# DOCKETED

| | |
|---|---|
| **Docket Number:** | 13-AFC-01 |
| **Project Title:** | Alamitos Energy Center |
| **TN #:** | 214637 |
| **Document Title:** | AES's Comments on the SCAQMD Final Determination of Compliance |
| **Description:** | N/A |
| **Filer:** | Elyse Engel |
| **Organization:** | CH2M |
| **Submitter Role:** | Applicant Consultant |
| **Submission Date:** | 12/5/2016 3:57:54 PM |
| **Docketed Date:** | 12/5/2016 |

AES Alamitos Energy, LLC
690 N. Studebaker Rd
Long Beach, CA 90803
*tel* 562 493 7891
*fax* 562 493 7320

December 5, 2016

Ms. Vicky Lee
Air Quality Engineer
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4178

**Subject: AES Alamitos, LLC (Facility ID 115394)**
**Draft Facility Permit to Operate and Final Determination of Compliance Comments**

Dear Ms. Lee:

AES Alamitos Energy, LLC (AES) appreciates the efforts by the South Coast Air Quality Management District (SCAQMD) in preparing the Alamitos Energy Center's (AEC) Final Determination of Compliance (FDOC). AES agrees with the conclusions derived by the SCAQMD and provides the following minor comments on the draft Facility Permit to Operate and FDOC for your consideration.

**Draft Facility Permit to Operate Comments:**

Pages 1 through 18, Section H, Table of Equipment – Please verify that the conditions referenced in Section H are consistent with the permit conditions presented in the FDOC. For example, Conditions E193.6 and E193.7 are still listed in the last column of this table for CCGT-1, CCGT-2, SCGT-1, SCGT-2, SCGT-3, and SCGT-4, despite having been deleted in the FDOC.

Page 60, Condition E73.2 – The wording for Condition E73.2 does not match that provided in the FDOC, and should be revised as follows for consistency:

E73.2 Notwithstanding the requirements of Section E conditions, the operator may ~~use~~ commence the construction of Phase II of this project if all of the following **condition**~~requirement~~(s) are met:

The BACT/LAER determination for the Phase II of this project shall be reviewed and modified (by SCAQMD) as appropriate at the latest reasonable time which occurs no later than 18 months prior to the commencement of construction of Phase II of the project.

**[40 CFR 52.21 – PSD, 6-19-1978]**

[Devices subject to this condition: D163, D164, D165, C170, D173, C178, D181, C183, D185, C188, D191, C194, D197, C200, D203, C206, D209, D210]

Page 61, Condition E193.6 – Condition E193.6 was deleted in the FDOC, and should similarly be deleted from the Facility Permit.

Page 62, Condition E193.7 – Condition E193.7 was deleted in the FDOC, and should similarly be deleted from the Facility Permit.

**Final Determination of Compliance Comments:**

Page 83, 2nd Paragraph – Attached to this letter is a performance guarantee for the combined-cycle gas turbines' ability to meet the Best Available Control Technology (BACT) limit of 1.5 parts per million by volume, dry basis (ppmvd) carbon monoxide (CO) at 15 percent oxygen ($O_2$).

Page 164, 1st Full Paragraph – It is stated that a CO BACT analysis is required per SCAQMD Rule 1701(b)(1) and 1703(a)(2). SCAQMD Rule 1701(b)(1) requires a BACT analysis when there is "a net emission increase of a criteria air contaminant," which does not seem applicable to the AEC's CO emissions as they result in a net decrease. Please resolve this discrepancy.

Page 325, Last Paragraph Before Question 4 – This paragraph should be revised as follows:

> Upon SCAQMD's request, AES is in the process of securing a written performance guarantee from the equipment vendor to ensure the proposed ~~simple~~**combined**-cycle turbines with oxidation catalyst will comply with the new BACT standard of 1.5 ppmvd CO at 15% $O_2$ without duct burner.

Should you have any questions regarding the comments provided, please do not hesitate to call me at 562-493-7840. We appreciate your attention to these comments.

