AFFIDAVIT OF RANAJIT SAHU, PH.D, QEP, CEM (NEVADA)

1. I have personal knowledge of the statements made herein.

2. I am a Consulting Engineer and an expert in the field of Environmental Engineering and Energy issues.

3. Attachment A to Exhibit 1 hereto is a true and accurate copy of my curriculum vitae.

4. I have reviewed the application and supporting materials associated with: Part 70 Air Operations Permit Renewal and Proposed PSD Permit, for the Magnolia LNG LLC—Magnolia LNG Facility, Lake Charles, Calcasieu Parish; AI Number 185639, Permit Number 0520-00481-V1 and PSD-LA-792(MI), and Activity Number PER20200001 and PER20200002.

6. Through my education, training, experience, and review of relevant documents, I have formed opinions regarding the emissions, control strategies, environmental impacts, and enforceability of the proposed Magnolia LNG export terminal project and its proposed permit.

7. The materials and mathematical calculations I reviewed and performed are what an experienced air pollution consultant or expert would rely upon in forming opinions regarding the emissions, control strategies and environmental impacts of a proposed liquid natural gas export terminal.

8. Exhibit 1 hereto is a true and accurate copy of my opinions regarding the emissions, control strategies, permit enforceability, and environmental impacts of the proposed Magnolia LNG LLC liquid natural gas export terminal, which I have prepared on behalf of Sierra Club, Healthy Gulf, and Louisiana Environmental Action Network.

I hereby certify under penalties of perjury that the foregoing representations are true to the best of my knowledge.

Ranajit Sahu, Ph.D

SWORN and SUBSCRIBED before ~~me~~
this _____ day of July, 2021,

_____

~~Notary~~ See Attachment

CALIFORNIA JURAT WITH AFFIANT STATEMENT GOVERNMENT CODE § 8202

☐ See Attached Document (Notary to cross out lines 1–6 below)
☐ See Statement Below (Lines 1–6 to be completed only by document signer[s], not Notary)

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Signature of Document Signer No. 1 *Signature of Document Signer No. 2 (if any)*

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California

County of Los Angeles

Subscribed and sworn to (or affirmed) before me

on this 29 day of July, 2021.
by *Date* *Month* *Year*

(1) Ranjit Sahu

(and (2) _____),
Name(s) of Signer(s)

proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

BRIAN CASTELLANOS REGALADO
Notary Public - California
Los Angeles County
Commission # 2300900
My Comm. Expires Aug 10, 2023

Place Notary Seal and/or Stamp Above

Signature _____
Signature of Notary Public

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Exhibit 1

Including Attachments A, B, and C

Comments on the

Proposed Part 70 Operating Permit Renewal and Modification for Magnolia LNG LLC's LNG Facility in Lake Charles, Calcasieu Parish, Louisiana (Agency Interest No. 185639; Activity No. PER20200001 ("Plant")

by

Dr. Ranajit (Ron) Sahu, Consultant[1]

The comments in this report are provided based on my review of the following documents:

(i) Prevention of Significant Deterioration (PSD) and Title V Air Permit Renewal Application, prepared by SLR, dated September 2020; and additional information submitted by SLR on February 9, 2021;

(ii) Air Dispersion Modeling Report, January 2021;

(iii) Revised Title V/PSD Permit Application, July 2015 prepared by ecology and environment Inc.;

(iv) Final Environmental Impact Statement (EIS) for the Magnolia LNG and Lake Charles Expansion Projects, 2015;

(v) Final Supplemental EIS, January 2020;

(vi) Louisiana Department of Environmental Quality's (DEQ) Air Permit Briefing Sheet for the Plant;

(vii) DEQ's Preliminary Determination Summary for the PSD-LA-792(MI) Permit, dated April 15, 2021;

(viii) DEQ's Statement of Basis for the proposed Part 70 Operating Permit 0520-00481-V1

(ix) Application for Construction Permit for Pleasants County Methanol Plant, Revision 1, March 15, 2021; and

(x) additional documents including correspondence between DEQ and the applicant; DEQ responses to prior comments; 2016 draft permit and fact sheet packages; 2016 permit; etc.

I note that critical information that is essential for DEQ's review of the proposed project as well as for public review was not available in the record. This includes:

[1] Resume provided in Attachment A.

(a) all emission calculation worksheets in native Excel format;

(b) electronic files for the air dispersion modeling report (January 2021); and

(c) vendor design and emissions guarantee information for all equipment for which the applicant has relied on such vendor data including but not limited to the turbines.

A. Introduction

Magnolia LNG is a proposed liquified natural gas (LNG) facility, designed to produce 8.8 million metric tonnes of LNG per year near Lake Charles in Calcasieu Parish, Louisiana. Per the Louisiana DEQ, the project was initially authorized by Permits 0520-00481-V0 and PSD-LA-792, issued in March 2016. The construction of the facility has not yet commenced.

At the facility, LNG will be produced using an Optimized Single Mixed Refrigerant (OSMR) technology using pipeline natural gas as feed stock. LNG produced will be stored at the site in two LNG storage tanks. LNG will leave the facility via LNG carriers, barges, and trucks.

The facility will consist of four identical natural gas liquefaction trains. Per DEQ and the applicant, the core of each LNG train is an OSMR process which uses industrial gas turbines, combined heat and power (CHP) technology, and ammonia auxiliary refrigeration.

Since the facility has not yet been constructed, the applicant has requested and the DEQ is proposing to grant a Part 70 operating permit renewal for the facility. Four heaters (EQT0028 through EQT0031) were removed from the permit, and a flare is added.

B. Emissions Summary

The updated potential annual emissions from the facility in tons per year are shown in the two tables below, taken from DEQ's analysis.

Pollutant	Before	After	Change
PM_{10}	29.20	28.43	- 0.77
$PM_{2.5}$	29.19	28.43	- 0.76
SO_2	18.85	17.75	- 1.10
NO_X	737.82	467.28	- 270.54
CO	1335.06	1343.27	+8.21
VOC	72.91	71.98	- 0.93
CO_2e	2,506,994	2,459,715	- 47,279

LAC 33:III.Chapter 51 Regulated Toxic Air Pollutants (TAP)			
Pollutant	Before	After	Change
Acetaldehyde	0.52	0.40	- 0.12
Acrolein	0.08	0.072	- 0.008
Benzene	0.71	0.58	- 0.13
Carbonyl Sulfide	0.01	0.04	+ 0.03
Ethyl Benzene	0.42	0.32	- 0.10
Formaldehyde	9.36	8.06	- 1.30
n-Hexane	2.67	0.67	- 2.00
Methanol	5.34	5.36	+ 0.02
Naphthalenes	0.02	0.08	+ 0.06
PAH	0.03	0.024	- 0.006
Toluene	1.80	1.57	- 0.23
Xylenes	0.95	0.81	- 0.14
NH_3	3.85	3.86	+ 0.01
H_2S	0.08	0.08	-
Totals	25.84	21.926	- 3.914

C. Criteria Pollutant PTE Emissions Are Underestimated

Shown below are excerpts from the emissions calculations of some of the sources at the Plant which were provided in the September 2020 application. As noted, prior electronic versions of these calculations were not available. In particular, the notes associated with these emissions calculations tables show the basis for the emissions calculations.

C.1 Missing Information

First, in several instances (such as for the turbines, which are significant sources) of air emissions at the Plant, the calculations rely on design engineering data (such as gas composition data from the applicant's design engineers for the turbines), vendor information (such as turbine data sheets), and EPA's AP-42 compilation of emission factors.

Design engineering data is also shown as the basis for other emission calculations such as the ammonia vent emissions.

The record simply does not contain any supporting basis for such design engineering data nor any information from equipment providers such as the turbine vendor including associated emissions guarantees. Thus, DEQ could not have verified any of these assumptions and, as such, these calculations of the PTE are simply unsupported.

Table 4
Emissions for Gas Turbine (Siemens SGT-750)
Magnolia LNG

Parameter	Units	Average Operation	Maximum Operation
Fuel Lower Heating Value (LHV)[1]	Btu/scf	923	
Fuel Higher Heating Value (HHV)[1]	Btu/scf	1025	
Ratio of HHV to LHV	-	1.111	
Hourly Fuel Flow (LHV)[2]	MMBtu/hr	282.00	333.00
Hourly Fuel Flow (HHV)[3]	MMBtu/hr	313.00	370.00
Annual Operation	hr/yr	8760	

Pollutant Type	Pollutant	HHV Emission Factor[4,5,6] (lb/MMBtu)	Average Hourly Emission Rate[7] (lb/hr)	Maximum Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Criteria	NO_x	-	11.35	13.40	49.71
	CO	-	22.74	25.25	99.60
	VOC	-	1.04	1.15	4.56
	PM	-	0.36	0.40	1.58
	PM_{10}	-	0.36	0.40	1.58
	$PM_{2.5}$	-	0.36	0.40	1.58
	SO_2	0.0001	0.0306	0.03	0.13
HAPs	Acetaldehyde	0.000040	0.01	0.01	0.05
	Acrolein	0.0000064	0.002	0.00	0.01
	Benzene	0.000012	0.004	0.00	0.02
	Ethylbenzene	0.000032	0.01	0.01	0.04
	Formaldehyde	0.00071	0.22	0.26	0.97
	Naphthalene	0.0000013	0.0004	0.00	0.002
	PAH	0.0000022	0.0007	0.00	0.003
	Toluene	0.00013	0.04	0.05	0.18
	Xylene	0.000064	0.02	0.02	0.09
	Total HAPs	-	**0.31**	**0.37**	**1.37**
Greenhouse Gas	CO_2[8]	117	36613.51	43281.15	160,367.18
	N_2O[8]	0.0002	0.07	0.08	0.30
	CH_4[8]	0.0022	0.69	0.82	3.02

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Average Hourly Emission Rate (lb CO_2e/hr)	Maximum Hourly Emission Rate (lb CO_2e/hr)	Annual Emissions (ton CO_2e/yr)
Greenhouse Gas (CO_2e)	CO_2	1	36,613.51	43,281.15	160,367.18
	N_2O	298	20.56	24.31	90.07
	CH_4	25	17.25	20.39	75.56
	Total GHGs	-	**36,651.33**	**43,325.85**	**160,532.81**

Notes:

1. Based on gas composition data from Magnolia LNG design engineers.
2. Based on turbine data sheets from Magnolia LNG design engineers. Average value and maximum value based on inlet temperature of 50° F (Load 100%)
3. Calculated based on ratio of HHV to LHV.
4. Emissions factors from USEPA AP-42, 5th Edition, Volume I - Section 3.1 - Stationary Gas Turbines. SO_2 emission factor based on sulfur content of 0.002% by weight (equivalent to 0.0001% molar).
5. SO_2 and individual HAP emissions based on AP-42 emission factors and hourly fuel flow.
6. N_2O emission factor based on 40 CFR 98 Table C-2 to Subpart C.
7. NO_x, CO, VOC, PM, PM_{10}, PM_{25}, CO_2, and CH_4 emissions based on design values for turbines. Maximum and Average values are based on annual average ambient temperature of 50° F.
8. USEPA Title 40 Part 98 Table C-2, Default CH4 and N2O Emission Factors for Various Types of Fuel

Table 6a
Emissions for Thermal Oxidizer-High Inert Case (Design Case)
Magnolia LNG

Notes:
1. Design maximum conditions.
2. Engineering estimate.
3. Formaldehyde emissions factors from USEPA AP-42 - Section 1.4 - Natural Gas Combustion. Emissions converted from units of lb/MMscf to lb/MMBtu by dividing by 1020 MMBtu/MMscf. Emission factor also multiplied by HHV/LHV ratio of 1.108.
4. N_2O emission factor based on 40 CFR 98 Table C-2 to Subpart C.
5. NOx, CO, VOC, and PM emission factors based on equipment datasheet.
6. CH_4 and individual HAPs (except formaldehyde) calculated by multiplying total feed rate by (1 minus rated [HC destruction efficiency/100]).
7. SO_2, H_2S, and carbonyl sulfide emissions based on oxidation of H_2S and carbonyl sulfide to SO_2. The rated oxidation efficiency is listed above.

Table 8a
Auxiliary Boiler - Case 1 - Avg Feed Gas Base Case
Magnolia LNG

HC Vap = Hydrocarbon liquid vaporization stream.
N2 Reject = N2 rich vapor rejected from the boil-off gas (BOG) system during normal operations and ship loading.
Notes:
1. Rate provided by Magnolia LNG.
2. HC destruction efficiency estimate provided by vendor.
3. Stack flow estimates calculated based on vendor information.
4. Emissions factors for "HC Vap" from USEPA AP-42 - Section 1.5 - Liquefied Petroleum Gas Combustion. Emission factors for butane industrial boilers. Emission factors converted from units of lb/1000-gal to lb/MMBtu by dividing by 102 MMBtu/1000-gal (for butane).
5. Emissions factors for "N2 Reject" and "Feed Gas" from USEPA AP-42 - Section 1.4 - Natural Gas Combustion. Emissions converted from units of lb/MMscf to lb/MMBtu by dividing by 1020 MMBtu/MMscf. Emission factor also multiplied by HHV/LHV ratio of 1.108. SO2 emission factor for feed gas based on sulfur content equivalent to <0.0001% molar.
6. Emissions factors for "All Streams" based on vendor data.
7. Stack concentrations based on vendor data.
8. Emission rates for CH_4 and individual HAPs (except formaldehyde) calculated by multiplying feed rate by (1 minus rated [HC destruction efficiency/100]).

Table 9
Emissions for Ammonia Vent
Magnolia LNG

Parameter	Value
Gas Rate[1] (kg/hr)	130.45
Gas Rate (lb/hr)	287.59
Hours of Operation[1] (hr/yr)	175

Component	Component MW (lb/lbmole)	Weight Fraction (wgt %)	Molar (Volume) Fraction[1] (mol %)	Feed Rate (lb/hr)		Annual Emissions
		Purge	Purge	kg/hr	lb/hr	(tpy)
Ammonia	17.03	2.3%	3.6%	3.00	6.61	0.58
Nitrogen	27.01	96.2%	94.2%	125.49	276.66	24.21
H2O	18.02	1.5%	2.2%	1.96	4.31	0.38
Total	-	**100.0%**	**100.0%**	**130.45**	**287.59**	**25.16**

Actual Stack Temperature[1]	68 F	20 C	293 K
Actual Stack Pressure	1 atm	101325 Pa	
Normlized Temperature	32 F	0 C	273 K
Normalized Pressure	1 atm	101325 Pa	
Ideal Gas Constant	8.314 m^3-Pa/mol-K		

Flow Constituent	Flue gas flow (lb-mole/hr)	Flue gas flow (mole/hr)	Mole Fraction (%)	Normalized Flow (Nm^3/hr)	Actual Flow	
					(m^3/hr)	(acfm)
Ammonia	0.39	176	3.6%	3.9	4.2	2.5
Nitrogen	10.24	4,646	94.2%	104.1	111.7	65.7
H2O	0.24	109	2.2%	2.4	2.6	1.5
TOTAL	**10.87**	**4,930**	**100.0%**	**110.4**	**119**	**70**

Notes:
1. Engineering data provided by Magnolia LNG.

C.2 Misuse of EPA AP-42

Second, as the notes accompanying the emissions calculations make clear, EPA's AP-42 is used for estimating the PTE emissions for numerous pollutants from various sources at the Plant. This is inappropriate for the reasons stated below.

(i) AP-42 emission factors are inappropriate for developing PTE estimates, since PTE, which is a regulatory construct, by design, is supposed to represent the "potential" or high-end emission estimate value while AP-42 emission factors represent "average" and not maximum emission rates. AP-42 makes this very clear:

> "In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i. e., a population average)."[2] (emphasis added)

> "Emission factor ratings in AP-42 (discussed below) provide indications of the robustness, or appropriateness, of emission factors for estimating average emissions for a source activity."[3] (emphasis added)

Thus, in each instance that the Magnolia Applications' calculations rely on AP-42 emission factors, they are simply wrong and the resultant PTE emissions (all other criticisms aside) are underestimates. This has material consequences since the air dispersion modeling relies on these emissions calculations to estimate impacts from the Plant.

(ii) Neither the Applicant's emission calculations nor the DEQ's review mention or discuss the reliability (i.e., accuracy) of AP-42 emission factors. AP-42 uses a rating system, quoted below, to provide the user with a sense of how accurate a particular emission factor is:

> "Each AP-42 emission factor is given a rating from A through E, with A being the best. A factor's rating is a general indication of the reliability, or robustness, of that factor. This rating is assigned based on the estimated reliability of the tests used to develop the factor and on both the amount and the representative characteristics of those data. In general, factors based on many observations, or on more widely accepted test procedures, are assigned higher rankings. Conversely, a factor based on a single observation of questionable quality, or one extrapolated from another factor for a similar process, would probably be rated much lower….
>
> The AP-42 emission factor rating is an overall assessment of how good a factor is, based on both the quality of the test(s) or information that is the source of the factor and on how well the factor represents the emission source. Higher ratings are for

[2] AP-42 Introduction, p. 1. Available at https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

[3] *Ibid*., p. 2.

factors based on many unbiased observations, or on widely accepted test procedures. For example, ten or more source tests on different randomly selected plants would likely be assigned an "A" rating if all tests are conducted using a single valid reference measurement method. Likewise, a single observation based on questionable methods of testing would be assigned an "E", and a factor extrapolated from higher-rated factors for similar processes would be assigned a "D" or an "E".

AP-42 emission factor quality ratings are thus assigned:

A — Excellent. Factor is developed from A- and B-rated source test data taken from many randomly chosen facilities in the industry population. The source category population is sufficiently specific to minimize variability.

B — Above average. Factor is developed from A- or B-rated test data from a "reasonable number" of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with an A rating, the source category population is sufficiently specific to minimize variability.

C — Average. Factor is developed from A-, B-, and/or C-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with the A rating, the source category population is sufficiently specific to minimize variability.

D — Below average. Factor is developed from A-, B- and/or C-rated test data from a small number of facilities, and there may be reason to suspect that these facilities do not represent a random sample of the industry. There also may be evidence of variability within the source population.

E — Poor. Factor is developed from C- and D-rated test data, and there may be reason to suspect that the facilities tested do not represent a random sample of the industry. There also may be evidence of variability within the source category population."[4]

Note, in particular, the very poor reliabilities of "D" and "E" rated factors.

Based on the above, consider the use of AP-42, Chapter 1.4 [for Natural Gas combustion], Tables 1.4-1, 1.4-2, and 1.4-3, as well as metal HAP emission factors in Table 1.4-4 using in this instance, as cited in the DEQ Evaluation. For ease of reference, I show below AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4, without supporting footnotes.[5]

[4] *Ibid*., pp. 8-10.

[5] The complete AP-42 Section is available at https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene[b, c]	2.4E-05	D
56-49-5	3-Methylcholanthrene[b, c]	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene[b,c]	<1.6E-05	E
83-32-9	Acenaphthene[b,c]	<1.8E-06	E
203-96-8	Acenaphthylene[b,c]	<1.8E-06	E
120-12-7	Anthracene[b,c]	<2.4E-06	E
56-55-3	Benz(a)anthracene[b,c]	<1.8E-06	E
71-43-2	Benzene[b]	2.1E-03	B
50-32-8	Benzo(a)pyrene[b,c]	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene[b,c]	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene[b,c]	<1.2E-06	E
207-08-9	Benzo(k)fluoranthene[b,c]	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene[b,c]	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene[b,c]	<1.2E-06	E
25321-22-6	Dichlorobenzene[b]	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene[b,c]	3.0E-06	E
86-73-7	Fluorene[b,c]	2.8E-06	E
50-00-0	Formaldehyde[b]	7.5E-02	B
110-54-3	Hexane[b]	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene[b,c]	<1.8E-06	E
91-20-3	Naphthalene[b]	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene[b,c]	1.7E-05	D
74-98-6	Propane	1.6E+00	E

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
129-00-0	Pyrene[b, c]	5.0E-06	E
108-88-3	Toluene[b]	3.4E-03	C

TABLE 1.4-4. EMISSION FACTORS FOR METALS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
7440-38-2	Arsenic[b]	2.0E-04	E
7440-39-3	Barium	4.4E-03	D
7440-41-7	Beryllium[b]	<1.2E-05	E
7440-43-9	Cadmium[b]	1.1E-03	D
7440-47-3	Chromium[b]	1.4E-03	D
7440-48-4	Cobalt[b]	8.4E-05	D
7440-50-8	Copper	8.5E-04	C
7439-96-5	Manganese[b]	3.8E-04	D
7439-97-6	Mercury[b]	2.6E-04	D
7439-98-7	Molybdenum	1.1E-03	D
7440-02-0	Nickel[b]	2.1E-03	C
7782-49-2	Selenium[b]	<2.4E-05	E
7440-62-2	Vanadium	2.3E-03	D
7440-66-6	Zinc	2.9E-02	E

It is clear from a review of the emission factor ratings provided in these tables above that many of them are generally rated at C, D, or E – indicating little to no accuracy. Yet, without acknowledgment or explanation, the applicant and DEQ have used and accepted these poorly-rated emission factors to estimate PTE emissions.

(iii) EPA has recently confirmed and cautioned against the misuse of AP-42 for permitting precisely for the reasons stated above. I am attaching a copy of an Enforcement Alert to these comments as Attachment B. I provide relevant excerpts below, with text highlighted by me.

United States Environmental Protection Agency

Office of Enforcement and Compliance Assurance

Enforcement Alert

Publication no. EPA 325-N-20-001 November 2020

EPA Reminder About Inappropriate Use of AP-42 Emission Factors

Purpose

This purpose of this Enforcement Alert is to remind permitting agencies, consultants, and regulated entities that improperly using AP-42 emission factors can be costly to their businesses, inefficient, and in some circumstances, can subject regulated entities to enforcement and penalties. The Environmental Protection Agency (EPA) is concerned that some permitting agencies, consultants, and regulated entities may incorrectly be using AP-42 emission factors in place of more representative source-specific emission values for Clean Air Act permitting and compliance demonstration purposes.

Consequences of Using AP-42 Factors

Permitting agencies, consultants, and regulated entities should be aware that even emission factors with more highly rated AP-42 grades of "A" or "B" are only based on averages of data from multiple, albeit similar, sources (*See* the Attachment for an overview of the history of AP-42 emission factors and the AP-42 emission factor rating system). Accordingly, these factors are not likely to be accurate predictors of emissions from any one specific source, except in very limited scenarios. While emission factors are helpful in making emission estimates for area-wide inventories for specific source types, AP-42 provides the following warning:

> "Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor. As such, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance."[1]

considered. **Remember, AP-42 emission factors should only be used as a last resort. Even then the facility assumes all risk associated with their use!**

Based on all of the above, the PTE for most of the pollutants from the dominant emissions sources at the Plant are either unsupported or underestimated.

C.3 TAP Emissions Are Underestimated

This is particularly important for the estimates of toxic air pollutants (TAPs), which are noted in the emissions excerpt table below.

LAC 33:III.Chapter 51 Regulated Toxic Air Pollutants (TAP)			
Pollutant	Before	After	Change
Acetaldehyde	0.52	0.40	- 0.12
Acrolein	0.08	0.072	- 0.008
Benzene	0.71	0.58	- 0.13
Carbonyl Sulfide	0.01	0.04	+ 0.03
Ethyl Benzene	0.42	0.32	- 0.10
Formaldehyde	9.36	8.06	- 1.30
n-Hexane	2.67	0.67	- 2.00
Methanol	5.34	5.36	+ 0.02
Naphthalenes	0.02	0.08	+ 0.06
PAH	0.03	0.024	- 0.006
Toluene	1.80	1.57	- 0.23
Xylenes	0.95	0.81	- 0.14
NH_3	3.85	3.86	+ 0.01
H_2S	0.08	0.08	-
Totals	25.84	21.926	- 3.914

Per DEQ's summary above, it concludes that the facility is a minor source of toxic air pollutants (TAPs) because the potential to emit (PTE) for any one TAP is less than 10 tons per year and the aggregate PTE for all TAPs is less than 25 tons per year. Based on my comments regarding the emissions calculations supporting these PTE estimates, I believe that they are underestimated and that the PTE for any single TAP (such as formaldehyde, which is over 8 tons per year per DEQ's estimate) could be greater than 10 tons per year and that the aggregate TAP PTE (currently 21.926 tons per year) could be over 25 tons per year if proper emissions PTE for these TAPs are properly estimated.

C.4 Fugitive Emissions Are Underestimated

The applicant has estimated fugitive emissions using estimated component counts shown in the excerpted table below and emission factors from an American Petroleum Institute publication.

Table 16
Process Streams and Piping Component Counts
Magnolia LNG

ID	Stream Type
Stream 1	Gate Gas/Feed Gas/HP Fuel Gas
Stream 2	HHC Inlet to HC Liquids Column, LP Fuel Gas
Stream 3	HHC Outlet from HC Liquids Column
Stream 4	BOG/BOG System Reject Gas
Stream 5	Mixed Refrigerant (MR)
Stream 6	LNG
Stream 7	Ammonia

	Component Count[1]				
Stream ID	Flange	Open End	Pump	Valve	Others
Stream 1	440	20	0	670	500
Stream 2	120	8	16	260	120
Stream 3	40	12	24	80	40
Stream 4	100	5	5	100	120
Stream 5	920	20	0	880	320
Stream 6	200	10	10	460	215
Stream 7	840	10	12	1280	480

	Molecular Weight	Molar (Volume) Fraction[1] (mol%)							Weight Fraction (wgt%)						
Compound	(lb/lbmole)	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5	Stream 6	Stream 7	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5	Stream 6	Stream 7
Carbon Dioxide	44.01	1.5001	0.0008	0.0004	0.0000	0.0000	0.0005	0.0000	3.8329	0.0010	0.0002	0.0000	0.0000	0.0012	0.0000
Nitrogen	28.01	1.0001	0.1728	0.0027	15.8436	16.0931	1.0161	0.0000	1.6265	0.1366	0.0011	24.7395	15.9124	1.6967	0.0000
Methane	16.04	94.2712	55.1357	16.7789	84.1525	33.1854	957685	0.0000	87.8066	249570	3.8864	752539	18.7917	91.5827	0.0000
Ethane	30.07	2.5240	9.2242	4.6499	0.0039	3.91464	2.5602	0.0000	4.4064	7.8259	2.0187	0.0065	41.5487	4.5890	0.0000
Propane	44.10	0.3200	4.3347	2.1736	0.0000	0.0000	0.3230	0.0000	0.8193	5.3931	1.3838	0.0000	0.0000	0.8491	0.0000
i-Butane	58.12	0.0900	2.9656	1.5514	0.0000	0.0000	0.0900	0.0000	0.3038	4.8634	1.3019	0.0000	0.0000	0.3118	0.0000
n-Butane	58.12	0.0900	4.3688	2.3478	0.0000	11.5751	0.0893	0.0000	0.3038	7.1646	1.9702	0.0000	23.7472	0.3094	0.0000
i-Pentane	72.15	0.0800	8.8141	6.8585	0.0000	0.0000	0.0755	0.0000	0.3350	17.9429	7.1445	0.0000	0.0000	0.3248	0.0000
n-Pentane	72.15	0.0800	11.8252	126023	0.0000	0.0000	0.0710	0.0000	0.3350	240726	131277	0.0000	0.0000	0.3055	0.0000
n-Hexane	86.18	0.0300	2.8696	338984	0.0000	0.0000	0.0054	0.0000	0.1501	6.9774	42.1773	0.0000	0.0000	0.0276	0.0000
Benzene	78.11	0.0030	0.2075	3.7020	0.0000	0.0000	0.0004	0.0000	0.0137	0.4572	4.1750	0.0000	0.0000	0.0017	0.0000
Cyclohexane	84.16	0.0010	0.0447	1.3310	0.0000	0.0000	0.0001	0.0000	0.0049	0.1061	16172	0.0000	0.0000	0.0003	0.0000
n-Heptane	100.20	0.0050	0.0326	7.1718	0.0000	0.0000	0.0000	0.0000	0.0294	0.0922	10.3751	0.0000	0.0000	0.0001	0.0000
Toluene	92.14	0.0010	0.0026	1.4113	0.0000	0.0000	0.0000	0.0000	0.0054	0.0068	1.8774	0.0000	0.0000	0.0000	0.0000
n-Octane	114.23	0.0030	0.0009	4.1436	0.0000	0.0000	0.0000	0.0000	0.0201	0.0028	6.8337	0.0000	0.0000	0.0000	0.0000
p-Xylene	106.17	0.0010	0.0001	1.3763	0.0000	0.0000	0.0000	0.0000	0.0062	0.0002	2.1096	0.0000	0.0000	0.0000	0.0000
Ethylbenzene	106.17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hydrogen Sulfide	34.08	0.0004	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0008	0.0002	0.0001	0.0000	0.0000	0.0001	0.0000
Ammonia	17.03	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000
Water	18.02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	-	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5	Stream 6	Stream 7
Stream Molecular Weight	17.22	35.44	69.26	17.94	28.33	16.78	17.03
VOC Weight Fraction (wgt %):	2.3268	67.0794	94.0935	0.0000	23.7472	2.1303	0.0000

Notes:
1. Engineering estimates provided by Magnolia LNG.

However, it provides no support at all for the assumed numbers of fugitive components other than stating that they are engineering estimates provided by the applicant. Similarly, the API emission factors used are not maximum, but simply average values, and are therefore not appropriate for use in developing estimates of PTE, as discussed above with respect to EPA's criticism of AP-42 emission factors.

C.5 Flare Emissions (NO_x and VOC) Are Underestimated

Next, I show that emissions from flaring are underestimated. As an example, the relevant table from the application for the warm flare is shown below.

