

# Texas Commission on Environmental Quality

## Interoffice Memorandum

**To:** Commissioners **Date:** June 26, 2020

**Thru:** Bridget C. Bohac, Chief Clerk  
Toby Baker, Executive Director

**From:** Tonya Baer, Deputy Director  
Office of Air

**Docket No.:** 2020-0353-RUL

**Subject:** Commission Approval for Proposed Rulemaking  
Chapter 17, Tax Relief for Property Used for Environmental Protection  
Chapter 18, Rollback Relief for Pollution Control Requirements  
SB 2: Title Change, Heat Recovery Steam Generator Updates, and Tier I  
Table Updates  
Rule Project No. 2020-031-018-AI

**Background and reason(s) for the rulemaking:**

The proposed rulemaking would address three separate issues. First, on May 3, 2019, in *Brazos Electric Power Cooperative v. Texas Commission on Environmental Quality*, 576 S.W.3d 374 (Tex. 2019) and *Texas Commission on Environmental Quality v. Brazos Valley Energy LLC*, 582.W.3d 277 (Tex. 2019), the Texas Supreme Court determined that the commission abused its discretion in issuing negative use determinations for heat recovery steam generators (HRSGs) and remanded cases to the commission for further proceedings, consistent with its opinions. HRSGs are included on the property listed at Texas Tax Code, §11.31(k) (k-list), which is codified in 30 Texas Administrative Code (TAC) Chapter 17, §17.17(b) as the Expedited Review List (ERL) and at Texas Tax Code, §26.054(f), which is codified in 30 TAC Chapter 18, §18.26 as the ERL. To address the Texas Supreme Court's opinions, the commission solicited advice from the Tax Relief for Pollution Control Property Advisory Committee (committee) on how to determine use percentages for future HRSG applications. The committee recommended the addition of HRSGs to the Tier I Table with a 65% use determination.

Second, this proposed rulemaking would incorporate the recommendations submitted by the committee in a letter dated December 13, 2018. After consideration of the Tier II and Tier III applications submitted from 2014 through 2018 that received positive use determinations (PUD), the committee recommended the pollution control property items that were demonstrated to be wholly used as pollution control property on a consistent basis and in the same manner on each application for any given property be added to the Tier I Table. The committee determined that 11 types of pollution control property currently submitted as Tier II property should instead be considered Tier I property in the Tier I Table and no longer require a Tier II application.

The TCEQ is required to review, and update as necessary, the items on the Tier I Table in Chapter 17, per §17.14(b), and the items on the ERL, per Texas Tax Code, §11.31(l), at least once every three years. Likewise, the TCEQ is required to review, and update as necessary, the items on the Tier I Table in Chapter 18, per §18.25(b), and the items on the ERL, per Texas Tax Code, §26.054(g) at least once every three years. This proposed rulemaking would fulfill the requirements for the commission to review and update the property included on the ERLs and Tier I Tables in Chapters 17 and 18.

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Finally, this proposed rulemaking would implement Senate Bill (SB) 2, Section 44, 86th Texas Legislature, 2019, which requires rulemaking to revise the title of Chapter 18 from Rollback Relief for Pollution Control Requirements to Voter-Approval Tax Rate Relief for Pollution Control Requirements.

**Scope of the rulemaking:**

The proposed rule revisions would amend Chapter 17 to address both the committee's December 9, 2019 recommendations concerning HRSGs and its December 13, 2018 recommendations concerning the Tier I Table and the ERL. The proposed amendments would add pollution control property recommended by the committee to the Tier I Table and include changes to accommodate the addition of HRSGs with a partial use percentage to the Tier I Table. In addition, the proposed amendments would update the HRSG description in Chapters 17 ERL. To ensure consistency between the Chapters 17 and 18 identical Tier I Tables and ERLs, and similar partial use determination, the revisions proposed to Chapter 18 would mirror the changes proposed to Chapter 17.

**A.) Summary of what the rulemaking would do:**

The proposed rulemaking would amend §17.14(a) and §18.25(a) to add HRSGs to the Tier I Tables with a partial use of 65%, consistent with the committee's formal advice submitted to the commission in December 2019 on the Chapter 17 rules. Other amendments proposed to §17.14(a) and §18.25(a) would accommodate including HRSGs on the Tier I Tables at a partial use percentage since the tables currently include only items used wholly for pollution control. The proposed rulemaking would also replace the existing HRSG description in the Chapter 17, §17.17(b) ERL and Chapter 18, §18.26 ERL with the same property description proposed to the Chapters 17 and 18 Tier I Tables.

Similarly, the proposed amendments would add 11 items to the Tier I Tables in §17.14(a) and §18.25(a), consistent with the committee's recommendations submitted to the commission in December 2018 on the Chapter 17 rules, except where changes to the committee's recommended rule language are necessary. These exceptions, described in the proposed revisions to both Chapters 17 and 18 are intended to ensure only the property used for pollution control is described in the rule and therefore eligible for a PUD, consistent with existing Tier I Table items. Specifically, clarifying language was added to the proposed description for land reclamation equipment and to the proposed description for nondestructive pipeline testing.

The proposed amendments to §17.17(a) and §18.30 would ensure that an applicant applying for property not used as described in the Tier I Table continues to be required to submit a Tier III application under the Chapter 17 rules and a Tier II application under the Chapter 18 rules. Finally, the proposed rulemaking would implement the Chapter 18 title change required by SB 2, Section 44.

**B.) Scope required by federal regulations or state statutes:**

The triennial review of the ERLs is required by Texas Tax Code, §11.31(l) and §26.045(g). This proposed rulemaking would fulfill the commission's triennial review mandate in

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Texas Tax Code, §11.31(l) and §26.045(g). No changes would be proposed to the ERLs based on the triennial reviews, but changes would be proposed to maintain consistency with the HRSG property descriptions proposed to the Chapters 17 and 18 Tier I Tables.

**C.) Additional staff recommendations that are not required by federal rule or state statute:**

The rulemaking would amend Chapter 17 based on recommendations provided by the committee on December 2018 and 2019 and would amend Chapter 18 to mirror those changes. The rulemaking would include certain amendments to §17.14(a) and §17.17(a) and (b), which would be mirrored in Chapter 18, §18.25(a), §18.26, and §18.30, that were not explicitly recommended by the committee in its formal advice in December 2018 and 2019. These proposed amendments to the Tier I Tables differ from the committee's recommendations to ensure that only the property used for pollution control is described in the rule and therefore eligible for a PUD, but the proposed amendments would not interfere with the committee's purpose for adding the items. The other proposed rule changes would accommodate the addition of HRSGs at a partial use determination in the Tier I Tables and would ensure consistency among the Tier I Tables and ERLs.

**Statutory authority:**

The rulemaking would be proposed under Texas Water Code (TWC), §5.102, which authorizes the commission to perform any acts authorized by the TWC or other laws that are necessary and convenient to the exercise of its jurisdiction and powers; and TWC, §5.103, which authorizes the commission to adopt rules necessary to carry out its powers and duties under the TWC.

The amendments to Chapter 17 would also be proposed under Texas Tax Code, §11.31, which authorizes the commission to adopt rules to implement the Pollution Control Property Tax Exemption. The proposed amendments to Chapter 17 would implement Texas Tax Code, §11.31.

The amendments to Chapter 18 would also be proposed under Texas Tax Code, §26.045, which authorizes that the voter-approval tax rate for a political subdivision of this state be increased by the rate that, if applied to the total current value, would impose an amount of taxes equal to the amount the political subdivision will spend out of its maintenance and operation funds under Texas Tax Code, §26.012(16) to pay for a facility, device, or method for the control of air, water, or land pollution that is necessary to meet the requirements of a permit issued by the commission. The proposed amendments to Chapter 18 would implement Texas Tax Code, §26.045 and Senate Bill 2, Section 44.

**Effect on the:**

**A.) Regulated community:**

The proposed rulemaking would affect industries that own property and choose to apply for use determinations for property added to the Tier I Table using a Tier I application.

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**B.) Public:**

The rulemaking could affect appraisal districts that grant and determine the value of tax exemptions.

**C.) Agency programs:**

Though impact to agency programs is expected to be minimal, the rulemaking may provide clear direction to program staff, reduce fee-related income, and require revision of program documents.

**Stakeholder meetings:**

The committee met six times to discuss how to address HRSG applications following the Texas Supreme Court rulings on May 3, 2019.

**Potential controversial concerns and legislative interest:**

Applicants may object to the committee's recommendation to add HRSGs to the Tier I Tables with a partial use determination of 65%, and they may desire a use determination greater than 65% for HRSGs. As the rules are currently written, adding HRSGs to the Tier I Tables would not prohibit an applicant from using the cost analysis procedure (CAP) under the Chapter 17 Tier III approach or the Chapter 18 Tier II approach, which requires the applicant to propose a reasonable method for calculating a partial determination, to receive a higher use determination for HRSGs than the committee's recommended 65%. Based on discussions during committee meetings, non-industry representatives may object to the inclusion of HRSGs on the Tier I Table with a 65% or greater use determination.

**Would this rulemaking affect any current policies or require development of new policies?**

No.

**What are the consequences if this rulemaking does not go forward? Are there alternatives to rulemaking?**

Choosing not to implement the committee's advice would not affect the eligibility of property for PUDs. Such PUDs could be made under existing Chapters 17 and 18 rules for the property the committee has advised to be added to the existing Tier I Tables. However, not making these proposed changes could be viewed as a violation of the requirements in §17.14(b) and §18.25(b) requiring updates to the Tier I Table if there is compelling evidence to support the conclusion that the item provides pollution control benefits. For HRSGs, the alternative to the proposed rulemaking would be to continue to use the CAP in §17.17 and Tier II approach in §18.30 for future use determination applications. Because no applications have been received under the Chapter 18 rules requesting a use determination for HRSGs, it is unclear what issues could result from using the Tier II calculation approach. However, it is known that the CAP has been problematic for the consideration of HRSGs with respect to the input variables for the formula, particularly *Capitol Cost Old* and *Production Capacity Factor*.

Commissioners

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**Key points in the proposal rulemaking schedule:**

**Anticipated proposal date:** July 15, 2020

**Anticipated *Texas Register* publication date:** July 31, 2020

**Anticipated public hearing date:** NA

**Anticipated public comment period:** July 31, 2020 - August 31, 2020

**Anticipated adoption date:** December 16, 2020

**Agency contacts:**

Elizabeth Sartain, Rule Project Manager, Air Quality Division, (512) 239-3933

Don Redmond, Staff Attorney, (512) 239-0612

Gwen Ricco, Texas Register Rule/Agenda Coordinator, (512) 239-2678

**Attachments:**

SB 2, Section 44

Advice for Expedited Review List and Tier I Table, letter dated December 13, 2018

Advice Regarding Future Heat Recovery Steam Generator Applications, letter dated December 9, 2019

cc: Chief Clerk, 2 copies  
Executive Director's Office  
Jim Rizk  
Morgan Johnson  
Brody Burks  
Office of General Counsel  
Elizabeth Sartain  
Gwen Ricco

AN ACT

relating to ad valorem taxation; authorizing fees.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. This Act may be cited as the Texas Property Tax Reform and Transparency Act of 2019.