Sincerely,

Stephen O'Kane
Manager
AES Alamitos Energy, LLC

Attachment

cc: Jeffrey Harris/ESH
Jerry Salamy/CH2M
Keith Winstead/CEC

# CCGT CO Performance Guarantee

11/11/2016

To: Michael Esham, Project Engineer, Vogt Power Intl.
From: Joshua D. Gillespie, EmeraChem LLC

Subj: CO/VOC OXIDATION CATALYST AES ALAMITOS ENERGY CENTER

**Catalyst selection based on:**

CO Catalyst Performance Warranty- 26280 hr / 3 yr
Scope: Catalyst modules and design for internal frame and gas seals
By Others: Duct/catalyst housing (including any transitions)

**CO SYSTEM DESIGN BASIS:**

| | |
|---|---|
| Gas Flow from: | GE 7FA.05 |
| Dimensions: | Inside liner dimensions of 25'-9" W x 76' H |
| Gas Flow (design case): | 4,389,000 lb/hr |
| Fuel | Natural Gas |
| Gas Flow Rate (at catalyst face)/ (design case): | Designed for gas velocities within +/- 15% of the mean velocity at the catalyst face |
| Temperature (at catalyst face): | Designed for gas temperatures within range +/- 25% F of given average temperature at all points at the catalyst face |
| CO Concentration (at catalyst face): | Given-See Table A-Performance Data |
| CO Reduction (design case): | To Max. 1.5 ppmvdc @15% O2 |
| VOC Concentration (at catalyst face): | Given-See Table A-Performance Data |
| VOC composition | Assumed-50% Saturated |

Joshua D. Gillespie
Sales and Proposals Manager
EmeraChem LLC

Vogt Power International Inc.
13551 Triton Park Boulevard Suite 2000
Louisville, KY 40223
Attn: Michael Esham, Project Engineer

Subject: AES Alamitos Energy Center CO Catalyst Data Sheet

Dear Mr. Esham,

Synergy Catalyst is providing this Carbon Monoxide (CO) design basis and emissions reduction and sensitivity analysis table for the CO Catalyst system for the removal of CO from the flue gas from a natural gas fired General Electric Frame 7FA.05 combustion turbine heat recovery steam generator for the AES Alamitos Energy Center.

The CO Catalyst system consists of the following scope of supply to fit within the VPI provide HRSG duct:

- Catalyst Support Structure Engineering Design
- Catalyst Support Structure with Catalyst mounting system
- Discreet-cell diesel foil brazed metallic catalyst substrate with Platinum Baseload formulation oxidation coating.

The Catalyst support structure will be designed to the project specific structural requirements. It will utilize rectangular tube steel shapes for the vertical support columns and horizontal cross beams as the primary structural components with tube steel shapes for inter-module structural bulwark and catalyst mounting to yield a strong and lightweight catalyst support structure. Baffle Seal plates will seal the support structure to the internal HRSG liner to eliminate exhaust gas bypass. The catalyst elements will be individually mounted and sealed with flat face tetraglas gaskets.

The brazed metallic oxidation catalysts are manufactured with a contaminant-free (oil-less and waterless) manufacturing process with vacuum brazing which yields the strongest and longest lasting oxidation catalysts. As the entire catalyst substrate becomes an integral brazed substrate, oxidation coating loss is minimized for application for thermal cycling applications. Precision zone coating precisely applies pristine and pure platinum materials to achieve highly efficient CO reduction rates. The CO Catalyst performance warranty period is 26,280 hours or 3 years. The CO System design basis is summarized as follows:

| CO SYSTEM DESIGN BASIS: | |
|---|---|
| Gas Flow from: | Natural Gas Fired combustion turbine GE 7FA.05 |
| Dimensions: | Inside liner dimensions of 25'-9" W x 76' H |
| Gas Flow: | Given - See Table A - Performance Data |
| Fuel: | Natural Gas |
| Gas Flow Rate (At catalyst face): | Designed for gas velocities within +15% of the mean velocity at the catalyst face |
| Temperature (At catalyst face): | Designed for gas temperatures within range +25%F of given average temperatures at all points at the catalyst face |
| CO Concentration (At catalyst face): | Given - See Table A - Performance Data |
| CO Reduction: | To Max. 1.5 ppmvd @ 15% O2 |
| VOC Concentration (At catalyst face): | Given - See Table A - Performance Data |
| VOC Composition: | Assumed – 50% Saturated |