Table 10
Emissions for Warm Flare
Magnolia LNG

Parameter	Units	Pilot Gas	Flare Gas (Start-up)	Flare Gas (Malfunction)
Combustion Gas Fuel Flow Rate[1] (mass)	kg/hr	54.09	119.209	268.309
	lb/hr	119.00	262.260	590.280
Combustion Gas Molecular Weight	g/mol	16.77	16.77	16.77
Combustion Gas Fuel Flow Rate[2] (volume)	Nm^3/hr	72.25	159.223	358.371
	scf/hr	2,551	5,622.171	12,654.064
Combustion Gas Higher Heating Value[2]	kcal/kg	12,725	12,725	12,725
	J/mol	893,510	893,510	893,510
Combustion Gas Fuel Heat Rate	kcal/hr	688,307	1,516,936.731	3,414,235.543
	MMBtu/hr	2.73	6019.20	13547.69
Yearly Operation[1]	hr/yr	8760	84	1.0
HC Destruction Efficiency	%	99.5%	99.5%	99.5%

Normalized Temperature	32 F	0 C	273K
Normalized Pressure	1 atm	101325 Pa	
Ideal Gas Constant	8314 m^3Pa/mol-K		

		Pilot Gas			Flare Gas (Start-Up)			Flare Gas (Malfunction)		
Component	Molecular Weight (lb/lbmole)	Molar (Volume) Fraction (mol%)	Weight Fraction (wgt%)	Feed Rate (lb/hr)	Molar (Volume) Fraction (mol%)	Weight Fraction (wgt%)	Feed Rate (lb/hr)	Molar (Volume) Fraction (mol%)	Weight Fraction (wgt%)	Feed Rate (lb/hr)
Carbon Dioxide	44.01	1.3579%	3.58%	4.24	1.3579%	3.58%	9.34528	1.3579%	3.58%	21.033.82
Nitrogen	28.01	0.2490%	0.42%	0.49	0.2490%	0.42%	1.09078	0.2490%	0.42%	2.45507
Methane	16.04	96.3219%	92.14%	109.65	96.3219%	92.14%	241.651.21	96.3219%	92.14%	543.894.90
Ethane	30.07	1.9289%	3.46%	4.12	1.9289%	3.46%	9.070.27	1.9289%	3.46%	20.414.86
Propane	44.10	0.0840%	0.22%	0.26	0.0840%	0.22%	0.57925	0.0840%	0.22%	1.303.74
i-Butane	58.12	0.0140%	0.05%	0.06	0.0140%	0.05%	0.12725	0.0140%	0.05%	286.41
n-Butane	58.12	0.0160%	0.06%	0.07	0.0160%	0.06%	0.14543	0.0160%	0.06%	0.32732
i-Pentane	72.15	0.0070%	0.03%	0.04	0.0070%	0.03%	0.16.98	0.0070%	0.03%	0.17776
n-Pentane	72.15	0.0050%	0.02%	0.03	0.0050%	0.02%	0.0.41	0.0050%	0.02%	0.26.97
n-Hexane	86.18	0.0006%	0.00%	0.00	0.0006%	0.00%	0.09	0.0006%	0.00%	0.18.20
Benzene	78.11	0.0012%	0.01%	0.01	0.0012%	0.01%	0.1.66	0.0012%	0.01%	0.2.99
Cyclohexane	84.16	0.0003%	0.00%	0.00	0.0003%	0.00%	0.0.95	0.0003%	0.00%	0.0.89
n-Heptane	100.21	0.0050%	0.03%	0.04	0.0050%	0.03%	0.8.35	0.0050%	0.03%	0.17.635
Toluene	92.14	0.0007%	0.00%	0.00	0.0007%	0.00%	0.0.09	0.0007%	0.00%	0.2.270
n-Octane	114.23	0.0000%	0.00%	0.00	0.0000%	0.00%	0.00	0.0000%	0.00%	0.00
p-Xylene	106.17	0.0000%	0.00%	0.00	0.0000%	0.00%	0.00	0.0000%	0.00%	0.00
Ethylbenzene	106.17	0.0000%	0.00%	0.00	0.0000%	0.00%	0.00	0.0000%	0.00%	0.00
Total	-	**100%**	**100%**	**119.00**	**100%**	**100%**	**262.260**	**100%**	**100%**	**590.280**
Stream Molecular Weight (g/mol)		16.77			16.77			16.77		

Pollutant Type	Pollutant	Emission Factor[3,4,5] (lb/MMBtu)	Emission Rate[6] (lb/hr) Pilot Gas	Flare Gas (Start)	Flare Gas (Emerg)	Annual Emissions (tpy) Pilot Gas	Flare Gas (Start)	Flare Gas (Emerg)	TOTAL
Criteria	NO_x	0.068	0.19	409.31	921.24	0.81	13.10	0.48	**14.37**
	CO	0.37	1.01	2227.11	5,012.84	4.43	71.27	2.51	**78.20**
	VOC	-	0.003	6.05	13.624	0.01	0.19	0.01	**0.21**
	PM	0.0083	0.023	49.96	112.45	0.10	1.60	0.06	**1.75**
	PM_{10}	0.0083	0.023	49.96	112.45	0.10	1.60	0.06	**1.75**
	$PM_{2.5}$	0.0083	0.023	49.96	112.45	0.10	1.60	0.06	**1.75**
	SO_2	0.0002	0.00055	1.20	2.71	0.0024	0.04	0.00	**0.04**
HAPs	Benzene	-	0.00003	0.07	0.165	0.00015	0.002	0.000	**0.00**
	Formaldehyde	0.000081	0.00022	0.49	1.10	0.0010	0.02	0.00	**0.02**
	Hexane	-	0.0000	0.04	0.09	0.0001	0.00	0.00	**0.00**
	Toluene	-	0.000023	0.05	0.11	0.00010	0.002	0.000	**0.00**
	Xylene	-	0.00000	0.00	0.00	0.00000	0.000	0.000	0.00
	Total HAPs		**0.00**	**0.65**	**1.47**	**0.0013**	**0.02**	**0.00**	**0.02**
Greenhouse Gas	CO_2	117	319.49	704.110.77	1,584,77278	1,399.36	22.53154	792.39	**24,723.29**
	N_2O	0.00022	0.00060	1.32	2.98	0.0026	0.04	0.00	**0.05**
	CH_4	-	0.548	1,208.26	2,71947	2.40	38.66	1.36	**42.43**

Pollutant Type	Pollutant	Warming Potential (GWP)	Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Greenhouse Gas (CO_2e)	CO_2	1	5,644.58	24,723.29
	N_2O	298	3.18	13.86
	CH_4	25	242.15	1,060.63
	Total GHGs	-	**5,889.90**	**25,797.78**

Notes:

1. Engineering data provided by Magnolia LNG ref Flare Design Basis: G086-900-72-PR-GEN-PDB-00001. Assumed 2 start-ups per train lasting 8 hours, and 40% of feed gas rate. The emergency flare assumed to be 1 event per year per train lasting 5 minutes.
2. Heat content assumed equivalent to feed gas.
3. NO_x and CO emission factors from United States Environmental Protection Agency (EPA) AP 42 Fifth Edition, Volume I - Section 13.5 -"Industrial Flares".
4. SO_2, formaldehyde, and PM emissions factors from USEPA AP-42 Section 1.4 -Natural Gas Combustion. Emissions converted from units of lb/MMscf to lb/MMBtu by dividing by 1020MMBtu/MMscf. Emission factor also multiplied by HHV/LHV ratio of 1.108. SO2 emission factor based on sulfur content of 0.0002% by weight (equivalent to 0.0001% molar).
5. CO_2 and N_2O emission factors from 40 CFR 98 Tables C-1 and C-2to Subpart C - Natural Gas Combustion.
6. Emission rates for VOC, CH_4, and individual HAPs (except formaldehyde) calculated by multiplying feed rate by (1 minus rated HC destruction efficiency/100).

I will discuss two examples – the NO_x emission factor of 0.068 lb/MMBtu and the hydrocarbon destruction efficiency of 99.5% assumed in the calculations above.

(i) For NO_x, the emission factor used is 0.068 lb/MMBtu, relying on AP-42 Table 13.5-1. I reproduce this table from AP-42 below, including the crucial note qualifying the 0.068 lb/MMBtu emission factor.

AP-42 Table 13.5-1 (English Units). THC, NOx AND SOOT EMISSIONS FACTORS FOR FLARE OPERATIONS FOR CERTAIN CHEMICAL MANUFACTURING PROCESSES

Pollutant	SCC	Emissions Factor Value	Emissions Factor Units	Grade or Representativeness
THC, elevated flaresc	30190099; 30119701; 30119705; 30119709; 30119741	0.14b	lb/106 Btu	B
THC, enclosed ground flares Low Percent Load	8.37 or 3.88e-3	lb/10^6 scf gas burned lb/10^6 Btu heat input	Moderately	
THC, enclosed ground flares Normal to High Percent Loadi	2.56 or 1.20e-3	lb/10^6 scf gas burned lb/106 Btu heat input	Moderately	
Nitrogen oxides, elevated flares	0.068 b	lb/10^6 Btu	B	
Soot, elevated flares	0 – 274b	µg/L	B	

b Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.
Other footnotes in original table not included.

The 0.068 lb/MMBtu value in AP-42 above is derived from testing discussed in Reference 1, a 1983 document which discusses a range of flare NO_x emissions, as high as 0.2 lb/MMBtu (or three times as high as the "average" 0.068 lb/MMBtu in the table below). Importantly, all of the flare testing data upon which the 0.068 lb/MMBtu NO_x emission factor in AP-42 is based were developed with testing conducted on an idealized propylene-only flare—contrary to what is stated in FN b to the table above. Reference 1 in FN b to the AP-42 Table 13.5-1 makes that clear.

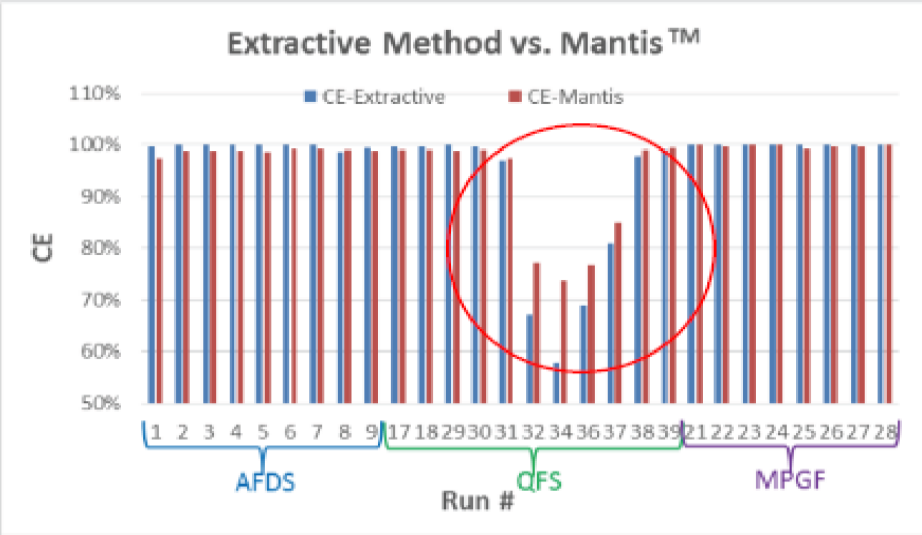
In this instance, nothing in the application indicates that propylene only or even 80% propylene and 20% propane will be burned in the warm flare, like the flare that is the basis of AP-42's NO_x emission factor. Thus, the appropriateness of the emission factor is fundamentally unsupported.

Further, as noted, the underlying AP-42 background document clearly states that there is a range of NO_x emission factors, with the highest being 0.2 lb/MMBtu instead of the average value of 0.068 lb/MMBtu. Consistent with the definition of PTE, this highest value should be used.

(ii) Next, the warm flare hydrocarbon destruction efficiency (DE) is assumed to be 99.5%, for which there is simply no citation or basis. It is clear that the proposed flare is not enclosed and is

an open stack flare. Open stack flares of the type to be used at the Plant are subject to ambient wind/rain conditions and therefore subject to wide range of destruction efficiencies.

It is well known that flare DE (and combustion efficiency (CE), a closely related term) depends on many factors which cannot be controlled in actual operating conditions.[6] Even when flares have been tested under ideal conditions, their destruction and combustion efficiencies can vary widely. The chart below is excerpted from some controlled testing done on flares to compare CE using two techniques – extractive sampling and Video Imaging Spectral Radiometry (VISR), using a product called MANTIS.[7]



As the chart shows, , even under controlled conditions, CE (and by extension, DE, which closely tracks CE) can drop from high values to very low values (55% or so in this case). So, simply assuming that destruction efficiency levels will always be 99.5%, as the Applicant's proposed flare calculations do, and DEQ accepted, is not realistic and the evidence establishes that achieving such rates is not feasible or not consistently achievable, such as with rapidly varying flow rates and waste gas compositions.

The DE assumption is critical for emissions. Consider, as an example, a flare whose VOC (or VOC TAP) emissions have been estimated to be 100 pounds/year using a DRE of 99.5%. If that flare achieved not 99.5% but just 99% DRE, its emissions would double to 200 pounds/year. If the DE dropped to 95%, the VOC emissions would rise to 1000 pounds/year, or ten times more than if the DE was 99.5% as assumed by the applicant. In calculating PTE, the applicant should have used the lowest achievable DE in all cases, because it would help represent the maximum emissions rate for that source. Since there is no reason to believe, based on actual flare monitoring

[6] See for example, a technical review of flare emissions prepared by EPA. https://www3.epa.gov/airtoxics/flare/2012flaretechreport.pdf

[7] https://www.providencephotonics.com/events

data noted above, that even well-designed and well-operated flares can achieve 99.5% DE under all circumstances (because of the impact of varying ambient conditions such as cross winds and rain, etc.) and that actual DE's can be far lower, it is clear that VOC (and associated TAP) emissions PTE have been significantly underestimated by the applicant and impermissibly accepted by the DEQ.

D. The Best Available Control Technology (BACT) Analyses Are Flawed

The BACT analysis provided in the Applications, which DEQ proposes to approve, are substantially flawed and poorly supported. Examples of flaws include: use of "good combustion practices" as BACT which is simply unenforceable; BACT candidates that are improperly ruled out based on technical infeasibility without any basis (as opposed to cost-effectiveness, which has not been provide except in just one instance); no support for the cost-effectiveness in the one instance it was used for the turbine NO_x emissions (i.e., use of selective catalytic reduction, SCR, which is widely used for controlling NO_x from turbines); and summary dismissal of electric motor drives instead of turbines for driving the refrigerant compressors.

The table below shows the summary of the BACT selection.

TABLE III. BACT SELECTION

Equipment	$PM_{10}/PM_{2.5}$	NO_x	CO	VOC	GHG
Turbines	Good combustion practices	Dry low NOx combustion NOx <= 10 ppmvd @ 15% O_2 (@ => 75% peak load)	Good combustion practices	Good combustion practices	good combustion/operating/ maintenance practices Fueled by natural gas Use intake air chiller
Thermal Oxidizers Auxiliary Boilers	Good combustion practices	Low NOx burners	Good combustion practices	Good combustion practices	good combustion/operating/ maintenance practices Fueled by natural gas
Water Pumps Tank Deluge Pumps Generator Engines	40 CFR 60 Subpart IIII	40 CFR 60 Subpart IIII	40 CFR 60 Subpart IIII	40 CFR 60 Subpart IIII	Good combustion practices
Flares	Good combustion practices	Good combustion practices	Good combustion practices	Good combustion practices	Good combustion practices
Fugitives				Piping design and good work practices	

D.1 Good Combustion Practice as BACT is Not Enforceable

It is worth noting that in many instances, BACT is simply noted as "good combustion practices." This is simply not an enforceable limit or work practice. DEQ's discussion on this simply states that "Good combustion practices include good equipment design, use of gaseous fuels (for good mixing), and proper combustion techniques such as optimizing the air to fuel ratio. While this control option is typically less efficient than other technologies, it has minimum environmental and energy impacts."[8] Nothing in these statements is enforceable. Simply, "good combustion practices" are whatever the applicant deems them to be. There is no enforceability for "good design," "good mixing," "proper combustion techniques," "optimizing the air to fuel ratio," or

[8] DEQ Preliminary Determination Summary, p. 8

"minimum environmental and energy impacts" clauses or concepts that are included in the discussion above.

If DEQ is willing to accept good combustion practices are BACT this concept must be made enforceable. Minimum temperatures, minimum residence times, use of numerical ranges for acceptable or optimal air to fuel ratios, and other quantitative measures need to be included so that enforceability can be determined as a practical matter.

It is also important to note that the same combustion conditions that are represented by good combustion practices will not provide lowest emissions of each pollutant. A good example is the flare, for which BACT is shown as good combustion practice for every pollutant. DEQ has failed to recognize that like many combustion sources, emissions of NO_x and those of VOCs/CO would not be low at the same time and that conditions that generate low NO_x will generally generate high VOC/CO. Thus, good combustion practice is different when it is used in context for these different pollutants.

D.2 DEQ Improperly Dismisses Electric Motor Drives As BACT for the Compressors

The DEQ improperly rejects the use of electric compressors as BACT for all of the pollutants from the turbines. Gas-fired turbines emit NO_x, CO, VOCs including many TAPs such as the carcinogens formaldehyde and benzene, among others), as well as fine particulate matter—and all of these can be eliminated by used electrically-driven compressors. In fact, such electric-drive compressors are widely used in many compression applications such as at natural gas compressor stations.[9] Siemens, the vendor noted in the record has electric motor compressors.[10] The sole purpose of the turbines is to drive the refrigerant compressors and this central business purpose or fundamental design of the Plant (i.e., refrigerating natural gas to form LNG) can be directly achieved using electrically-driven compressors. Yet, with no basis whatsoever, DEQ states, incorrectly, that electric motors are "deemed technically infeasible" in this application.

Even if the turbine, in conjunction with a combined heat and power facility is used to produce steam, that steam can be produced by many other means, including very low-emitting combustion devices or electric heaters. This cannot be a reason to reject electric motor driven compressors on technical infeasibility grounds.

And, to the extent that the applicant could have made a cost-effectiveness argument regarding why electric motor drive compressors cannot be BACT, no such information is available in the record. And, it would not be availing anyway, since, as I have noted, many compressors use electric motor drives.

[9] See data table for electric compressors at https://hifld-geoplatform.opendata.arcgis.com/datasets/natural-gas-compressor-stations/explore?location=37.939803%2C-96.043032%2C4.89&showTable=true

[10] See Siemens' offerings, for example, at https://new.siemens.com/global/en/markets/oil-gas/turbine-replacement.html

D.3 SCR Improperly Rejected As BACT for Turbine NO_x

SCR, the top control for NO_x from turbines, was rejected as BACT based on cost considerations. The table below shows the cost analysis relied upon by the DEQ.

MAGNOLIA LNG FACILITY
AGENCY INTEREST NO. 185639
MAGNOLIA LNG, LLC
LAKE CHARLES, CALCASIEU PARISH, LOUISIANA
PSD-LA-792(MI)

TABLE I: BACT COST SUMMARY

Control Alternatives		Availability/ Feasibility	Negative Impacts (a)	Control Efficiency (%)	Emissions Reduction (TPY)	Capital Cost ($)	Annualized Cost ($/yr)	Cost Effectiveness ($/ton)	Notes
NOx	SCR	Yes/No	1,2,3	90	44.74	4,977,000	932,869	20,697	Rejected
Notes: a) Negative impacts: 1) economic, 2) environmental, 3) energy, 4) safety									

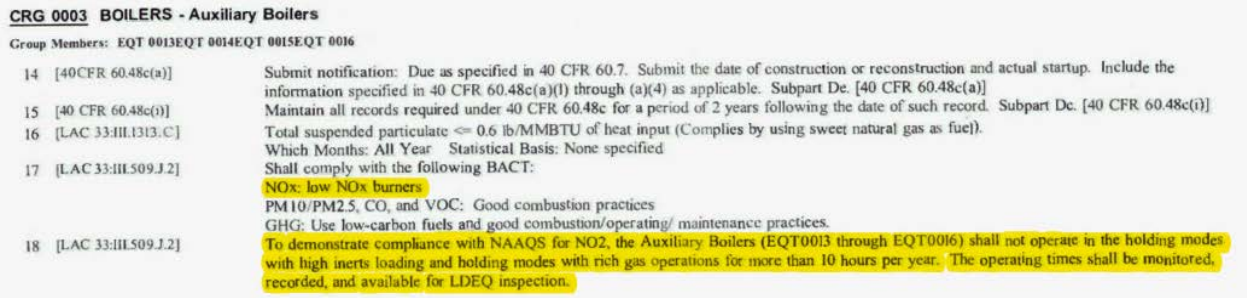
There are numerous issues with this analysis. The basis for using just 90% control efficiency for SCR is not clear since SCR efficiencies can be significantly higher depending on the type and volume of catalyst used. Higher efficiencies would create more NO_x reduction and directly lower the calculated cost-effectiveness. The capital cost assumed (i.e., 4,977,000) for each SCR is unsupported by any vendor data or detail (i.e., what this cost line item includes and if included items are appropriate). DEQ does not discuss whether one SCR could be used for multiple turbines, thereby reducing capital and operating costs as a whole, making SCR cost-effective. DEQ also does not discuss what level of cost-effectiveness would be acceptable to the agency. For example, it is common in many states to use values of around $15,000 per ton of NO_x reduced as being cost-effective.[11] This was used for NOx in an LNG facility in Texas in the 2016 timeframe as indicated in the cication. Using this metric, only a few additional percent increase in control efficiency would make SCR cost-effective, even using the unsupported capital cost value used by DEQ.

In summary, this rejection of SCR for NO_x BACT is flawed. Had SCR been used, the BACT level would be 2 ppm (at 15% oxygen) instead of 10 ppm as accepted by DEQ.

D.4 NO_x BACT for Auxiliary Boilers NO_x is Unenforceable

The NO_x BACT for the auxiliary boilers, i.e., low NO_x burners, is unenforceable. Like "good combustion practices" "low NO_x" burners are not a standard term denoting a consistent level of NO_x emissions or performance. Thus, simply stating that NO_x BACT for auxiliary boilers is low NO_x burner, as shown in the discussion below, is unenforceable.

[11] Testimony of Dr. Sushil Gautam, Hearing Proceedings (Volume II of II) on Texas LNG Brownsville, LLC, Texas Commission on Environmental Quality (TCEQ) Docket No. 2019-0624-AIR and SOAH Docket No. 582-19-6261, November 21, 2019, page 344-345. Included as Attachment C.



CRG 0003 BOILERS - Auxiliary Boilers

Group Members: EQT 0013EQT 0014EQT 0015EQT 0016

14	[40CFR 60.48c(a)]	Submit notification: Due as specified in 40 CFR 60.7. Submit the date of construction or reconstruction and actual startup. Include the information specified in 40 CFR 60.48c(a)(1) through (a)(4) as applicable. Subpart Dc. [40 CFR 60.48c(a)]
15	[40 CFR 60.48c(i)]	Maintain all records required under 40 CFR 60.48c for a period of 2 years following the date of such record. Subpart Dc. [40 CFR 60.48c(i)]
16	[LAC 33:III.1313.C.]	Total suspended particulate <= 0.6 lb/MMBTU of heat input (Complies by using sweet natural gas as fuel). Which Months: All Year Statistical Basis: None specified
17	[LAC 33:III.509.J.2]	Shall comply with the following BACT: NOx: low NOx burners PM10/PM2.5, CO, and VOC: Good combustion practices GHG: Use low-carbon fuels and good combustion/operating/ maintenance practices.
18	[LAC 33:III.509.J.2]	To demonstrate compliance with NAAQS for NO2, the Auxiliary Boilers (EQT0013 through EQT0016) shall not operate in the holding modes with high inerts loading and holding modes with rich gas operations for more than 10 hours per year. The operating times shall be monitored, recorded, and available for LDEQ inspection.

E. Modeling Issues

In this section, I note several modeling issues.

First, I reiterate that my review was incomplete since none of the electronic modeling files were provided in the record. It is not clear if DEQ verified the modeling done by the applicant's consultant since there was no DEQ modeling review memorandum or similar document.

Second, I reiterate that all of the emissions deficiencies I have discussed prior also apply here since emission estimates are a critical input to the dispersion modeling.

Third, it is clear that even though this Plant has been proposed since 2015, i.e., six years ago, the applicant has not collected on-site meteorological data or local monitoring for background data for specific pollutants. Onsite meteorological data is always preferred in modeling applications since it is, by definition, the most representative data. It is clear that the applicant had ample opportunity to collect such data and has chosen not to. Thus, there are questions of representativeness of the meteorological data and background data that have been used in the analysis, which cannot be ascertained. Simply stating that the data used are representative of the Plant site, as stated by the applicant's consultant, and as accepted by the DEQ, does not make them so.

Fourth, the use of so-called significant impact levels (SILs), especially the NO_x SIL, in the manner used to absolve the Plant's NO_x impacts, is improper. For NO_x, the modeling clearly shows that the cumulative impacts (i.e., facility plus other contributing sources) will far exceed the 1-hour NO_x NAAQS, as confirmed by the summary table below.

Pollutant	Averaging Period	Calculated Maximum Ground Level Concentration (µg/m³)	NAAQS or (AAS) (µg/m³)
PM_{10}	24 hour	0.67	150
	Annual	0.09	50
PM_{25}	24 hour	0.59	35
	Annual	0.09	12
NO_2	1 hour	873(a)	188
	Annual	0.99	100
CO	1 hour	492	40,000
	8-hour	222	10,000

(a) Refined Modeling- Magnolia LNG contributes 2.34 ug/m^3

However, DEQ states, that "[R]efined modeling predicted 1-hour NO concentrations will be more than the standard of 188 µg/ m3; however. Magnolia LNG's contributions to these amounts are below the SILs thereby demonstrating in accordance with EPA regulations and guidance that the NO_2 emissions from the facility will not cause or contribute to any NAAQS exceedances. Impact of NO_x and VOC emissions on ozone concentrations will be less than the SIL."[12] (emphasis added)

Use of the NO_x SIL (itself an interim value as noted by the applicant, and an arguably improper surrogate for the "cause or contribute" basis for a SIL) in this manner is simply wrong. Since it is clear that there are impacts by the Plant in areas that are exceeding the NAAQS, i.e., in non-attainment areas, once cannot minimize these impacts, even if they are below the SIL, as acceptable. Once an area is in non-attainment, as clearly shown by the applicant's own modeling, any additional NO_x contribution, by definition, is causing or contributing to that non-attainment and is therefore significant.

Fifth, there are numerous assumptions made by the applicant in the cumulative analysis, as noted in the modeling report. These include, among others, changes made by the applicant's consultants to account for "missing stack parameters or unrealistic parameters,"[13] exclusion of "start-up, shutdown, and maintenance emissions,"[14] exclusion of "alternate operating scenarios,"[15] and assuming that all "high hourly emission rates for…flares were….the result of emergency or upset conditions."[16] There are significant alterations to the emissions from the many cumulative sources in the area. Yet, there is no discussion of why or what specific emissions or stack parameters were altered. Without specific detail, it cannot be assumed that these changes and others noted in the modeling report, are trivial and immaterial.

Sixth, the applicant used EPA's co-called Modeled Emission Rate Precursors (MERPs) analysis to estimate impacts of photochemical pollutants such as ozone (from precursor NO_x and VOCs) and $PM_{2.5}$ (from precursor NO_x and SO_2). However, a critical assumption before MERPs can be

[12] DEQ Air Permit Briefing Sheet, p. 3.
[13] SLR Modeling Report, January 2021, p. 17.
[14] SLR Modeling Report, January 2021, p. 17.
[15] SLR Modeling Report, January 2021, p. 18.
[16] SLR Modeling Report, January 2021, p. 18.

used is to show that the modeling conducted by EPA for the "hypothetical" source is in fact representative of the Plant. Yet, there is no discussion of representativeness at all.

F. Lack of Ongoing Testing/Verification of Assumptions Used in the Application

It is clear that the analysis presented by the applicant for emissions, BACT, and modeling of air impact from the Plant rely on many assumptions. I have noted several of them in the comments above, including references to design engineering details, manufacturer's data, use of AP-42 emission factors, use of API emission factors, use of SCR control efficiency, use of flare hydrocarbon destruction efficiency, and many others.

Yet, it is clear from the review of the proposed permits that none of these critical assumptions are required to be: (i) verified as an initial matter; or (ii) met at all times, consistent with the obligation of the Plant to be in continuous compliance with its representations at all times.

In fact, the required testing (for some of the sources only, given that other sources such as the flares simply cannot be tested, as designed) is so meagre as to be meaningless.

Critically, there is no requirement to use Continuous Emission Monitors (CEMS) for pollutants such as NO_x, CO, VOC, filterable particulate matter, for sources such as the turbines and boilers where such instruments have been in use for at least 30 years in many cases.

Given that the permit contains almost zero verification of the many critical representations, it is clear that the assumed PTE estimates, with their flaws as noted, are simply unconstrained. Furthermore actual emissions are simply unknowable at any given time. There is no reason to simply accept that the representations are true and thus require no verification.

Attachment A – Resume

RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)

CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES

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Alhambra, CA 91801
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e-mail (preferred): ronsahu@gmail.com; sahuron@earthlink.net

EXPERIENCE SUMMARY

Dr. Sahu has over thirty one years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; soils and groundwater remediation including landfills as remedy; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over twenty eight years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past twenty six years include various trade associations as well as individual companies such as steel mills, petroleum refineries, chemical plants, cement manufacturers, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, land development companies, and various entities in the public sector including EPA, the US Dept. of Justice, several states (including Oregon, New Mexico, Pennsylvania, and others), various agencies such as the California DTSC, and various municipalities. Dr. Sahu has performed projects in all 50 states, numerous local jurisdictions and internationally.

In addition to consulting, for approximately twenty years, Dr. Sahu taught numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management). He also taught at Caltech, his alma mater (various engineering courses), at the University of Southern California (air pollution controls) and at California State University, Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

EXPERIENCE RECORD

2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.), public sector (such as the US Department of Justice), and public interest group clients with project management, environmental consulting, project management, as well as regulatory and engineering support consulting services.

1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for** Air Quality/Geosciences/Hazardous Waste Groups, Pasadena. Responsible for the management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.

Parsons ES, **Manager for Air Source Testing Services**. Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.

1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.

1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.

1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.

1988-1989 Heat Transfer Research, Inc. **Research Engineer**. Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

EDUCATION

1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1984 M. S., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

TEACHING EXPERIENCE

Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

“Thermodynamics and Heat Transfer,” Fall and Winter Terms of 1996-1997.

U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992-2010.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Various years since 2006.

University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007, Spring 2008, Spring 2009.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

PROFESSIONAL AFFILIATIONS AND HONORS

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-mid-1990s.