SECTION 2. Chapter 1, Tax Code, is amended by adding Section 1.045 to read as follows:

Sec. 1.045. REFERENCE TO CERTAIN TERMS IN LAW. Unless the context indicates otherwise:

(1) a reference in law to a taxing unit's effective maintenance and operations rate is a reference to the taxing unit's no-new-revenue maintenance and operations rate, as defined by Chapter 26;

(2) a reference in law to a taxing unit's effective tax rate is a reference to the taxing unit's no-new-revenue tax rate, as defined by Chapter 26; and

(3) a reference in law to a taxing unit's rollback tax rate is a reference to the taxing unit's voter-approval tax rate, as defined by Chapter 26.

SECTION 3. Section 1.07(a), Tax Code, is amended to read as follows:

(a) An official or agency required by this title to deliver a notice to a property owner may deliver the notice by regular first-class mail, with postage prepaid, unless this section or

1 Property Value)

2 (c) The county or municipality shall include a notice of the  
3 increase in the no-new-revenue maintenance and operations rate  
4 provided by this section, including a description and amount of  
5 eligible county hospital expenditures, in the information  
6 published under Section 26.04(e) and, as applicable, in the notice  
7 prescribed by Section 26.06 or 26.061.

8 SECTION 44. The heading to Section 26.045, Tax Code, is  
9 amended to read as follows:

10 Sec. 26.045. VOTER-APPROVAL TAX RATE [~~ROLLBACK~~] RELIEF FOR  
11 POLLUTION CONTROL REQUIREMENTS.

12 SECTION 45. Sections 26.045(a), (c), and (i), Tax Code, are  
13 amended to read as follows:

14 (a) The voter-approval [~~rollback~~] tax rate for a political  
15 subdivision of this state is increased by the rate that, if applied  
16 to the [~~total~~] current total value, would impose an amount of taxes  
17 equal to the amount the political subdivision will spend out of its  
18 maintenance and operation funds under Section 26.012(16) to pay for  
19 a facility, device, or method for the control of air, water, or land  
20 pollution that is necessary to meet the requirements of a permit  
21 issued by the Texas Commission on Environmental Quality.

22 (c) To receive an adjustment to the voter-approval  
23 [~~rollback~~] tax rate under this section, a political subdivision  
24 shall present information to the executive director of the Texas  
25 Commission on Environmental Quality in a permit application or in a  
26 request for any exemption from a permit that would otherwise be  
27 required detailing:

1 (1) the anticipated environmental benefits from the  
2 installation of the facility, device, or method for the control of  
3 air, water, or land pollution;

4 (2) the estimated cost of the pollution control  
5 facility, device, or method; and

6 (3) the purpose of the installation of the facility,  
7 device, or method, and the proportion of the installation that is  
8 pollution control property.

9 (i) A political subdivision of the state seeking an  
10 adjustment in its voter-approval [~~rollback~~] tax rate under this  
11 section shall provide to its tax assessor a copy of the letter  
12 issued by the executive director of the Texas Commission on  
13 Environmental Quality under Subsection (d). The tax assessor shall  
14 accept the copy of the letter from the executive director as  
15 conclusive evidence that the facility, device, or method is used  
16 wholly or partly as pollution control property and shall adjust the  
17 voter-approval [~~rollback~~] tax rate for the political subdivision as  
18 provided for by Subsection (a).

19 SECTION 46. Section 26.05, Tax Code, is amended by amending  
20 Subsections (a), (b), (c), (d), (e), and (g) and adding Subsections  
21 (d-1), (d-2), and (e-1) to read as follows:

22 (a) The governing body of each taxing unit [~~, before the~~  
23 ~~later of September 30 or the 60th day after the date the certified~~  
24 ~~appraisal roll is received by the taxing unit,~~] shall adopt a tax  
25 rate for the current tax year and shall notify the assessor for the  
26 taxing unit of the rate adopted. The governing body must adopt a  
27 tax rate before the later of September 30 or the 60th day after the

\_\_\_\_\_  
President of the Senate

\_\_\_\_\_  
Speaker of the House

I hereby certify that S.B. No. 2 passed the Senate on April 15, 2019, by the following vote: Yeas 18, Nays 12, one present not voting; May 7, 2019, Senate refused to concur in House amendments and requested appointment of Conference Committee; May 10, 2019, House granted request of the Senate; May 25, 2019, Senate adopted Conference Committee Report by the following vote: Yeas 21, Nays 9.

\_\_\_\_\_  
Secretary of the Senate

I hereby certify that S.B. No. 2 passed the House, with amendments, on May 1, 2019, by the following vote: Yeas 109, Nays 36, two present not voting; May 10, 2019, House granted request of the Senate for appointment of Conference Committee; May 25, 2019, House adopted Conference Committee Report by the following vote: Yeas 88, Nays 50.

\_\_\_\_\_  
Chief Clerk of the House

Approved:

\_\_\_\_\_  
Date

\_\_\_\_\_  
Governor

**Bob Adair**  
Chairman, Tax Relief for Pollution Control Property  
Advisory Committee  
Texas Commission on Environmental Quality  
Office: 832.765.1419  
Email: bob.adair@p66.com

December 13, 2018

Mr. Jon Niermann, Chairman  
Ms. Emily Lindley, Commissioner  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, TX 78711-3087

Dear Commissioners:

Subject: Advice for Expedited Review List and Tier I Table  
Tax Relief for Pollution Control Property

The TCEQ Tax Relief for Pollution Control Property Advisory Committee has observed the following regulations as part of its responsibilities per Texas Tax Code §11.31(n) “to advise the commission regarding the implementation of this section.”

- Texas Tax Code §11.31(l) states, “The Texas Commission on Environmental Quality by rule shall update the list adopted under Subsection (k) at least once every three years. An item may be removed from the list if the commission finds compelling evidence to support the conclusion that the item does not provide pollution control benefits.”
- Texas Administrative Code Title 30, Part 1, Chapter 17, Rule §17.14(b) states, “The commission shall review and update the Tier I Table at least once every three years.”

A review of the Expedited Review List in §11.31(k) and Tier I Table in §17.14(b) were included on the Committee’s 2018 meeting agendas for April 30, September 10, and December 3, whereby public meeting notices were issued by TCEQ and comments solicited from Committee members, TCEQ staff, and the public. No comments were received regarding the Expedited Review List, so the Committee advises no change. Regarding the Tier I Table, the Committee reviewed a list, requested of and provided by TCEQ staff, of common items on Tier II and Tier III applications since 2014 that TCEQ has routinely issued full or partial positive use determinations. Based on this review, the Committee voted, without opposition, on December 3, 2018 to advise TCEQ to add the attached items to the Tier I Table.

Please feel free to contact me or any member of the Advisory Committee to discuss this advice.

Respectfully,



B. G. Adair

c: Toby Baker, Executive Director, Texas Commission on Environmental Quality

# **Tax Relief for Pollution Control Property Advisory Committee**

## ***Representing Industry:***

Mr. Bob Adair, representing Texas Oil and Gas Association

Mr. Paul Coon, representing Association of Electric Companies of Texas

Mr. Timothy Jones, representing Texas Association of Manufacturers

Mr. Gregory P. Maxim, with Cummings Westlake LLC

Mr. Michael J. Nasi, representing Clean Coal Technology Foundation

Mr. Michael Ford, representing Texas Chemical Council

## ***Representing Appraisal Districts:***

Mr. Roland R. Bieber, Retired Chief Appraiser for Jefferson County Appraisal District

Mr. C. Wayne Frazell, with Pritchard & Abbott Inc.

## ***Representing a School District or Junior College District:***

Mr. Lloyd Graham, Superintendent of the La Porte Independent School District

## ***Representing Taxing Units:***

Mr. Don Lee, with the Texas Conference of Urban Counties

Mr. Bill Longley, with the Texas Municipal League

## ***Representing the Environmental Group:***

Dr. Cyrus Reed, with the Sierra Club

## ***The Independent Technical Expert:***

Mr. Charles Allred, an independent contractor

**Advised Additions to Tier I Table in 30 TAC 17.14(a)**

by TCEQ Tax Relief for Pollution Control Property Advisory Committee

Triennial Review of Tier I Table (based on review of Tier II and Tier III applications filed 2014 through April 2018)

12/3/2018

**Nitrogen Oxides Controls**

Tentative No.	Media	Property	Description	%
A-90	Air	Dry Low NOx Emission Systems	Equipment installed on natural gas fired compression turbines to reduce NOx emissions including combustor liners, injectors, fuel conditioning system, fuel ring, fuel control valve and pilot valve, sensors and controls, fuel gas treater, fuel nozzle assemblies, transition piece assemblies, cap assemblies, inner crossfire tubes and outer crossfire tubes.	100
A-91	Air	Lean Burn Portions of Reciprocating Engines	Turbocharger, fuel injection system consisting of fuel nozzles positioned within a pre-combustion chamber, and precombustion chamber for engines.	100

**Volatile Organic Compounds Control**

Tentative No.	Media	Property	Description	%
A-116	Air	Fixed Storage Tank Roofs	Fixed roofs installed on external floating roofs tanks used to store any product containing volatile organic compounds as an additional VOC control measure.	100
A-117	Air	Geodesic Domes	Geodesic domes installed on external floating roof storage tanks as a means of controlling volatile organic compound emissions.	100
A-118	Air	Submerged Fill Pipes	Submerged fill pipes installed in storage tanks used to store any product containing volatile organic compounds.	100
A-119	Air	Dual Mechanical Pump Seals	The incremental cost difference between the cost of dual mechanical seal pumps and comparable single sealed pumps.	100
A-120	Air	Seal-less Pumps	The incremental cost difference between the cost of seal-less pumps and the cost of similarly sized pumps with seals.	100

**Miscellaneous Control Equipment**

Tentative No.	Media	Property	Description	%
A-190	Air	Airless Paint Spray Gun	Incremental cost difference between an airless paint spray gun and a comparable standard air powered paint spray gun.	100

**Solid Waste Management**

Tentative No.	Media	Property	Description	%
S-29	Land/ Water	Reclamation Equipment	Construction type equipment such as dozers, frontend loaders and dump trucks used exclusively for land reclamation.	100

**Miscellaneous Pollution Control Equipment**

Tentative No.	Media	Property	Description	%
M-23	Land/ Water/ Air	Remote Controlled Block Valves	When installed in pipelines used to transport hydrocarbons and natural gas as a spill control measure.	100
M-24	Land/ Water	Nondestructive Pipeline Testing	Expenditures such as radiography.	100

**Advised Additions to Tier I Table in 30 TAC 17.14(a)**

by TCEQ Tax Relief for Pollution Control Property Advisory Committee

Triennial Review of Tier I Table (based on review of Tier II and Tier III applications filed 2014 through April 2018)

12/3/2018

The above referenced triennial review of Tier I is in compliance with 30 TAC §17.14(b), which states: "The commission shall review and update the Tier I Table at least once every three years.

- (1) The commission may add an item to the table only if there is compelling evidence to support the conclusion that the item provides pollution control benefits and a justifiable pollution control percentage is calculable.
- (2) The commission may remove an item from the table only if there is compelling evidence to support the conclusion that the item does not render pollution control benefits."