Very Respectfully,

James Whitehorn
Director, Power Generation Sales

**JOHNSON MATTHEY STATIONARY EMISSIONS CONTROL, LLC**
1121 ALDERMAN DRIVE, SUITE 204 ALPHARETTA, GA 30005
**T** +1 678-341-7525 **F** +1 678-341-7509

November 11, 2016

Michael Esham
Vogt Power International

Re: CO Catalyst Information AES Alamitos Energy Center

Dear Michael:

Our CO Catalyst Selection was based on:

- CO Catalyst Performance Warranty – 26280 hr / 3 yr
- Scope: Catalyst modules and design for internal frame and gas seals
- By Others: Duct/catalyst housing (including any transitions)

The following table summarizes the flue gas conditions, CO catalyst performance guarantees and the CO catalyst sizing.

| Inlet Conditions | |
|---|---|
| Fuel | Natural Gas |
| Design Exhaust Flow Rate | 2,702,000 – 4,389,000 lb/hr |
| Design Exhaust Temperature | 636 - 737 ºF |
| Inlet CO concentration | 9 ppmvd (15% O2) |
| Inlet VOC concentration | 1.4 ppmvd (15% O2) |
| Temperature Distribution Required | +/- 25°F deviation from mean |
| Velocity Distribution Required | +/- 15% deviation from mean |
| Catalyst Performance | |
| CO Emissions | ≤ 1.5 ppmvd (15% $O_2$) |
| CO Catalyst information | |
| Approximate Catalyst Frame Dimensions | 25.75’ w x 76’ h |

Sincerely,

David Repp
Sales Manager – Power Plant Catalyst
TEL : 678-341-7525 FAX : 678-341-7509
david.repp@jmusa.com

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| # Units | GT Make/Model |
|---|---|
| 2 | GE 7FA.05 |