Air and Waste Management Association, West Coast Section, 1989-mid-2000s.

PROFESSIONAL CERTIFICATIONS

EIT, California (#XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2021.

PUBLICATIONS (PARTIAL LIST)

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R. Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NOx Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

“From Purchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada,” with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

“The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants,” with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

PRESENTATIONS (PARTIAL LIST)

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

Annex A

Expert Litigation Support

A. Occasions where Dr. Sahu has provided Written or Oral testimony before Congress:

1. In July 2012, provided expert written and oral testimony to the House Subcommittee on Energy and the Environment, Committee on Science, Space, and Technology at a Hearing entitled "Hitting the Ethanol Blend Wall – Examining the Science on E15."

B. Matters for which Dr. Sahu has provided affidavits and expert reports include:

2. Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.

3. Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the United States in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).

4. Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the United States in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).

5. Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the United States in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (Middle District of North Carolina).

6. Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the United States in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (Southern District of Ohio).

7. Affidavit (March 2005) on behalf of the Minnesota Center for Environmental Advocacy and others in the matter of the Application of Heron Lake BioEnergy LLC to construct and operate an ethanol production facility – submitted to the Minnesota Pollution Control Agency.

8. Expert Report and Deposition (10/31/2005 and 11/1/2005) on behalf of the United States in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc*., 5:04-cv-00034-KSF (Eastern District of Kentucky).

9. Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.

10. Expert Report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.

11. Expert Report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.

12. Expert Report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.

13. Expert Report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.

14. Expert Testimony (July 2007) on behalf of the Izaak Walton League of America and others in connection with the acquisition of power by Xcel Energy from the proposed Gascoyne Power Plant – at the State of

Minnesota, Office of Administrative Hearings for the Minnesota PUC (MPUC No. E002/CN-06-1518; OAH No. 12-2500-17857-2).

15. Affidavit (July 2007) Comments on the Big Cajun I Draft Permit on behalf of the Sierra Club – submitted to the Louisiana DEQ.

16. Expert Report and Deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

17. Expert Reports and Pre-filed Testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.

18. Expert Report and Deposition (October 2007) on behalf of MTD Products Inc., in connection with *General Power Products, LLC v MTD Products Inc*., 1:06 CVA 0143 (Southern District of Ohio, Western Division) .

19. Expert Report and Deposition (June 2008) on behalf of Sierra Club and others in the matter of permit challenges (Title V: 28.0801-29 and PSD: 28.0803-PSD) for the Big Stone II unit, proposed to be located near Milbank, South Dakota.

20. Expert Reports, Affidavit, and Deposition (August 15, 2008) on behalf of Earthjustice in the matter of air permit challenge (CT-4631) for the Basin Electric Dry Fork station, under construction near Gillette, Wyoming before the Environmental Quality Council of the State of Wyoming.

21. Affidavits (May 2010/June 2010 in the Office of Administrative Hearings))/Declaration and Expert Report (November 2009 in the Office of Administrative Hearings) on behalf of NRDC and the Southern Environmental Law Center in the matter of the air permit challenge for Duke Cliffside Unit 6. Office of Administrative Hearing Matters 08 EHR 0771, 0835 and 0836 and 09 HER 3102, 3174, and 3176 (consolidated).

22. Declaration (August 2008), Expert Report (January 2009), and Declaration (May 2009) on behalf of Southern Alliance for Clean Energy in the matter of the air permit challenge for Duke Cliffside Unit 6. *Southern Alliance for Clean Energy et al., v. Duke Energy Carolinas, LLC*, Case No. 1:08-cv-00318-LHT-DLH (Western District of North Carolina, Asheville Division).

23. Declaration (August 2008) on behalf of the Sierra Club in the matter of Dominion Wise County plant MACT.us

24. Expert Report (June 2008) on behalf of Sierra Club for the Green Energy Resource Recovery Project, MACT Analysis.

25. Expert Report (February 2009) on behalf of Sierra Club and the Environmental Integrity Project in the matter of the air permit challenge for NRG Limestone's proposed Unit 3 in Texas.

26. Expert Report (June 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*

27. Expert Report (August 2009) on behalf of Sierra Club and the Southern Environmental Law Center in the matter of the air permit challenge for Santee Cooper's proposed Pee Dee plant in South Carolina).

28. Statements (May 2008 and September 2009) on behalf of the Minnesota Center for Environmental Advocacy to the Minnesota Pollution Control Agency in the matter of the Minnesota Haze State Implementation Plans.

29. Expert Report (August 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

30. Expert Report and Rebuttal Report (September 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

31. Expert Report (December 2009) and Rebuttal reports (May 2010 and June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

32. Pre-filed Testimony (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

33. Pre-filed Testimony (July 2010) and Written Rebuttal Testimony (August 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions,* No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

34. Expert Report (August 2010) and Rebuttal Expert Report (October 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Liability Phase.

35. Declaration (August 2010), Reply Declaration (November 2010), Expert Report (April 2011), Supplemental and Rebuttal Expert Report (July 2011) on behalf of the United States in the matter of DTE Energy Company and Detroit Edison Company (Monroe Unit 2). *United States of America v. DTE Energy Company and Detroit Edison Company*, Civil Action No. 2:10-cv-13101-BAF-RSW (Eastern District of Michigan).

36. Expert Report and Deposition (August 2010) as well as Affidavit (September 2010) on behalf of Kentucky Waterways Alliance, Sierra Club, and Valley Watch in the matter of challenges to the NPDES permit issued for the Trimble County power plant by the Kentucky Energy and Environment Cabinet to Louisville Gas and Electric, File No. DOW-41106-047.

37. Expert Report (August 2010), Rebuttal Expert Report (September 2010), Supplemental Expert Report (September 2011), and Declaration (November 2011) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (District of Colorado).

38. Written Direct Expert Testimony (August 2010) and Affidavit (February 2012) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

39. Deposition (August 2010) on behalf of Environmental Defense, in the matter of the remanded permit challenge to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

40. Expert Report, Supplemental/Rebuttal Expert Report, and Declarations (October 2010, November 2010, September 2012) on behalf of New Mexico Environment Department (Plaintiff-Intervenor), Grand Canyon Trust and Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. Public Service Company of New Mexico* (PNM), Civil No. 1:02-CV-0552 BB/ATC (ACE) (District of New Mexico).

41. Expert Report (October 2010) and Rebuttal Expert Report (November 2010) (BART Determinations for PSCo Hayden and CSU Martin Drake units) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

42. Expert Report (November 2010) (BART Determinations for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

43. Declaration (November 2010) on behalf of the Sierra Club in connection with the Martin Lake Station Units 1, 2, and 3. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Case No. 5:10-cv-00156-DF-CMC (Eastern District of Texas, Texarkana Division).

44. Pre-Filed Testimony (January 2011) and Declaration (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

45. Declaration (February 2011) in the matter of the Draft Title V Permit for RRI Energy MidAtlantic Power Holdings LLC Shawville Generating Station (Pennsylvania), ID No. 17-00001 on behalf of the Sierra Club.

46. Expert Report (March 2011), Rebuttal Expert Report (June 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

47. Declaration (April 2011) and Expert Report (July 16, 2012) in the matter of the Lower Colorado River Authority (LCRA)'s Fayette (Sam Seymour) Power Plant on behalf of the Texas Campaign for the Environment. *Texas Campaign for the Environment v. Lower Colorado River Authority*, Civil Action No. 4:11-cv-00791 (Southern District of Texas, Houston Division).

48. Declaration (June 2011) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

49. Expert Report (June 2011) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

50. Declaration (August 2011) in the matter of the Sandy Creek Energy Associates L.P. Sandy Creek Power Plant on behalf of Sierra Club and Public Citizen. *Sierra Club, Inc. and Public Citizen, Inc. v. Sandy Creek Energy Associates, L.P.*, Civil Action No. A-08-CA-648-LY (Western District of Texas, Austin Division).

51. Expert Report (October 2011) on behalf of the Defendants in the matter of *John Quiles and Jeanette Quiles et al. v. Bradford-White Corporation, MTD Products, Inc., Kohler Co., et al.*, Case No. 3:10-cv-747 (TJM/DEP) (Northern District of New York).

52. Declaration (October 2011) on behalf of the Plaintiffs in the matter of *American Nurses Association et. al. (Plaintiffs), v. US EPA (Defendant)*, Case No. 1:08-cv-02198-RMC (US District Court for the District of Columbia).

53. Declaration (February 2012) and Second Declaration (February 2012) in the matter of *Washington Environmental Council and Sierra Club Washington State Chapter v. Washington State Department of Ecology and Western States Petroleum Association*, Case No. 11-417-MJP (Western District of Washington).

54. Expert Report (March 2012) and Supplemental Expert Report (November 2013) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.*, Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

55. Declaration (March 2012) in the matter of *Center for Biological Diversity, et al. v. United States Environmental Protection Agency*, Case No. 11-1101 (consolidated with 11-1285, 11-1328 and 11-1336) (US Court of Appeals for the District of Columbia Circuit).

56. Declaration (March 2012) in the matter of *Sierra Club v. The Kansas Department of Health and Environment*, Case No. 11-105,493-AS (Holcomb power plant) (Supreme Court of the State of Kansas).

57. Declaration (March 2012) in the matter of the Las Brisas Energy Center *Environmental Defense Fund et al., v. Texas Commission on Environmental Quality*, Cause No. D-1-GN-11-001364 (District Court of Travis County, Texas, 261st Judicial District).

58. Expert Report (April 2012), Supplemental and Rebuttal Expert Report (July 2012), and Supplemental Rebuttal Expert Report (August 2012) on behalf of the states of New Jersey and Connecticut in the matter of the Portland Power plant *State of New Jersey and State of Connecticut (Intervenor-Plaintiff) v. RRI Energy Mid-Atlantic Power Holdings et al.*, Civil Action No. 07-CV-5298 (JKG) (Eastern District of Pennsylvania).

59. Declaration (April 2012) in the matter of the EPA's EGU MATS Rule, on behalf of the Environmental Integrity Project.

60. Expert Report (August 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Harm Phase.

61. Declaration (September 2012) in the Matter of the Application of *Energy Answers Incinerator, Inc.* for a Certificate of Public Convenience and Necessity to Construct a 120 MW Generating Facility in Baltimore City, Maryland, before the Public Service Commission of Maryland, Case No. 9199.

62. Expert Report (October 2012) on behalf of the Appellants (Robert Concilus and Leah Humes) in the matter of Robert Concilus and Leah Humes v. Commonwealth of Pennsylvania Department of Environmental Protection and Crawford Renewable Energy, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2011-167-R.

63. Expert Report (October 2012), Supplemental Expert Report (January 2013), and Affidavit (June 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

64. Pre-filed Testimony (October 2012) on behalf of No-Sag in the matter of the North Springfield Sustainable Energy Project before the State of Vermont, Public Service Board.

65. Pre-filed Testimony (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

66. Expert Report (February 2013) on behalf of Petitioners in the matter of Credence Crematory, Cause No. 12-A-J-4538 before the Indiana Office of Environmental Adjudication.

67. Expert Report (April 2013), Rebuttal report (July 2013), and Declarations (October 2013, November 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

68. Declaration (April 2013) on behalf of Petitioners in the matter of *Sierra Club, et al., (Petitioners) v Environmental Protection Agency et al. (Resppondents),* Case No., 13-1112, (Court of Appeals, District of Columbia Circuit).

69. Expert Report (May 2013) and Rebuttal Expert Report (July 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

70. Declaration (August 2013) on behalf of A. J. Acosta Company, Inc., in the matter of *A. J. Acosta Company, Inc., v. County of San Bernardino*, Case No. CIVSS803651.

71. Comments (October 2013) on behalf of the Washington Environmental Council and the Sierra Club in the matter of the Washington State Oil Refinery RACT (for Greenhouse Gases), submitted to the Washington State Department of Ecology, the Northwest Clean Air Agency, and the Puget Sound Clean Air Agency.

72. Statement (November 2013) on behalf of various Environmental Organizations in the matter of the Boswell Energy Center (BEC) Unit 4 Environmental Retrofit Project, to the Minnesota Public Utilities Commission, Docket No. E-015/M-12-920.

73. Expert Report (December 2013) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

74. Expert Testimony (December 2013) on behalf of the Sierra Club in the matter of Public Service Company of New Hampshire Merrimack Station Scrubber Project and Cost Recovery, Docket No. DE 11-250, to the State of New Hampshire Public Utilities Commission.

75. Expert Report (January 2014) on behalf of Baja, Inc., in *Baja, Inc., v. Automotive Testing and Development Services, Inc. et. al*, Civil Action No. 8:13-CV-02057-GRA (District of South Carolina, Anderson/Greenwood Division).

76. Declaration (March 2014) on behalf of the Center for International Environmental Law, Chesapeake Climate Action Network, Friends of the Earth, Pacific Environment, and the Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. the Export-Import Bank (Ex-Im Bank) of the United States*, Civil Action No. 13-1820 RC (District Court for the District of Columbia).

77. Declaration (April 2014) on behalf of Respondent-Intervenors in the matter of *Mexichem Specialty Resins Inc., et al., (Petitioners) v Environmental Protection Agency et al.,* Case No., 12-1260 (and Consolidated Case Nos. 12-1263, 12-1265, 12-1266, and 12-1267), (Court of Appeals, District of Columbia Circuit).

78. Direct Prefiled Testimony (June 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17319 (Michigan Public Service Commission).

79. Expert Report (June 2014) on behalf of ECM Biofilms in the matter of the US Federal Trade Commission (FTC) v. ECM Biofilms (FTC Docket #9358).

80. Direct Prefiled Testimony (August 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of Consumers Energy Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17317 (Michigan Public Service Commission).

81. Declaration (July 2014) on behalf of Public Health Intervenors in the matter of *EME Homer City Generation v. US EPA* (Case No. 11-1302 and consolidated cases) relating to the lifting of the stay entered by the Court on December 30, 2011 (US Court of Appeals for the District of Columbia).

82. Expert Report (September 2014), Rebuttal Expert Report (December 2014) and Supplemental Expert Report (March 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

83. Expert Report (November 2014) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

84. *Declaration (January 2015) relating to Startup/Shutdown in the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.*

85. Pre-filed Direct Testimony (March 2015), Supplemental Testimony (May 2015), and Surrebuttal Testimony (December 2015) on behalf of Friends of the Columbia Gorge in the matter of the Application for a Site Certificate for the Troutdale Energy Center before the Oregon Energy Facility Siting Council.

86. Brief of Amici Curiae Experts in Air Pollution Control and Air Quality Regulation in Support of the Respondents, On Writs of Certiorari to the US Court of Appeals for the District of Columbia, No. 14-46, 47, 48. *Michigan et. al., (Petitioners) v. EPA et. al., Utility Air Regulatory Group (Petitioners) v. EPA et. al., National Mining Association et. al., (Petitioner) v. EPA et. al.,* (Supreme Court of the United States).

87. Expert Report (March 2015) and Rebuttal Expert Report (January 2016) on behalf of Plaintiffs in the matter of *Conservation Law Foundation v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

88. Declaration (April 2015) relating to various Technical Corrections for the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.

89. Direct Prefiled Testimony (May 2015) on behalf of the Michigan Environmental Council, the Natural Resources Defense Council, and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Increase its Rates, Amend its Rate Schedules and Rules Governing the Distribution and Supply of Electric Energy and for Miscellaneous Accounting Authority, Case No. U-17767 (Michigan Public Service Commission).

90. Expert Report (July 2015) and Rebuttal Expert Report (July 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

91. Declaration (August 2015, Docket No. 1570376) in support of "Opposition of Respondent-Intervenors American Lung Association, et. al., to Tri-State Generation's Emergency Motion;" Declaration (September 2015, Docket No. 1574820) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors for Remand Without Vacatur;" Declaration (October 2015) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors to State and Certain Industry Petitioners' Motion to Govern, *White Stallion Energy Center, LLC v. US EPA*, Case No. 12-1100 (US Court of Appeals for the District of Columbia).

92. Declaration (September 2015) in support of the Draft Title V Permit for Dickerson Generating Station (Proposed Permit No 24-031-0019) on behalf of the Environmental Integrity Project.

93. Expert Report (Liability Phase) (December 2015) and Rebuttal Expert Report (February 2016) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., Environmental Law and Policy Center, and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

94. Declaration (December 2015) in support of the Petition to Object to the Title V Permit for Morgantown Generating Station (Proposed Permit No 24-017-0014) on behalf of the Environmental Integrity Project.

95. Expert Report (November 2015) on behalf of Appellants in the matter of *Sierra Club, et al. v. Craig W. Butler, Director of Ohio Environmental Protection Agency et al.*, ERAC Case No. 14-256814.

96. Affidavit (January 2016) on behalf of Bridgewatch Detroit in the matter of *Bridgewatch Detroit v. Waterfront Petroleum Terminal Co., and Waterfront Terminal Holdings, LLC.*, in the Circuit Court for the County of Wayne, State of Michigan.

97. Expert Report (February 2016) and Rebuttal Expert Report (July 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

98. Direct Testimony (May 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

99. Declaration (June 2016) relating to deficiencies in air quality analysis for the proposed Millenium Bulk Terminal, Port of Longview, Washington.

100. Declaration (December 2016) relating to EPA's refusal to set limits on PM emissions from coal-fired power plants that reflect pollution reductions achievable with fabric filters on behalf of Environmental Integrity Project, Clean Air Council, Chesapeake Climate Action Network, Downwinders at Risk represented by Earthjustice in the matter of *ARIPPA v EPA, Case No. 15-1180.* (D.C. Circuit Court of Appeals).

101. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

102. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Backus Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

103. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Drakulic Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

104. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Deutsch Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

105. Affidavit (February 2017) pertaining to deficiencies water discharge compliance issues at the Wood River Refinery in the matter of *People of the State of Illinois (Plaintiff) v. Phillips 66 Company, ConocoPhillips Company, WRB Refining LP (Defendants)*, Case No. 16-CH-656, (Circuit Court for the Third Judicial Circuit, Madison County, Illinois).

106. Expert Report (March 2017) on behalf of the Plaintiff pertaining to non-degradation analysis for waste water discharges from a power plant in the matter of *Sierra Club (Plaintiff) v. Pennsylvania Department of Environmental Protection (PADEP) and Lackawanna Energy Center*, Docket No. 2016-047-L (consolidated), (Pennsylvania Environmental Hearing Board).

107. Expert Report (March 2017) on behalf of the Plaintiff pertaining to air emissions from the Heritage incinerator in East Liverpool, Ohio in the matter of *Save our County (Plaintiff) v. Heritage Thermal Services, Inc. (Defendant), Case No. 4:16-CV-1544-BYP*, (US District Court for the Northern District of Ohio, Eastern Division).

108. Rebuttal Expert Report (June 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight (Plaintiffs) v Coyote Creek Mining Company LLC (Defendant)*, Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).

109. Expert Affidavit (August 2017) and Penalty/Remedy Expert Affidavit (October 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant,)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).

110. Expert Report (August 2017) on behalf of Appellant in the matter of *Patricia Ann Troiano (Appellant) v. Upper Burrell Township Zoning Hearing Board (Appellee)*, Court of Common Pleas of Westmoreland County, Pennsylvania, Civil Division.

111. Expert Report (October 2017), Supplemental Expert Report (October 2017), and Rebuttal Expert Report (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

112. Declaration (December 2017) on behalf of the Environmental Integrity Project in the matter of permit issuance for ATI Flat Rolled Products Holdings, Breckenridge, PA to the Allegheny County Health Department.

113. Expert Report (Harm Phase) (January 2018), Rebuttal Expert Report (Harm Phase) (May 2018) and Supplemental Expert Report (Harm Phase) (April 2019) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

114. Declaration (February 2018) on behalf of the Chesapeake Bay Foundation, et. al., in the matter of the Section 126 Petition filed by the state of Maryland in *State of Maryland v. Pruitt (Defendant)*, Civil Action No. JKB-17-2939 (Consolidated with No. JKB-17-2873) (US District Court for the District of Maryland).

115. Direct Pre-filed Testimony (March 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of *NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC*, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington.

116. Expert Affidavit (April 2018) and Second Expert Affidavit (May 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.

117. Direct Pre-filed Testimony and Affidavit (December 2018) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).

118. Expert Report (February 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.

119. Declaration (March 2019) on behalf of Earthjustice in the matter of comments on the renewal of the Title V Federal Operating Permit for Valero Houston refinery.

120. Expert Report (March 2019) on behalf of Plaintiffs for Class Certification in the matter of *Resendez et al v Precision Castparts Corporation* in the Circuit Court for the State of Oregon, County of Multnomah, Case No. 16cv16164.

121. Expert Report (June 2019), Affidavit (July 2019) and Rebuttal Expert Report (September 2019) on behalf of Appellants relating to the NPDES permit for the Cheswick power plant in the matter of *Three Rivers Waterkeeper and Sierra Club (Appellants) v. State of Pennsylvania Department of Environmental Protection (Appellee) and NRG Power Midwest (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-088-R.

122. Affidavit/Expert Report (August 2019) relating to the appeal of air permits issued to PTTGCA on behalf of Appellants in the matter of *Sierra Club (Appellants) v. Craig Butler, Director, et. al., Ohio EPA (Appellees)* before the State of Ohio Environmental Review Appeals Commission (ERAC), Case Nos. ERAC-19-6988 through -6991.

123. Expert Report (October 2019) relating to the appeal of air permit (Plan Approval) on behalf of Appellants in the matter of *Clean Air Council and Environmental Integrity Project (Appellants) v. Commonwealth of Pennsylvania Department of Environmental Protection and Sunoco Partners Marketing and Terminals L.P*., before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-057-L.

124. Expert Report (December 2019), Affidavit (March 2020), Supplemental Expert Report (July 2020), and Declaration (February 2021) on behalf of Earthjustice in the matter of *Objection to the Issuance of PSD/NSR and Title V permits for Riverview Energy Corporation*, Dale, Indiana, before the Indiana Office of Environmental Adjudication, Cause No. 19-A-J-5073.

125. Affidavit (December 2019) on behalf of Plaintiff-Intervenor (Surfrider Foundation) in the matter of *United States and the State of Indiana (Plaintiffs), Surfrider Foundation (Plaintiff-Intervenor), and City of Chicago (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant),* Civil Action No. 2:18-cv-00127 (US District Court for the Northern District of Indiana, Hammond Division).

126. Declarations (January 2020, February 2020, May 2020, July 2020, and August 2020) and Pre-filed Testimony (April 2021) in support of Petitioner's Motion for Stay of PSCAA NOC Order of Approval No. 11386 in the matter of the *Puyallup Tribe of Indians v. Puget Sound Clean Air Agency (PSCAA) and Puget Sound Energy (PSE),* before the State of Washington Pollution Control Hearings Board, PCHB No. P19-088.

127. Expert Report (April 2020) on behalf of the plaintiff in the matter of Orion Engineered Carbons, GmbH (Plaintiff) vs. Evonik Operations, GmbH (formerly Evonik Degussa GmbH) (Respondent), before the German Arbitration Institute, Case No. DIS-SV-2019-00216.

128. Expert Independent Evaluation Report (June 2020) for *PacifiCorp's Decommissioning Costs Study Reports dated January 15, 2020 and March 13, 2020 relating to the closures of the Hunter, Huntington, Dave Johnston, Jim Bridger, Naughton, Wyodak, Hayden, and Colstrip (Units 3&4) plants*, prepared for the Oregon Public Utility Commission (Oregon PUC).

129. Direct Pre-filed Testimony (July 2020) on behalf of the Sierra Club in the matter of *the Application of the Ohio State University for a certificate of Environmental Compatibility and Public Need to Construct a Combined Heat and Power Facility in Franklin County, Ohio*, before the Ohio Power Siting Board, Case No. 19-1641-EL-BGN.

130. Expert Report (August 2020) and Rebuttal Expert Report (September 2020) on behalf of WildEarth Guardians (petitioners) in the matter of *the Appeals of the Air Quality Permit No. 7482-M1 Issued to 3 Bear Delaware Operating – NM LLC (EIB No. 20-21(A) and Registrations Nos. 8729, 8730, and 8733 under General Construction Permit for Oil and Gas Facilities (EIB No. 20-33 (A)*, before the State of New Mexico, Environmental Improvement Board.

131. Expert Report (July 2020) on the *Initial Economic Impact Analysis (EIA) for A Proposal To* Regulate *NOx Emissions from Natural Gas Fired Rich-Burn Natural Gas Reciprocating Internal Combustion Engines (RICE) Greater Than 100 Horsepower* prepared on behalf of Earthjustice and the National Parks Conservation Association in the matter of Regulation Number 7, Alternate Rules before the Colorado Air Quality Control Commission.

132. Expert Report (August 2020) and Supplemental Expert Report (February 2021) on the Potential Remedies to Avoid Adverse Thermal Impacts from the Merrimack Station on behalf of Plaintiffs in the matter of *Sierra Club Inc. and the* Conservation *Law Foundation (Plaintiffs) v. Granite Shore Power, LLC et. al., (Defendants)*, Civil Action No. 19-cv-216-JL (US District Court for the District of New Hampshire.)

133. Expert Report (August 2020) and Supplemental Expert Report (December 2020) on behalf of Plaintiffs in the matter of *PennEnvironment Inc., and Clean Air Council (Plaintiffs) and Allegheny County Health Department (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant)*, Civil Action No. 2-19-cv-00484-MJH (US District Court for the Western District of Pennsylvania.)

134. Pre-filed Direct Testimony (October 2020) and Sur-rebuttal Testimony (November 2020) on behalf of petitioners (Ten Persons Group, including citizens, the Town of Braintree, the Town of Hingham, and the City of Quincy) in the matter of Algonquin Gas Transmission LLC, Weymouth MA, No. X266786 Air Quality Plan Approval, before the Commonwealth of Massachusetts, Department of Environmental Protection, the Office of Appeals and Dispute Resolution, OADR Docket Nos. 2019-008, 2019-009, 2019010, 2019-011, 2019-012 and 2019-013.

135. Expert Report (November 2020) on behalf of Protect PT in the matter of *Protect PT v. Commonwealth of Pennsylvania Department of Environmental Protection and Apex Energy (PA) LLC*, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2018-080-R (consolidated with 2019-101-R)(the "Drakulic Appeal").

136. Expert Report (December 2020) on behalf of Plaintiffs in the matter of *Sierra Club Inc. (Plaintiff) v. GenOn Power Midwest LP (Defendants)*, Civil Action No. 2-19-cv-01284-WSS (US District Court for the Western District of Pennsylvania.)

137. Pre-filed Testimony (January 2021) on behalf of the Plaintiffs (Shrimpers and Fishermen of the Rio Grande Valley represented by Texas RioGrande Legal Aid, Inc.) in the matter of the Appeal of Texas Commission on Environmental Quality (TCEQ) Permit Nos. 147681, PSDTX1522, GHGPSDTX172 for the Jupiter Brownsville Heavy Condensate Upgrader Facility, Cameron County, before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-21-0111, TCEQ Docket No. 2020-1080-AIR.

138. Expert Report (June 2021) and Declarations (May 2021 and June 2021) on behalf of Plaintiffs in the matter of *Sierra Club (Plaintiff) v. Woodville Pellets, LLC (Defendant)*, Civil Action No. 9:20-cv-00178-MJT (US District Court for the Eastern District of Texas, Lufkin Division.)

139. Declaration (July 2021) on behalf of Plaintiffs in the matter of *Stephanie Mackey and Nick Migliore, on behalf of themselves and all others similarly situated (Plaintiffs) v. Chemtool Inc. and Lubrizol Corporation (Defendants)*, Case No. 2021-L-0000165, State of Illinois, Circuit Court of the 17th Judicial Circuit, Winnebago County.

140. Expert Report (April 2021) and Sur-Rebuttal Report (June 2021) on behalf of the Plaintiffs in the matter of *Modern Holdings, LLC, et al. (Plaintiffs) v. Corning Inc., et al. (Defendants)*, Civil Action No. 5:13-cv-00405-GFVT, (US District Court for the Eastern District of Kentucky, Central Division at Lexington).

141. Expert Witness Disclosure (June 2021) on behalf of the Plaintiffs in the matter of *Jay Burdick, et. al., (Plaintiffs) v. Tanoga Inc. (d/b/a Taconic) (Defendant)*, Index No. 253835, (State of New York Supreme Court, County of Rensselaer).

142. Expert Report (June 2021) on behalf of Appellants in the matter of *PennEnvironment and Earthworks (Appellants) v. Commonwealth of Pennsylvania Department of Environmental Protection (Appellee) and MarkWest Liberty Midstream and resource, LLC (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2020-002-R.

143. Expert Reports (March 2021 and May 2021) regarding the Aries Newark LLC Sludge Processing Facility, Application No. CPB 20-74, Central Planning Board, City of Newark, New Jersey.

144. Expert Report (????, 2021) for A,Almanzar de la Cruz v. BP Exploration and Production Inc., et. al., Case No. 2:19-cv-00532.

145. Affidavit (May 2021) for D. Faerber in the matter of D. Faerber v. BP (????)

146. Expert Report (April 2021) for Charles Johnson Jr., v. BP Exploration and Production Inc., et. al., Civil Action No. 20-CV-01329.

147. Expert Report (April 2021) for Floyd Ruffin, v. BP Exploration and Production Inc., et. al., Civil Action No. 20-cv-00334-CJB-JCW (US District Court for the Eastern District of Louisiana).

148. Expert Report (May 2021) for *Clifford Osmer (Plaintiff) v. BP Exploration and Production Inc., et. al., (Defendants)* related to 12-968 BELO in MDL No. 2179, Civil Action No. 18-12557 (US District Court for the Eastern District of Louisiana),

149. Expert Report (June 2021) for Antonia Saavedra-Vargas v. BP Exploration and Production Inc., et. al., Civil Action No. 18-11461 (US District Court for the Eastern District of Louisiana)

150. Affidavit (June 2021) for Lourdes Rubi in the matter of *Lourdes Rubi (Plaintiff) v. BP Exploration and Production Inc., et. al., (Defendants)*, related to 12-968 BELO in MDL No. 2179 (US District Court for the Eastern District of Louisiana).

C. Occasions where Dr. Sahu has provided oral testimony <u>in depositions, at trial or in similar proceedings</u> include the following:

151. Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill.

152. Trial Testimony (February 2002) on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.

153. Trial Testimony (February 2003) on behalf of the United States in the Ohio Edison NSR Cases, *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).