Tentative numbers are intended for ease of comparison with the existing Tier I Table. If approved by Commissioners, the Advisory Committee realizes TCEQ staff will assign new numbers to each item in the appropriate category.

**Bob Adair**  
Chairman, Tax Relief for Pollution Control  
Property Advisory Committee  
Texas Commission on Environmental Quality  
Office: 832.765.1419  
Email: bob.adair@p66.com

December 9, 2019

Ms. Donna F. Huff, Director  
Air Quality Division  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, TX 78711-3087

Dear Director Huff:

Subject: Advice Regarding Future Heat Recovery Steam Generator Applications  
Tax Relief for Pollution Control Property

The TCEQ Tax Relief for Pollution Control Property Advisory Committee (“Committee”) hereby responds to your letter dated July 19, 2019 (attached for quick reference) in which you requested advice from the Committee on how to determine use percentages for future use determination applications that include heat recovery steam generators (HRSGs). We recognize the Texas Supreme Court recently remanded HRSG cases to the Commission for further proceedings consistent with its opinion, therefore alignment with the court opinion was a primary objective as the Committee considered advice, especially in response to the three questions indicated in the above referenced letter. The Committee reviewed data provided by TCEQ and other publicly available sources and discussed this matter, with prior notice to the public, in public meetings on August 23<sup>rd</sup>, September 26<sup>th</sup>, October 17<sup>th</sup>, November 8<sup>th</sup>, November 19<sup>th</sup>, and December 2<sup>nd</sup>. Public input was solicited before and during each meeting.

At a high level, advice to each of the three questions in the July 19<sup>th</sup> letter are presented below:

1. Are the existing rules in 30 Texas Administrative Code (TAC) Section 17.17(c) adequate to determine a use percentage, in whole or in part, for new Tier III applications for HRSGs, consistent with the Court’s opinions? If yes, what considerations should be given to reviewing input variables (particularly Capital Cost Old and Production Capacity Factor) used in the Cost Analysis Procedure (CAP) for HRSGs?  
Advice: No (informally agreed by Committee as alternative methods were evaluated)
2. If the existing rules are not adequate, what is an appropriate method for distinguishing the proportion of HRSGs used for pollution control from the proportion used for production that is consistent with the Texas Supreme Court’s opinions?  
Advice: Add HRSGs to the Tier I Table with a pollution control use of 65% (Committee vote of 7-6).
3. Should the Commission propose rulemaking to remove HRSGs from the Expedited Review List of Section 17.17(b)?  
Advice: No (Committee vote of 12-0, with one member absent)

Additional explanations are included in the enclosed majority advice.

Committee members were reminded of Article 5.4 of Committee bylaws, which states, in part, "If there is not consensus among all members of the Committee, minority members are encouraged to submit minority reports for the Commissioners' consideration. Executive Director staff will assist minority members in drafting minority reports." A minority report may be submitted separate from this advice regarding question 2.

The Committee sincerely appreciates you and other TCEQ staff's ongoing support to the Committee, especially additional support provided during our consideration of HRSGs.

Please feel free to contact me or any member of the Advisory Committee to discuss this advice.

Respectfully,



B. G. Adair

Enclosures

c: Mr. Jon Nierman, Chairman, TCEQ  
Mr. Bobby Janecka, Commissioner, TCEQ  
Ms. Emily Lindley, Commissioner, TCEQ  
Mr. Toby Baker, Executive Director, TCEQ  
TCEQ Tax Relief for Pollution Control Property Advisory Committee members

Majority Advice Regarding Heat Recovery Steam Generators  
TCEQ Tax Relief for Pollution Control Property Advisory Committee

On July 19, 2019, Donna Huff, Director, Air Quality Division on behalf of Toby Baker, Executive Director of the Texas Commission on Environmental Quality (“*TCEQ*” or “*Commission*”), issued a written request to Bob Adair, Chairman, Tax Relief for Pollution Control Property Advisory Committee (the “*Committee*”), for advice on how to determine the appropriate use percentage for future applications that include Heat Recovery Steam Generators (“*HRSGs*”). Specifically, the letter from Director Huff requested the Committee assist TCEQ with the following questions:

- 1) Are the existing rules in 30 Texas Administrative Code (TAC) Section 17.17(c) adequate to determine a use percentage, in whole or in part, for new Tier III applications for HRSGs, consistent with the Court’s opinions? If yes, what considerations should be given to reviewing input variables (particularly Capital Cost Old and Production Capacity Factor) used in the Cost Analysis Procedure (CAP) for HRSGs?
- 2) If the existing rules are not adequate, what is an appropriate method for distinguishing the proportion of HRSGs used for pollution control from the proportion used for production that is consistent with the Texas Supreme Court’s opinions?
- 3) Should the Commission propose rulemaking to remove HRSGs from the Expedited Review List of Section 17.17(b)? If yes, what compelling evidence can the Committee provide that HRSGs do not provide pollution control benefits?

This report will begin with two questions in which the Committee agrees on advice and end with the question in which we significantly differ.

**Expedited Review List**

**Question 3: Should the Commission propose rulemaking to remove HRSGs from the Expedited Review List of Section 17.17(b)?**

**Advice:** No. On November 8<sup>th</sup>, a quorum of the committee (only one member was absent) voted, without opposition, “No” to this question. The basis for this vote was the Committee’s agreement that HRSGs provide an environmental benefit and there is no compelling evidence<sup>1</sup> to remove HRSGs from the Expedited Review List.

**Inadequacy of Current Rules for HRSGs**

**Question 1: Are the existing rules in 30 Texas Administrative Code (TAC) Section 17.17(c) adequate to determine a use percentage, in whole or in part, for new Tier III applications for HRSGs, consistent with the Court’s opinions? If yes, what considerations should be given to reviewing input variables (particularly Capital Cost Old and Production Capacity Factor) used in the Cost Analysis Procedure (CAP) for HRSGs?**

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<sup>1</sup> Texas Tax Code §11.31(l) states, “The Texas Commission on Environmental Quality by rule shall update the list adopted under Subsection (k) at least once every three years. An item may be removed from the list if the commission finds *compelling evidence* to support the conclusion that the item does not provide pollution control benefits.”

**Advice:** No. The Committee considered many alternatives to determine the appropriate use percentage for HRSGs but ultimately considered only two formal motions. The first motion was based upon a methodology that features extensive changes in the pollution control use calculation, while the second motion (presented as a substitute motion) was based on modifications to the current version of the CAP. However, *both motions were to advise that TCEQ add HRSGs to the Tier I Table with a partial use percentage.*

The substitute motion for a modified CAP failed 6-7, while the initial motion (described below) passed 7-6. Although no vote was taken to specifically address Question 1, it is clear from both Committee motions on Question 2 that the Committee determined that yet to be identified changes would be necessary to the current CAP in order to determine an appropriate use percentage for HRSGs.

### **Appropriate Method to Indicate Pollution Control Use**

**Question 2: If the existing rules are not adequate, what is an appropriate method for distinguishing the proportion of HRSGs used for pollution control from the proportion used for production that is consistent with the Texas Supreme Court's opinions?**

**Advice:** Expedited review listed equipment B-08 should be moved to the Tier I Table with a positive use determination of 65 percent pollution control use. The review and outcome from Committee meetings were as follows:

#### Majority Advice for Use Determination

After months of the Committee grappling with this issue and its desire to provide timely advice to assist TCEQ in resolving this longstanding issue, on December 2<sup>nd</sup>, the Committee presented two motions to determine formal advice. *The Committee majority concluded the proposed pollution control use of 65% is based on the most credible data, technically sound, and legally supportable.* A motion was presented by Mr. Allred and seconded by Mr. Coon to add HRSGs to the Tier I Table with a pollution control use of 65%. Mr. Nasi offered an amendment to the motion (approved by Mr. Allred and Mr. Coon) to clarify the motion. As the amended motion passed 7-6, a more detailed description of the motion is presented below.

- Add “unless otherwise designated with a partial use percentage on the Tier I Table” to the beginning of the last sentence of 30 TAC §17.14(a) to read: Unless otherwise designated with a partial use percentage on the Tier I Table, if a marketable product is recovered (not including materials that are disposed) from property listed in this subsection, a Tier III application is required.
- Add “except heat recovery steam generators listed as a partial use percentage” to the first sentence of Figure 30 TAC §17.14(a) to read: The property listed in this table is property that the executive director has determined is used wholly for pollution control purposes when used as shown in the Description section of the table and when no marketable product arises from using the property, except heat recovery steam generators listed as a partial use percentage.

- Add the following item to Figure 30 TAC §17.14(a).

No.	Media	Property	Description	%
A-90	Air	Heat Recovery Steam Generators	A boiler designed to capture waste heat from combustion turbine exhaust for the generation of steam while reducing unit output-based emissions.	65

### Support for Majority Advice

What follows describes the support behind the Committee majority advice, which are calculations of both the environment benefit and the productive benefit and averaging the two calculations to derive a specific partial exemption percentage for HRSGs in the Tier 1 Table.<sup>2</sup> These calculations were primarily developed by Mr. Allred, Independent Technical Expert, and checked for technical accuracy and math by Mr. Coon, the member representing the Association of Electric Companies of Texas. Other Committee members represented by this majority advice reviewed the logic of the methodology and sufficiency of data versus the minority proposal as described in “Other Considered Use Determination.”

#### Calculation 1: Pollution control benefit component

In an attempt to provide a data driven basis for differentiating between the pollution control use and the productive use of HRSGs, Mr. Allred developed a methodology using information from Gas Turbine World<sup>3</sup> with regard to actual heat rates and production statistics from operating power plants. He assumed simple-cycle facilities could achieve the low end of the BACT emissions limits as part of this methodology.<sup>4</sup> **Mr. Allred calculated a pollution control benefit of 71%.**

#### Calculation 2: Production benefit component

The most straight-forward methodology for deriving the productive benefit component first is to document and specify the efficiency gains from using a combined-cycle facility as compared to a simple-cycle facility. Based on Gas Turbine World data, combined-cycle facilities on average have a 31.96% improvement in heat rate compared to simple-cycle facilities. Mr. Allred also calculated the average percent increase in a plant’s megawatt output attributable to combined-cycle operations. Ultimately, **Mr. Allred calculated a productive benefit of 41%, thereby resulting in a 59% pollution control benefit.**

Mr. Allred then averaged the pollution control benefit from both calculations (71% and 59%) to propose a 65% overall pollution control benefit from the use of HRSGs.

<sup>2</sup> The calculations and input information developed by Mr. Allred in support of the proposal are provided in the enclosed spreadsheets.

<sup>3</sup> Gas Turbine World was brought to the attention of the Committee by Committee member Daryl Attaway, with Pritchard & Abbott Inc.

<sup>4</sup> The range of emissions reductions results from the TCEQ’s Best Available Control Technology (BACT) limits, which range from 5.0-9.0 parts per million (ppm) for simple-cycle facilities as compared to 2.0 ppm for combined-cycle facilities. As a conservative assumption for these calculations, it is assumed the simple-cycle facilities can achieve the low end of the BACT limits.