**Inside Duct Dimensions:** **Height** **Width**
**CO Duct** **76** **25.75** **Ft**

| VPI Case Number | Units | E001.100%.20F.2U | E002.100%.28F.2U | E003.100%.59F.2U | E004.100%.59F.2U | E005.100%.65.3F.2U | E006.100%.70F.2U | E007.100%.77F.2U | E008.100%.89F.2U | E009.100%.100F.2U | E010.100%.107F.2U | E011.100%.59F.2U | E012.100%.65.3F.2U | E013.100%.65.8F.2U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,389,000 | 4,368,000 | 4,310,000 | 4,313,000 | 4,298,001 | 4,306,000 | 4,236,000 | 4,120,000 | 3,970,000 | 3,858,000 | 4,310,000 | 4,296,000 | 4,306,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 74.8833 | 74.7507 | 74.2941 | 74.2949 | 73.7015 | 74.4168 | 74.0318 | 73.7824 | 72.2150 | 74.5179 | 74.0854 | 73.6239 | 73.9055 |
| Argon (Ar) | Vol % | 0.8946 | 0.8930 | 0.8875 | 0.8875 | 0.8804 | 0.8890 | 0.8844 | 0.8814 | 0.8627 | 0.8902 | 0.8850 | 0.8795 | 0.8829 |
| Oxygen (O2) | Vol % | 12.3663 | 12.3152 | 12.1814 | 12.1811 | 12.0736 | 12.3438 | 12.2624 | 12.2463 | 11.8160 | 12.5100 | 12.0560 | 12.0151 | 12.0491 |
| Carbon Dioxide (CO2) | Vol % | 3.9563 | 3.9641 | 3.9696 | 3.9699 | 3.9434 | 3.9039 | 3.8926 | 3.8667 | 3.8710 | 3.8333 | 4.0048 | 3.9625 | 3.9837 |
| Water (H2O) | Vol % | 7.8996 | 8.0771 | 8.6674 | 8.6666 | 9.4012 | 8.4465 | 8.9288 | 9.2232 | 11.2353 | 8.2486 | 8.9688 | 9.5191 | 9.1788 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.4541 | 28.4353 | 28.3713 | 28.3714 | 28.2886 | 28.3895 | 28.3357 | 28.3011 | 28.0814 | 28.4047 | 28.3415 | 28.2775 | 28.3166 |
| Dry O2% | Vol % | 13.4269 | 13.3973 | 13.3374 | 13.3370 | 13.3264 | 13.4826 | 13.4646 | 13.4906 | 13.3116 | 13.6347 | 13.2438 | 13.2792 | 13.2668 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.93 | 13.78 | 13.55 | 13.57 | 13.53 | 13.55 | 13.17 | 12.48 | 11.65 | 10.85 | 13.56 | 13.52 | 13.57 |
| TEG Temp at CO | °F (+/- 25°F) | 726.6 | 728.7 | 736.4 | 736.5 | 737.2 | 736.5 | 735.6 | 733.2 | 731.4 | 725.8 | 736.8 | 737.2 | 737.0 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E014.100%.70F.2U | E015.100%.77F.2U | E016.100%.85F.2U | E017G.100%.89F.2U | E018.100%.100F.2U | E019.100%.107F.2U | E020.100%.20F.1U | E021.100%.28F.1U | E022.100%.59F.1U | E023.100%.59F.1U | E024.100%.65.3F.1U | E025.75%.70F.1U | E026.44%.77F.1U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 75 | 44 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,308,000 | 4,301,001 | 4,269,001 | 4,264,000 | 4,077,000 | 4,266,000 | 4,389,000 | 4,368,000 | 4,310,000 | 4,313,000 | 4,298,001 | 4,306,000 | 4,236,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.9880 | 73.6507 | 73.2909 | 73.2865 | 71.8849 | 73.5754 | 74.8833 | 74.7507 | 74.2941 | 74.2949 | 73.7015 | 74.4168 | 74.0318 |
| Argon (Ar) | Vol % | 0.8839 | 0.8798 | 0.8755 | 0.8755 | 0.8587 | 0.8789 | 0.8946 | 0.8930 | 0.8875 | 0.8875 | 0.8804 | 0.8890 | 0.8844 |
| Oxygen (O2) | Vol % | 12.0640 | 12.0480 | 12.0030 | 12.0072 | 11.6576 | 12.2818 | 12.3663 | 12.3152 | 12.1814 | 12.1811 | 12.0736 | 12.3438 | 12.2624 |
| Carbon Dioxide (CO2) | Vol % | 3.9874 | 3.9494 | 3.9231 | 3.9204 | 3.9063 | 3.8204 | 3.9563 | 3.9641 | 3.9696 | 3.9699 | 3.9434 | 3.9039 | 3.8926 |
| Water (H2O) | Vol % | 9.0767 | 9.4720 | 9.9075 | 9.9105 | 11.6924 | 9.4436 | 7.8996 | 8.0771 | 8.6674 | 8.6666 | 9.4012 | 8.4465 | 8.9288 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3281 | 28.2814 | 28.2314 | 28.2308 | 28.0346 | 28.2728 | 28.4541 | 28.4353 | 28.3713 | 28.3714 | 28.2886 | 28.3895 | 28.3357 |