154. Trial Testimony (June 2003) on behalf of the United States in the Illinois Power NSR Case, *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).

155. Deposition (10/20/2005) on behalf of the United States in connection with the Cinergy NSR Case. *United States, et* al. *v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (Southern District of Indiana).

156. Oral Testimony (August 2006) on behalf of the Appalachian Center for the Economy and the Environment re. the Western Greenbrier plant, WV before the West Virginia DEP.

157. Oral Testimony (May 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) re. the Thompson River Cogeneration plant before the Montana Board of Environmental Review.

158. Oral Testimony (October 2007) on behalf of the Sierra Club re. the Sevier Power Plant before the Utah Air Quality Board.

159. Oral Testimony (August 2008) on behalf of the Sierra Club and Clean Water re. Big Stone Unit II before the South Dakota Board of Minerals and the Environment.

160. Oral Testimony (February 2009) on behalf of the Sierra Club and the Southern Environmental Law Center re. Santee Cooper Pee Dee units before the South Carolina Board of Health and Environmental Control.

161. Oral Testimony (February 2009) on behalf of the Sierra Club and the Environmental Integrity Project re. NRG Limestone Unit 3 before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

162. Deposition (July 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al*.

163. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Coleto Creek coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

164. Deposition (October 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

165. Deposition (October 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

166. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Tenaska coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH). (April 2010).

167. Oral Testimony (November 2009) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

168. Deposition (December 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

169. Oral Testimony (February 2010) on behalf of the Environmental Defense Fund re. the White Stallion Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

170. Deposition (June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

171. Trial Testimony (September 2010) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, State of Maryland, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case in US District Court in the Western District of Pennsylvania. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

172. Oral Direct and Rebuttal Testimony (September 2010) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

173. Oral Testimony (September 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions,* No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

174. Oral Testimony (October 2010) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

175. Oral Testimony (November 2010) regarding BART for PSCo Hayden, CSU Martin Drake units before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

176. Oral Testimony (December 2010) regarding BART for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

177. Deposition (December 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

178. Deposition (February 2011 and January 2012) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (D. Colo.).

179. Oral Testimony (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

180. Deposition (August 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

181. Deposition (July 2011) and Oral Testimony at Hearing (February 2012) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of

Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

182. Oral Testimony at Hearing (March 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

183. Oral Testimony at Hearing (April 2012) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

184. Oral Testimony at Hearing (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

185. Deposition (March 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

186. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

187. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

188. Deposition (February 2014) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

189. Trial Testimony (February 2014) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.,* Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

190. Trial Testimony (February 2014) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

191. Deposition (June 2014) and Trial (August 2014) on behalf of ECM Biofilms in the matter of the *US Federal Trade Commission (FTC) v. ECM Biofilms* (FTC Docket #9358).

192. Deposition (February 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

193. Oral Testimony at Hearing (April 2015) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

194. Deposition (August 2015) on behalf of Plaintiff in the matter of *Conservation Law Foundation (Plaintiff) v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

195. Testimony at Hearing (August 2015) on behalf of the Sierra Club in the matter of *Amendments to 35 Illinois Administrative Code Parts 214, 217, and 225* before the Illinois Pollution Control Board, R15-21.

196. Deposition (May 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners*

LP (Defendants), Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

197. Trial Testimony (October 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

198. Deposition (April 2016) on behalf of the Plaintiffs in *UNatural Resources Defense Council, Respiratory Health Association, and Sierra Club (Plaintiffs) v. Illinois Power Resources LLC and Illinois Power Resources Generation LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (Central District of Illinois, Peoria Division).

199. Trial Testimony at Hearing (July 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

200. Trial Testimony (December 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

201. Trial Testimony (July-August 2016) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

202. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

203. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Backus Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

204. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Drakulic Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

205. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Deutsch Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

206. Deposition Testimony (July 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight v Coyote Creek Mining Company LLC (Defendant)* Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).

207. Deposition Testimony (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

208. Deposition Testimony (December 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).

209. Deposition Testimony (January 2018) in the matter of National Parks Conservation Association (NPCA) v. State of Washington Department of Ecology and British Petroleum (BP) before the Washington Pollution Control Hearing Board, Case No. 17-055.

210. Trial Testimony (January 2018) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

211. Trial Testimony (April 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington.

212. Deposition (June 2018) (harm Phase) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

213. Trial Testimony (July 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.

214. Deposition (January 2019) and Trial Testimony (January 2019) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).

215. Deposition (February 2019) and Trial Testimony (March 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.

216. Deposition (June 2019) relating to the appeal of air permits issued to PTTGCA on behalf of Appellants in the matter of *Sierra Club (Appellants) v. Craig Butler, Director, et. al., Ohio EPA (Appellees)* before the State of Ohio Environmental Review Appeals Commission (ERAC), Case Nos. ERAC-19-6988 through -6991.

217. Deposition (September 2019) on behalf of Appellants relating to the NPDES permit for the Cheswick power plant in the matter of *Three Rivers Waterkeeper and Sierra Club (Appellants) v. State of Pennsylvania Department of Environmental Protection (Appellee) and NRG Power Midwest (Permittee)*, before the Commonwealth of Pennsylvania Environmental Hearing Board, EHB Docket No. 2018-088-R.

218. Deposition (December 2019) on behalf of the Plaintiffs in the matter of David Kovac, individually and on behalf of wrongful death class of Irene Kovac v. BP Corporation North America Inc., Circuit Court of Jackson County, Missouri (Independence), Case No. 1816-CV12417.

219. Deposition (February 2020, virtual) and testimony at Hearing (August 2020, virtual) on behalf of Earthjustice in the matter of *Objection to the Issuance of PSD/NSR and Title V permits for Riverview Energy Corporation*, Dale, Indiana, before the Indiana Office of Environmental Adjudication, Cause No. 19-A-J-5073.

220. Hearing (July 14-15, 2020, virtual) on behalf of the Sierra Club in the matter of *the Application of the Ohio State University for a certificate of Environmental Compatibility and Public Need to Construct a Combined Heat and Power Facility in Franklin County, Ohio*, before the Ohio Power Siting Board, Case No. 19-1641-EL-BGN.

221. Hearing (September 2020, virtual) on behalf of WildEarth Guardians (petitioners) in the matter of *the Appeals of the Air Quality Permit No. 7482-M1 Issued to 3 Bear Delaware* Operating *– NM LLC (EIB No. 20-21(A) and Registrations Nos. 8729, 8730, and 8733 under General Construction Permit for Oil and Gas Facilities (EIB No. 20-33 (A)*, before the State of New Mexico, Environmental Improvement Board.

222. Deposition (December 2020, March 4-5, 2021, all virtual) and Hearing (April 2021, virtual) in support of Petitioner's Motion for Stay of PSCAA NOC Order of Approval No. 11386 in the matter of the *Puyallup Tribe of Indians v. Puget Sound Clean Air Agency (PSCAA) and Puget Sound Energy (PSE)*, before the State of Washington Pollution Control Hearings Board, PCHB No. P19-088.

223. Hearing (September 2020, virtual) on the *Initial Economic Impact Analysis (EIA) for A Proposal To* Regulate *NOx Emissions from Natural Gas Fired Rich-Burn Natural Gas Reciprocating Internal Combustion Engines (RICE) Greater Than 100 Horsepower* prepared on behalf of Earthjustice and the National Parks Conservation Association in the matter of Regulation Number 7, Alternate Rules before the Colorado Air Quality Control Commission.

224. Deposition (December 2020, virtual and Hearing February 2021, virtual) on behalf of the Plaintiffs (Shrimpers and Fishermen of the Rio Grande Valley represented by Texas RioGrande Legal Aid, Inc.) in the

matter of the Appeal of Texas Commission on Environmental Quality (TCEQ) Permit Nos. 147681, PSDTX1522, GHGPSDTX172 for the Jupiter Brownsville Heavy Condensate Upgrader Facility, Cameron County, before the Texas State Office of Administrative Hearings, SOAH Docket No. 582-21-0111, TCEQ Docket No. 2020-1080-AIR.

225. Deposition (January 2021, virtual) on behalf of Plaintiffs in the matter of *PennEnvironment Inc., and Clean Air Council (Plaintiffs) and Allegheny County Health Department (Plaintiff-Intervenor) v. United States Steel Corporation (Defendant),* Civil Action No. 2-19-cv-00484-MJH (US District Court for the Western District of Pennsylvania.)

226. Deposition (February 2021, virtual) on behalf of Plaintiffs in the matter of *Sierra Club Inc. (Plaintiff) v. GenOn Power Midwest LP (*Defendants*)*, Civil Action No. 2-19-cv-01284-WSS (US District Court for the Western District of Pennsylvania.)

227. Deposition (April 2021, virtual) on the Potential Remedies to Avoid Adverse Thermal Impacts from the Merrimack Station on behalf of Plaintiffs in the matter of *Sierra Club Inc. and the* Conservation *Law Foundation (Plaintiffs) v. Granite Shore Power, LLC et. al., (Defendants),* Civil Action No. 19-cv-216-JL (US District Court for the District of New Hampshire.)

228. Deposition (June 2021, virtual) on behalf of Plaintiffs in the matter of *Sierra Club (Plaintiff) v. Woodville Pellets, LLC (Defendant),* Civil Action No. 9:20-cv-00178-MJT (US District Court for the Eastern District of Texas, Lufkin Division).

229. Deposition (June 2021, virtual) on behalf of the Plaintiffs in the matter of *Modern Holdings, LLC, et al. (Plaintiffs) v. Corning Inc., et al. (Defendants),* Civil Action No. 5:13-cv-00405-GFVT, (US District Court for the Eastern District of Kentucky, Central Division at Lexington).

230. Testimony (June 2021, virtual) regarding the Aries Newark LLC Sludge Processing Facility, Application No. CPB 20-74, Central Planning Board, City of Newark, New Jersey.

Attachment B – EPA Enforcement Alert

EPA United States Environmental Protection Agency
Office of Enforcement and Compliance Assurance

Enforcement Alert

Publication no. EPA 325-N-20-001 November 2020

EPA Reminder About Inappropriate Use of AP-42 Emission Factors

Purpose

This purpose of this Enforcement Alert is to remind permitting agencies, consultants, and regulated entities that improperly using AP-42 emission factors can be costly to their businesses, inefficient, and in some circumstances, can subject regulated entities to enforcement and penalties. The Environmental Protection Agency (EPA) is concerned that some permitting agencies, consultants, and regulated entities may incorrectly be using AP-42 emission factors in place of more representative source-specific emission values for Clean Air Act permitting and compliance demonstration purposes.

Consequences of Using AP-42 Factors

Permitting agencies, consultants, and regulated entities should be aware that even emission factors with more highly rated AP-42 grades of "A" or "B" are only based on averages of data from multiple, albeit similar, sources (*See* the Attachment for an overview of the history of AP-42 emission factors and the AP-42 emission factor rating system). Accordingly, these factors are not likely to be accurate predictors of emissions from any one specific source, except in very limited scenarios. While emission factors are helpful in making emission estimates for area-wide inventories for specific source types, AP-42 provides the following warning:

> "Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor. As such, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance."[1]

With the advent of 1-hour and short-term National Ambient Air Quality Standards (NAAQS), permit limits must be able to account for short term fluctuations. AP-42 emission factors also do not account for short term variation in emissions as the emission factors are intended for use in developing area-wide annual or triannual inventories. In developing emission factors, test data are typically taken from normal operating conditions and generally avoid conditions that can cause short-term fluctuations in emissions. These short-term fluctuations in emissions can stem from variations in process conditions, control device conditions, raw materials, ambient conditions, or other similar factors. This means that if facilities use AP-42 emission factors as permit limits, facilities increase their chances of violating their short-term permit limits. It also increases the likelihood of a geographic area's non-compliance with the NAAQS.

DISCLAIMER: This document aims to explain the application of certain EPA regulatory provisions using plain language. Nothing in this Alert revises or replaces any regulatory provisions, any other part of the Code of Federal Regulations, the Federal Register, or the Clean Air Act. Following the approaches for determining a single storage vessel's potential for VOC emissions and attempting to comply with the closed vent system requirements as discussed in this Alert do not equate to or guarantee compliance with the Clean Air Act, its implementing regulations, and associated state/local requirements. For more information, visit: www.epa.gov/compliance.

[1] AP-42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources. Introduction, p. 2 (emphasis added).

It is also important to understand that there is a great deal of variability in the emissions data that are used to generate the emission factors. This variability is not necessarily reflected in the emission factor. AP-42 describes this as follows:

> "The extent of between-source variability that exists, even among similar individual sources, can be large depending on process, control system, and pollutant. Although the causes of this variability are considered in emission factor development, this type of information is seldom included in emission test reports used to develop AP-42 factors. As a result, some emission factors are derived from tests that may vary by an order of magnitude or more. Even when the major process variables are accounted for, the emission factors developed may be the result of averaging source tests that differ by factors of five or more."[2]

In addition to potential permit noncompliance, or increased risk of area noncompliance with the NAAQS, using an emission factor as an emission limit could have monetary implications for an individual source or permitting agency. For example, many permitting agencies collect permitting fees based on the amount of pollution emitted. If a facility uses an emission factor to estimate and report emissions, but the actual emission rate is lower than the emission factor, then the facility will report more emissions and consequently pay more in fees. On the other hand, if a facility emits at a rate above the emission factor, not only is the source violating its permit limit and the Clean Air Act, it is also not paying the appropriate amount in fees.

Another potential monetary implication for facilities is an enforcement action assessing penalties for violating the Clean Air Act. As described in a 2006 report issued by the EPA Inspector General:

> "…according to EPA enforcement records, three industries – petroleum refineries, wood products, and ethanol production – operated with insufficient control equipment primarily because emission limits were significantly underestimated due to the emission factors used. EPA, through separate enforcement actions, required companies in these industries to install additional emission controls, resulting in the combined reduction of over 1,000,000 tons of pollutants."[3]

For example, the EPA Inspector General's 2006 report documented an EPA investigation in the Wood Products industry that found a nationwide pattern of Clean Air Act violations by one company. EPA found that the company had used an AP-42 emission factor designated as "poor" for volatile organic compound (VOC) emissions that resulted in the company underestimating such emissions and claiming that its facilities were not subject to permitting requirements. To resolve the violations, the company entered into a consent decree with the United States, which required the company to pay a civil penalty of $1.1 million and to install air pollution control equipment at a cost of $70 million.[4]

One example of a present-day concern is the use of a default vapor pressure value for estimating VOC emissions from heated tanks that store heavy refinery liquids such as No. 6 fuel oil. The true vapor pressure (TVP) of a stored liquid is important when calculating the emissions from tanks using the equations in AP-42, Chapter 7, Liquid Storage Tanks. The default vapor pressure is only an estimate and may not be correct for every blend of No. 6 fuel oil. Direct emissions testing of No. 6 fuel oil tanks and TVP testing in 2012 and 2013, suggested that in those cases the use of the default vapor pressure in AP-42 had resulted in emissions estimates that were understated by a factor of 100 for permitting and reporting purposes. Reliance on the default vapor pressure in AP-42 and the resulting emission factors, instead of directly measuring VOC emissions and vapor pressure, can be very costly for businesses as shown by two recently concluded cases, summarized in the following two boxes.

[2] AP-42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources. Introduction, p. 3 (emphasis added).

[3] U.S. EPA Office of Inspector General, *EPA Can Improve Emissions Factors Development and Management*, Report No. 2006-P-00017, March 22, 2006.

[4] Id.

Sprague Resources LP operates heated asphalt and No. 6 fuel oil storage tanks at seven facilities across New England. Applying VOC testing results rather than AP-42 estimates, EPA found that Sprague had unpermitted facilities that required permits, and also had facilities with permits that failed to fully account for VOC emissions. Sprague entered into a settlement with the United States and the Commonwealth of Massachusetts that required the company to pay $350,000 civil penalties, obtain revised state air pollution control permits, limit the amount of asphalt and No. 6 fuel oil stored in and passed through the tanks at six facilities, and provide odor controls on tanks at two facilities.

Global Partners LP operates heated asphalt and No. 6 fuel oil storage tanks at a facility in South Portland, Maine. Applying VOC testing results rather than AP-42 estimates, EPA found that Global's permit failed to fully account for VOC emissions. Global entered into a settlement with the United States that required the company to obtain a revised state air pollution control permit, limit the amount of asphalt and No. 6 fuel oil stored in and passed through the tanks at the facility, install odor controls on tanks, pay a $40,000 penalty, and invest $150,000 in a local wood-stove replacement project.

Regulated entities of any size who voluntarily discover, promptly disclose, expeditiously correct, and take steps to prevent recurrence of potential violations may be eligible for a reduction or elimination of any civil penalties that otherwise might apply. Most violations can be disclosed and processed via EPA's automated online "eDisclosure" system (seehttps://www.epa.gov/compliance/epas-edisclosure). To learn more about the EPA's violation disclosure policies, including conditions for eligibility, please review EPA's Audit Policy website at https://www.epa.gov/compliance/epas-audit-policy. Many states also offer incentives for self-policing; please check with the appropriate state agency for more information.

What Can Be Done?

Consultants and facility owners/operators should obtain and use the most representative emissions data, which in many cases may be source-specific emissions data, when determining applicability, applying for a permit, or demonstrating compliance with permit limits.

Various EPA publications (e.g., https://www.epa.gov/emc) describe the benefits and limitations of different ways to quantify source-specific emissions. These techniques in order of accuracy are:

- **Continuous Emissions Monitoring System (CEMS)** – CEMs offers a highly accurate source-specific method that continuously monitors the emissions coming out of a particular stack; however, although the accuracy of this method is high, the cost is also the highest at $20,000-$50,000 per year.
- **Stack Testing** – Like a CEMS, source-specific data are generated at a particular stack but emissions are only measured for a specific time, typically for a few hours during normal operations. Costs for stack testing typically run $20,000, but testing may only be necessary every 2 to 5 years.
- **Vendor Guarantees and Stack Test Data from Similar Facilities** – If representative source-specific data cannot be obtained, emissions information from equipment vendors, particularly emission performance guarantees or actual test data from similar equipment, is a better source of information for permitting decisions than an AP-42 emission factor.
- **Material Balance Calculations** – While the material balance calculations are not generally considered as accurate as direct measurements, they may provide more reliable average emission estimates for certain sources where a high percentage of material is lost to the atmosphere (e.g., solvent VOC emissions). The costs for recordkeeping are approximately $2,000-$10,000 per year. This method works well for materials and processes that are well understood.
- **Optical Remote Sensing** – Measurement techniques involving differential absorption light detection and ranging (known as DIAL) and solar occultation flux or SOF can be used to measure emissions from sources such as coke ovens, storage tanks, wastewater treatment plants, and process units that are otherwise difficult to measure by other means. Measurement bias on the order of ±30 percent is expected but the data can be more accurate than engineering estimates or emission factors.
- **Emission Factors** – When source-specific emissions or other more reliable approaches are unavailable, AP-42 emission factors may be the only way to estimate emissions. Again, the limitations of the factor in accurately representing the facility's emissions and the environmental/financial risk of using the emission factor for a particular situation should be carefully considered. **Remember, AP-42 emission factors should only be used as a last resort. Even then the facility assumes all risk associated with their use!**

Attachment – History of AP-42

Before the EPA existed, the U.S. Public Health Service (PHS) published "A Compilation of Air Pollutant Emission Factors" in 1968.* The purpose of the report was to assist the various agencies responsible for compiling air pollution emission inventories for communities across the nation by providing them with relevant data. PHS recognized that measuring each individual source of air pollution in a particular airshed was impractical, and so, to simplify the airshed emission inventory process, while still maintaining a reasonably accurate inventory, PHS developed emission factors based on the technical literature and a limited number of source-specific tests. The resulting emission factors were simple averages of the rate at which pollutants were emitted from the burning or processing of a given quantity of material. In some cases, emission factors were based on only one or two data points.

* The PHS assigned the number 999-AP-42 to this publication. 999 was the series number, AP was an abbreviation for air pollution, and 42 was the document number. Thus, the origin of today's AP-42!

With the creation of the EPA, publication of the emission factors was continued with "Compilation of Air Pollutant Emission Factors, Second Edition," by the EPA Office of Air Quality Planning and Standards in 1973. The 3rd and 4th editions of AP-42 were released in 1977 and 1985. EPA published the most recent AP-42, the 5th edition in 1995[5], and has published multiple supplements and updates since. Currently, AP-42 contains more than 21,500 emission factors for over 200 air pollutants. Within AP-42, each emission factor is given a rating between "A" (excellent) and "E" (poor) (see Table 1 below). It is important to note that half of the emission factors are rated "D" or "E" and one-fifth are unrated. This means that less than one-third of the emission factors are rated between "Excellent" and "Average."

As we work to improve our ability to estimate emissions nationally, the grading in AP-42 helps us better understand the quality of the data. But even factors that are rated "A" or "B" are not designed to be used by a single source where other, more reliable, site-specific, data are available.

Table 1: Explanation of AP-42 Emission Factor Quality Ratings

Rating	Explanation
"A" – Excellent	Emission factor is developed from tests conducted with sound, or generally sound, methodology. Test data are from many randomly chosen facilities and the source category population is sufficiently specific to minimize variability. Data may, or may not, be reported in enough detail for adequate validation.
"B" – Above Average	Same as "A," but test data are from a "reasonable number" of facilities. Although no specific bias is evident, it's not clear if the facilities represent a random sample of the industry. The source category population is sufficiently specific to minimize variability.
"C" – Average	Same as "B," but the factor can be developed from an unproven or new methodology. Test data may be lacking a significant amount of background information. Although no specific bias is evident, it's not clear if the facilities tested represent a random sample of the industry. The source category population is specific enough to minimize variability.
"D" – Below Average	Same as "C," but test data are from a small number of facilities, and there may be reason to suspect the facilities do not represent a random sample of the industry. There may also be evidence of variability within the source population.
"E" – Poor	Factor is developed from: (1) tests based on an unproven or new methodology, or tests that may be lacking a significant amount of background information, or (2) tests based on a generally unacceptable method, but the method may provide an "order of magnitude" value for the source. Facilities tested may not represent a random sample of the industry and there is evidence of variability within the source category population.

[5] AP-42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources. Introduction, pp. 9-10.

Attachment C – Transcript of November 21, 2019 Hearing Transcript in Texas LNG Brownsville Matter

SOAH DOCKET NO. 582-19-6261
TCEQ DOCKET NO. 2019-0624-AIR

TEXAS LNG BROWNSVILLE, LLC	*	STATE OFFICE OF
	*	
PROPOSED PERMIT NO. 139561	*	ADMINISTRATIVE HEARINGS

****

HEARING PROCEEDINGS

VOLUME II of II

NOVEMBER 21, 2019

****

BE IT REMEMBERED that on this 21st day of November, 2019, from 9:02 a.m. to 2:58 p.m., the above-entitled matter came on for hearing at the State Office of Administrative Hearings, 300 West 15th Street, Fourth Floor, Austin, Texas, 78701, before the Honorable Rudy Calderon and the Honorable Pratibha Shenoy; and the following proceedings were reported by Debbie D. Cunningham, Certified Shorthand Reporter.

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(Thursday, November 21, 2019 9:02 a.m.)

P R O C E E D I N G S

ALJ CALDERON: It is approximately 9:00 o'clock. It is November 21st, 2019; and we're going back on the record on Docket Number 582-19-6261, Texas LNG Brownsville for the issuance of Air Quality Permit Number 139561.

We left off yesterday in between Cross-Examination of Dr. Gautam.

Dr. Gautam, please come back to the stand. And, Doctor, you are still under oath. So I just wanted to remind you of that.

And we are now to Vecinos' Cross.

Ms. Samson.

CROSS-EXAMINATION

BY MS. SAMSON:

Q. Dr. Gautam, my name's Hannah Samson; and I think we met at your deposition. I'm an attorney for Vecinos Para El Bienestar De La Coumunidad Costera.

I want to look at your -- talk about your background for a little bit.

A. Okay.

Q. You've been at TCEQ for three years, correct?

A. Yeah, a little over three years.

Q. A little over three years. And the time

you've been at TCEQ is the amount of time that you've been working on air quality issues?

A. I was with air permitting all the time.

Q. But prior to your time at TCEQ, you weren't working on air quality issues?

A. I was not working on air quality issues, that's correct, in terms of, like, I was not working for any agencies or for any industry; but, like, my background is in environmental science. And I have done, like, a fair amount of, like, studies on air quality. So, like, in terms of personal background, I do have background on air quality.

Q. Okay. Prior to your time at TCEQ, you were working as a lab chemist in Houston --

A. Yes.

Q. -- right?

And I'm looking at Executive Director's Exhibit 2, which is your CV. Do you have that exhibit in front of you?

A. Yes, I do.

Q. Okay. So prior to being at TCEQ, you were at A&B Environmental Laboratory in Houston; and your CV states that you performed chemical analysis of environmental samples, water, soil, and mixtures, correct?

A. Yes.

Q. So that was not work on air quality issues?

A. That was primary on looking at organic compounds on water and soil and mixes.

Q. Okay. So not air quality issues?

A. I mean, not directly related to air quality.

Q. Okay. And then prior to that, you were a graduate research assistant in South Dakota, correct?

A. Yes.

Q. And there, you were looking at coastal wetlands of North America, correct?

A. Yes.

Q. So that was also not primarily focused on air quality --

A. I mean --

Q. -- issues?

A. -- it was kind of. Like, not primarily focused but, like, a part of it was focused on the air quality because I was looking at what happens to methane, what happens to carbon dioxide that are emitted from the soil and how it goes into the atmosphere. So, I mean, we can list that as looking at air quality in that sense; but, like, it was not something that I do.

Q. Was it only looking at carbon dioxide and methane --

A. No.

Q. -- being released into the air?

A. No. There were, like, some other things. Like, I was looking at the soil; but it was not just carbon dioxide and methane.

Q. But it was primarily methane and carbon dioxide --

A. Yes.

Q. -- as it relates to air quality issues?

A. Yes.

Q. Okay. And then, before that, you were at Virginia Tech looking at surface and groundwater interaction; is that correct?

A. Yes.

Q. Okay. And, again, that's not primarily --

A. No.

Q. -- an air quality issue?

A. No.

Q. Okay. So I'll turn back to your time at TCEQ. You had just switched to a new division when you were assigned to the Texas LNG permit application?

A. I was switched to a new section, but not a new division.

Q. So it was all in the Air Permits Division --

A. Yes.

Q. -- but it was a new section of the Air Permits Division?

A. Yes.

Q. Okay. And your first assignment in that new section was drafting the response to comments for the Texas LNG?

A. I mean, that was not the first assignment. That was one of the assignments that I was given when I was transferred to that section, but I don’t exactly remember which one was the first one for me.

Q. Sure. But the first assignment that you had pertaining to the Texas LNG permit was responding to comments?

A. Yeah, because that project was in the middle of responding to comments.

Q. Okay. And at that point the technical review had already been completed?

A. Yes.

Q. And the draft permit for Texas LNG was already issued?

A. Yes.

Q. And prior to you being assigned to the Texas LNG permit application, there were two other permit reviewers assigned to the application?

A. Yes, correct.

Q. And the first was Joel Lunsford?

A. Yes.

Q. And then the second was Sean O'Brien?

A. Yes.

Q. Do you have a sense of which tasks were completed by Joel Lunsford versus which tasks were completed by Sean O'Brien?

A. I mean, those tasks to the issuance of that permit was completed by Joel Lunsford. And maybe Mr. Sean O'Brien was working on response to comments, but I don't have any definite knowledge of that.

Q. So that's your best guess, but you're not actually sure which air permit reviewer did which tasks?

A. I mean, regarding Mr. Joel Lunsford, it's not my best guess because, I mean, he was the permit reviewer at that time; and he issued that permit. But it is just my guess that Mr. Sean O'Brien was working on response to comments.

Q. Okay. So you definitely know that Joel Lunsford was there up until the draft was issued, but you're not exactly sure after that point when the switch was made?

A. Yes.

Q. Okay. So I understand that Sean O'Brien, unfortunately, passed away. So his departure from TCEQ

was not planned in any sense, correct?

A. That's correct.

Q. But Joel Lunsford did choose to leave TCEQ; or he left under, you know, a planned departure?

A. I don't know why he left, how he left.

Q. You have no knowledge as to how he left?

A. I have no knowledge.

Q. Was there anything in the file for Texas LNG that was kept at TCEQ that was kind of a checklist of what Joel Lunsford had done on the Texas LNG permit application?

A. I did not find a checklist.

Q. Okay. Did you find, like, a transfer memo outlining what he had done to investigate the Texas LNG permit application?

A. I did not find that in the file I was given.

Q. Did you find that anywhere in what you were given when you started this task at TCEQ?

A. Some kind of memo?

Q. Anything that would identify exactly the steps that Joel Lunsford took in looking over the Texas LNG permit application.

A. I mean, other than that Technical Review Summary and MAERT table, I don't have anything.

Q. So is your testimony that you're giving in

this case primarily based on that Technical Review Summary?

A. And, I mean, when I was assigned this project, I also did some review of the application; and now I'm familiar with the application as well. So I know, like, if calculations were done properly or not and that kind of thing.

Q. So you went through and you recalculated some of the calculations in the permit application?

A. I spot-checked some of them.

Q. You spot-checked some, but not all?

A. Not all. And, I mean, all the calculations should be done by the Applicant; and as a permit reviewer, I mean, if we want, we check that result. But, I mean, depending on the permit reviewer, some may do all the calculations; some may just spot-check.

Q. It's not a guarantee that a permit reviewer at TCEQ is going to thoroughly recheck the calculations in an Applicant's permit to TCEQ? That is up to the air permit reviewer if they decide to check a calculation?

A. Normally, I mean, the best practices, I mean, we do check calculations; but we don't do all the calculations.

Q. So how do you decide which calculations to go and rerun?

A. I mean, we do look at -- normally Applicants would give us their Excel spreadsheets, like, that they used for calculations. And so it's easy for us to, I mean, just go through and review if everything was done correctly or not. And then we just make sure that emission calculations were done correctly. And that's how, like, we follow.

Q. And yesterday you said that as far as cost calculations, an air permit reviewer does not tend to recheck the cost calculations?