Each Committee member vote on the motion that passed was recorded as follows:

	<u>Yes</u>	<u>No</u>
Bob Adair (Chair), representing Texas Oil and Gas Association	√	
Charles Allred, independent technical expert	√	
Daryl Attaway, with Pritchard & Abbott Inc.		√
Roland Bieber, retired Chief Appraiser for Jefferson County Appraisal District		√
Paul Coon, representing Association of Electric Companies of Texas	√	
Mike Ford, representing Texas Chemical Council	√	
Lloyd Graham, Superintendent of La Porte Independent School District		√
Ted Jones, representing Texas Association of Manufacturers	√	
Don Lee, with the Texas Conference of Urban Counties		√
Bill Longley, with the Texas Municipal League		√
Greg Maxim, with Cummings Westlake LLC, representing Industry	√	
Mike Nasi, representing Clean Coal Technology Foundation	√	
Cyrus Reed, with the Sierra Club		√

The Committee majority acknowledges TCEQ staff may recommend additional revisions in other parts of 30 TAC Chapter 17 to appropriately implement the intent of this advice that HRSGs should be added to the Tier I Table with a pollution control use of 65%.

The Committee majority also recognizes the minority members for their professional deliberations and interaction with all members, TCEQ staff, and the public.

Submitted December 9, 2019 by Committee Majority on the Above Advice

Bob Adair (Chairman), representing Texas Oil and Gas Association  
Charles Allred, independent technical expert  
Paul Coon, representing Association of Electric Companies of Texas  
Mike Ford, representing Texas Chemical Council  
Ted Jones, representing Texas Association of Manufacturers  
Greg Maxim, with Cummings Westlake LLC, representing Industry  
Mike Nasi, representing Clean Coal Technology Foundation

Other Considered Use Determination

On December 2<sup>nd</sup>, all 13 Committee members were present (either in the TCEQ agenda room or on the telephone) at a public meeting recorded by TCEQ staff. After additional discussion and public input, a substitute motion was presented by Mr. Lee and seconded by Dr. Reed to add HRSGs to the Tier I Table with a pollution control use of 47%. The motion failed 6-7. The majority will defer to the minority to elaborate on the merits of this proposal, if they so choose.

**Proposed % Environmental Use for Heat Recovery Steam Generators**

**Average % Increase in Plant Output Attributable to Combined Cycle Operation** = **49.39%** = *Indicated % Productive Use Due to Recovery of Exhaust Heat from Combustion Turbines*

**Average % Improvement in Heat Rate Attributable to Combined Cycle Operation** = **31.96%** = *Indicated % Productive Use Due to Recovery of Exhaust Heat from Combustion Turbines*

**Average Indicated % Productive Use Due to Recovery of Exhaust Heat from Combustion Turbines** = **40.67%** = *Average of % Increase in Plant Output Attributable to Combined Cycle Operation and % Improvement in Heat Rate Attributable to Combined Cycle Operation*

**Indicated % Nonproductive Use** = **59.33%** = *1 - Average Indicated % Productive Use Due to Recovery of Exhaust Heat from Combustion Turbines*

**NOx lbs per MWh Output Basis for Simple Cycle Plants at BACT NOx Concentration of 5.0 ppmvd at 15% O2** = **0.15388**      **NOx lbs per MWh Output Basis for Combined Cycle Plants at BACT NOx Concentration of 2.0 ppmvd at 15% O2** = **0.04421**

**Reduction in NOx lbs per MWh Output Basis for Combined Cycle Plants** = **0.10967** = *NOx lbs per MWh Output Basis for Simple Cycle Plants - NOx lbs per MWh Output Basis for Combined Cycle Plants*

**% Reduction in NOx lbs per MWh Output Basis** = **71.27%** = *Reduction in NOx lbs per MWh Output Basis for Combined Cycle Plants / NOx lbs per MWh Output Basis for Simple Cycle Plants*

**Indicated % Environmental Use** = **71.27%** = *Average of % Reduction in NOx Concentration and % Reduction in NOx lbs per MWh Output Basis*

**Indicated % Nonproductive Use:** = **59.33%**

**Indicated % Environmental Use:** = **71.27%**

**Average:** = **65.30%**

**Proposed % Environmental Use:** = **65%** *For Heat Recovery Steam Generators (HRSG)*

**Productive Use Analysis for Combined Cycle Plants-Plant Output Increase**

**Average Output for Combustion Turbines = 318 MW**

**Average Output for Steam Turbines = 157 MW**

**Average % Increase in Plant Output Attributable to Combined Cycle Operation = Average Output for Steam Turbines / Average Output for Combustion Turbines**

**Average % Increase in Plant Output Attributable to Combined Cycle Operation = 49.39% = Indicated % Productive Use Due to Recovery of Exhaust Heat from Combustion Turbines**

**Combined Cycle Specifications from 2019 Gas Turbine World Handbook**

<b>Gas Turbine Manufacturer</b>	<b>No. &amp; Model Gas Turbine</b>	<b>Total Combined Cycle Net Plant Output</b>		<b>Steam Turbine Output</b>		<b>Combustion Turbine Output w/o HRSG</b>		<b>Net % Improvement in Plant Output Attributable to Combined Cycle Operation</b>
MAN Energy Solutions	2 x THM 1304-12N	34.0	MW	11.0	MW	23.0	MW	47.83%
Siemens Energy	1 x SGT-600	35.9	MW	12.6	MW	24.5	MW	51.43%
PW Power Systems	1 x FT8 SP 30	41.1	MW	12.0	MW	30.9	MW	38.83%
Siemens Energy	1 x SGT-A35 RB211 DLE	42.6	MW	12.6	MW	31.9	MW	39.50%
Siemens Energy	1 x SGT-700	45.2	MW	14.4	MW	32.8	MW	43.90%
GE Power	1 x LM2500+ G4 DLE	47.7	MW	14.2	MW	34.5	MW	41.16%
Siemens Energy	1 x SGT-750	51.6	MW	13.5	MW	39.8	MW	33.92%
GE Power	1 x LM6000 DLE (50)	58.0	MW	14.4	MW	45.0	MW	32.00%
Siemens Energy	1 x SGT-800	66.6	MW	21.0	MW	47.5	MW	44.21%
GE Power	1 x 6B.03	68.0	MW	25.6	MW	44.0	MW	58.18%
Siemens Energy	2 x SGT-600	73.3	MW	26.5	MW	49.0	MW	54.08%
PW Power Systems	2 x FT8 SP-30	83.1	MW	24.6	MW	61.8	MW	39.81%
Siemens Energy	2 x SGT-700	91.6	MW	30.0	MW	65.6	MW	45.73%
Ansaldo Energia	1 x AE64.3A	118.0	MW	40.5	MW	80.0	MW	50.63%
GE Power	2 x LM6000 DLE (50)	117.0	MW	29.1	MW	90.0	MW	32.33%
GE Power	1 x 6F.03	135.0	MW	49.4	MW	88.0	MW	56.14%
GE Power	2 x 6B.03	137.0	MW	51.6	MW	88.0	MW	58.64%
Siemens Energy	2 x SGT-800	135.4	MW	44.2	MW	95.0	MW	46.53%
GE Power	1 x LMS100 (50Hz)	141.0	MW	25.8	MW	118.0	MW	21.86%
GE Power	1 x 7E.03	142.0	MW	53.6	MW	91.0	MW	58.90%
Mitsubishi Hitachi Power Systems	1 x H-100 (50Hz)	171.0	MW	58.3	MW	116.5	MW	50.04%
Siemens Energy	1 x SGT6-2000E	174.0	MW	60.0	MW	117.0	MW	51.28%
Mitsubishi Hitachi Power Systems	1 x M701DA	212.5	MW	70.4	MW	144.1	MW	48.85%

Gas Turbine Manufacturer	No. & Model Gas Turbine	Total Combined Cycle Net Plant Output		Steam Turbine Output		Combustion Turbine Output w/o HRSG		Net % Improvement in Plant Output Attributable to Combined Cycle Operation
Ansaldo Energia	2 x AE64.3A	240.0	MW	82.6	MW	160.0	MW	51.63%
GE Power	2 x 6F.03	272.0	MW	100.9	MW	176.0	MW	57.33%
Siemens Energy	1 x SGT5-2000E	275.0	MW	93.0	MW	187.0	MW	49.73%
GE Power	2 x 7E.03	287.0	MW	110.0	MW	182.0	MW	60.44%
Mitsubishi Hitachi Power Systems	1 x M501F	285.1	MW	102.4	MW	185.4	MW	55.23%
GE Power	1 x GT13E2	305.0	MW	100.3	MW	210.0	MW	47.76%
Mitsubishi Hitachi Power Systems	2 x H-100 (50Hz)	346.0	MW	120.6	MW	232.9	MW	51.78%
GE Power	1 x 7F.05	376.0	MW	144.7	MW	243.0	MW	59.55%
Siemens Energy	1 x SGT6-5000F	387.0	MW	133.0	MW	260.0	MW	51.15%
Mitsubishi Hitachi Power Systems	1 x M501GAC	427.0	MW	146.2	MW	283.0	MW	51.66%
Mitsubishi Hitachi Power Systems	1 x M501J	484.0	MW	157.8	MW	330.0	MW	47.82%
GE Power	1 x 9F.05	493.0	MW	186.0	MW	314.0	MW	59.24%
Ansaldo Energia	1 x GT26-1	505.0	MW	160.0	MW	370.0	MW	43.24%
Siemens Energy	2 x SGT5-2000E	551.0	MW	186.0	MW	374.0	MW	49.73%
Mitsubishi Hitachi Power Systems	1 x M701F	566.0	MW	186.7	MW	385.0	MW	48.49%
Mitsubishi Hitachi Power Systems	2 x M501F	572.2	MW	206.8	MW	370.8	MW	55.77%
GE Power	2 x GT13E2-2	613.0	MW	203.7	MW	420.0	MW	48.50%
Mitsubishi Hitachi Power Systems	1 x M501JAC	614.0	MW	193.7	MW	425.0	MW	45.58%
Mitsubishi Hitachi Power Systems	1 x M701JAC (2018)	650.0	MW	208.3	MW	448.0	MW	46.50%
GE Power	1 x 9HA.01	660.0	MW	213.0	MW	446.0	MW	47.76%
Mitsubishi Hitachi Power Systems	1 x M701J	701.0	MW	228.7	MW	478.0	MW	47.85%
GE Power	2 x 7F.05	756.0	MW	293.0	MW	486.0	MW	60.29%
Siemens Energy	2 x SGT6-5000F	775.0	MW	267.0	MW	520.0	MW	51.35%
Mitsubishi Hitachi Power Systems	1 x M701JAC 2015	818.0	MW	260.5	MW	563.0	MW	46.27%
GE Power	1 x 9HA.02	838.0	MW	289.7	MW	571.0	MW	50.74%
Mitsubishi Hitachi Power Systems	2 x M501GAC	856.0	MW	294.4	MW	566.0	MW	52.01%
GE Power	2 x 7HA.01	880.0	MW	316.2	MW	580.0	MW	54.52%
Siemens Energy	2 x SGT6-8000H	930.0	MW	325.0	MW	620.0	MW	52.42%
Mitsubishi Hitachi Power Systems	2 x M501J	971.0	MW	318.6	MW	660.0	MW	48.27%
GE Power	2 x 9F.05	989.0	MW	374.7	MW	628.0	MW	59.67%
Ansaldo Energia	2 x GT26-2	1,010.0	MW	320.0	MW	740.0	MW	43.24%
Mitsubishi Hitachi Power Systems	2 x M501JAC	1,231.0	MW	364.8	MW	850.0	MW	42.92%
GE Power	2 x 7HA.02	1,148.0	MW	397.2	MW	768.0	MW	51.72%
Siemens Energy	2 x SGT5-8000HL	1,416.0	MW	464.0	MW	962.0	MW	48.23%
Ansaldo Energia	2 x GT36-S5	1,444.0	MW	444.0	MW	1,076.0	MW	41.26%
GE Power	2 x 9HA.02	1,680.0	MW	557.6	MW	1,142.0	MW	48.83%
<b>Average:</b>		<b>467.3</b>	<b>MW</b>	<b>157.1</b>	<b>MW</b>	<b>318.1</b>	<b>MW</b>	

