/~/media/Files/Planning%20and%20Research/Rules%20and%20Regs/reg%2008/rg0818.ashx?la=en

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another. *Summit Petroleum Corp. v. U.S. E.P.A.*, 690 F.3d 733, 744 (6th Cir. 2012); s*ee also MacClarence v. U.S. E.P.A.*, 596 F.3d 1123, 1127 (9th Cir. 2010).

Here, the terminal and liquefaction facilities, pipeline, and compressor stations will all be owned by Cheniere Energy or subsidiaries thereof, and are therefore under the control of the same person. The collected facilities are adjacent to one another, in that Cheniere Energy and its subsidiaries will own real property or easements providing a continuous connection between the various sources, and the sources will be physically connected by the pipeline. And these facilities are part of the same industrial grouping, because they are all components of Cheniere's proposal to liquefy and export natural gas. Accordingly, in evaluating Cheniere's instant application, TCEQ must also consider the proposed Sinton and Taft compressor stations and associated pipeline as part of the same major source.

III. Conclusion

The pending application is incomplete and the analysis fails to comply with the applicable law and rules and fails to adequately protect public health

Respectfully submitted,

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