A. We do, I mean, look at what was given by the Applicant; but we just don't derive our own cost calculations. I mean, I don't know, like, how that is done because I've never done that.

Q. You've never done a cost calculation?

A. I have never done a cost calculation.

Q. Have you ever -- and so you've never rechecked the cost calculations presented by an Applicant?

A. So for permits I have been -- so far I've not had an opportunity to go through cost calculations.

Q. Okay.

MS. SAMSON: And, Dr. Gautam, I'm just going to make a small comment for the court reporter. I think it's hard if we're talking over each other. So I'll try to wait for you to finish; and if you will just

wait for me to finish my question, it will just make it a little easier.

THE WITNESS: Okay.

Q. (BY MS. SAMSON) So you're not exactly sure what Joel Lunsford did before leaving TCEQ on the Texas LNG permit application --

A. So, I mean --

Q. -- except for what's in the Technical Review Summary?

A. So, I mean, all permit reviewers, I mean, we are trained. We go to that particular section, and we follow some standard processes. And if we follow all the standard processes and practices, I mean, we would do a thorough review of the application. And, I guess, like, I mean, that's the standard practice, like, every permit reviewer would follow; and Mr. Lunsford must have followed that standard practice.

Q. So the standard practice is to do a thorough review; but a thorough review only means spot-checking some of the calculations done by the Applicant?

A. I mean, we just want to make sure that all the rules are met and correct and applied and then, I mean, make sure it's acceptable.

Q. So my question was that doing a thorough review of the application only means spot-checking some

of the calculations? That's how you're trained by TCEQ, that you only have to spot-check?

A. No, I mean, I did not say that is how we are trained by TCEQ. It depends on the permit reviewer. Some permit reviewers will do all the calculations, and sometimes just do the spot-check if they have confidence on the application.

Q. What would the confidence of the application be based on?

A. I mean, if, when they are checking, they don't find any error.

Q. Do you know if Joel Lunsford reviewed the FERC application?

A. Maybe. FERC application, I don't know. I mean, I have no knowledge of that.

Q. Would it be common for a TCEQ air permit reviewer to review a federal agency application in the state permitting process?

A. No.

Q. So if he had reviewed it, that would have been an uncommon step to take in the permit review?

A. Yes. Maybe they can review for their knowledge, but that's not a part of the air permitting process.

Q. And did you review any part of the FERC

application submitted by Texas LNG regarding this facility?

A. I did not.

Q. You did not.

Okay. I'm going to turn back to the heaters. So we've been looking at the matrices, the BACT tables, APDG-6497. And the copy that's already in the record is Texas LNG's Exhibit 8. Do you have that in front of you, Dr. Gautam? If not, I'll bring you a copy.

A. Yes, I do.

Q. So I'm told it's the smaller copy; but, I mean, I can read the smaller copy. Do you need the larger copy of it? It's okay if it's "yes." I can bring you the other.

A. Maybe I can read it, but it is really small.

Q. Okay. Let me bring you the larger copy. So we're looking at the heaters, which we know from previous testimony is line 33 in the tables; and the specifics are on page...

MS. SAMSON: I'm sorry, your Honor. May I approach the witness?

ALJ SHENOY: Yes.

Q. (BY MS. SAMSON) So for the heaters on line 33 -- and we're on page 39 in the NOx box -- and

that says that NOx for a heater is supposed to be -- the proposed emission rate is supposed to be specified; and the Applicant is supposed to provide justification if the NOx is more than 0.01 pounds per MMBTU, correct?

A. That is what's in here.

Q. That's what's in the BACT table. And the Texas LNG facility is going to use heaters that emit NOx at a rate 0.024 pounds per MMBTU?

A. That's correct.

Q. Okay. So as part of your testimony, you provided the technical review, which is ED's Exhibit 14. And I'd like to turn to page 5 of that exhibit. And in the middle of that page is a section on heat transfer fluid heaters. Let me know when you've made it there, Dr. Gautam.

A. ED Exhibit Number 14?

Q. ED Exhibit Number 14, and we're on page 5 of that exhibit.

A. Yes, I am there.

MS. SAMSON: Okay. And just for the record, it also was produced in Tab C of the admin record as Bates Numbers 24 through 31.

Q. (BY MS. SAMSON) So on page 5 of Exhibit 14, it states -- I'm starting at the third sentence in that paragraph -- "However, top-tier BACT requires an

emission rate of 0.01 pounds per MMBTU," correct?

A. Yes.

Q. And you stated that this technical review was written by Joel Lunsford?

A. Yes.

Q. What is top-tier BACT?

A. It is a TCEQ BACT standard, like, where BACT is based on similar industry and similar processes but also technical feasibility and economic reasonableness.

Q. So then the paragraph continues, "An economic evaluation indicated that adding an SCR would not be economically reasonable and would create additional emissions for other pollution without reducing an appreciable amount of NOx," correct?

A. Yes.

Q. And so then the conclusion is, "Therefore, the use of ultra-low NOx burners is considered BACT," correct?

A. Yes.

Q. Okay. Are you aware that the Freeport LNG terminal has heaters using ultra-low NOx burners only, without SCR, at a NOx emission -- with a NOx emission limit of .006 pounds per MMBTU?

A. You know, like, what was the size of the heater?

Q. You don't know what the size of the heater was?

A. No, I don't know the size of the heater.

Q. But do you know that the NOx emission limit is .006 pounds per MMBTU?

A. I don't know that.

Q. Do you know that Freeport went through their application process and completed it in 2014?

A. Yes, but Freeport has, like, nonattainment permit; and they have to meet LAER. And they were maybe not emitting for NOx; and that's why they used .006, to meet the LAER.

Q. But did you review or did anyone at TCEQ turn to review the heaters used at Freeport LNG?

A. I mean, if that Freeport LNG application was already in-house or it was already issued, it is, like, standard practice to review.

Q. So does that mean that someone at TCEQ actually looked at cost calculations for Freeport LNG to see if that would be economically unreasonable for use at Texas LNG?

A. I don't know that.

Q. Is there anything in the record at TCEQ that shows that there was a cost calculation done or anything referencing the economic reasonableness of the Freeport

LNG heaters?

A. I don't know because I have not reviewed that application.

Q. Was there anything in the permit review file kept on Texas LNG that referenced economic reasonableness of the Freeport heaters?

A. I did not find anything like that.

Q. Are you also aware that the RG LNG's proposed heaters for its facility was ultra-low NOx burners only at a NOx emissions rate of .015 pounds per MMBTU?

A. Yes.

Q. And the RG LNG facility is going to be right next door -- is proposed to be right next door to the Texas LNG facility?

A. Yes, that is correct.

Q. So that is in an attainment area?

A. It is an attainment area.

Q. And it's not subject to LAER analysis?

A. But that is a major source, though.

Q. But the BACT analysis, you've already testified, is supposed to be the same methodology regardless of whether it's a minor or major source?

A. It should be.

Q. So did anyone at TCEQ evaluate whether there were other ultra-low NOx burners demonstrated in

practice that could get the NOx submissions down at Texas LNG below .024 pounds per MMBTU?

A. I don’t have that knowledge.

Q. Did you see anything in the record that indicated that that was part of the review process of Texas LNG?

A. I mean, besides that SCR economic analysis and accompanied in the application mentioning they did, I mean, look at RBLC. That was what was mentioned in the application.

Q. But there was -- no one did anything at TCEQ to examine cost calculations of other ultra-low NOx burners?

A. I’m not aware of that; but, I mean, I happened to go through and see the calculations provided by the company. And, I mean, there was some kind of mentioning about ultra-low NOx burner; but, I mean, I don’t know, like, if other permit reviewers, if they did that.

Q. If they looked at that cost calculation -- you don’t know if the other permit reviewers looked at that cost calculation?

A. I mean, it was e-mailed to Mr. Joel Lunsford. So he must have, but I don’t have knowledge of that.

Q. But you don’t see any notes on cost calculation, and that cost calculation isn’t mentioned

in the technical review?

A. It is not mentioned in the technical review.

Q. Is there a bright-line rule at TCEQ for the value per ton of NOx removed, as we're looking at what technology is economically feasible?

A. So most of the time it is based on previously issued permits. If other applicants or if other companies can do it, then, I mean, it is our intention that the next permit applicant should be able to do it.

Q. So the permit reviewers at TCEQ are supposed to have an idea of the previous cost calculations done at previously permitted facilities?

A. Not for all. If it was a Tier III analysis, then they have to be aware of, but not for Tier I and II.

Q. So, for example, in this case, SCR was determined not to be economically feasible?

A. Yes.

Q. And the cost calculations in the record indicate that it was $93,200 per ton of NOx removed?

A. That's correct.

Q. There's no rule that states the level that the cost amount that's considered to be economically feasible?

A. I mean, I don't have any dollar amount; but, I

mean, for the size of the heater that Texas LNG has, 79.5 MMBTU heater, and is considered a small heater. So adding, like, control for that size of heater, I mean, it won't make economic sense based on what we have seen around TCEQ. If the heater was, like, let's say, about 300 MMBTU per hour, then it would make more economic sense to add.

Q. So, Dr. Gautam, I'm trying to understand why other ultra-low NOx burners for the heater weren't considered. So my question is: SCR was determined not to be economically reasonable. But if there were other ultra-low NOx burners out there which could lower the NOx emission rates -- and we've identified a few -- that your response was that at Freeport, it's in a nonattainment area. LAER analysis applies. And that LAER analysis indicates a different cost cut-off than that, correct?

A. For the LAER we don't look at economics.

Q. Price is no issue?

A. Regardless of the cost, they have to install that particular control device.

Q. And that is the distinction that TCEQ is making between the Freeport LNG and Texas LNG, correct, in terms of the heaters, that there's no cost limit?

A. We need to look at the size of the heater as

well. I mean, how big was the size of the heater at Freeport LNG? Texas LNG's heater size is 79.5 MMBTU per hour, and was the size of the Freeport heater 79.5 MMBTU per hour? I don't know that.

Q. Okay. But there's nothing in the record for Texas LNG that explains that a comparison was made to the heaters at Freeport LNG?

A. I did not find that in the application.

Q. And the same for Rio Grande LNG?

A. I guess Rio Grande permit was not issued, so I don't know.

Q. But there's nothing that says it was reviewed?

A. I did not find that in the application.

Q. Okay. So do you have the admin record in front of you, Dr. Gautam?

A. Yes, I do.

Q. Okay. So if we look at --

MS. REDDING: Hannah, just so you know, I don't know that that's the whole thing.

MS. SAMSON: Okay. It's Tab C.

MS. REDDING: Do you have the Bates number?

MS. SAMSON: Yes. It's going to be Bates Number 650 in the admin record.

MS. REDDING: Hannah, what was the number

again?

MS. SAMSON: It's 650.

THE WITNESS: 615?

MS. SAMSON: 6-5-0. Sorry. It should be Table D2.

THE WITNESS: This is 650.

Q. (BY MS. SAMSON) Okay. So this is the Table D2 of the cost calculations for Selective Catalytic Reduction controls for the heaters at Texas LNG, correct?

A. Correct.

Q. Okay. And you've stated that permit reviewers don't normally go back through the cost calculations?

A. I've never been through, like, any permit application that had to go through cost calculations. So I don't know what exactly the process would be; and if I get some application that has cost control, I mean, I would bring that to, like, our management. And I would get the values on that, so.

Q. So in the case of Texas LNG permit application, were the cost calculations brought to a manager to review?

A. I don't know that.

Q. Is there anything in the record that indicates that they were brought to a manager to review?

A. I did not find that.

Q. So if you're looking at this table, do you have an understanding of what the input numbers are? Like, if we're looking at this top number, which is the NOx submission before control --

A. Yes.

Q. -- do you understand what that 0.024 number is supposed to come from?

A. That's the BACT, like, low-NOx burner. That's for that.

Q. So that is the emissions rate for the heater that's in the Texas LNG application?

A. Yes.

Q. But if this were a blank table and the top number needed to be inputted, do you know where that number is actually supposed to come from?

A. It has to come from...

Q. It's supposed to be an uncontrolled emission source, correct?

A. It says before controlled, so it has to be uncontrolled.

Q. And we know from the Texas LNG permit that 0.024 pounds per MMBTU is not an uncontrolled emission source because the Texas LNG heater uses ultra-low NOx burners?

A. So the heater is already equipped with ultra-low NOx burner, that's why. I mean, it's already controlled.

Q. It is already controlled? It's not an uncontrolled emission source?

A. As I understand, that heater is already equipped with ultra-low NOx burner, so.

Q. Are you familiar with the NSR manual?

A. Which NSR manual?

Q. The New Source Review Workshop Manual. Are you familiar with that document?

A. I'm briefly familiar with that but, like, not entirely familiar with it.

Q. Okay. I'm going to hand you a copy of this document.

MS. SAMSON: And I guess we're on Exhibit 21 for Vecinos?

ALJ CALDERON: I'm seeing 1 through 19. So this would be 20.

MS. SAMSON: I'm sorry. Exhibit 20.

Q. (BY MS. SAMSON) You said that you're briefly familiar with the NSR manual. So I pulled some pages from the NSR manual. Do you recognize those pages?

A. Yes.

Q. You do? Is this a true and accurate copy of

portions of the NSR manual?

A. Yes.

Q. And these pages of the NSR manual refer to calculating baseline emissions?

A. Yes.

MS. SAMSON: Your Honor, at this point I'd like to move to admit Vecinos Exhibit 20.

(Vecinos Exhibit 20 offered.)

ALJ CALDERON: Any objections?

MS. ADAMS: I'll just re-urge the objection we made to their originally filing the reference as noted on the front page, though it's hard to look at without get a migraine, that it's specifically applicable to prevention of significant deterioration and nonattainment area permitting, which aren't applicable here.

ALJ CALDERON: I'll overrule the objection and admit Vecinos Exhibit 20.

(Vecinos Exhibit 20 admitted.)

MS. SAMSON: And I will note for the record that the weird front page is the author's doing, not our copying efforts.

Q (BY MS. SAMSON) Okay. So if we look at page B.37, Dr. Gautam, I'm looking at that paragraph entitled Calculating Baseline Emissions.

A. Yes.

Q. And the first sentence says, "The baseline emissions rate represents a realistic scenario of upper boundary uncontrolled emissions for the source," correct?

A. That’s what is explained here.

Q. That’s what it says?

A. Yes.

Q. And then it goes on to say, "The NSPS/NESHAP requirements or 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. In other words, baseline emissions are essentially uncontrolled emissions, calculated using realistic upper boundary operating assumptions."

A. So we’ll use this for major source. We don’t use it for minor source, unless, I mean, they can become a major source.

Q. So what guidance document do you rely on in calculating the cost of a control used in a minor source facility?

A. I have no other rules controlling the cost.

Q. But I’m asking as an Agency, TCEQ, or an applicant that’s supposed to turn to some document to

correctly calculate the cost of any control in its permit application, can you identify another source that a permit application or the reviewer would turn to?

A. I don't know. I don't have that knowledge.

Q. Because this calculating baseline emissions section, it's really just how the number -- it's just a formula, correct?

A. Yes.

Q. And that formula isn't going to change whether or not it's a major source or a minor source if we're just talking about the cost calculation?

A. I don't know that.

Q. But you can't identify another guidance document for calculating minor source?

A. I mean, I can't identify at this moment.

Q. Okay. We're going to turn away from that document. Thank you.

So we'll just talk about thermal oxidizers for one moment, Dr. Gautam. The thermal oxidizers are referenced in the back tables on line 22. And I know they gave you the larger version. I don't have the page number for that larger document.

A. Okay.

Q. So I'll give you a moment if you can find it. So, Dr. Gautam, it looks like it's on page 38.

A. Page 38. I'm there.

Q. Line 22 under the NOx column states that low NOx burners are BACT and they're supposed to operate at 0.06 pounds per MMBTU or less, correct?

A. That's what it says.

Q. Okay. And the thermal oxidizers at Texas LNG will have NOx emissions of 0.06 pounds per MMBTU?

A. That's correct.

Q. Is there any evidence that TCEQ looked to other operational facilities to see which thermal oxidizers were permitted?

A. I don't know that.

Q. Is there any evidence that TCEQ looked to other facilities that had been permitted but weren't operational yet regarding the thermal oxidizers?

A. I mean, that thermal oxidizer already meets 0.06 pounds per MMBTU, so --

Q. Doctor -- I'm sorry --

A. I don't know that.

Q. Dr. Gautam, that wasn't responsive to my question.

A. I don't know that.

Q. You don't know if they looked to other facilities that had been permitted but weren't operational?

A. I don't know.

Q. Was there anything in the file that showed that they had looked at other facilities that had been permitted but not operational?

A. I did not find that in the record.

Q. And was there any evidence that TCEQ looked to other facilities undergoing permitting?

A. I don't know that.

Q. Was there any evidence in the record that TCEQ had looked to other facilities that were undergoing permitting?

A. I don't know that; but, again, like, if that permit was already in-house or the application was in-house, it would be the standard practice to look at it.

Q. But there's no discussion of it in the record?

A. No.

Q. So, Dr. Gautam, regarding the flares, was there any analysis provided by Texas LNG to TCEQ regarding the technical practicability or economic reasonableness of ground flares at Texas LNG's facility?

A. So, I mean, we don't distinguish between a ground flare or elevated flare. We just say the control device has to be to the flare, and they are not required to give any economic analysis.

Q. But, again, my question was: Was there any analysis provided to TCEQ regarding ground flares?

A. I did not find that in the record.

Q. Are you aware of TCEQ's flare task force?

A. No.

Q. And did you review the 2010 TCEQ flare study that Bill Powers cited to in his testimony?

A. I mean, I'm familiar with that study; but I don't remember all the specifics of it.

Q. Are you familiar with any ongoing studies or analysis that TCEQ has done regarding flares implemented at LNG facilities?

A. To LNG facilities?

Q. Or industry facilities.

A. I mean, besides that article referred to earlier, I don't know of any others.

Q. So you're not aware of ongoing work by TCEQ to research flare destruction efficiency?

A. I mean, I personally don't. I'm not aware.

MS. SAMSON: That's all that I have. Thank you, Dr. Gautam.

ALJ CALDERON: Okay. Ms. Redding?

MS. REDDING: Yes, your Honor.

ALJ CALDERON: Redirect.

*

REDIRECT EXAMINATION

BY MS. REDDING:

Q. Good morning, Dr. Gautam. I just have a few questions here for you. There's been a lot of discussion about Joel Lunsford and Sean O'Brien. So it's your understanding that Joel Lunsford drafted the permit in this application?

A. That's correct.

Q. Do you have any reason to believe that Mr. Lunsford did not do a thorough review of the application?

A. I have no reason to believe that.

Q. And we talked a little bit yesterday about the MERA analysis. Do you have any reason to believe Mr. Lunsford did not do a thorough review of the MERA analysis?

A. I don't have any reason to believe that because it is standard practice that all permit reviewers do review the MERA analysis.

Q. And so there were also some questions about the permit reviewer's role in reviewing the MERA analysis. Are permit reviewers trained to review MERA analysis?

A. Yes, they are trained to. And, in fact, it is the primary duty of the permit reviewer to review the

MERA analysis. But the data that comes through the MERA analysis goes through use or refine modeling for the AERMOD, and we would send it to ADMT for review. But, like, if MERA analysis was done using screening table that is in our MERA analyzing but it was done using SCREEN3 modeling, then we are not required to send it to anyone.

Q. And all the permit reviewers are trained to use SCREEN3?

A. Yes.

Q. So Mr. Norton asked you some questions yesterday regarding the determination if the application was technically complete. So you have a box next to you with a lot of pages of paper, and that's the admin records. I'm going to ask you to find Bates page number 00039 of the Administrative Record.

ALJ CALDERON: Ms. Redding, is that Tab A?

MS. REDDING: I believe it's Tab A.

MS. MOORE: Tab B.

MS. REDDING: Oh, Tab B. Right, Tab B. It shows up on my computer as different tabs.

Q. (BY MS. REDDING) Will you please describe that document?

A. It is the second public notice letter to Texas

LNG by TCEQ.

Q. Okay. And what is the date of that document?

A. September 15th, 2016.

Q. Okay. Will you please read the first two sentences?

A. "The Executive Director has completed the technical review of your application and has prepared a preliminary decision and draft permit."

Q. All right. That's all for that paper.

Will you please find Bates Number 00029?

A. Yes.

Q. What does it say at the top of that page?

A. So it's the notice of public meeting and notice of application and preliminary decision for air quality permit for Permit Number 139561, which is the Texas LNG permit.

Q. Okay. Looking at the column that you're looking at right now, will you please read the first two sentences of the second paragraph?

A. "The Executive Director has completed the technical review of the application and has prepared a draft permit, which, if approved, will establish the conditions under which the facility must operate."

Q. And at the very, very top of that page, there's, like, some tiny words above the columns. Can

you read what that says?

A. So I don't know.

MS. REDDING: Your Honor, may I approach?

ALJ CALDERON: You may.

A. The Brownsville Herald. It was published on Sunday, September 25, 2016.

Q. (BY MS. REDDING) All right. I'm done with those.

So regarding this application and this permit, have you provided everything that you received regarding this application?

A. From Texas LNG?

Q. Yes.

A. Yes.

Q. Okay. And I have a couple of questions about BACT for you. So what is meant by a case-by-case review?

A. So in the case of the Air Permits Division of TCEQ, we mean we look at its permit application as individual case.

Q. So does that mean that it's a case-by-case review for each piece of equipment?

A. No.

Q. And there's been some mention of other LNG facilities during the hearing. If an applicant were to

come in and submit a new application for an LNG facility, would that applicant have to use the same equipment as the previously permitted LNG facilities?

A. They don't have to use the same equipment.

Q. And one more question, kind of going back to the admin records. Did you provide the documents that were included in Tab C of the Administrative Record?

A. Yes.

Q. And how did you decide which documents to include?

A. So, I mean, since I was not the one who, like, drafted the draft, so I just, I mean, collected or gathered documents that I would review or I would refer to if I were reviewing these papers for the Texas LNG permit application.

Q. And do you know if you included Vecinos Exhibit 20 in Tab C?

A. I don't remember that.

MS. REDDING: Okay. That's all I have.

ALJ CALDERON: Ms. Adams?

MS. ADAMS: Yes, I do have a couple.

CROSS-EXAMINATION

BY MS. ADAMS:

Q. Good morning, Dr. Gautam. Earlier when you were testifying, you said, "The heater is already

equipped with an ultra-low NOx burner. Can you explain what you mean by that?

A. So, I mean, in the application it says that the heater that comes was already equipped with ultra-low NOx burner.

Q. That's as coming from the provider, the manufacturer?

A. From the manufacturer.

Q. This is also from the Administrative Record. It's the permit application. I pulled it out and just made a copy so we don't have to dig through the box; but for the other parties, it starts at Texas LNG 00002. And I have an extra copy if you-all want a paper copy from the Administrative Record, the permit application.

ALJ CALDERON: Thank you.

Q. (BY MS. ADAMS) And if you'll turn with me to Bates page 186, do you see Appendix C, the MERA evaluation on page 186?

A. I'm not there yet.

Q. It's Bates page 186.

A. Yes, I'm there.

Q. And then 187?

A. Yes.

Q. And what is shown at Texas LNG 187?

A. It is the MERA Evaluation Summary.

Q. And you agree that the information shown on that page was provided to TCEQ in the permit application?

A. Yes.

Q. And if you will, look at ED Exhibit 16.

A. Yes.

Q. This is the MERA guidelines. And specifically starting at page 23 of that document --

A. Yes, I'm there.

Q. -- what are these tables that are shown on pages 23, 24, 25, and 26?

A. So, I mean, these are the screening tables that the permit reviewer or applicant can refer to, to calculate GLCmax, without permitting modeling.

Q. And that was information that the TCEQ had in reviewing the Texas LNG permit application?

A. Yes.

Q. And I'm looking at your direct testimony on page 8. I'm sorry. That's your colleague's direct testimony.

Let me find yours. Starting on line 14, and I believe --

A. I'm not there yet.

Q. Oh, I'm sorry.

A. Can you tell me what exhibit?

Q. I believe it's ED Exhibit 1.

A. Page number?

Q. Page 8.

A. Yes, I'm there.

Q. And it's your testimony, Dr. Gautam, that TCEQ -- that Texas LNG provided all the necessary assumptions and calculations in the permit application?

A. Yes.

Q. And then, if you would, turn to page 28 of your direct testimony.

A. Yes, I'm there.

Q. Starting at line 15, it's your testimony that a permit reviewer can follow the MERA guidance that we looked at and evaluate an applicant's MERA analysis?

A. Yes, that's my testimony.

Q. And it's your opinion that that Texas LNG MERA analysis was acceptable?

A. It is my opinion. And even, I mean, the MERA analysis would be more conservative because they did MERA analysis for emissions coming out of thermal oxidizer, coming from flare, and coming from heaters, which are exempt.

Q. And Texas LNG also provided modeling data; is that correct?

A. Yes, they did provide modeling data.

Q. And if you look at ED Exhibit 15 --

A. Yes, I'm there.

Q. -- does this document confirm your opinion that Texas LNG submitted modeling data?

A. Yes.

Q. And why is that?

A. Because this is the memo from ADMT to permit reviewer that says that the modeling and everything is acceptable.

Q. And you understand that modeling files are part of the Administrative Record?

A. Yes.

MS. ADAMS: No further questions. Thank you, Dr. Gautam.

ALJ CALDERON: Mr. Arthur?

MR. ARTHUR: No questions, your Honor.

ALJ CALDERON: Mr. Norton?

MR. NORTON: A couple of questions, your Honor.

RECROSS-EXAMINATION

BY MR. NORTON:

Q. Dr. Gautam, could you turn to Exhibit 16, the Modeling and Effects Review Applicability analysis and go to page 15?

ALJ CALDERON: I'm sorry. What was that,

Mr. Norton?

MR. NORTON: ED 16.

A. Yes, I'm there.

Q (BY MR. NORTON) Could you look at the three bullet points down at the bottom of that page?

A. Yes.

Q. Could you read the first of those three bullet points for me?

A. "GLCmax is the predicted maximum ground-level concentration of the new and increased emissions from planned MSS and Production combined (from Step 8A or Step 8B; see note below.)"

Q. Now, could I get you to look at that Bates page 186 that you were looking at a minute ago of the Administrative Record?

A. Bates?

Q. 186. It's the one you were just looking at, the MERA table, C1.

A. Yes, I'm there.

Q. All right. Is there anything on that page that you're looking at, Bates 186, that shows that the Applicant used this formula from the MERA analysis that you read a moment ago?

A. I mean, just looking at it here, it doesn't say that.

Q. Okay. Now, if you could, go to ED Exhibit 15.

A. Yes, I'm there.

Q. Does anything in this memo show that the modeling team ever received or reviewed the data and calculations that we just talked about in the MERA drop-out conclusions?

A. I mean, it is not mentioned in this memorandum.

Q. So there's nothing in this memo that would indicate to you that they ever provided that or that anyone ever reviewed it?

A. I mean, this memo is primarily for criteria, not for MERA data.

Q. Is there anything else in the Administrative Record that indicates that they provided that data or that it was reviewed that you know of?

A. Other than the summary evaluation, I did not find any other data.

MR. NORTON: Thank you. That's all the questions we have.

ALJ CALDERON: Vecinos?

MS. SAMSON: No further questions.

ALJ CALDERON: Well, thank you, Dr. Gautam. You're dismissed.

THE WITNESS: Thank you.

ALJ CALDERON: Ms. Redding, you have one more witness?

MS. REDDING: Yes.

ALJ CALDERON: We've been going about an hour, so let's take a quick break. Let's be back at 10:15.

(Off the record from 10:03 to 10:15 a.m.)

ALJ CALDERON: We're back on the record, and the ED is going to call their second witness.

MS. MOORE: The ED calls Justin Cherry.

(Witness sworn by ALJ Calderon.)

JUSTIN CHERRY,

having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MS. MOORE:

Q. Good morning.

A. Good morning.

Q. Will you please state your name for the record?

A. Justin Cherry.

Q. And where are you employed?

A. The TCEQ.

Q. What's your current position?

A. I'm an Engineer V. I'm a Senior Modeler on the Air Dispersion Modeling Team.

Q. You have before you what have been marked as ED Exhibits 17 through, I believe, 28; is that correct?

A. Yes.

Q. Okay. That's perfect. Do you recognize them?

A. Yes.

ALJ CALDERON: Could you speak up a little bit? It's kind of hard to hear.

MS. MOORE: Yes. Would you like me to stand up or use the microphone?

ALJ CALDERON: You can try the microphone and see if the distortion is too bad.

MS. MOORE: Is it on now?

MS. REDDING: Yes.

MS. MOORE: Okay.

Q. (BY MS. MOORE) So we just identified that you have before you Exhibits 17 through 28. Can you tell me what they are?

A. It is my pre-filed testimony and the associated exhibits.

Q. Are they true and accurate?

A. Yes.

Q. Okay. Do you adopt this testimony as if you were giving it live today?

A. I do.

Q. Okay. Mr. Cherry, I'd like to discuss

something that was discussed yesterday morning regarding the NAAQS modeling that was submitted by the Applicant. So if you can, turn to your pre-filed testimony, which is ED Exhibit 17, page 7. And then lines 32 through 34 -- or, actually, can you just read 34 for me, please?

A. "We conducted an audit of the Air Dispersion Modeling submitted by the Applicant."

Q. Okay. And to complete the thought, can you turn to page 8 and read lines 17 through 21?

A. "Mr. Cherry, would you please explain the basic parts of the Air Quality Analysis Audit Memorandum?"

"The audit memo includes a discussion of the minor new source review, which includes a de minimus analysis, a NAAQS analysis, a review of the air quality monitoring data, and the state property line analysis."

Q. Okay. Let's focus on the NAAQS analysis. Can you tell us what the Applicant submitted from that analysis?

A. The Applicant submitted modeling files using the AERMOD refined models to determine their impacts.

Q. Okay. Yesterday I believe Mr. Weeks said in his testimony that the Applicant did not submit refined modeling. So you're saying that they did?

MR. NORTON: You're Honor, I'm going to

object to this line of questions. They're supplementing their pre-filed testimony, and that was not part of what the whole pre-filed testimony system was supposed to allow.

MS. MOORE: We would argue that we are clarifying, as Protestants have done with their witnesses over the past couple of days. We're trying to clarify aspects of what their review entailed.