**Productive Use Analysis for Combined Cycle Plants-Heat Rate Improvement**

Average Heat Rate for Simple Cycle Plants = 8,823 Btu/kWh

Average Heat Rate for Combined Cycle Plants = 6,003 Btu/kWh

Average Improvement in Heat Rate Attributable to Combined Cycle Operation = Average Heat Rate for Simple Cycle Plants - Average Heat Rate for Combined Cycle Plants

Average Improvement in Heat Rate Attributable to Combined Cycle Operation = 2,820 Btu/kWh

Average % Improvement in Heat Rate Attributable to Combined Cycle Operation = Average Improvement in Heat Rate Attributable to Combined Cycle Operation / Average Heat Rate for Simple Cycle Plants

Average % Improvement in Heat Rate Attributable to Combined Cycle Operation = **31.96%** = Indicated % Productive Use Due to Recovery of Exhaust Heat from Combustion Turbines

*Combined & Simple Cycle Specifications Obtained from 2019 Gas Turbine World Handbook*

Gas Turbine Manufacturer	No. & Model Gas Turbine	Total Combined Cycle Net Plant Output	Steam Turbine Output	Combustion Turbine Output w/o HRSG	Simple Cycle Mode Heat Rate	Combined Cycle Mode Heat Rate	Improvement in Heat Rate Attributable to Combined Cycle Operation	% Improvement in Heat Rate Attributable to Combined Cycle Operation
MAN Energy Solutions	2 x THM 1304-12N	34.0 MW	11.0 MW	23.0 MW	11,460 Btu / kWh	7,720 Btu / kWh	3,740 Btu / kWh	32.64%
Siemens Energy	1 x SGT-600	35.9 MW	12.6 MW	24.5 MW	10,161 Btu / kWh	6,843 Btu / kWh	3,318 Btu / kWh	32.65%
PW Power Systems	1 x FT8 SP 30	41.1 MW	12.0 MW	30.9 MW	9,327 Btu / kWh	6,950 Btu / kWh	2,377 Btu / kWh	25.49%
Siemens Energy	1 x SGT-A35 RB211 DLE	42.6 MW	12.6 MW	31.9 MW	9,141 Btu / kWh	6,464 Btu / kWh	2,677 Btu / kWh	29.29%
Siemens Energy	1 x SGT-700	45.2 MW	14.4 MW	32.8 MW	9,170 Btu / kWh	6,517 Btu / kWh	2,653 Btu / kWh	28.93%
GE Power	1 x LM2500+ G4 DLE	47.7 MW	14.2 MW	34.5 MW	8,709 Btu / kWh	6,343 Btu / kWh	2,366 Btu / kWh	27.17%
Siemens Energy	1 x SGT-750	51.6 MW	13.5 MW	39.8 MW	8,456 Btu / kWh	6,407 Btu / kWh	2,049 Btu / kWh	24.23%
GE Power	1 x LM6000 DLE (50)	58.0 MW	14.4 MW	45.0 MW	8,097 Btu / kWh	6,179 Btu / kWh	1,918 Btu / kWh	23.69%
Siemens Energy	1 x SGT-800	66.6 MW	21.0 MW	47.5 MW	9,048 Btu / kWh	6,344 Btu / kWh	2,704 Btu / kWh	29.89%
GE Power	1 x 6B.03	68.0 MW	25.6 MW	44.0 MW	10,180 Btu / kWh	6,614 Btu / kWh	3,566 Btu / kWh	35.03%
Siemens Energy	2 x SGT-600	73.3 MW	26.5 MW	49.0 MW	10,161 Btu / kWh	6,702 Btu / kWh	3,459 Btu / kWh	34.04%
PW Power Systems	2 x FT8 SP-30	83.1 MW	24.6 MW	61.8 MW	9,327 Btu / kWh	6,878 Btu / kWh	2,449 Btu / kWh	26.26%
Siemens Energy	2 x SGT-700	91.6 MW	30.0 MW	65.6 MW	9,170 Btu / kWh	6,424 Btu / kWh	2,746 Btu / kWh	29.95%
Ansaldo Energia	1 x AE64.3A	118.0 MW	40.5 MW	80.0 MW	9,374 Btu / kWh	6,215 Btu / kWh	3,159 Btu / kWh	33.70%
GE Power	2 x LM6000 DLE (50)	117.0 MW	29.1 MW	90.0 MW	8,097 Btu / kWh	6,161 Btu / kWh	1,936 Btu / kWh	23.91%
GE Power	1 x 6F.03	135.0 MW	49.4 MW	88.0 MW	9,277 Btu / kWh	5,998 Btu / kWh	3,279 Btu / kWh	35.35%
GE Power	2 x 6B.03	137.0 MW	51.6 MW	88.0 MW	10,180 Btu / kWh	6,551 Btu / kWh	3,629 Btu / kWh	35.65%
Siemens Energy	2 x SGT-800	135.4 MW	44.2 MW	95.0 MW	9,048 Btu / kWh	6,239 Btu / kWh	2,809 Btu / kWh	31.05%
GE Power	1 x LMS100 (50Hz)	141.0 MW	25.8 MW	118.0 MW	7,833 Btu / kWh	6,399 Btu / kWh	1,434 Btu / kWh	18.31%
GE Power	1 x 7E.03	142.0 MW	53.6 MW	91.0 MW	10,060 Btu / kWh	6,505 Btu / kWh	3,555 Btu / kWh	35.34%
Mitsubishi Hitachi Power Systems	1 x H-100 (50Hz)	171.0 MW	58.3 MW	116.5 MW	8,909 Btu / kWh	5,945 Btu / kWh	2,964 Btu / kWh	33.27%
Siemens Energy	1 x SGT6-2000E	174.0 MW	60.0 MW	117.0 MW	9,639 Btu / kWh	6,533 Btu / kWh	3,106 Btu / kWh	32.22%
Mitsubishi Hitachi Power Systems	1 x M701DA	212.5 MW	70.4 MW	144.1 MW	9,810 Btu / kWh	6,635 Btu / kWh	3,175 Btu / kWh	32.36%
Ansaldo Energia	2 x AE64.3A	240.0 MW	82.6 MW	160.0 MW	9,374 Btu / kWh	6,093 Btu / kWh	3,281 Btu / kWh	35.00%
GE Power	2 x 6F.03	272.0 MW	100.9 MW	176.0 MW	9,277 Btu / kWh	5,944 Btu / kWh	3,333 Btu / kWh	35.93%
Siemens Energy	1 x SGT5-2000E	275.0 MW	93.0 MW	187.0 MW	9,349 Btu / kWh	6,403 Btu / kWh	2,946 Btu / kWh	31.51%
GE Power	2 x 7E.03	287.0 MW	110.0 MW	182.0 MW	10,060 Btu / kWh	6,439 Btu / kWh	3,621 Btu / kWh	35.99%
Mitsubishi Hitachi Power Systems	1 x M501F	285.1 MW	102.4 MW	185.4 MW	9,230 Btu / kWh	5,976 Btu / kWh	3,254 Btu / kWh	35.25%
GE Power	1 x GT13E2	305.0 MW	100.3 MW	210.0 MW	8,980 Btu / kWh	6,189 Btu / kWh	2,791 Btu / kWh	31.08%
Mitsubishi Hitachi Power Systems	2 x H-100 (50Hz)	346.0 MW	120.6 MW	232.9 MW	8,909 Btu / kWh	5,884 Btu / kWh	3,025 Btu / kWh	33.95%
GE Power	1 x 7F.05	376.0 MW	144.7 MW	243.0 MW	8,570 Btu / kWh	5,660 Btu / kWh	2,910 Btu / kWh	33.96%
Siemens Energy	1 x SGT6-5000F	387.0 MW	133.0 MW	260.0 MW	8,530 Btu / kWh	5,725 Btu / kWh	2,805 Btu / kWh	32.88%
Mitsubishi Hitachi Power Systems	1 x M501GAC	427.0 MW	146.2 MW	283.0 MW	8,531 Btu / kWh	5,640 Btu / kWh	2,891 Btu / kWh	33.89%
Mitsubishi Hitachi Power Systems	1 x M501J	484.0 MW	157.8 MW	330.0 MW	8,105 Btu / kWh	5,504 Btu / kWh	2,601 Btu / kWh	32.09%
GE Power	1 x 9F.05	493.0 MW	186.0 MW	314.0 MW	8,846 Btu / kWh	5,619 Btu / kWh	3,227 Btu / kWh	36.48%
Ansaldo Energia	1 x GT26-1	505.0 MW	160.0 MW	370.0 MW	8,322 Btu / kWh	5,640 Btu / kWh	2,682 Btu / kWh	32.23%

Gas Turbine Manufacturer	No. & Model Gas Turbine	Total Combined Cycle Net Plant Output		Steam Turbine Output		Combustion Turbine Output w/o HRSG		Simple Cycle Mode Heat Rate		Combined Cycle Mode Heat Rate		Improvement in Heat Rate Attributable to Combined Cycle Operation		% Improvement in Heat Rate Attributable to Combined Cycle Operation	
Siemens Energy	2 x SGT5-2000E	551.0	MW	186.0	MW	374.0	MW	9,349	Btu / kWh	6,403	Btu / kWh	2,946	Btu / kWh	31.51%	
Mitsubishi Hitachi Power Systems	1 x M701F	566.0	MW	186.7	MW	385.0	MW	8,144	Btu / kWh	5,504	Btu / kWh	2,640	Btu / kWh	32.42%	
Mitsubishi Hitachi Power Systems	2 x M501F	572.2	MW	206.8	MW	370.8	MW	9,230	Btu / kWh	5,955	Btu / kWh	3,275	Btu / kWh	35.48%	
GE Power	2 x GT13E2-2	613.0	MW	203.7	MW	420.0	MW	8,980	Btu / kWh	6,153	Btu / kWh	2,827	Btu / kWh	31.48%	
Mitsubishi Hitachi Power Systems	1 x M501JAC	614.0	MW	193.7	MW	425.0	MW	7,775	Btu / kWh	5,332	Btu / kWh	2,443	Btu / kWh	31.42%	
Mitsubishi Hitachi Power Systems	1 x M701JAC (2018)	650.0	MW	208.3	MW	448.0	MW	7,755	Btu / kWh	5,332	Btu / kWh	2,423	Btu / kWh	31.24%	
GE Power	1 x 9HA.01	660.0	MW	213.0	MW	446.0	MW	7,910	Btu / kWh	5,378	Btu / kWh	2,532	Btu / kWh	32.01%	
Mitsubishi Hitachi Power Systems	1 x M701J	701.0	MW	228.7	MW	478.0	MW	8,067	Btu / kWh	5,477	Btu / kWh	2,590	Btu / kWh	32.11%	
GE Power	2 x 7F.05	756.0	MW	293.0	MW	486.0	MW	8,570	Btu / kWh	5,640	Btu / kWh	2,930	Btu / kWh	34.19%	
Siemens Energy	2 x SGT6-5000F	775.0	MW	267.0	MW	520.0	MW	8,530	Btu / kWh	5,715	Btu / kWh	2,815	Btu / kWh	33.00%	
Mitsubishi Hitachi Power Systems	1 x M701JAC 2015	818.0	MW	260.5	MW	563.0	MW	7,826	Btu / kWh	5,332	Btu / kWh	2,494	Btu / kWh	31.87%	
GE Power	1 x 9HA.02	838.0	MW	289.7	MW	571.0	MW	7,740	Btu / kWh	5,320	Btu / kWh	2,420	Btu / kWh	31.27%	
Mitsubishi Hitachi Power Systems	2 x M501GAC	856.0	MW	294.4	MW	566.0	MW	8,531	Btu / kWh	5,622	Btu / kWh	2,909	Btu / kWh	34.10%	
GE Power	2 x 7HA.01	880.0	MW	316.2	MW	580.0	MW	8,120	Btu / kWh	5,453	Btu / kWh	2,667	Btu / kWh	32.84%	
Siemens Energy	2 x SGT6-8000H	930.0	MW	325.0	MW	620.0	MW	8,530	Btu / kWh	5,602	Btu / kWh	2,928	Btu / kWh	34.33%	
Mitsubishi Hitachi Power Systems	2 x M501J	971.0	MW	318.6	MW	660.0	MW	8,105	Btu / kWh	5,486	Btu / kWh	2,619	Btu / kWh	32.31%	
GE Power	2 x 9F.05	989.0	MW	374.7	MW	628.0	MW	8,846	Btu / kWh	5,603	Btu / kWh	3,243	Btu / kWh	36.66%	
Ansaldo Energia	2 x GT26-2	1,010.0	MW	320.0	MW	740.0	MW	8,322	Btu / kWh	5,640	Btu / kWh	2,682	Btu / kWh	32.23%	
Mitsubishi Hitachi Power Systems	2 x M501JAC	1,231.0	MW	364.8	MW	850.0	MW	7,775	Btu / kWh	5,315	Btu / kWh	2,460	Btu / kWh	31.64%	
GE Power	2 x 7HA.02	1,148.0	MW	397.2	MW	768.0	MW	8,009	Btu / kWh	5,365	Btu / kWh	2,644	Btu / kWh	33.01%	
Siemens Energy	2 x SGT5-8000HL	1,416.0	MW	464.0	MW	962.0	MW	8,034	Btu / kWh	< 5,416	Btu / kWh	2,618	Btu / kWh	32.59%	
Ansaldo Energia	2 x GT36-S5	1,444.0	MW	444.0	MW	1,076.0	MW	7,972	Btu / kWh	5,548	Btu / kWh	2,424	Btu / kWh	30.41%	
GE Power	2 x 9HA.02	1,680.0	MW	557.6	MW	1,142.0	MW	7,740	Btu / kWh	5,306	Btu / kWh	2,434	Btu / kWh	31.45%	
<b>Average:</b>								<b>8,823</b>	Btu / kWh	<b>6,003</b>	Btu / kWh	<b>2,820</b>	Btu / kWh	<b>31.87%</b>	

**Environmental Use Analysis for Combined Cycle Plants**

**Average Simple Cycle Output Based NOx = 0.1539 lbs / MWh**

**Average Combined Cycle Output Based NOx = 0.0442 lbs / MWh**

**Reduction in Output Based NOx for Combined Cycle Plants = 0.1097 = Average Simple Cycle Output Based NOx - Average Combined Cycle Output Based NOx**

**% Reduction in NOx lbs per MWh Output Basis = 71.27% = Reduction in Output Based NOx for Combined Cycle Plants / Average Simple Cycle Output Based NOx**

**Indicated % Environmental Use = 71.27%**

*Combined Cycle Specifications Data from 2019 Gas Turbine World Handbook*

<sup>1</sup> EPA NSPS Method 19 specifies a stoichiometric flue gas volume of 8,710 dscf/MMBtu of nominal natural gas.

Gas Turbine Manufacturer	No. & Model Gas Turbine	Net Plant Output	Heat Rate Btu/kWh	Efficiency	Steam Turbine Output	Hourly Heat Input Rate in MMBtu / hour	EPA Method 19 <sup>1</sup> Flue Gas Exhaust Volume in dscf / hour	BACT NOx Concentration in ppmvd @ 15% O2	NOx Mass Emissions in lbs / hour	NOx Input-Based Emissions in lbs /MMBtu	NOx Output-Based Emissions in lbs / MWh
MAN Energy Solutions	2 x THM 1304-12N	34.0 MW	7,720 Btu	44.2%	11.0 MW	262.48	2,286,200.80	2.0	1.93	0.007365	0.0569
Siemens Energy	1 x SGT-600	35.9 MW	6,843 Btu	49.9%	12.6 MW	245.66	2,139,730.83	2.0	1.81	0.007365	0.0504
PW Power Systems	1 x FT8 SP 30	41.1 MW	6,950 Btu	49.1%	12.0 MW	285.65	2,487,967.95	2.0	2.10	0.007365	0.0512
Siemens Energy	1 x SGT-A35 RB211 DLE	42.6 MW	6,464 Btu	52.8%	12.6 MW	275.37	2,398,441.34	2.0	2.03	0.007365	0.0476
Siemens Energy	1 x SGT-700	45.2 MW	6,517 Btu	52.4%	14.4 MW	294.57	2,565,690.76	2.0	2.17	0.007365	0.0480
GE Power	1 x LM2500+ G4 DLE	47.7 MW	6,343 Btu	53.8%	14.2 MW	302.56	2,635,307.18	2.0	2.23	0.007365	0.0467
Siemens Energy	1 x SGT-750	51.6 MW	6,407 Btu	53.3%	13.5 MW	330.60	2,879,536.45	2.0	2.43	0.007365	0.0472
GE Power	1 x LM6000 DLE (50)	58.0 MW	6,179 Btu	55.2%	14.4 MW	358.38	3,121,507.22	2.0	2.64	0.007365	0.0455
Siemens Energy	1 x SGT-800	66.6 MW	6,344 Btu	53.8%	21.0 MW	422.51	3,680,065.58	2.0	3.11	0.007365	0.0467
GE Power	1 x 6B.03	68.0 MW	6,614 Btu	51.6%	25.6 MW	449.75	3,917,339.92	2.0	3.31	0.007365	0.0487
Siemens Energy	2 x SGT-600	73.3 MW	6,702 Btu	50.9%	26.5 MW	491.26	4,278,844.99	2.0	3.62	0.007365	0.0494
PW Power Systems	2 x FT8 SP-30	83.1 MW	6,878 Btu	49.6%	24.6 MW	571.56	4,978,303.28	2.0	4.21	0.007365	0.0507
Siemens Energy	2 x SGT-700	91.6 MW	6,424 Btu	53.1%	30.0 MW	588.44	5,125,298.46	2.0	4.33	0.007365	0.0473
Ansaldo Energia	1 x AE64.3A	118.0 MW	6,215 Btu	54.9%	40.5 MW	733.37	6,387,652.70	2.0	5.40	0.007365	0.0458
GE Power	2 x LM6000 DLE (50)	117.0 MW	6,161 Btu	55.4%	29.1 MW	720.84	6,278,490.27	2.0	5.31	0.007365	0.0454
GE Power	1 x 6F.03	135.0 MW	5,998 Btu	56.9%	49.4 MW	809.73	7,052,748.30	2.0	5.96	0.007365	0.0442
GE Power	2 x 6B.03	137.0 MW	6,551 Btu	52.1%	51.6 MW	897.49	7,817,111.77	2.0	6.61	0.007365	0.0482
Siemens Energy	2 x SGT-800	135.4 MW	6,239 Btu	54.7%	44.2 MW	844.76	7,357,864.83	2.0	6.22	0.007365	0.0459
GE Power	1 x LMS100 (50Hz)	141.0 MW	6,399 Btu	53.3%	25.8 MW	902.26	7,858,675.89	2.0	6.65	0.007365	0.0471
GE Power	1 x 7E.03	142.0 MW	6,505 Btu	52.5%	53.6 MW	923.71	8,045,514.10	2.0	6.80	0.007365	0.0479
Mitsubishi Hitachi Power Systems	1 x H-100 (50Hz)	171.0 MW	5,945 Btu	57.4%	58.3 MW	1,016.60	8,854,542.45	2.0	7.49	0.007365	0.0438
Siemens Energy	1 x SGT6-2000E	174.0 MW	6,533 Btu	52.2%	60.0 MW	1,136.74	9,901,022.82	2.0	8.37	0.007365	0.0481
Mitsubishi Hitachi Power Systems	1 x M701DA	212.5 MW	6,635 Btu	51.4%	70.4 MW	1,409.94	12,280,555.63	2.0	10.38	0.007365	0.0489
Ansaldo Energia	2 x AE64.3A	240.0 MW	6,093 Btu	56.0%	82.6 MW	1,462.32	12,736,807.20	2.0	10.77	0.007365	0.0449
GE Power	2 x 6F.03	272.0 MW	5,944 Btu	57.4%	100.9 MW	1,616.77	14,082,049.28	2.0	11.91	0.007365	0.0438
Siemens Energy	1 x SGT5-2000E	275.0 MW	6,403 Btu	53.3%	93.0 MW	1,760.83	15,336,785.75	2.0	12.97	0.007365	0.0472
GE Power	2 x 7E.03	287.0 MW	6,439 Btu	53.0%	110.0 MW	1,847.99	16,096,019.03	2.0	13.61	0.007365	0.0474
Mitsubishi Hitachi Power Systems	1 x M501F	285.1 MW	5,976 Btu	57.1%	102.4 MW	1,703.76	14,839,728.70	2.0	12.55	0.007365	0.0440
GE Power	1 x GT13E2	305.0 MW	6,189 Btu	55.1%	100.3 MW	1,887.65	16,441,387.95	2.0	13.90	0.007365	0.0456
Mitsubishi Hitachi Power Systems	2 x H-100 (50Hz)	346.0 MW	5,884 Btu	58.0%	120.6 MW	2,035.86	17,732,375.44	2.0	14.99	0.007365	0.0433
GE Power	1 x 7F.05	376.0 MW	5,660 Btu	60.3%	144.7 MW	2,128.16	18,536,273.60	2.0	15.67	0.007365	0.0417
Siemens Energy	1 x SGT6-5000F	387.0 MW	5,725 Btu	59.6%	133.0 MW	2,215.58	19,297,658.25	2.0	16.32	0.007365	0.0422
Mitsubishi Hitachi Power Systems	1 x M501GAC	427.0 MW	5,640 Btu	60.5%	146.2 MW	2,408.28	20,976,118.80	2.0	17.74	0.007365	0.0415