MR. NORTON: Your Honor, that was on Redirect; and the only thing we did was correct a few errors in our testimony. We didn't add anything to it, and that's exactly what they're doing now.

If they want to try that on Redirect after Mr. Cherry has been cross-examined, I think that's legitimately within the scope of whatever Cross-Examination was; but to do it now as part of their direct case is not the way this hearing was supposed to run.

MS. MOORE: We would be happy to do it on Redirect.

ALJ CALDERON: I was about to say that. So you can do it on Redirect.

MS. MOORE: Okay.

Q. (BY MS. MOORE) So let's talk a little bit about the MERA analysis. This goes to kind of what

Dr. Gautam was talking about. I just want to clarify --

MR. BALLARD: Objection, your Honor. They're doing the same thing.

MR. NORTON: Same ob- -- I wanted to hear the question first.

MS. MOORE: We'll do it on Redirect.

All right. We pass the witness.

ALJ CALDERON: Okay. Ms. Adams?

MS. ADAMS: Nothing, your Honor.

ALJ CALDERON: Mr. Arthur?

MR. ARTHUR: Thank you, your Honor.

CROSS-EXAMINATION

BY MR. ARTHUR:

Q. Good morning, Mr. Cherry. I'd like to look at your pre-filed testimony on page 11. At line 28 you testify, "Yes, the TCEQ meteorological data relied on included surface station data from Brownsville International Airport from 2012." Do you see that?

A. Yes.

Q. Were you here yesterday for Mr. Powers' testimony?

A. Yes, I was.

Q. Okay. Did you hear him testify that the Brownsville International Airport surface station data was collected at approximately 10 meters or 33 feet?

A. Yes, I did.

Q. Okay. Are you also aware that the Applicant's proposed flares have heights ranging from 180 feet to 315 feet?

A. I mean, if you say that's what it is, okay.

Q. Okay. Do you have any concerns about the difference in the heights at which -- the difference in those two heights?

A. No, I do not. The heights are taken into account in the modeling.

Q. And how so?

A. A flare, being a stack, a point source, it has required inputs, just as a stack height, the amount of emissions, velocity, temperature, things of that nature.

Q. Okay. So how does modeling sources that are at 180 feet to 315 feet account for meteorological data that's collected at 33 feet?

A. I'm not exactly sure how to answer that. Like, the model, what it does, it tries to use its mathematical equations to simulate the atmospheric processes of how a pollutant would transport and disperse into the atmosphere. So through those calculations it takes into account that height, wind speed, wind direction, things like that.

Q. Okay. Turning to page 16, please, I'm looking

at line 14 where you say, "A tiering approach," do you see that?

A. Uh-huh.

Q. What do you mean by "a tiering approach"?

A. So NO2 has three tiers that it can be evaluated. The first tier is considered full NOx to NO2 conversion. The second tier is considered the ambient ratio method, where there's just a certain percentage of NOx that's converted. And then there's a third tier that uses a different modeling technique, PVMRM or OLM, to determine NOx concentrations.

Q. Okay. Thank you.

I'd like to look next at page 21. And I'm looking at the Q and A starting on line 11 where you're asked, "Would this include Rio Grande LNG; Annova LNG; Jupiter Brownsville, LLC; and this project, Texas LNG Brownsville?"

And the answer is "yes."

Do you see that?

A. Yes.

Q. Okay. So I want to understand which projects accounted for which other projects in terms of cumulative impact. So as I understand it, Rio Grande LNG -- well, I'll just ask you: Do you know if Rio Grande LNG accounted for Annova and Texas LNG?

A. I do not know if they did.

Q. Okay. So the same question regarding Texas LNG. Which of their neighbors did they account for?

A. Rio Grande LNG was included in the full impact analysis.

Q. But not Annova?

A. Annova or Jupiter was not because those applications had not been submitted at the time of this review.

Q. Okay. So for Annova would you expect it to include Rio Grande and Texas LNG?

A. If a cumulative analysis was required, yes, I do.

Q. Okay. All right. Let's turn to page 23, please. So my question is from line 12, and I recognize this is the question here. So I'm just going to ask you your interpretation of the wording in this question. When it states "this review," what did you understand that to be referring to, which review?

A. I would imagine in terms of the audit review for this permit for Texas LNG.

Q. Okay. Well, let me ask it a slightly different way. How did you interpret it, given the way that you answered the question? Which review do you think we're talking about here?

A. The modeling review.

Q. Okay. Thank you, Mr. Cherry.

MR. ARTHUR: Pass the witness.

ALJ CALDERON: Mr. Norton?

MR. NORTON: Mr. Ballard's going to cross-examine Mr. Cherry.

ALJ CALDERON: Mr. Ballard.

CROSS-EXAMINATION

BY MR. BALLARD:

Q. Good morning, Mr. Cherry. How are you this morning?

A. Doing well.

Q. My name is Sam Ballard. Do you recall that we met during your deposition?

A. I do.

Q. In your pre-filed testimony you discuss that an applicant must submit an air quality analysis, correct?

A. That's correct.

Q. And air dispersion modeling may be part of such analysis, correct?

A. Correct.

Q. How does the MERA analysis fit into all that?

A. It's part of the air quality analysis. It relates to impacts associated with non-criteria

pollutants.

Q. There's a binder in front of you on the front that says Port Isabel pre-filed testimony. Can we look at Exhibit 9, Port Isabel?

A. Yes, sir.

Q. Do you recognize this table?

A. I recognize it from the deposition.

Q. And can you read the title for the record please?

A. Yes. Table C-1, Texas LNG Brownsville, LLC, Texas LNG Facility, Constituent MERA Evaluation Summary.

Q. And the Bates label on the bottom right?

A. Texas LNG 000187.

Q. And the column to the far right, what is that titled?

A. It's titled MERA Step Where Chemical Drops Out.

Q. Can you explain what that column represents?

A. It represents at what step of the MERA guidance document that a particular pollutant fell out.

Q. Does TCEQ require an applicant to submit the data and calculations to substantiate the findings in this column?

A. I don't know that it's required that they provide the calculations as long as the results can be

verified.

MR. BALLARD: May I approach the witness to discuss this deposition testimony with him?

ALJ CALDERON: You may.

Q. (BY MR. BALLARD) That will have your deposition testimony in there if you will turn to that tab.

A. Okay.

Q. We can go to page 26, please, of your deposition testimony.

A. I'm there.

Q. So let's look at lines 5 through 11, and can you read lines 5 through 8 first?

A. Yeah.

"So, more generally, to substantiate where the constituents fall out from each MERA step, the applicant is required by TCEQ to submit work to substantiate that."

Q. And then can you please read lines 9 through 11?

A. Yeah.

"They have to support that determination, and so they have to provide that information necessary to support that conclusion."

Q. And so the work to substantiate the MERA drop-

out conclusions, does that work constitute the data and calculations that underlie that?

A. It could. It could also just be the emissions associated with that.

Q. Have you seen anything in the application that would substantiate the findings in the column MERA Step Where Chemical Drops Out in Table C-1?

A. I did not review the application.

Q. So you're not aware of anything in the Administrative Record that would substantiate the findings in that column?

A. I am not.

Q. And if an Applicant failed to provide such work to substantiate the results in that column, what would be the outcome?

A. I would imagine the permit reviewer would request that information, or it wouldn't go forward.

Q. So if that information was never provided, what would be the outcome?

A. The permit wouldn't be the -- wouldn't move forward. It wouldn't go anywhere until that information was provided or the permit was voided because they weren't providing that information.

Q. So if the work to substantiate the findings in this column was never provided to TCEQ, the permit would

not be issued?

A. Potentially. I'm not sure.

Q. Let's look at lines 18 through 19 on that same page of your deposition transcript. Could you please read that for me?

A. "And if TCEQ never received such data, what's the outcome?"

Q. And lines 21 through 22?

A. "My guess would be they wouldn't be getting a permit."

Q. Let's turn to Texas LNG Exhibit 18, if you would.

A. Which one?

Q. It's going to be Texas LNG Exhibit 18. It's the MERA spreadsheet. It should be the very last exhibit there.

A. I'm there.

Q. Are you familiar with this exhibit?

A. I don't believe so.

Q. Have you seen similar Excel spreadsheets like that before regarding MERA analysis?

A. I have.

Q. So, if you would, take a second to review what's in front of you; and then let me know if, in your opinion, within that spreadsheet appears to be data and

calculations that could be used to substantiate the MERA drop-out conclusions, if that constitutes the underlying work.

A. Yes, the necessary information is there.

Q. And do you know if TCEQ ever received that spreadsheet?

A. I do not know.

Q. Do you know if Joel Lunsford ever reviewed it?

A. I do not know.

Q. Do you know if Sean O'Brien ever reviewed it?

A. I do not know.

Q. Do you know if either of them received it?

A. I'm sorry. Could you say that again?

Q. You don't know if either Joel Lunsford or Sean O'Brien received that spreadsheet?

A. I do not know.

Q. Do you know whether that spreadsheet is part of the Administrative Record?

A. I'm not sure, no.

Q. And you just described that that spreadsheet, within it, looks like it is the work that underlies the MERA drop-out conclusions, correct?

A. Yes.

Q. If Lunsford never reviewed that table, would you still agree with his assessment the MERA analysis

looked, quote, unquote, "fine"?

A. Can you say that again?

Q. If Joel Lunsford never received or reviewed that spreadsheet, would you still agree with his assessment that the MERA analysis looked, quote, unquote, "fine"?

A. No.

Q. Let's move on and talk about benzene. Is benzene a carcinogen?

A. I believe so.

Q. Is it toxic to humans and animals?

A. I believe it is.

Q. Does the application account for benzene emissions from acid gas treatment?

A. I don't know. I did not review the MERA analysis.

Q. If I represented to you that it did, would you have any reason to disagree with me?

A. No.

Q. Does the application account for benzene emissions from equipment leaks?

A. I don't know.

Q. If I represented to you that it did, would you have any reason to disagree with me?

A. No, I wouldn't.

Q. Does the application account for benzene emissions from condensate storage tanks?

A. I don't know.

Q. If I represented to you that it did, would you have any reason to disagree with me?

A. I would not.

Q. Did the application account for benzene emissions from truck unloading?

A. I don't know.

Q. If I represented to you that it did, would you have any reason to disagree with me?

A. I do not.

Q. Does the application account for benzene emissions from thermal oxidizers?

A. I don't know.

Q. If I represented to you that it did, would you have any reason to disagree with me?

A. I do not.

Q. Does the application account for benzene emissions from flares?

A. Same.

Q. For this type of project, would you expect to see benzene emissions from flares?

A. I don't know.

Q. Okay. Let's look at Port Isabel Exhibit 45.

That should be in front of you.

MR. BALLARD: May I approach the witness to show it to him?

ALJ CALDERON: You may.

Q. (BY MR. BALLARD) It's actually this loose exhibit, Number 45.

A. Oh, sorry.

Q. That's all right.

And does that exhibit look like some of the work that is in that MERA spreadsheet, Texas LNG Exhibit 18 we just looked at?

A. Yes.

Q. And the Bates label at the top of Exhibit 45, could you read that for the record, please?

A. The face label? I'm not sure what you're...

Q. It will say "Texas LNG," and there will be a number at the top in the green.

A. Texas LNG 001569.

Q. Is that the same Bates label of Texas LNG Exhibit 18?

A. No, it's not.

Q. It's not?

A. I mean, I don't see the 001569.

Q. Look at the bottom right-hand corner.

A. Yes, there it is. Sorry.

Q. So it's the same Bates label?

A. Yes.

Q. And for Exhibit 45, if you look at the bottom, what tab does it look like we're in?

A. The benzene tab.

Q. And let's look at Column B of the spreadsheet. What does "EPN" stand for?

A. Emissions point number.

Q. Do you see any indication that benzene emissions from flares were accounted for in this table?

A. Not based on the EPN ID. I couldn't tell you. I'm not sure what EPN is related to the flares.

Q. You wouldn't expect to see an EPN described as FLR to represent a flare?

A. It could be. Applicant's use different names all the time, but it doesn't necessarily have an "FL" in it. It could be anything.

Q. Okay. Looking at Exhibit 45, you can't tell me whether or not Texas LNG accounted for benzene emissions from flares?

A. Not based on what's on the information provided here.

Q. Let's look at Port Isabel Exhibit 46, and it's the other spreadsheet that's at the end of that table there. That's the one.

A. Okay.

Q. Can you read the Bates label that's at the top for the record, please?

A. Yes, it's Texas LNG 027678.

Q. And does this table look similar to the one that's in Port Isabel Exhibit 45?

A. Yes, it does.

Q. And what tab are we in for Exhibit 46?

A. Benzene.

Q. And do you see in the EPN in Column B the items FRL1, FLR2, FLR4?

A. I do.

Q. You don't know whether those represent flares?

A. I would suspect that they are flares.

Q. Okay. If in Exhibit 46 it appears that benzene emissions for flares are accounted for, why are they not also accounted for in Exhibit 45?

A. Well, based on previous testimony, I believe I heard that they were exempt. So they didn't need to be included.

Q. The flares were exempt?

A. I thought that's what I heard in previous testimony.

Q. I mean, do you have personal knowledge of whether that's the case?

A. I do not know.

Q. So you can't explain to me why in Table 45 -- or Exhibit 45, rather, the flares do not appear -- the benzene emissions for flares do not appear to be accounted for?

A. No. I'm not a permit reviewer, and they determine the scope of the project.

Q. But you've reviewed -- you review, as part of the Air Dispersion Modeling Team, MERA analysis?

A. When asked to, yes.

Q. And so you told me earlier that these tables we're looking at appear to be the work that underlies the MERA analysis, right?

A. Appears to be.

Q. Okay. Do you know whether or not anything resembling Exhibit 46 was ever submitted to TCEQ?

A. I do not know.

Q. Do you know whether Joel Lunsford reviewed anything similar to that?

A. I do not know.

Q. Sean O'Brien?

A. I do not know.

Q. If you had received, as a member of the Air Dispersion Modeling Team, these two tables in Exhibit 45 as missing flares, but Exhibit 46 has flares, is that

something you would inquire about?

A. Yes.

Q. So that's something you think is important enough that you would ask the Applicant why there's a discrepancy?

A. Yeah, I would want to know why there is a discrepancy, sure.

Q. And, to your knowledge, TCEQ never asked the Applicant about that discrepancy?

A. Not that I know of, no.

Q. Let's turn to Port Isabel Exhibit 10 if we can.

A. I'm there.

Q. If we can turn to page 15 of 30, please --

A. I'm there.

Q. -- at the bottom part of the page it concerns Step 10 of the MERA analysis, correct?

A. Yes.

Q. And what does that formula or ratio at the bottom represent?

A. I believe it's the ratio technique.

Q. Ratio technique for what exactly?

A. It's to determine if the total impacts could potentially be acceptable.

Q. Could you read the first bullet point

underneath that ratio for the record, please?

A. "GLCmax is the predicted maximum ground-level concentration of the new and increased emissions from planned MSS and Production combined (from Step 8A or Step 8B; see note below.)"

Q. Do you know whether or not Texas LNG submitted any data to TCEQ showing that the predicted maximum ground-level concentration of the new and increased emissions from MSS and Production combined for benzene emissions?

A. I do not know. I did not review the MERA analysis.

Q. And so for Texas LNG to demonstrate that a MERA analysis constituent dropped out at Step 10, it would have to show data meeting this first bullet point?

A. I would think so.

Q. And you don't know if Joel Lunsford ever received or reviewed that information?

A. I do not know.

Q. You don't know if Sean O'Brien ever received or reviewed that information?

A. I do not know.

Q. What happens after Step 10? What does Step 11 entail if a constituent reaches Step 11 of the MERA analysis?

A. Site-wide modeling is conducted.

Q. Do you know whether site-wide modeling was conducted for Texas LNG's project?

A. Site-wide modeling was conducted for what?

Q. Let's say for benzene specifically.

A. I do not know.

Q. If I represent to you that it was not, would you have any reason to disagree with me?

A. No.

MR. BALLARD: I'm going to introduce a new exhibit your Honor, if I can approach the witness.

ALJ CALDERON: You may.

MR. BALLARD: This will be Port Isabel Exhibit 47, and this is the same Bates label as Port Isabel Exhibit 46. And you'll see whereas in Port Isabel Exhibit 46 we were in the benzene tab, we're in the MERA Summary tab here; and this is a screenshot that counsel Port Isabel took of the electronic file of that Texas LNG production document. So we're introducing them under the same conditions we introduced Exhibit 46 yesterday.

(Port Isabel Exhibit 47 offered.)

MS. ADAMS: Fine. No objections.

ALJ CALDERON: This will be admitted as Exhibit 47 for Port Isabel.

(Port Isabel Exhibit 47 admitted.)

Q. (BY MR. BALLARD) Now, if you will, look at that table; and in conjunction with that, let us also turn back to Port Isabel Exhibit 9.

A. I'm there.

Q. So for the chemical benzene, at which step does it drop out in Port Isabel Exhibit 9?

A. Step 10.

Q. In Port Isabel Exhibit 47 at which step does benzene drop out?

A. It says Step 11.

Q. For Port Isabel Exhibit 9 let's look at benzo(k)flouranthene.

MR. BALLARD: And for the court reporter I'll spell that, B-E-N-Z-O, K in parentheses, F-L-U-O-R-A-N-T-H-E-N-E.

Q. (BY MR. BALLARD) And in Port Isabel Exhibit 9 at which step does that chemical drop out?

A. Step 11.

Q. I'm sorry. Port Isabel Exhibit 9.

A. Oh, sorry. It says Step 5.

Q. And in Port Isabel Exhibit 47 in which step does benzo(k)flouranthene drop out?

MS. ADAMS: Your Honors, I just want to make a running objection to this line of questioning

asking the witness about a document that he's already seen and not representing the date or anything else relating to the document that's Bates labeled -- or now marked as 47 because I believe if he would represent the date, the witness would know that this was months before the application was submitted. So the comparison between the two is irrelevant; and, essentially, Counsel is testifying by just asking questions on a document that the witness has never seen and doesn't know anything about other than the information that Counsel has represented on the screenshot.

MR. BALLARD: Well, your Honors, when this document was produced to us, I don't know how to discern the date. The date's not listed on this document; and this is wholly relevant to all three referred issues because if there's a flaw in the MERA analysis, that goes to all three referred issues. And Mr. Cherry is a qualified air modeling dispersion expert that has reviewed MERA analysis in the past, and so I think his testimony as to why there are differences and discrepancies between these two documents is necessary.

MS. ADAMS: I just want to, for the record, inform the Court that Texas LNG produced all of its spreadsheets in native format so that they'd have all that information. And this witness didn't do the

MERA analysis in this case, and he's not offering an opinion on the calculations done in the MERA analysis. As he said, that was done by someone else at TCEQ.

So, again, my objection remains that it's basically Counsel just testifying at this point.

ALJ CALDERON: It seems like that Port Isabel is just trying to show the differences between the two spreadsheets; and you can address any timeline or anything like that during your Recross, so the objection is overruled.

Q. (BY MR. BALLARD) So, Mr. Cherry, I think I had left off asking you at what step benzo(k)flouranthene dropped out in Port Isabel Exhibit 47.

A. Yes, at Step 11.

Q. And is benzo(k)flouranthene a derivative of benzene?

A. I believe so.

Q. Do you know if it's a carcinogen?

A. I'm not sure.

Q. You don't know if it's toxic to humans and animals?

A. The fact that it's being evaluated, I would imagine it has some adverse impact.

Q. And you don't know why there's a discrepancy

between the two tables?

A. There could be a number of reasons.

Q. But you don't know what those reasons would be?

A. I do not.

Q. If you had received these two tables and you saw in one benzene dropped out at 10 and benzo(k)flouranthene dropped out at 5 and on the other table they both dropped out at 11, is that something you would inquire about?

A. Yes, I would.

Q. And if benzene dropped out at Step 11 and benzo(k)flouranthene dropped out at Step 11 in site-wide modeling, you would inquire about both of those constituents, correct?

A. For the site-wide evaluation, yes.

Q. Are you aware whether anyone at TCEQ received a table resembling Exhibit 47?

A. I'm not aware.

Q. Do you know if Joel Lunsford ever reviewed that document?

A. I don't know.

Q. What about Sean O'Brien?

A. I do not know.

Q. Do you know what Deever Bradley's role is in

this application?

A. I do not know.

Q. You don't know whether he's the engineer that sealed the permit?

A. I do not know, no.

Q. Does the name Miriam Hacker ring a bell?

A. It rings a bell from you bringing it up during the deposition, I believe; but that's about it.

Q. I'll share with you maybe one more exhibit.

MR. BALLARD: May I approach the witness, your Honor?

ALJ CALDERON: You may.

MR. BALLARD: This will be Port Isabel Exhibit 48.

MS. ADAMS: We're going to object to this document on the grounds of hearsay.

MR. BALLARD: Well, it's a document y'all produced. It's between Deever Bradley and Miriam Hacker.

MS. ADAMS: I don't believe that's an exception to the hearsay rule.

MR. BALLARD: This is a document between the engineers that Texas LNG had hired to conduct the MERA analysis.

MS. ADAMS: I still don't believe that's

an exception to the hearsay rule.

MR. BALLARD: Well, your Honor, we don't have to introduce it for the truth of the matter asserted. I just wanted the witness to read from it and ask him for his opinions on it.

MS. ADAMS: That's not a valid basis other than truth of the matter asserted because you can't impeach a witness on a document that he's not on and has never seen before.

MR. BALLARD: I'm not attempting to impeach the witness. I just want the air modeler's opinion about what it said in the e-mail correspondence. I think it is completely important to the MERA analysis in this case and whether it was conducted adequately.

ALJ CALDERON: Okay. Hold on one second here.

Okay. I'm not going to admit this. You can question him on it, but it will not be admitted as an exhibit. So you can question him without the exhibit.

MR. BALLARD: Your Honor, could I have the witness recite the very first e-mail at the top for the record as a foundation for his opinion on it?

MS. ADAMS: This isn't a document he's relying on. He's not offering an opinion on this

document. And reading into the evidence hearsay as evidence is the same as asserting the document for the truth of the matter, and there's no exception to the hearsay rule that applies here.

ALJ CALDERON: It's a hypothetical question, though. He was speaking hypothetically if this were to be real, so.

MS. ADAMS: I can listen to the question and then object. I haven't heard him ask it that way. He just asked if he could have the witness read it into the record, which would be reading direct hearsay into the record.

And I will say that Mr. Bradley is going to testify. So if he wants to Cross Mr. Bradley on this document, I think that's valid, not using it for the truth of the matter, but for Cross and impeachment purposes; but that's not the same for a witness who doesn't rely on it and who's never seen it before. And Mr. Bradley will be the first witness that will be called by Texas LNG.

ALJ CALDERON: Well, he can offer it at that time; but for right now, he can ask a hypothetical based on what this is.

MR. BALLARD: So just to be clear, your Honors, the witness can recite this e-mail so I can ask

him a question about it? I just want to lay the foundation for the question, your Honors.

ALJ SHENOY: So let's just set it up that he's an expert. He's allowed to answer a hypothetical question; but you can't start by saying, "Let him recite this into the record," without making clear that this is going to be you asking him his opinion on hypotheticals. So let's start with that. Then you can say, "Read this because this is the basis of the hypothetical that we are going to talk about," and proceed from there.

MR. BALLARD: Okay.

Q. (BY MR. BALLARD) Let me ask you a hypothetical question, Mr. Cherry.

A. Okay.

Q. If the engineers and air modelers that put together the MERA analysis for Texas LNG acknowledged that the MERA looked super messy, would that concern you at all?

A. I guess I would want to know what the underlying messiness is.

MR. BALLARD: So can I have him to read the e-mail for context and ask him another question?

ALJ SHENOY: It's still within the hypothetical that if he saw this, what would he say as an expert?

MR. BALLARD: Yes, your Honor.

ALJ SHENOY: Okay.

Q. (BY MR. BALLARD) Mr. Cherry, if you would, please read the very first page Bates labeled Texas LNG 021249, at the very top, the e-mail correspondence between Deever Bradley and Miriam Hacker.

A. Just the paragraph?

Q. Just the paragraph -- actually, could you read the subject line and the paragraph?

A. "The subject line is "Forward: Texas LNG MERA."

"The MERA continues to look super messy to me. I have looked back at the original and current versions, and detail for the benzene analysis is not complete. What do you guys typically submit to TCEQ, just the summary page, the detailed analyses? If this has been fully reviewed prior to this round, I am surprised. I am trying to fill in gaps, but someone who knows this analysis would be much more efficient."

Q. And please finish the e-mail.

A. Oh, "Please advise." Sorry.

Q. And who signed that e-mail?

A. "Thanks, Miriam."

Q. So if you were reviewing the MERA analysis of this case and you had received this e-mail in the course

of your review, would that concern you?

A. I would want to know, you know, what the issues are.

Q. Would it concern you, though?

A. What do you mean by "concern"?

Q. Would you have been concerned about the MERA analysis looking, quote, unquote, "super messy"?

A. Again, I would want to know, you know, what those concerns are.

Q. And, to your knowledge, TCEQ never received this e-mail?

A. To my knowledge, no.

MR. BALLARD: We'll pass the witness, your Honor.

ALJ CALDERON: Ms. Samson?

MS. SAMSON: No questions, your Honor.

ALJ CALDERON: Redirect from ED?

MS. MOORE: Yes, your Honor.

REDIRECT EXAMINATION

BY MS. MOORE:

Q. Mr. Cherry, I just want to clarify about your role in the MERA analysis. Did you look at the MERA analysis at all?

A. I did not.

Q. To your knowledge, who reviewed the MERA

analysis?

A. Joel Lunsford.

Q. Do you have reason to believe that Mr. Lunsford did not have the information that he needed to complete his review?

A. I have no reason to believe that.

Q. Okay. Earlier in your testimony did you say that there could be more than one way to substantiate a MERA analysis during the TCEQ's review?

A. I don't remember if I said that or not.

Q. Okay. Well, if I may refresh your memory, I think you said that you can look at the tables that Mr. Ballard was referencing?

A. Right, the screening tables?

Q. Correct, or you could look at emissions?

A. Yes. Oh, yeah. Yeah, if you have the emissions and the necessary information about the source, like, distance to property line and the stack height, things of that nature.

Q. Okay. So if you have those factors, you don't necessarily need the screening tables?

A. Well, you'll need the screening tables to verify the factors that you use to do that calculation.

Q. Okay. I see. And then Mr. Ballard also asked you many questions regarding benzene emissions. In your

modeling review that you actually did for this project, would you have looked at benzene emissions?

A. No, because that would be part of the MERA analysis.

Q. Okay. Which you did not review?

A. Correct.

MS. MOORE: The ED passes.

ALJ CALDERON: Ms. Adams?

CROSS-EXAMINATION

BY MS. ADAMS:

Q. Good morning, Mr. Cherry. I believe there's still a copy of the permit application on the mess of documents in front of you there. It's just a binder-clipped copy of the permit application.

A. Clipped, got it.

Q. I think you said on your direct that you've not reviewed the totality of the permit application?

A. Correct.

Q. Would you turn to page 186 of the permit application? Really what I want you to go to is 187 -- I keep doing that -- 186 is the cover page.

A. Okay. I'm there.

Q. And you understand that this is the MERA evaluation summary?

A. That's what it says.

Q. Is that the screening table you were referring to?

A. No. The screening table I was referring to is in the MERA analysis guidance document.

Q. Oh, I see. So I think that's in front of you, too, at ED Exhibit 16. And are you referring to the screening tables on ED Exhibit 16 starting on page 23?

A. Yes, ma'am.

Q. Okay. Thank you.

And on page 7 -- and I apologize for flipping around documents so much -- at page 7 of your direct testimony --

A. I'm there.

Q. -- on line 24 you refer to the Air Quality Analysis?

A. Yes, ma'am.

Q. I'm going to hand you a portion of the Administrative Record. It starts at Texas LNG 348.

MS. ADAMS: And I've got an excerpted copy from the Administrative Record if your Honors would like that.

Q. (BY MS. ADAMS) Is this what you're referring to as an Air Quality Analysis report?

A. This would be part of the Air Quality Analysis, the Air Dispersion Modeling Report, yes.

Q. And that's something that you did review in your role as a modeler on this?

A. Yes.

Q. And the modeling files were all provided by Texas LNG?

A. Yes, ma'am.

Q. And that's part of the Administrative Record, those modeling files?

A. As far as I know.

Q. If Mr. Lunsford didn't have the information he needed to do the MERA analysis, would you anticipate that he would follow up with Texas LNG and ask for that information?

A. I would expect him to, yes.

MS. ADAMS: That's all I have.

MR. ARTHUR: No, questions, your Honor.

MR. BALLARD: No questions, your Honor.

MS. SAMSON: No questions, your Honor.

ALJ CALDERON: Thank you. You're dismissed.

THE WITNESS: Thank you.

ALJ CALDERON: Does the ED have any more witnesses?

MS. MOORE: No, your Honors.

ALJ CALDERON: We'll move to the

Applicant then.

MS. ADAMS: Before we do, I have an electronic version of Exhibit 18 that we e-mailed to the parties per your request. It's the same that was previously produced, but just instead of dealing with the printed PDF.

ALJ CALDERON: Why don't we go ahead and take a couple of minutes so we can get cleaned up, and then we will be ready?

(Momentarily off the record.)

MS. ADAMS: Texas LNG would like to call its first witness, Mr. Donald Bradley; he goes by "Deever."

(Witness sworn by ALJ Calderon.)

DONALD "DEEVER" BRADLEY,

having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MS. ADAMS:

Q. Mr. Bradley, can you state and spell your name for the court reporter?

A. Sure. Donald, D-O-N-A-L-D, Devere, D-E-V-E-R-E, BRADLEY, the III.

Q. And you go by "Deever," Mr. Bradley?

A. I go by "Deever," yes.

Q. In front of you is your direct testimony in

this case, and have you reviewed that to determine if it contains any errors?

A. Yes, I have reviewed it. I have three changes to make.

Q. Okay. Can you tell us the first one, please?

A. Sure. On page 19 at line 9. We refer to the Federal Energy Regulatory Commission as FERC, not FERM. "FERC" is what it should be.

Q. Okay. Can you just go ahead and fix that on there, and then we'll give the court reporter an updated versus?

A. Sure.

The second is on page 35. I'm on the first line and the word "nominator" is listed. It should say "numerator."

ALJ CALDERON: Which line?

THE WITNESS: The first line. It should say, "...is the numerator on the left fraction."

Q. (BY MS. ADAMS) Any more?

A. There's one more on page 41, line 18. And it's stated "Mr. Powers on behalf of City of Port Isabel," but that should be Mr. Weeks.

Q. I'll caution you I'm having a hard time hearing you. I fear our friends at Port Isabel may have a hard time hearing you. Will you try to keep your

voice up?

A. Sure.

Q. With those changes, do you recognize in front of you then your direct testimony and supporting exhibits?

A. Yes, I do.

MS. ADAMS: And we'd like to re-offer Applicant's Exhibit 4 with the changes just made, and the exhibits already in evidence.

(Texas LNG corrected Exhibit 4 offered.)

ALJ CALDERON: Admitted.

(Texas LNG corrected Exhibit 4 admitted.)

MS. ADAMS: Pass the witness.

ALJ CALDERON: Ms. Redding?

MS. REDDING: No questions, your Honor.

ALJ CALDERON: Mr. Arthur?

MR. ARTHUR: Thank you, your Honor.

CROSS-EXAMINATION

BY MR. ARTHUR:

Q. Mr. Bradley, I'm Garrett Arthur for the Office of Public Interest Counsel. I'd like to turn to your pre-filed testimony at page 18; and I'm looking at your testimony starting on line 4 where you state, "Elevated flare tips are custom designed based on the anticipated waste gas flow rates and in consideration of other

operating factors." Do you see that?

A. I do.

Q. What do you mean by "other operating factors"? Such as?

A. Well, we're looking at someone designing a flare would look at the constituents in the waste gas going to it and the waste gas flow rate and then the velocity and looking at the heating value.

ALJ CALDERON: Excuse me, Mr. Bradley, could you speak up?

THE WITNESS: Sure. I'm sorry. That's usually not a problem for me.

ALJ CALDERON: Maybe try to turn on your mic and see if that works any better.

THE WITNESS: Sure. How's that?

ALJ CALDERON: Thank you.

THE WITNESS: That definitely sounds louder.

A. Let me go back and start that answer again. So someone designing a flare would certainly be interested in the make-up of the waste gas going to the flare. They'd be interested in the heat content. They'd be interested in the flow rates, those sorts of things.

Q. (BY MR. ARTHUR) Okay. Would wind speed be

another operating factor?

A. I think that -- I'm not a flare designer, but I think someone who's designing a flare would take that into consideration.

Q. Okay. Please turn to page 22. I'm looking at your testimony starting on line 6 where you state, "That analysis resulted in an annualized cost of $93,200 per ton of NOx removed, which is not economically reasonable; and, therefore, it is not BACT." Do you see that?

A. I do.

Q. Okay. What is your basis for saying it's not economically reasonable?

A. TCEQ has, I guess, guidelines or references for BACT and what's considered economically reasonable. So they base that on prior applications. They do not publish that bright-line value, as we refer to it in BACT, as "bright line." It's not published. It's not listed in a rule because it changes over time. It gradually goes up over time.

So, generally, you have to call on TCEQ and ask them what that value is. And, again, it's typically a range. And I think for NOx -- this goes back to 2016, which is when the application was turned in -- it could range from 10- to 15,000, perhaps; but

$93,000 is clearly, in my experience, not economically reasonable.

Q. Okay. So you said that you received guidance from TCEQ that 10- to 15,000 per ton of NOx is reasonable?

A. In my experience that is a value that -- that is a range that we have used for NOx.

Q. Okay. Next is page 23. So here, you're testifying regarding some other LNG facilities, correct?

A. Yes.

Q. Okay. So in your answer at line 15, you point out that, "Freeport LNG is located in an ozone nonattainment area, subject to LAER analysis, which, again, does not apply to Texas LNG." Do you see that?

A. Yes, I do.

Q. Is Rio Grande LNG located in an ozone nonattainment area?

A. No, it is not.

Q. Thank you.

I'd like to turn next to -- let's see here -- page 27. Okay. So starting at Line 22 you testify, "No use of the Bay Area program would substantially increase the cost of compliance, which, again, Texas LNG is in compliance without any monitoring program."

So my question to you is: Do you mean here that the Applicant would comply with BACT for fugitive VOCs with no LDAR program, because you're stating that Texas LNG is in compliance without any monitoring program?

A. Right, I do -- yes. I appreciate you pointing that out. That's not what I meant.

Q. Okay. What did you mean?

A. I meant to say, "And Texas LNG will follow an LDAR monitoring program."

Q. Okay. I'd like to look next on page 28; and I'm looking at your testimony starting on line 9, where you state that, "The use of leakless technology results in a significant increase in equipment costs without typically resulting in a significant corresponding decrease in emissions." Do you see that?

A. I do.

Q. Okay. Could you put some numbers on what you mean here by "significant increase in equipment costs"?

A. Sure. So some of the leakless technology that's identified in TCEQ's APDG air permit vision guidance document for fugitives suggests leakless valves. In my experience with industrial facilities in the Bay Area of California, putting them in as replacement valves costs five to ten times, sometimes

more, than the amount of a regular valve.

So this facility has something on the order of, I think, 8,000 -- 8,000 to 10,000 valves; I forget the number. Let's go with 8,000. So if you have 8,000 valves and you were to install those valves on all 8,000 of those at maybe $5,000 apiece -- they're more expensive the bigger the valve -- then you're looking at a capital cost of $4 million. So I took 8,000 and multiplied it by 5,000 per valve.

Q. Okay.

A. So you've got $4 million there in capital costs. And when you go through a BACT cost analysis, you take that capital cost; and you have to analyze it. So you apply interest rate at the time period; and when you do that, that brings that number down to about 12 percent. That's what that capital recovery factor is. So 12 percent of $4 million is $480,000.

Now, the LDAR program -- well, the emissions at the site, I think, uncontrolled from valves are probably about 8 tons per year. I think that's a high number, but we'll go with that. So if you're going to install -- if you're going to spend $4 million to -- $4 million that reduces down to $480,000 and you're going to spend $480,000 to reduce 8 tons of emissions, you're going to be spending $60,000 per ton. That would

be economically unreasonable.

I would also add that there is not a similar leakless technology for connecters, and there are well over 10,000 connecters at the site to connect all the piping. So you would have to essentially weld all those fittings, which would have ramifications for the safety and for change-out maintenance. So it's really not practical.

Q. So when you say "a significant decrease in emissions," what would you consider a significant decrease?

A. Well, with fugitive emissions -- I mean, the uncontrolled emissions from the VOC fugitives only come to 12 tons per year, something like that. So you couldn't get all the way down to zero. So we're talking about a fraction of that number. It's already a very low number that is in the process stream that would be emitted as fugitives.

Q. Okay. I'd like to turn next to page 49, please.

ALJ CALDERON: I'm sorry. Did you say 41 or 49?

MR. ARTHUR: 49.

Q. (BY MR. ARTHUR) And I think this may just be a typo, so I'd like to clarify. So in the question it

states that, "Operational procedures contained in the permit are enforceable through the permit." Should that say "application"?

A. I'm sorry. What line are you pointing to?

Q. Line 24.

A. You're right again. Yes, earlier on that's mentioned. So, yes -- well, enforceable through the permit and a representation during the ERM application.

Q. Right. Thank you.

All right. So I'd like to turn to page 51, please; and at line 17 you state that, "VOCs are specifically referenced in the draft permit in relation to the testing requirements." What VOC testing is required?

A. If I recall correctly, there's a VOC test for the efficiency of the thermal oxidizers.

Q. Okay.

A. Destruction efficiency.

Q. Okay. And that's the only VOC testing requirement?

A. I'd want to check back with the permit itself to be absolutely sure in answering your question.

Q. Okay. Please do.

A. Where would that be?

Q. Let's see.

MS. ADAMS: Attached to 1D.

MR. ARTHUR: In the admin record at Tab 1D?

MS. REDDING: No, the Applicant's 1D.

MS. ADAMS: Applicant's.

MR. ARTHUR: Oh, sorry. It looks like he's got it.

A. So Special Condition 16B, which is on Bates page number 011, also has a requirement for testing for VOC from the heat transfer fluid heaters, HTF4 and HTF2, as well as thermal oxidizer. And the thermal oxidizer requires testing for VOCs as well as -- or VOCs as well as for a VOC destruction efficiency represented in the application.

Q. (BY MR. ARTHUR) Okay. Thank you.

So I'd like to go back to your pre-filed testimony at page 50. You were asked on line 15 whether there were limits --

A. Let me catch back up with you.

Q. Sorry.

A. That's okay. Page 50.

Q. Yes, page 50, starting at line 15, you're asked, "Are there limits on Texas LNG's emissions that are not listed in the MAERT?"

And you answered, "Yes, based on the

representations in the Application, which are conditions upon which the permit is issued under the first general condition in the draft permit."

Do you see that?

A. I do.

Q. So which limits do you mean here that are not listed in the MAERT?

A. Well, I mean parameters that we used in the emissions calculations to develop them. So it could be hours of operation, the compositions, heating values, number of fugitive components. It would be information like that.

Q. Okay. So you're talking limits in a broader sense than pounds per hour from an emission point?

A. Right. In order to get to pounds an hour for emission point, you have to have a basis for those numbers. I'm talking about those numbers that go into that calculation.

Q. Okay. Thank you, Mr. Bradley.

MR. ARTHUR: I pass the witness.

ALJ CALDERON: Mr. Norton, will it be you or Mr. Ballard?

MR. NORTON: I'm sorry, your Honor?

ALJ CALDERON: You're up for Cross, you or Mr. Ballard.

MR. NORTON: We are going to let Vecinos go before us if that's all right.

ALJ CALDERON: I'm going to assume you will take more than 20 minutes. It's a little too early to stop; but maybe if you're going to switch topics before noon, then we can take a break.

You may proceed.

CROSS-EXAMINATION

BY MS. SAMSON:

Q. Good morning, Mr. Bradley. My name is Hannah Samson.

A. Good morning.

Q. I represent the Protestant group Vecinos.

The company that you work for is ERM, correct?

A. That's right.

Q. And you were hired by Texas LNG to put together the permit application that was submitted to TCEQ?

A. I think originally Texas LNG hired a company called Natural Resource Group; and Natural Resource Group was acquired by ERM in 2014, I think.

Q. But you stated that you personally were working on this application from start to finish, correct?

A. Yes.

Q. And as the lead permit engineer? Would that be the correct title?

A. In our company the title that I have on a project is partner in charge.

Q. Partner in charge. Okay.

A. Actually, let me restate that. I'm not the ultimate partner in charge on the project. That was somebody else, but I would say for this task I was the partner in charge.

Q. So partner in charge of putting together the permit?

A. The application, the air permit application.

Q. Okay. So that means that you were the lead on developing the TCEQ application?

A. No, it doesn't mean that I was the lead. I was also the certifying engineer. So it was ultimately completed under my supervision as the certifying engineer and the PIC on this project.

Q. Did you help formulate the BACT analysis for this permit application?

A. Yes.

Q. And did you have final review of the work product in the BACT analysis?

A. I did.

Q. Does that include the cost calculations?

A. Yes.

Q. Who was Miriam Hacker?

A. Miriam Hacker worked for Natural Resource Group in Denver. She was the person who I would describe as a project engineer for this. So she worked primarily on this application. I worked with Miriam throughout the process.

Q. Is it fair to say that she would -- that you would oversee her work on the BACT analysis to ensure that it was done correctly?

A. I'd oversee her work on the entirety of the application.

Q. So you would review her work and correct any errors in it?

A. I would provide guidance. I would make edits, whether they be on the application text or updates to the emission calculations or the MERA analysis, sure.

Q. And to the cost calculations, also?

A. Yes.

Q. Okay. And there's also Braemar Engineering -- I might be mispronouncing that --

A. Correct.

Q. -- that was tasked with designing the Texas LNG facility?

A. Yes. I think they were the owner's engineers. So they were really the liaison involved with the engineering design.

Q. So ERM has a contract with Texas LNG, and so does Braemar Engineering?

A. Yes, they're separate.

Q. Okay. And ERM had to work with the Braemar engineers in choosing various emission sources?

A. We worked with Braemar to understand the emissions sources that they were considering and including in their design and variations to them.

Q. Between ERM and Braemar, who was tasked with reaching out to vendors for emission sources?

A. I mean, it could be either one of us.

Q. Did you personally reach out to vendors in compiling the emission sources?

A. I don't believe I did.

Q. Do you know if Miriam Hacker reached out to vendors for the emission sources?

A. I would say it's likely that Miriam was involved, yes.

Q. Is it also possible that someone from Braemar Engineering reached out to vendors?

A. Certainly.

Q. Who had the final say of which vendors would

be used in the Texas LNG facility?

A. I'm not sure. I think that ultimately would be a Texas LNG decision, based on advice from Braemar.

Q. So that would not be a decision made by ERM?

A. I don't think it was a decision made by ERM.

Q. If there was vendor information compiled by Braemar Engineering, would that have been passed on to ERM in preparing the application?

A. I'm sorry. Information on design, you said?

Q. For example, if Braemar Engineering had reached out to a vendor to identify an emission source, any information that was compiled by Braemar, would that have made it to ERM?

A. Well, I don't know if Braemar would reach out to vendors to identify an emission source. Braemar is tasked with the design of the facility. So they understand the unit operations. They understand the equipment that's going to be involved in it, but I don't think they would be asking vendors what to put in the LNG plant they're designing.

Q. Okay. So I'll rephrase the question then. If Braemar Engineering had received emission values from a vendor for a particular technology, would that have been passed on to ERM?

A. I'm not sure.

Q. It's possible that it might not have been passed on to ERM?

A. I think it would depend on the context. If Braemar was taking the lead in reaching out to vendors for cost information, you know, as part of a BACT analysis, then I think that information would have been passed on so we could use it in that analysis.

MS. SAMSON: I can move on to my next topic, or we can break.

ALJ CALDERON: I think it's probably a good time to break. So let's come back at -- let's make it 1:15.

(Lunch break 11:49 a.m. to 1:15 p.m.)

ALJ SHENOY: Back on record after our lunch break. We will continue with the Cross of Mr. Bradley by Ms. Samson.

CROSS-EXAMINATION (Continued)

BY MS. SAMSON:

Q. Mr. Bradley, I'm now going to turn to talk about the heaters at the Texas LNG facility.

A. Okay.

Q. I think it's well established in the record, so we don't have to pull up the BACT tables again that the tables state that the NOx limit for a heater should be at 0.1 pounds per MMBTU or 0.01 pounds for MMBTU or

provide other justification, correct?

A. Yes. The table says to propose the best NOx performance based on the burner configuration and the fuel gas fires.

Q. And the figure in that table is 0.01 pounds per MMBTU?

A. It does match the 0.01, yes.

Q. Okay. And, once again, the proposed heaters at Texas LNG will be emitting at a NOx level of 0.024 pounds per MMBTU?

A. That’s what we’re permitting for, yes.

Q. Okay. Are you familiar with the APDG-6110 guidance that TCEQ puts out?

A. Yes.

Q. Okay. So that guidance is in the admin record Tab C. The Bates number on the bottom of the page is 129. I’m not sure if that will help you.

A. I might need assistance.

Q. It’s ED Exhibit 5, I believe, which might be easier to find.

A. Yep.

Q. So without the Bates stamp, it will be page 12 of 51.

A. Yes, I’m there.

Q. Okay. So the second paragraph on that page

states that, "Tier 1 BACT evaluation can be relatively straightforward in that the technical practicability and economic reasonableness of a particular emission reduction option may have already been demonstrated in prior reviews for the same process and/or industry," correct?

A. Yes, that's what it says.

Q. Okay. Is it true that, quote, "what has already been demonstrated in prior reviews," quote, is the amount that ends up in the TCEQ Tier 1 BACT tables?

A. Well, you left out the word "may." So it's "may have already been demonstrated." The TCEQ BACT tables are updated. I'm not sure on what schedule; but, you know, over the years they've updated it as new levels or new technologies or work practices for BACT are established.

Q. Would a figure be put into the Tier 1 BACT tables if it hadn't already been demonstrated in practice or in a prior permit review?

A. I hope not.

Q. So it stands that the 0.01 pounds per MMBTU NOx emission level would have been demonstrated at a facility either already in operation or that had been under permit review?

A. Yes.

Q. Did Texas LNG take any steps to see if technology at or below the submission limit, the 0.01 pounds per MMBTU, was in use or had been permitted at an LNG facility without the use of SCR?

A. We took a look the RACT/BACT/LAER Clearinghouse, as has been described previously. We looked specifically at hot oil heaters. We found twelve other facilities. One of them was, I guess, Lone Star Fractionators, which I think it was stated yesterday is an LNG facility. It is not. It's a natural gas fractionation facility. They're entirely different facilities. And aside from that one, which I think was -- well, it's in the Houston area, where I live, in a nonattainment are. So it wasn't one we considered. The other sources were all above the level that we ended up proposing.

Q. So did you only perform that one search of the RBLC for hot oil heaters?

A. I think that we might have performed, you know, multiple searches of the RBLC. The one I'm most aware of, because I went back and checked it, was leading up to this for hot oil heaters.

Q. And in that search you did not find the Freeport LNG facility?

A. That's right.

Q. Did you submit any information about your RBLC searches to TCEQ? And I'm sorry. When I say "you," Texas LNG.

A. Right. Yes, I understand that.

Well, it was not -- I don't believe it was in the application. There might have been a discussion with an engineer at the time about it, but I don't know whether we submitted information about our RBLC search.

Q. Do you know that there was a discussion with the permit reviewer about the RBLC search?

A. No, I don't.

Q. Besides the search of the RBLC, did anyone at Texas LNG look at other operational or permitted LNG facilities to see if heaters without SCR technology were operating at 0.01 pounds per MMBTU for the NOx emissions?

A. I'm not sure if people -- if those of us working on the application looked at that. We relied ultimately on Samsung Engineering, which has engineers all over the world and in the U.S. And we explained to them what we were trying to achieve in terms of the TCEQ Tier 1 BACT.

Q. Did you tell Samsung that you were trying to achieve 0.01 pounds per MMBTU for the NOx emissions?

A. I think we would have communicated that. The Tier 1 BACT table is available for everybody to see.

Q. And you would have specifically asked for technology at that emissions level?

A. We were looking for the best NOx performance, exactly the language that I already read from the Tier 1 BACT list, yes.

Q. For the thermal oxidizers did anyone at Texas LNG look to other operational or permitted LNG facilities to see what their limits for NOx were on their thermal oxidizers?

A. I don’t know whether they did. We achieved BACT. If you look at the Tier I table, it says 0.06 or less. We achieved 0.06; we meet BACT.

Q. Are you aware that the Rio Grande LNG facility has thermal oxidizers that operate with BACT for NOx at a rate less than the 0.06 pounds per MMBTU?

A. Yes, I’ve seen that they have a slightly lower value that’s listed in the permit application. I also know what the word "or" means in the definition, the definition of the word "or." It’s in the table. It says, "0.06 or less." And we met 0.06.

Q. Are you aware that there’s a facility in Lake Charles that operates at an even lower NOx emissions level -- or that it’s permitted with thermal

oxidizers to operate at an even lower NOx emissions limit of 0.035 pounds per MMBTU?

A. I don't remember specifically looking at that application leading up to this, but we met the Tier 1 BACT.

Q. Okay. So I'd like to look at Tab D of the admin record, which is what the -- it's really part of the application submitted by the Applicant.

A. Okay.

Q. So it's Bates stamped as Texas LNG 00049.

MS. ADAMS: Do you mind if I help him find it?

MS. SAMSON: Oh, sure.

MS. ADAMS: Hannah, can you tell me the number again?

MS. SAMSON: 49 is the Texas LNG Bates.

MS. ADAMS: 409?

MS. SAMSON: 049, 49.

ALJ SHENOY: While we're getting set up, let's just go off the record for a moment.

(Momentarily off the record.)

Q (BY MS. SAMSON) Are you there, Mr. Bradley, at Bates stamped page 49?

A. Yes, I'm there.

Q. Okay. So this is what you proposed to TCEQ in

regards to the heat transfer fluid heaters, which are at Section 5.5 labeled HTF Heaters, correct?

A. Yes.

Q. And it goes on for a little bit on page 49 and then a little bit on page 50?

A. Yes.

Q. That's the entire documentation that you submitted to TCEQ in regards to the heaters?

A. In the application, yes.

Q. In the application. Okay.

Did anyone at TCEQ ask you to provide more supporting documentation about the heaters proposed at Texas LNG?

A. First of all, I'd like to just add to my prior response. You asked if this was the entirety. I would add that Table 5-3 is, of course, much more detailed.

Q. Sure. And Appendix D includes two tables, B1 and B2, about the cost analysis for SCR?

A. That's right. And those numbers are summarized here in the text.

As far as your question about did anybody -- did you ask if anybody asked for additional information?

Q. More documentation, more information from TCEQ to Texas LNG.

A. I don't recall if they did.

Q. Did anyone from TCEQ ask Texas LNG for cost analysis on other heaters that also used ultra-low NOx burner technology?

A. I don't know whether they did.

Q. Okay. We might come back to the application in a minute; but first, I'm going to show you a portion of a document that was produced by Texas LNG. It is Texas LNG Bates number 031536. It's a portion of an October 2015 draft of the permit application.

MS. SAMSON: Your Honor, may I approach to give copies to him?

ALJ SHENOY: Yes.

MS. SAMSON: So, like I said, it's only a portion of that draft application as it pertains to the HTF heaters.

ALJ SHENOY: Are you planning to offer this, Ms. Samson?

MS. SAMSON: Yes.

ALJ SHENOY: So this would be Vecinos 21?

MS. SAMSON: Exhibit 21.

ALJ SHENOY: Do you want to offer it now?

MS. SAMSON: Yes. Like I said, this was produced in Texas LNG's discovery. So I'd like to move to admit it as Vecinos 21.

(Vecinos Exhibit 21 offered.)

ALJ SHENOY: Okay. Hearing no objections, Vecinos Exhibit 21 is admitted.

(Vecinos Exhibit 21 admitted.)

Q. (BY MS. SAMSON) Okay. So as I stated, this is a portion of that draft application from October 2015; and I'd like to point you to the same section, 5.5 on the heaters.

A. Uh-huh.

Q. And this is Texas LNG 031577. At the very last sentence of that page it says, "The projected potential for emissions for NOx are 0.05 pounds per MMBTU," correct?

A. I see that's what we wrote in the draft document, yes.

Q. And on, not the next page, but what is Texas LNG 031579 --

A. Yes.

Q. -- the second paragraph on the page says, "Texas LNG also reviewed costs associated with installing ultra-low NOx burners on the HTF Heaters. Estimated cost per ton NOx associated with this control is approximately $6,960 per ton of NOx removed," correct?

A. I see that's what we wrote in this draft

document.

Q. And it says, "The full cost analysis and basis for calculations is included in Appendix D," right?

A. Yes.

Q. Okay. And you're indicating that this is a draft document?

A. Yes. That's what it's labeled as, and that's how you introduced it to me.

Q. Yes.

How did Texas LNG become aware of heaters with a NOx emission limit of 0.024 pounds per MMBTU?

A. I don't recall exactly how we did.

Q. Was it in looking at other facilities that had been permitted or applied for permitting?

A. I think it was probably a combination of things. It was the RBLC database. I think it was talking to Braemar about the design requirements and what we were trying to achieve to satisfy Tier 1 BACT.

Q. Could it have been based off of information provided by a vendor?

A. For this 6,960?

Q. Sorry. For a heater that has a NOx emission of 0.024 pounds per MMBTU. Could that have come to your awareness through something a vendor told either ERM or Braemar Engineering?

A. I suppose it could have.

Q. Okay. So also in this draft document on what's marked Texas LNG 031578, at the very last sentence on that page it says, "The cost effectiveness of an SCR system is estimated to be $35,000 per ton of NOx removed," correct?

A. That's what it says, yes.

Q. Okay, Mr. Bradley.

MS. SAMSON: May I approach again, your Honor?

ALJ SHENOY: Yes.

Q (BY MR. NORTON) I'm handing you Vecinos Exhibit 22, produced during Texas LNG's discovery. It's an e-mail dated October 27th, 2015; and it's from Miriam Hacker to yourself.

MS. SAMSON: And, your Honor, I'm going move to admit this exhibit, which is 22.

(Vecinos Exhibit 22 offered.)

ALJ SHENOY: Any objections?

MS. ADAMS: I'm sorry. I was still reading it.

I would just raise the same hearsay objection. This is an e-mail from Miriam Hacker. It's an out-of-court statement, and she's offering it as evidence for the truth of the matter asserted. It's

inadmissible hearsay.

MS. SAMSON: Your Honors, it is not hearsay because it's a statement of a party opponent or an agent or employee of a party opponent while within the scope of their work done for the party opponent. Miriam Hacker was employed at ERM. We've already heard testimony to the effect.

ALJ SHENOY: The objection's overruled. Exhibit 22 is admitted for Vecinos.

(Vecinos Exhibit 22 admitted.)

Q (BY MS. SAMSON) Mr. Bradley, I might have misspoken spoken before. This e-mail was sent by you to Ms. Hacker?

A. That's correct.

Q. Apologies for that.

And the second sentence states, "The SCR argument is good, but the ULAB argument on the HTF heaters won't fly." And that's in reference to this October 25th draft?

A. Is that what was attached?

Q. There is an attachment that states Texas LNG Air Permit Application 102025 comments incorporated.

A. So do you know whether there was a prior e-mail in the chain that had some attachments?

Q. This is what was produced to me in discovery.

This is the only prior draft that included a cost analysis -- and I can represent that in my review of discovery, the only draft I saw that included cost analysis of a UNLB heater.

A. I think that's fine.

Q. Okay. So you'd be in agreement that that statement was in reference to this October 2015 draft?

A. They're reasonably connected, yes.

Q. Okay.

A. And I think that I phrased this e-mail how I would phrase a conversation in person, which is to say that I know from experience, as I walked through with Mr. Arthur at the beginning, you know, what TCEQ would need to consider economically reasonable. And for something like NOx control, something like $7,000, which was one of the options we were considering. Again, this is five months before the application got finalized. So I'm letting Miriam know I don't think that's a sufficient argument. And that's pretty much it.

MS. SAMSON: Your Honors, I'm going to ask that that whole portion of dialogue be stricken from the record because it's not responsive to any question that I asked the witness.

ALJ SHENOY: There was no pending question to which the witness was offering answers, so

we will not consider that part of his answer.

THE WITNESS: I thought I was adding.

ALJ SHENOY: You thought you were expanding on your prior answer?

THE WITNESS: Yes, she asked me.

MS. SAMSON: I asked if that sentence was contained in the e-mail and tried to pin down the document that it was in response to.

ALJ SHENOY: I think that you had answered that question. Ms. Adams will have a chance to go back with you if you want to expand on it.

THE WITNESS: Okay.

Q. (BY MS. SAMSON) So also in the October 2015 e-mail it says, "The full cost analysis will be included in Appendix D." So I'm going to --

MS. SAMSON: If I may approach?

ALJ SHENOY: Yes.

Q (BY MS. SAMSON) I have an -- actually, sorry. Before I do that, if we look back at the permit application -- and we've already stated that submitted within the permit application were two tables, B1 and B2; and both those tables were cost analysis for SCR, correct?

A. That's correct.

Q. There was no cost analysis provided by Texas

LNG to TCEQ regarding an ultra-low NOx burner technology?

A. Right, because we were proposing ultra-low NOx burners.

Q. Okay.

MS. SAMSON: So now I'm going to approach to hand the witness what has been marked as Texas LNG 016691. This is a table that was produced in discovery by Texas LNG. And similar to the tables that were produced yesterday, it was produced in its native format; but I have showed them to Counsel for Texas LNG. And there are a number of tabs on the native format, so this is four of the tabs printed off, not the entire document.

ALJ SHENOY: So you said that you provided this to Ms. Adams so that she can confirm that it actually looks like what...

MS. SAMSON: I provided this because it was produced as confidential. So I provided it with the PDF production and also printed it out because there was some discussion about how to deal with the native format of the document. So there's been no alteration to the document.

ALJ SHENOY: Okay. And as far as the confidentiality concern, that's been addressed?

MS. SAMSON: Yes, we did run it by Texas LNG.

MS. ADAMS: We don't have any objections to this document, your Honor.

ALJ SHENOY: Okay. So this will be Vecinos Exhibit 23 that's admitted.

(Vecinos Exhibit 23 admitted.)

MS. SAMSON: And I would move to have this admitted into evidence.

ALJ SHENOY: It is admitted as Exhibit 23.

MS. SAMSON: Oh, I'm sorry.

Q. (BY MS. SAMSON) So the e-mail, Mr. Bradley, that we were looking at was dated October 27th, 2015, correct?

A. That's right.

Q. Okay. And this set of tables on Table 1A, the date says October 26th, 2015, correct?

A. That's correct.

Q. And this set of tables does have a Table D3, correct?

A. I do see that, yes.

Q. Okay. And so does it sound reasonable that this would be the table that supports the cost per NOx per ton of NOx removed that's in the October 2015 draft?

A. The pounds per ton of NOx reduced in this table that we had as far as our draft calculations five months prior to this application has the number 6,960 that mentions or that -- I'm sorry -- is the same as what's in the draft that goes along with the tabs that I see here that this is an 80 percent control efficiency, and it was already a low NOx burner, ultra-low NOx or not, 80 percent. We were going to reduce that low NOx burner by an additional 80 percent. So maybe that's part of what Miriam would have gone back to take a look at in the response to my prior e-mail.

Q. Did you review the testimony provided by the Executive Director in this matter?

A. I did.

Q. Did you see where Dr. Gautam said that an ultra-low NOx burner could reduce emissions by up to 80 percent?

A. Yes.

Q. So if we look at this, Table D3, the top number, the natural gas NOx before control, that's the uncontrolled emissions?

A. Uncontrolled emissions using a low NOx burner, yes.

Q. This is the uncontrolled emissions before control technology is applied to a heater?

A. Well, it says "before control." But I know from experience that the range which you're talking about, .047, it's already a low NOx burner.