Gas Turbine Manufacturer	No. & Model Gas Turbine	Net Plant Output	Heat Rate Btu/kWh	Efficiency	Steam Turbine Output	Hourly Heat Input Rate in MMBtu / hour	EPA Method 19 <sup>1</sup> Flue Gas Exhaust Volume in dscf / hour	BACT NOx Concentration in ppmvd @ 15% O2	NOx Mass Emissions in lbs / hour	NOx Input-Based Emissions in lbs/MMBtu	NOx Output-Based Emissions in lbs / MWh
Mitsubishi Hitachi Power Systems	1 x M501J	484.0 MW	5,504 Btu	62.0%	157.8 MW	2,663.94	23,202,882.56	2.0	19.62	0.007365	0.0405
GE Power	1 x 9F.05	493.0 MW	5,619 Btu	60.7%	186.0 MW	2,770.17	24,128,154.57	2.0	20.40	0.007365	0.0414
Ansaldo Energia	1 x GT26-1	505.0 MW	5,640 Btu	60.5%	160.0 MW	2,848.20	24,807,822.00	2.0	20.98	0.007365	0.0415
Siemens Energy	2 x SGT5-2000E	551.0 MW	6,403 Btu	53.3%	186.0 MW	3,528.05	30,729,341.63	2.0	25.98	0.007365	0.0472
Mitsubishi Hitachi Power Systems	1 x M701F	566.0 MW	5,504 Btu	62.0%	186.7 MW	3,115.26	27,133,949.44	2.0	22.94	0.007365	0.0405
Mitsubishi Hitachi Power Systems	2 x M501F	572.2 MW	5,955 Btu	57.3%	206.8 MW	3,407.45	29,678,898.21	2.0	25.10	0.007365	0.0439
GE Power	2 x GT13E2-2	613.0 MW	6,153 Btu	55.5%	203.7 MW	3,771.79	32,852,282.19	2.0	27.78	0.007365	0.0453
Mitsubishi Hitachi Power Systems	1 x M501JAC	614.0 MW	5,332 Btu	64.0%	193.7 MW	3,273.85	28,515,216.08	2.0	24.11	0.007365	0.0393
Mitsubishi Hitachi Power Systems	1 x M701JAC (2018)	650.0 MW	5,332 Btu	64.0%	208.3 MW	3,465.80	30,187,118.00	2.0	25.53	0.007365	0.0393
GE Power	1 x 9HA.01	660.0 MW	5,378 Btu	63.5%	213.0 MW	3,549.48	30,915,970.80	2.0	26.14	0.007365	0.0396
Mitsubishi Hitachi Power Systems	1 x M701J	701.0 MW	5,477 Btu	62.3%	228.7 MW	3,839.38	33,440,973.67	2.0	28.28	0.007365	0.0403
GE Power	2 x 7F.05	756.0 MW	5,640 Btu	60.5%	293.0 MW	4,263.84	37,138,046.40	2.0	31.40	0.007365	0.0415
Siemens Energy	2 x SGT6-5000F	775.0 MW	5,715 Btu	59.7%	267.0 MW	4,429.13	38,577,678.75	2.0	32.62	0.007365	0.0421
Mitsubishi Hitachi Power Systems	1 x M701JAC 2015	818.0 MW	5,332 Btu	64.0%	260.5 MW	4,361.58	37,989,326.96	2.0	32.12	0.007365	0.0393
GE Power	1 x 9HA.02	838.0 MW	5,320 Btu	64.1%	289.7 MW	4,458.16	38,830,573.60	2.0	32.83	0.007365	0.0392
Mitsubishi Hitachi Power Systems	2 x M501GAC	856.0 MW	5,622 Btu	60.7%	294.4 MW	4,812.43	41,916,282.72	2.0	35.44	0.007365	0.0414
GE Power	2 x 7HA.01	880.0 MW	5,453 Btu	62.6%	316.2 MW	4,798.64	41,796,154.40	2.0	35.34	0.007365	0.0402
Siemens Energy	2 x SGT6-8000H	930.0 MW	5,602 Btu	60.9%	325.0 MW	5,209.86	45,377,880.60	2.0	38.37	0.007365	0.0413
Mitsubishi Hitachi Power Systems	2 x M501J	971.0 MW	5,486 Btu	62.2%	318.6 MW	5,326.91	46,397,351.26	2.0	39.23	0.007365	0.0404
GE Power	2 x 9F.05	989.0 MW	5,603 Btu	60.9%	374.7 MW	5,541.37	48,265,306.57	2.0	40.81	0.007365	0.0413
Ansaldo Energia	2 x GT26-2	1,010.0 MW	5,640 Btu	60.5%	320.0 MW	5,696.40	49,615,644.00	2.0	41.95	0.007365	0.0415
Mitsubishi Hitachi Power Systems	2 x M501JAC	1,231.0 MW	5,315 Btu	64.2%	364.8 MW	6,542.77	56,987,483.15	2.0	48.19	0.007365	0.0391
GE Power	2 x 7HA.02	1,148.0 MW	5,365 Btu	63.6%	397.2 MW	6,159.02	53,645,064.20	2.0	45.36	0.007365	0.0395
Siemens Energy	2 x SGT5-8000HL	1,416.0 MW	< 5,416 Btu >	63.0%	464.0 MW	7,669.06	66,797,477.76	2.0	56.48	0.007365	0.0399
Ansaldo Energia	2 x GT36-S5	1,444.0 MW	5,548 Btu	61.5%	444.0 MW	8,011.31	69,778,527.52	2.0	59.00	0.007365	0.0409
GE Power	2 x 9HA.02	1,680.0 MW	5,306 Btu	64.3%	557.6 MW	8,914.08	77,641,636.80	2.0	65.65	0.007365	0.0391
<b>Average:</b>											<b>0.0442</b>

**Environmental Use Analysis for Combined Cycle Plants**

Average Simple Cycle Output Based NOx = **0.1539** lbs / MWh

Average Combined Cycle Output Based NOx = **0.0442** lbs / MWh

Reduction in Output Based NOx for Combined Cycle Plants = **0.1097** = Average Simple Cycle Output Based NOx - Average Combined Cycle Output Based NOx

% Reduction in NOx lbs per MWh Output Basis = **71.27%** = Reduction in Output Based NOx for Combined Cycle Plants / Average Simple Cycle Output Based NOx

Indicated % Environmental Use = **71.27%**

*Simple Cycle Specifications Data from 2019 Gas Turbine World Handbook  
Identified Simple Cycle Equipment with Comparable Output to the Plant Output for the Combined  
Cycle Plants Listed in the 2019 Gas Turbine World Handbook*

<sup>1</sup> EPA NSPS Method 19 specifies a stoichiometric flue gas volume of 8,710 dscf/MMBtu of nominal natural gas.

Gas Turbine Manufacturer	No. & Model Gas Turbine	Frequency Hz	ISO Base Output		Combustion Turbine Output	Heat Rate Btu/kWh	Efficiency	Hourly Heat Input Rate in MMBtu / hour	EPA Method 19 <sup>1</sup> Flue Gas Exhaust Volume in dscf / hour	BACT NOx Concentration in ppmvd @ 15% O2	NOx Mass Emissions in lbs / hour	NOx Input-Based Emissions in lbs /MMBtu	NOx Output-Based Emissions in lbs / MWh
GE Power	LM2500+ G4 DLE	60	34,500 kW	=	34.5 MW	8,709 Btu	39.2%	300.46	6,788.61	5.0	5.53	0.018412	0.1604
Siemens Energy	SGT-750	50/60	37,031 kW	=	37.0 MW	8,456 Btu	40.4%	313.13	7,074.96	5.0	5.77	0.018412	0.1557
GE Power	LM6000PF DLE	60	45,000 kW	=	45.0 MW	8,097 Btu	42.1%	364.37	8,232.48	5.0	6.71	0.018412	0.1491
GE Power	LM6000PF DLE	60	45,000 kW	=	45.0 MW	8,097 Btu	42.1%	364.37	8,232.48	5.0	6.71	0.018412	0.1491
GE Power	LM6000PF Sprint	60	50,000 kW	=	50.0 MW	8,109 Btu	42.1%	405.45	9,160.75	5.0	7.47	0.018412	0.1493
GE Power	LM6000PF Sprint	60	50,000 kW	=	50.0 MW	8,109 Btu	42.1%	405.45	9,160.75	5.0	7.47	0.018412	0.1493
GE Power	LM6000 SAC (57)	60	54,000 kW	=	54.0 MW	8,162 Btu	41.8%	440.75	9,958.28	5.0	8.12	0.018412	0.1503
Siemens Energy	SGT-A65 DLE (TRENT)	50	61,900 kW	=	61.9 MW	7,874 Btu	43.3%	487.40	11,012.35	5.0	8.97	0.018412	0.1450
PW Power Systems	1 x FT4000 SP60	50/60	68,747 kW	=	68.7 MW	8,305 Btu	41.1%	570.94	12,899.92	5.0	10.51	0.018412	0.1529
PW Power Systems	1 x FT4000 SP60	50/60	68,747 kW	=	68.7 MW	8,305 Btu	41.1%	570.94	12,899.92	5.0	10.51	0.018412	0.1529
Ansaldo Energia	AE64.3A	50/60	80,000 kW	=	80.0 MW	9,374 Btu	36.4%	749.92	16,943.72	5.0	13.81	0.018412	0.1726
GE Power	6F.03	50/60	88,000 kW	=	88.0 MW	9,277 Btu	36.8%	816.38	18,445.23	5.0	15.03	0.018412	0.1708
Mitsubishi Hitachi Power Systems	M501DA	60	113,950 kW	=	114.0 MW	9,780 Btu	34.9%	1,114.43	25,179.49	5.0	20.52	0.018412	0.1801
GE Power	LMS100 Wet	60	118,000 kW	=	118.0 MW	7,628 Btu	44.7%	900.10	20,336.98	5.0	16.57	0.018412	0.1404
GE Power	LMS100 Wet	60	118,000 kW	=	118.0 MW	7,628 Btu	44.7%	900.10	20,336.98	5.0	16.57	0.018412	0.1404
Mitsubishi Hitachi Power Systems	M701DA	50	144,090 kW	=	144.1 MW	9,810 Btu	34.8%	1,413.52	31,937.18	5.0	26.03	0.018412	0.1806
Mitsubishi Hitachi Power Systems	M701DA	50	144,090 kW	=	144.1 MW	9,810 Btu	34.8%	1,413.52	31,937.18	5.0	26.03	0.018412	0.1806
Mitsubishi Hitachi Power Systems	M701DA	50	144,090 kW	=	144.1 MW	9,810 Btu	34.8%	1,413.52	31,937.18	5.0	26.03	0.018412	0.1806
Mitsubishi Hitachi Power Systems	M701DA	50	144,090 kW	=	144.1 MW	9,810 Btu	34.8%	1,413.52	31,937.18	5.0	26.03	0.018412	0.1806
Mitsubishi Hitachi Power Systems	M701DA	50	144,090 kW	=	144.1 MW	9,810 Btu	34.8%	1,413.52	31,937.18	5.0	26.03	0.018412	0.1806
Ansaldo Energia	AE94.2	50	190,000 kW	=	190.0 MW	9,400 Btu	36.3%	1,786.00	40,352.94	5.0	32.88	0.018412	0.1731
Ansaldo Energia	AE94.2	50	190,000 kW	=	190.0 MW	9,400 Btu	36.3%	1,786.00	40,352.94	5.0	32.88	0.018412	0.1731
GE Power	7F.05	60	241,000 kW	=	241.0 MW	8,580 Btu	39.8%	2,067.78	46,719.49	5.0	38.07	0.018412	0.1580
GE Power	7F.05	60	241,000 kW	=	241.0 MW	8,580 Btu	39.8%	2,067.78	46,719.49	5.0	38.07	0.018412	0.1580
Mitsubishi Hitachi Power Systems	M501GAC	60	283,000 kW	=	283.0 MW	8,531 Btu	40.0%	2,414.27	54,548.17	5.0	44.45	0.018412	0.1571
Mitsubishi Hitachi Power Systems	M501GAC	60	283,000 kW	=	283.0 MW	8,531 Btu	40.0%	2,414.27	54,548.17	5.0	44.45	0.018412	0.1571
Siemens Energy	SGT6-8000H	60	310,000 kW	=	310.0 MW	8,530 Btu	40.0%	2,644.30	59,745.40	5.0	48.69	0.018412	0.1571
Siemens Energy	SGT6-8000H	60	310,000 kW	=	310.0 MW	8,530 Btu	40.0%	2,644.30	59,745.40	5.0	48.69	0.018412	0.1571
Siemens Energy	SGT6-8000H	60	310,000 kW	=	310.0 MW	8,530 Btu	40.0%	2,644.30	59,745.40	5.0	48.69	0.018412	0.1571
Ansaldo Energia	GT36-S6	60	369,000 kW	=	369.0 MW	8,067 Btu	42.3%	2,976.72	67,256.18	5.0	54.81	0.018412	0.1485
GE Power	7HA.02	60	384,000 kW	=	384.0 MW	8,009 Btu	42.6%	3,075.46	69,486.96	5.0	56.63	0.018412	0.1475
Siemens Energy	SGT6-9000HL	60	405,000 kW	=	405.0 MW	8,010 Btu	42.6%	3,244.05	73,296.18	5.0	59.73	0.018412	0.1475
Mitsubishi Hitachi Power Systems	M701JAC	50	448,000 kW	=	448.0 MW	7,755 Btu	44.0%	3,474.24	78,497.10	5.0	63.97	0.018412	0.1428
Ansaldo Energia	GT36-S5	50	538,000 kW	=	538.0 MW	7,972 Btu	42.8%	4,288.94	96,904.36	5.0	78.97	0.018412	0.1468
Ansaldo Energia	GT36-S5	50	538,000 kW	=	538.0 MW	7,972 Btu	42.8%	4,288.94	96,904.36	5.0	78.97	0.018412	0.1468
Ansaldo Energia	GT36-S5	50	538,000 kW	=	538.0 MW	7,972 Btu	42.8%	4,288.94	96,904.36	5.0	78.97	0.018412	0.1468