And back to the last question, Dr. Gautam's testimony, I believe, talks about, you know, a reduction from -- the ultra-low NOx is not a further percentage reduction off of low NOx. They're not compound. You don't compound the percentages.

Q. What would an uncontrolled emission without a low NOx burner be?

A. Well, most burners actually are -- let me think about this for a second.

It would certainly be higher than .0747. It might .06 or .08.

Q. Is this the first set of calculations that Texas LNG did for -- this October 2015 set of calculations, is this the first set of calculations that Texas LNG did for SCR and ultra-low NOx burners?

A. I don't know. We worked on this for several months. I think we had -- I know we had emission calculations prior to this.

Q. But you don't know if this is the first set of cost calculations?

A. Yeah, I don't know.

Q. And after the ultra-low NOx burner technology

is applied in this table, the controlled emission gets down to 0.009 pounds per MMBTU, correct? That's the second -- on the D3 table, that's the second figure? It just states 0.009 pounds per MMBTU?

A. Yes. I reviewed this spreadsheet, and we're reducing the top number by about 80 percent.

Q. And the resulting emissions level is 0.009 pounds per MMBTU?

A. If you reduce the top number by 80 percent, yes, that's the result.

Q. And, again, this is at the cost per ton of NOx reduced per $6,960?

A. Yes, this is our preliminary calculation or a preliminary calculation.

Q. Okay. But the burner and installation costs used in this table is based off of a specific burner. At the bottom Footnote 1 it states, "Burner and installation costs are based on Vendor John Zink Next Generation burners"?

A. That's what the footnote says, yes.

So do you have a copy of that URL?

MS. SAMSON: I will ask for that statement to be stricken from the record. That's nonresponsive to the question.

THE WITNESS: It's part of the footnote,

immediately after the footnote.

ALJ SHENOY: So you were just asking if there's a copy?

THE WITNESS: That's right.

ALJ SHENOY: It's overruled. It will be taken for what it is.

Q (BY MS. SAMSON) So was the rate of -- the 0.009 pounds per MMBTU in terms of ppm NOx emissions, that's equivalent to about 10 ppm?

A. I think it would be a little bit lower than that.

Q. 8 ppms, 9 ppms?

A. In that range, probably close to 8.

Q. Was the rate of 8 ppm to 10 ppm ever presented to you at any other point in developing the Texas LNG permit application?

A. I don't remember. We might have had the same number in a draft a week later. I'm not sure.

Q. Did a vendor -- did information from the vendor ever point to the fact that 10 ppm was an emissions level available for ultra-low NOx burners?

A. I don't know specifically.

Q. If that figure was obtained by Braemer Engineering, would it be passed on to you?

A. I think it's likely it would happen.

MS. SAMSON: Your Honor, can I approach again?

ALJ SHENOY: Yes.

MS. SAMSON: This is a series of e-mails also produced by Texas LNG. These are e-mails between engineers at Braemar Engineering, again, under contract at the time with Texas LNG. And they were produced in the course of discovery, so I'd like to have them admitted as Vecinos Exhibit 24.

(Vecinos Exhibit Number 24 offered.)

MS. ADAMS: May I have just a moment?

ALJ SHENOY: Yes.

MS. ADAMS: No, objection, your Honor.

ALJ SHENOY: Okay. Hearing no objection, Vecinos Exhibit Number 24 is admitted.

(Vecinos Exhibit Number 24 admitted.)

Q (BY MS. SAMSON) Okay. So I'm going to turn to the third page of this exhibit, which is Bates Texas LNG 042300.

A. Yes.

Q. And David Glessner has sent an e-mail to Miriam Hacker in February of 2016 that states, "We are still working on the NOx BACT level for the HTF heater, and a couple of vendors have told us that it is in the 19- to-20-ppm range," correct?

A. Yes, I see that's in the e-mail.

Q. Okay. And another e-mail forwarded from Miriam Hacker to you on February 18th, 2016 describes some comments that FERC had made regarding HTF heaters that were submitted to FERC, correct?

A. That's what it looks like she is referring to.

Q. Was it the comments from FERC that led to Texas LNG looking for HTF heaters with ultra-low NOx burners at a rate lower than 0.04 pounds per MMBTU for NOx emissions?

A. Well, not necessarily just for -- I mean, we hadn't even put -- the application hadn't even been finalized yet and submitted at that time.

Q. But you had submitted some pre-filing draft documents to FERC at this time?

A. It looks like we had submitted some information to FERC. Yes, it looks like we had submitted some information to FERC. I'm not sure if I was aware of that or not.

Q. And you had received comments back from FERC?

A. That's what it looks like, yes.

ALJ CALDERON: Ms. Samson, can I interrupt you for one second?

MS. SAMSON: Sure.

ALJ CALDERON: Can we go off the record?

(Momentarily off the record.)

ALJ CALDERON: You may proceed.

Q (BY MS. SAMSON) And then on February 24th, 2016 Miriam Hacker sent an e-mail to you; and this is on the first page of this exhibit. Are you looking where I'm looking?

A. Yes, I am.

Q. Okay. And the second sentence says, "We have some base calcs for the cost analysis in our original calculations, but they were not favorable. I'm not sure we need to include them." Do you see that, Mr. Bradley?

A. I see that.

Q. Did I read that correctly?

A. Yes.

She also says she was sending me a draft for review and asked me if she could get it back by the following Monday.

Q. When Miriam Hacker's referring to the cost calculations that are not favorable, is she referring to the October 2015 calculations for ultra-low NOx burners where the calculations came out to $6,960 per ton of NOx removed?

A. I'm not sure what she's referring to. This e-mail was a few months after that, so.

Q. Okay. Thank you.

I'm going to hand you another series of e-mails produced by Texas LNG in discovery.

MS. SAMSON: And, again, this is a series of e-mails between various folks at Braemar Engineering; and these are dated February 15th -- or the most recent ones are dated February 15th, 2016. And they are e-mails with some manufacturer quotes in them.

So I would like to admit this as Vecinos Exhibit 25.

(Vecinos Exhibit Number 25 offered.)

ALJ SHENOY: Ms. Adams, are you still looking at it?

MS. ADAMS: Yes. There are some e-mails in here that are not from a party representative, so I do just need to review this.

No objection, your Honor.

ALJ SHENOY: That is Vecinos 25, and it's admitted.

(Vecinos Exhibit Number 25 admitted.)

Q (BY MS. SAMSON) So at the very top of this set of e-mails, Mr. Bradley, is an e-mail from David Glessner, who is with Braemar Engineering. And the second sentence states, "9 ppm may be difficult to achieve without an SCR," correct?

A. That's what it says, yes.

Q. And if you turn to the second page, there's a forwarded e-mail from Tulsa Heaters that states, "There are ample burner manufacturers in the U.S. and Europe that can supply burners capable of achieving NOx emissions of 10 ppm," correct?

A. That's what it says, yes.

Q. And so was there any investigation into manufacturers that could potentially manufacture a heater that operated at 10 ppm without an SCR component to it?

A. I think we have an e-mail here from a vendor who is opining that there might be burners out there that can get down to that level.

Q. Sure, but my question is: Was there any investigation into the statement to find out if that was possible or not?

A. I'm not sure if we undertook an investigation, as you're calling it.

Q. Because in October of 2015, you had encountered cost information for a John Zink burner that could get NOx emissions down to 0.09 pounds per MMBTU; and the cost per ton of NOx emitted there was $6,960?

A. Let me go back to that reference.

Yes, we had a calculation from BACT in October of 2015 that had a starting value of .047,

reduced it by 80 percent. I already stated that I think it is not necessarily representative of an ultra-NOx burner and how low it can get. That's a preliminary number.

Q. Did anyone from Texas LNG ever submit a version of Table D3 to TCEQ?

A. It was not submitted as part of the application because we were already proposing ultra-NOx burners.

Q. Did a copy of that table ever make it to TCEQ?

A. I'm not sure.

Q. I'd like to direct you to the Administrative Record Tab C. It will be Bates stamped 650, I believe.

MS. ADAMS: Do you want me to help him find it?

MS. SAMSON: I actually have an extra copy of this -- let me make sure I do before I say that.

Well, sorry, Jennifer. If you can -- I thought I had another copy. It's 651. I'm sorry.

ALJ CALDERON: 650 or 651?

MS. SAMSON: I'm sorry 651. Table D3 is at the top of it.

MS. ADAMS: Was this pulled out before?

MS. SAMSON: I don't think it's been looked at before. It may be on the back of a page that

we were looking at before.

Q (BY MS. SAMSON) Do you have D3 in front of you, Mr. Bradley?

A. I do.

Q. Okay. So while looking at the October 2015 version of D3, you expressed issue with the 80 percent control efficiency percentage; but, here, the difference in the table is that first number, the natural gas NOx before control figure, correct? That's the number that's different from the October 2015 version of this table?

A. Right.

Q. The October 2015 version has an uncontrolled emissions level of 0.47 pounds per MM --

A. 0.047.

Q. -- 0.047 pounds per MMBTU?

A. Yes.

Q. And this has an uncontrolled figure of 0.024 pounds per MMBTU?

A. Yes.

Q. Okay. And in this table the amount per ton of NOx reduced has increased to $14,720, correct?

A. That's right.

Q. But the difference in this table -- it's still based -- sorry. It is still based on the John Zink Next

Generation Burner cost estimates if we look at Footnote 1, correct?

A. It has the same footnote. I'm not sure if it's actually based on that number or not.

Q. But the difference in this table is, again, that uncontrolled emissions limit at the very top, correct?

A. Yes. I would say before control. That's how it's labeled.

Q. Before control?

A. Yes.

MS. SAMSON: I'm going to approach, with permission --

ALJ SHENOY: Yes.

MS. SAMSON: -- with another couple of e-mails produced by Texas LNG during discovery; and I'm going to move to admit this as Vecinos Exhibit 26.

(Vecinos Exhibit 26 offered.)

Q. (BY MS. SAMSON) And these e-mails, Mr. Bradley, are -- the top e-mail from Miriam to you is dated March 2nd, 2016, correct?

ALJ SHENOY: I'm sorry. Let me stop you.

Were there any objections to this document?

MS. SAMSON: I'm sorry.

MS. ADAMS: No.

ALJ SHENOY: So 26 is admitted for Vecinos.

(Vecinos Exhibit 26 admitted.)

ALJ SHENOY: Go ahead.

MS. SAMSON: Thank you.

Q. (BY MS. SAMSON) This is dated March 2nd, 2016, correct?

A. That's right.

Q. And the permit by Texas LNG was submitted on March 24th, 2016 to TCEQ?

A. The 23rd or 24th. I'm not sure of the exact date.

Q. Okay. So Miriam sends an e-mail to you and Ross Hargrove stating, "Ross, you posed one question about the truth of the statement and the document. The statement you cited was included in the last version of this permit application and was likely inserted by Dave. I suggest that we leave it in and let Dave change it if he wants." Did I read that correctly?

A. I'm not sure to what this is referring; but, yes, you read it correctly.

Q. Is "Dave" referring to David Glessner?

A. I would guess that it is, yes.

Q. And you're not sure what statement this is

referring to?

A. No.

Q. So are you certain that it was either addressed by Dave or fact-checked before it was submitted to TCEQ?

A. Well, I think any comments that are made in the draft document are assessed and evaluated. I think that's what we would have done, yes.

Q. Do you have personal knowledge that the statement was addressed before the application was submitted to TCEQ?

A. Well, I don't remember what it was, so I can't -- I just don't remember what this was.

Q. Okay. The next paragraph starts, "Deever, you have suggested that the BACT section is 'very brief considering the argument we are making.'" Did I read that correctly?

A. Yes, that's what it says.

Q. Was the BACT section edited between March 2nd, 2016 and March 23rd or 24th, 2016?

A. I'd have to take a look and see if that version's changed.

Q. But you're not sure if that comment was addressed before it was submitted to TCEQ?

A. I'm not sure what was addressed pertaining to

my comment.

Q. Okay. Regarding the flares at the facility, in the permit, the draft permit issued by TCEQ, are there any limitations on when the flares can be used as it pertains to meteorological conditions?

A. I'm not aware of a special condition limiting operation of the flares. The text of the application states the intention of when a facility would schedule turnarounds, typically summer hours, and whatnot.

Q. But there's no limitation on the use of flares for certain weather events in the draft permit?

A. Not in this permit. I'm not aware of weather events being a part of any permit conditions that I've been involved with.

MS. SAMSON: That's all I have, Mr. Bradley. Thank you.

ALJ SHENOY: And so Port Isabel is going now to Cross, correct?

MR. NORTON: Can we take a couple of minutes, your Honor?

ALJ SHENOY: Sure. Let's go off the record.

(Off the record from 2:11 to 2:17 p.m.)

ALJ SHENOY: We're continuing the Cross of Mr. Bradley.

Mr. Norton?

MR. NORTON: No questions, your Honor.

ALJ SHENOY: Redirect?

MS. ADAMS: I don't think so.

ALJ SHENOY: That will terminate our questions then.

Thank you very much, Mr. Bradley.

Do we need a moment to get situated for your next witness in terms of documents?

MS. ADAMS: We'll clean up over there a little bit, but we don't need to take a break.

(Momentarily off the record.)

ALJ SHENOY: Are you ready for your next witness, Ms. Adams?

MS. ADAMS: I am.

(Witness sworn by ALJ Shenoy.)

ALJ SHENOY: Okay. Be seated and please spell your first and last name for the court reporter.

THE WITNESS: Sure. My name is Lyle Chinkin, L-Y-L-E C-H-I-N-K-I-N.

LYLE CHINKIN,

having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MS. ADAMS:

Q. Good afternoon, Mr. Chinkin.

A. Good afternoon.

Q. You have in front of you your direct testimony. Have you had a chance to review that to determine if it contained any errors?

A. Yes, I did, actually; and I did find one error.

Q. Okay. And can you tell us where that is?

A. Yes.

Q. And for the record you're on Applicant's Exhibit 5, which is your direct testimony?

A. Yes. On page 29, line 9 there's a typographical error, where it says, "limited to less than 3 percent," it should be "limited to less than 8 percent."

MS. GAINES: I'm sorry. Can you say that number again, what you're changing it to?

THE WITNESS: From a 3 to a 8.

Q. (BY MS. ADAMS) Will you just go ahead and write that on there, that correction?

A. I've done that.

MS. ADAMS: Texas LNG would like to re-offer Exhibit Number 5.

(Texas LNG corrected Exhibit 5 offered.)

MR. NORTON: No objection.

ALJ SHENOY: Hearing no objections,

previously admitted Texas LNG Exhibit 5 is substituted with this one correction and is admitted.

(Texas LNG corrected Exhibit 5 admitted.)

MS. ADAMS: Pass the witness.

MS. REDDING: No questions, your Honor.

MR. ARTHUR: No questions, your Honor.

ALJ SHENOY: Go ahead, Ms. Gaines.

CROSS-EXAMINATION

BY MS. GAINES:

Q. Good afternoon, Mr. Chinkin.

A. Good afternoon.

Q. My name is Erin Gaines. I believe we met by video; is that correct?

A. That’s correct, yes.

Q. It’s good to meet you in person.

This is the first time, in this case, that you have applied TCEQ BACT method, correct?

A. That’s correct. I’ve applied BACT around the country, but this is my first time in Texas.

Q. So it’s fair to say you’re more familiar with EPA’s top-down method for BACT, correct?

A. That’s correct.

Q. And you agree that the two approaches reach the same results, correct?

A. That’s correct.

Q. In your previous case that you've worked on that you discussed during your deposition related to power plants. Do you remember your work in that case?

A. Yes, I do.

Q. What was the general approach you and your team took to determine what BACT was for those power plants?

A. Well, that was a federal case in another state outside of Texas; and we were tasked with trying to determine what would BACT have been historically. This was, like, 15, 20 years ago. So we did the best we could with the RBLC, looking at, you know, what technologies were used that long ago to determine what would have been a lengthy BACT implementation had this facility implemented BACT correctly.

Q. And you referred to that, I believe, in your deposition as a historical BACT analysis, like you're saying, went back in history; is that correct?

A. That's correct.

Q. And you agree that determining BACT today would be different from the sources than it was 15, 20 years ago?

A. Right, because BACT does evolve over time as technology changes.

Q. And you agree that the approach you took there

is not very dissimilar to what goes on in Texas today with the three-tier approach; is that correct?

A. Well, to be clear, in the state of Texas, as I understand it, they've streamlined the process for minor sources in particular, where what we did in that case would be almost a Tier III in Texas' approach. So we independently did all those things that are in a Tier III in Texas for that facility, which was outside of Texas in that case.

Q. Okay. I'm going to read from your deposition to refresh your memory of your statement at that time. On page 83, Line 11 I asked, "Can you tell me how, not the specifics because I'm sure it's specific to that facility, but how you and your team went about determining what was BACT for those facilities at that time?"

You answered, "Well, trying to keep it at a high level is not very dissimilar to what goes on in Texas today with the, you know, three-tiered approach, which is sort of Tier I is -- what were other facilities who installed controls, you know, cost effectively and practically were doing across the country."

Would you like to see that answer?

A. Yeah. I think that was consistent with what I just said.

Q. I'm sorry?

A. I think that answer was consistent with what I just said. That was a major in a nonattainment area.

Q. Sir, I was just asking -- I'm allowed to read from your deposition if it's different than what you're saying here today.

A. Well, I'm just clarifying the question I thought I was answering in my deposition was different than the one you just asked me. So I was just trying to be clear. That's all.

Q. Okay. The record will reflect that.

A. Okay.

Q. As part of your work on this case for the Texas LNG facility, in your opinions about BACT related to flares, you did not look at other technologies or emissions limits that are in use at other facilities, correct?

A. I'm sorry. Can you repeat that again?

Q. Okay. As part of your BACT analysis in this case for flares, you have not looked at other technologies or emissions limits that are in use at other facilities, correct?

A. No. I looked at the BACT Tier I tables that TCEQ provided.

Q. You looked at that; and then you did not

independently look at other permits -- other emissions limits and other permits, correct?

A. That's correct.

Q. You did not look at the RBLC database?

A. I did not do that in this case.

Q. You didn't look at other LNG facilities that are permitted in Texas?

A. That's correct, I did not do that.

Q. Do you agree wind speed generally increases with height?

A. In general that would be true.

Q. And the data that you provided in your pre-filed testimony with the wind rose is at a height of 10 meters; is that correct?

A. That's the wind rose that was used for air quality modeling in this case. It looks like I was supplied that wind rose, that is correct.

Q. The height of 10 meters; is that correct?

A. That's correct.

Q. What is the height of the tallest flare at the Texas LNG facility?

A. The tallest flare is about a hundred meters.

Q. Are you familiar with the special conditions in the permit, Texas LNG's permit for flares?

A. I read them. I don't have them memorized.

Q. Sure. We can look at them if you want. I'm going to ask you some general questions about them. Are you aware of a permit requirement for Texas LNG's facility that limits the use of flares to certain wind conditions?

A. Well, from memory -- I think we should look at it -- my recollection is there are special conditions about not being able to see visible smoke from the flare for more than five minutes in two hours, if I remember correctly.

Q. So --

A. And that could be caused by a weather phenomenon, so it's implicitly weather related but not explicitly. There was no wind speed limitations.

Q. Okay. We're looking at the permit in the Administrative Record, Bates Number 67.

ALJ SHENOY: Is there a way for the witness to find it, or maybe someone can help him.

MS. SAMSON: I will bring you this copy.

THE WITNESS: That would be great. Thank you.

Q (BY MS. GAINES) Okay. Let me know when you've gotten there.

A. So are we on page 3 of Special Conditions.

Q. Page 3 of Special Conditions. Is that what

you're looking at?

A. Yes.

Q. Okay. So I had asked you: Is there a permit condition that limits the use of flares to certain wind conditions? And you pointed -- you were recalling a condition about smoke or visible emissions?

A. Correct. So the letter D is what I was referring to of the special conditions.

Q. Okay. And letter D does not state anything about wind speeds or certain meteorological conditions, correct?

A. Yes, correct, not explicitly.

Q. Okay. That's my question.

And the actual destruction efficiency of the flare is not a permit requirement -- measuring the actual destruction efficiency from the flare on an ongoing basis is not a permit requirement, correct?

A. Measuring the destruction? No, that is not a requirement of any permit I've ever been involved with.

Q. I'm asking you about this permit, sir.

A. Okay. It is not --

Q. If you can limit your answers to my questions, I'd appreciate that.

A. Certainly.

Q. Are the actual emissions from the flares

required to be measured in this permit, emissions of VOCs, for example?

A. No, they are not.

Q. Is the composition of the waste gas going to the flare required to be measured in this permit?

A. It is not a requirement added to this permit.

Q. Is the wind speed at the height of the flare required to be measured in this permit?

A. No, it is not.

Q. Are you familiar with the Flare Task Force at TCEQ?

A. I'm not personally familiar with the task force. I know members of the task force and I've read about them, but I'm not a member of that task force.

Q. But you're aware that it exists, the Flare Task Force?

A. Yes.

Q. Have you read any of the publications or studies that they have produced as part of that task force?

A. I recently read something, and I think you guys produced a PowerPoint presentation that the task force put together.

MS. GAINES: May I approach?

ALJ SHENOY: Yes.

Q (BY MS. GAINES) Is this the presentation that you reviewed?

A. Yes, this is it.

Q. Okay.

MS. GAINES: Your Honors, I'll move to admit this exhibit as Vecinos 27.

(Vecinos Exhibit 27 offered.)

ALJ SHENOY: Are there any objections?

(No audible response.)

ALJ SHENOY: Hearing no objections, Vecinos 27 is admitted.

(Vecinos Exhibit 27 admitted.)

Q (BY MS. GAINES) If you turn to page 18 of this document, Mr. Chinkin, the Bates number is Vecinos 003103 at the bottom.

A. I see that.

Q. Okay. At the top of the page it says, "Flare Performance Impacts, Meteorological Conditions: Wind, ambient temperature, humidity, other conditions?" Do you see that?

A. Yes, I do.

Q. And then under Potential Performance Impacts, the first one states, "High winds can cause flame separation and result in increased emissions." Do you see that?

A. Yes, I do.

Q. The second one is, "University of Albert study found crosswinds greater than 5 miles per hour reduced combustion efficiency."

And the last one, "Meteorological conditions are not accounted for in DRE assumptions."

You said you've reviewed this document?

A. Yes, I have.

Q. Okay. Do you have any opinions about what these studies -- the results of these studies that the task force has included in the presentation?

A. Sure. I've read lots of literature, including the University of Albert study. These are all potential issues that others have researched and documented. I'm not sure how much you want me to go on.

Q. Are you relying on that University of Alberta study to form your opinion in this case?

A. No, I'm not. I did this just since you sent this out the other night. So my opinion is not based on what you sent out the other night.

Q. Yeah, but you just told me that you had reviewed that study?

A. Since you sent this out the other night.

Q. Okay. And the study found that crosswinds greater than 5 miles per hour reduced combustion

efficiency from flares, correct?

A. Well, my quick read of the study, given the amount of time we had --

Q. Okay. I'm actually -- that's what this document says. And then you --

MS. GAINES: I don't believe your counsel has disclosed any additional studies he has read.

MS. ADAMS: So the history here is on the eve of trial, they produced this presentation, literally the day before we started, as a supplemental disclosure. And Mr. Chinkin reviewed it and saw the reference to the study and said, "I wonder what the study said." And he went and looked at it. So it's not a basis of his opinion.

But I do think it's inappropriate to ask him about a line and then refuse to let him expand on the study --

MS. GAINES: If he's going to expand upon it, then I think we should introduce that study.

ALJ SHENOY: The Alberta study?

MS. GAINES: Yes, the University of Alberta study.

ALJ SHENOY: Ms. Adams?

MS. ADAMS: I don't have the study. I've never looked at the study, so I don't guess I care if it

goes into evidence. We have a lot of wind studies in evidence, but I don't have it nor have I ever seen it. So I'd like to take a look at it.

ALJ SHENOY: Before we have Mr. Chinkin opining about something that's -- I mean, he can use hearsay in forming opinions; but I don't want a previously undisclosed opinion to be put out there for other parties to have to respond to when we've prevented other experts from doing that as well.

Q (BY MS. GAINES) Let me just ask you to turn to a new page, then, in this document, page 26, Vecinos 003111.

A. Okay. I'm there.

Q. And the second bullet point states, "Small differences between the assumed DRE and the actual DRE can result in big differences between the actual and the reported emissions." Do you agree with that statement?

A. Well, it's a math question. If you cut your money in half, you have to double your money to get back to where you were. So that's a semantic.

Q. But you have no reason not -- page 26 -- you're saying you agree with that statement because it's basic math? Is that what you're saying?

A. I'm saying it's semantics to say it's a big difference from a small change.

Q. Okay.

A. That's just how you refer to numbers. If you double your number, is that a big change? If you half your number, is that a big change? It's semantics.

Q. I see. So you don't have an opinion because of the term "big." But if we go down, I believe they do provide an example: If the DRE is 99 percent, then the estimated VOC emissions are two tpy, tons per year; is that correct?

A. That's correct.

Q. And then if the DRE is 98 percent, then the estimated VOC emissions doubles to 4 tpy. Do you agree with that math?

A. Correct. That's what I was just saying. When you make a 1-percent change on a 2-percent number, it can have what looks like a bigger effect.

Q. Okay.

MS. GAINES: No further questions.

ALJ SHENOY: Port Isabel?

MR. NORTON: We have no questions, your Honor.

ALJ SHENOY: Ms. Adams?

MS. ADAMS: One brief follow-up.

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REDIRECT EXAMINATION

BY MS. ADAMS:

Q. Now, Mr. Chinkin, if you turn in that same document to Bates page 3098 or page 13, as labeled on the slide, is there anything on that slide that gives you information on what the assumed destruction removal efficiency rate is for a flare?

A. Yes, there is.

Q. And where is that?

A. In the middle section under 30 TAC 116, Permits for New/Modified Sources, the third bullet down talks about the "removal efficiency is assumed to be 98 or 99 percent when the flare meets 40 CFR 60.18 requirements."

Q. And do you know whether that’s true for elevated flares?

A. That’s true whether the flare is elevated or at the ground.

MS. ADAMS: That’s all.

ALJ SHENOY: Okay. Any Recross on that limited scope of Redirect?

MS. GAINES: No, your Honor.

ALJ SHENOY: Thank you, Mr. Chinkin.

Let’s go off the record.

(Off the record from 2:40 to 2:49 p.m.)

ALJ SHENOY: Ms. Adams?

MS. ADAMS: Applicant's position is that if -- I believe from Judge Calderon's reading in the beginning that the parties and the judges are in agreement that submitting the Administrative Record into evidence meets prima facie demonstration that the draft permit meets all legal and technical state and federal requirements. And if the parties are in agreement on that, then, we stand by what's in the Administrative Record and the direct testimony submitted; and we have nothing further.

ALJ SHENOY: And that is what we read into the record, the standard that's been adopted by the TCEQ in the CFDs that have gone forth so far.

Does any other party have any comments?

MR. NORTON: If I what understand her to say is that once they submitted the Administrative Record into the record of this proceeding -- which happened back on Monday, I think, or even at the preliminary hearing --

ALJ CALDERON: At the preliminary hearing.

MR. NORTON: -- that the burden was changed over; there was a presumption that attached when it got put into the record that day, then I agree that a

presumption was legally attached to it at that point. And what we've been here doing all this time is to test whether that was a valid presumption or whether it's been rebutted, so.

ALJ SHENOY: So everyone is in agreement?

(No audible response.)

ALJ SHENOY: We had asked at the beginning of the hearing -- which, I was going to say early this week, but that was yesterday -- that the parties talk about a briefing outline. And I don't think you've had a chance to do that, probably; but we'd ask if you can submit it -- I don't know -- next week is a short week...

MR. NORTON: Can I ask when the transcript is going to be ready?

ALJ SHENOY: Let's go off the record.

(Off the record from 2:51 to 2:55 p.m.)

ALJ SHENOY: While we were off the record, we discussed next steps, deadlines, and process; and we have agreed with the parties that by the close of business on this coming Monday, which is November 25th, the parties will submit either a single agreed briefing outline with the three referred issues that remain and sub-heads that they can agree on; or they'll submit their competing outlines if they're unable to agree.

So, again, by the end of the day, close of business on November 25th. And Judge Calderon and I will attempt to get that turned around and back to the parties as soon as possible so that you have a confirmed outline.

Your deadlines have already been spelled out in other orders and have not changed.

Does any party have any questions about process or anything else?

MR. NORTON: Do we know when we can get a rough of the transcript?

(Momentary discussion with the reporter off the record.)

ALJ SHENOY: Once we're off the record here, if you-all want to confer and make sure that the court reporter has your contact information and whatever needs to be done, you can certainly do that.

It's only 3:00 o'clock, but I think that we have someone coming to close up the room soon. Does anyone need accommodations in terms of removing boxes from here by 5:00?

MR. ARTHUR: Could I make one point in regards to the transcript? So the TCEQ -- well, I'll just speak frankly: We don't pay for a transcript, so we rely on the transcript being filed with the TCEQ.

Is that your intention, to file it at the Agency?

(Momentary discussion with the reporter off the record.)

MS. ADAMS: We can file it.

MR. ARTHUR: Okay. Thanks.

ALJ SHENOY: Any other questions?

(No audible response.)

ALJ SHENOY: Thank you-all very much. It was a very interesting two days, lots of things for us to go back and look at and understand; and we're looking forward to your closing arguments, also.

We're adjourned.

(Hearing adjourned at 2:58 p.m.)

C E R T I F I C A T E

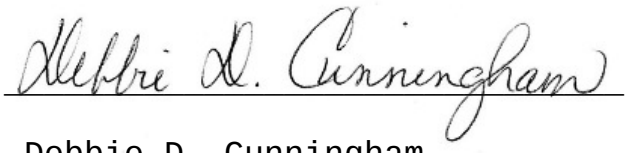
STATE OF TEXAS)

COUNTY OF TRAVIS)

I, Debbie D. Cunningham, Certified Shorthand Reporter in and for the State of Texas, do hereby certify that the above-mentioned matter occurred as hereinbefore set out.

I FURTHER CERTIFY THAT the proceedings of such were reported by me or under my supervision, later reduced to typewritten form under my supervision and control and that the foregoing pages are a full, true, and correct transcription of the original notes.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this 4th day of December, 2019.



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