Gas Turbine Manufacturer	No. & Model Gas Turbine	Frequency Hz	ISO Base Output		Combustion Turbine Output		Heat Rate		Efficiency	Hourly Heat Input Rate in MMBtu / hour	EPA Method 19 <sup>1</sup> Flue Gas Exhaust Volume in dscf / hour	BACT NOx Concentration in ppmvd @ 15% O2	NOx Mass Emissions in lbs / hour	NOx Input-Based Emissions in lbs /MMBtu	NOx Output-Based Emissions in lbs / MWh	
					kW	MW	Btu/kWh	Btu								
Mitsubishi Hitachi Power Systems	M701JAC (2015)	50	563,000	kW	=	563.0	MW	7,826	Btu	43.6%	4,406.04	99,550.17	5.0	81.13	0.018412	0.1441
GE Power	9HA.02	50	571,000	kW	=	571.0	MW	7,740	Btu	44.1%	4,419.54	99,855.24	5.0	81.37	0.018412	0.1425
Siemens Energy	SGT5-9000HL	50	593,000	kW	=	593.0	MW	7,972	Btu	42.8%	4,727.40	106,810.94	5.0	87.04	0.018412	0.1468
Siemens Energy	2 x SGT6-8000H	60	620,000	kW	=	620.0	MW	< 8,530	Btu	40.0%	5,288.60	119,490.81	5.0	97.38	0.018412	0.1571
Siemens Energy	2 x SGT6-8000H	60	620,000	kW	=	620.0	MW	< 8,530	Btu	40.0%	5,288.60	119,490.81	5.0	97.38	0.018412	0.1571
Siemens Energy	2 x SGT5-4000F	50	658,000	kW	=	658.0	MW	8,322	Btu	41.0%	5,475.88	123,722.13	5.0	100.82	0.018412	0.1532
Mitsubishi Hitachi Power Systems	2 x M501J	60	660,000	kW	=	660.0	MW	8,105	Btu	42.1%	5,349.30	120,862.26	5.0	98.49	0.018412	0.1492
Ansaldo Energia	2 x GT36-S6	60	738,000	kW	=	738.0	MW	8,067	Btu	42.3%	5,953.45	134,512.36	5.0	109.62	0.018412	0.1485
GE Power	2 x 7HA.02	60	768,000	kW	=	768.0	MW	8,009	Btu	42.6%	6,150.91	138,973.91	5.0	113.25	0.018412	0.1475
Siemens Energy	2 x SGT6-9000HL	60	810,000	kW	=	810.0	MW	8,010	Btu	42.6%	6,488.10	146,592.35	5.0	119.46	0.018412	0.1475
Mitsubishi Hitachi Power Systems	2 x M501JAC	60	850,000	kW	=	850.0	MW	7,775	Btu	44.0%	6,608.75	149,318.32	5.0	121.68	0.018412	0.1432
Mitsubishi Hitachi Power Systems	2 x M501JAC	60	850,000	kW	=	850.0	MW	7,775	Btu	44.0%	6,608.75	149,318.32	5.0	121.68	0.018412	0.1432
Mitsubishi Hitachi Power Systems	2 x M701JAC	50	896,000	kW	=	896.0	MW	7,755	Btu	44.0%	6,948.48	156,994.19	5.0	127.94	0.018412	0.1428
Mitsubishi Hitachi Power Systems	2 x M701JAC	50	896,000	kW	=	896.0	MW	7,755	Btu	44.0%	6,948.48	156,994.19	5.0	127.94	0.018412	0.1428
Mitsubishi Hitachi Power Systems	2 x M701J	50	956,000	kW	=	956.0	MW	8,067	Btu	42.3%	7,712.05	174,246.36	5.0	142.00	0.018412	0.1485
Ansaldo Energia	2 x GT36-S5	50	1,076,000	kW	=	1,076.0	MW	7,972	Btu	42.8%	8,577.87	193,808.73	5.0	157.94	0.018412	0.1468
Ansaldo Energia	2 x GT36-S5	50	1,076,000	kW	=	1,076.0	MW	7,972	Btu	42.8%	8,577.87	193,808.73	5.0	157.94	0.018412	0.1468
Ansaldo Energia	2 x GT36-S5	50	1,076,000	kW	=	1,076.0	MW	7,972	Btu	42.8%	8,577.87	193,808.73	5.0	157.94	0.018412	0.1468
Mitsubishi Hitachi Power Systems	3 x M501JAC	60	1,275,000	kW	=	1,275.0	MW	7,775	Btu	44.0%	9,913.13	223,977.48	5.0	182.52	0.018412	0.1432
Siemens Energy	2 x SGT5-9000HL	50	1,186,000	kW	=	1,186.0	MW	7,972	Btu	42.8%	9,454.79	213,621.89	5.0	174.09	0.018412	0.1468
Mitsubishi Hitachi Power Systems	3 x M701J	50	1,434,000	kW	=	1,434.0	MW	8,067	Btu	42.3%	11,568.08	261,369.54	5.0	213.00	0.018412	0.1485
Ansaldo Energia	3 x GT36-S5	50	1,614,000	kW	=	1,614.0	MW	7,972	Btu	42.8%	12,866.81	290,713.09	5.0	236.91	0.018412	0.1468
Mitsubishi Hitachi Power Systems	3 x M701JAC (2015)	50	1,689,000	kW	=	1,689.0	MW	7,826	Btu	43.6%	13,218.11	298,650.51	5.0	243.38	0.018412	0.1441
<b>Average:</b>															<b>0.1539</b>	



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

July 19, 2019

Mr. Bob Adair  
Chairman, Tax Relief for Pollution Control Property Advisory Committee  
c/o Phillips 66  
2331 CityWest Blvd.  
S1362-01 Headquarters Building  
Houston, Texas 77042

Via email

Re: Request for Advice Regarding Future Heat Recovery Steam Generator Applications

Dear Mr. Adair:

On May 3, 2019, the Texas Supreme Court determined that the Commission abused its discretion in issuing negative determinations for Heat Recovery Steam Generators (HRSG) and remanded cases to the Commission for further proceedings consistent with its opinion. During the June 12, 2019 Commission Agenda, Chairman Niermann and Commissioner Lindley directed Tax Relief for Pollution Control Property program staff to solicit advice from the Tax Relief for Pollution Control Property Advisory Committee ("the Committee") on how to determine use percentages for future use determination applications that include HRSGs.

In order to resolve longstanding issues and consider options for proceeding with new HRSG applications in an expeditious manner, the TCEQ is requesting that the Committee assist us with the following questions:

- 1) Are the existing rules in 30 Texas Administrative Code (TAC) Section 17.17(c) adequate to determine a use percentage, in whole or in part, for new Tier III applications for HRSGs, consistent with the Court's opinions? If yes, what considerations should be given to reviewing input variables (particularly Capital Cost Old and Production Capacity Factor) used in the Cost Analysis Procedure (CAP) for HRSGs?
- 2) If the existing rules are not adequate, what is an appropriate method for distinguishing the proportion of HRSGs used for pollution control from the proportion used for production that is consistent with the Texas Supreme Court's opinions?
- 3) Should the Commission propose rulemaking to remove HRSGs from the Expedited Review List of Section 17.17(b)? If yes, what compelling evidence can the Committee provide that HRSGs do not provide pollution control benefits?

We appreciate your help with determining use percentages for future applications and look forward to discussing these issues at the next meeting on August 23, 2019. The remanded applications will be reviewed and processed in accordance with the rules that existed at the time they were originally submitted and consistent with the court's opinions.

Mr. Bob Adair  
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July 19, 2019

If you have questions regarding this letter or need further assistance, please contact Walker Williamson, Manager of the Air Quality Planning Section by telephone at (512) 239-3181, by e-mail at [Walker.Williamson@tceq.texas.gov](mailto:Walker.Williamson@tceq.texas.gov), or write to the Texas Commission on Environmental Quality, Tax Relief for Pollution Control Property Program, MC-110, P.O. Box 13087, Austin, Texas 78711-3087.

Sincerely,

A handwritten signature in blue ink, appearing to read 'DHF', is positioned above the typed name.

Donna F. Huff, Director  
Air Quality Division