| Dry O2% | Vol % | 13.2683 | 13.3086 | 13.3230 | 13.3280 | 13.2011 | 13.5626 | 13.4269 | 13.3973 | 13.3374 | 13.3370 | 13.3264 | 13.4826 | 13.4646 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.59 | 13.61 | 13.47 | 13.46 | 12.34 | 13.52 | 13.50 | 13.40 | 13.07 | 13.08 | 13.04 | 13.06 | 12.68 |
| TEG Temp at CO | °F (+/- 25°F) | 736.8 | 737.3 | 737.3 | 737.3 | 734.4 | 730.8 | 687.3 | 689.3 | 693.7 | 693.8 | 694.2 | 693.6 | 692.0 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E027.100%.89F.1U | E028.100%.100F.1U | E029.75%.107F.1U | E030.48%.59F.1U | E031.100%.65.3F.1U | E032.75%.65.8F.1U | E033.44%.70F.1U | E034.100%.77F.1U | E035.100%.85F.1U | E036.100%.89F.1U | E037.100%.100F.1U | E038.100%.107F.1U | E039.75%.28F.2U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 75 | 48 | 100 | 75 | 44 | 100 | 100 | 100 | 100 | 100 | 75 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,120,000 | 3,970,000 | 3,858,000 | 4,310,000 | 4,296,000 | 4,306,000 | 4,308,000 | 4,301,001 | 4,269,001 | 4,264,000 | 4,077,000 | 4,266,000 | 3,533,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.7824 | 72.2150 | 74.5179 | 74.0854 | 73.6239 | 73.9055 | 73.9880 | 73.6507 | 73.2909 | 73.2865 | 71.8849 | 73.5754 | 74.8233 |
| Argon (Ar) | Vol % | 0.8814 | 0.8627 | 0.8902 | 0.8850 | 0.8795 | 0.8829 | 0.8839 | 0.8798 | 0.8755 | 0.8755 | 0.8587 | 0.8789 | 0.8938 |
| Oxygen (O2) | Vol % | 12.2463 | 11.8160 | 12.5100 | 12.0560 | 12.0151 | 12.0491 | 12.0640 | 12.0480 | 12.0030 | 12.0072 | 11.6576 | 12.2818 | 12.5213 |
| Carbon Dioxide (CO2) | Vol % | 3.8667 | 3.8710 | 3.8333 | 4.0048 | 3.9625 | 3.9837 | 3.9874 | 3.9494 | 3.9231 | 3.9204 | 3.9063 | 3.8204 | 3.8693 |
| Water (H2O) | Vol % | 9.2232 | 11.2353 | 8.2486 | 8.9688 | 9.5191 | 9.1788 | 9.0767 | 9.4720 | 9.9075 | 9.9105 | 11.6924 | 9.4436 | 7.8922 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3011 | 28.0814 | 28.4047 | 28.3415 | 28.2775 | 28.3166 | 28.3281 | 28.2814 | 28.2314 | 28.2308 | 28.0346 | 28.2728 | 28.4470 |
| Dry O2% | Vol % | 13.4906 | 13.3116 | 13.6347 | 13.2438 | 13.2792 | 13.2668 | 13.2683 | 13.3086 | 13.3230 | 13.3280 | 13.2011 | 13.5626 | 13.5942 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 12.00 | 11.21 | 10.41 | 13.08 | 13.03 | 13.08 | 13.10 | 13.09 | 12.94 | 12.93 | 11.90 | 13.00 | 8.70 |
| TEG Temp at CO | °F (+/- 25°F) | 689.0 | 686.6 | 677.1 | 694.0 | 694.2 | 694.2 | 694.1 | 694.3 | 693.9 | 693.8 | 690.1 | 686.4 | 707.1 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E040.75%.59F.2U | E041.75%.65.3F.2U | E042.75%.107F.2U | E043.45%.28F.2U | E044.44%.59F.2U | E045.44%.65.3F.2U | E046.48%.107F.2U | E047.75%.28F.1U | E048.75%.59F.1U | E049.75%.65.3F.1U | E050.75%.107F.1U | E051.45%.28F.1U | E052.44%.59F.1U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 75 | 75 | 75 | 45 | 44 | 44 | 48 | 75 | 75 | 75 | 75 | 45 | 44 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 3,421,000 | 3,378,000 | 3,074,000 | 2,802,000 | 2,702,000 | 2,702,000 | 2,731,000 | 3,533,000 | 3,421,000 | 3,378,000 | 3,074,000 | 2,802,000 | 2,702,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 74.3501 | 73.7353 | 74.5059 | 74.9117 | 74.5085 | 73.9089 | 74.7837 | 74.8233 | 74.3501 | 73.7353 | 74.5059 | 74.9117 | 74.5085 |
| Argon (Ar) | Vol % | 0.8882 | 0.8808 | 0.8901 | 0.8949 | 0.8901 | 0.8829 | 0.8934 | 0.8938 | 0.8882 | 0.8808 | 0.8901 | 0.8949 | 0.8901 |
| Oxygen (O2) | Vol % | 12.3412 | 12.1706 | 12.4758 | 12.7718 | 12.7929 | 12.6697 | 13.2669 | 12.5213 | 12.3412 | 12.1706 | 12.4758 | 12.7718 | 12.7929 |
| Carbon Dioxide (CO2) | Vol % | 3.8961 | 3.8987 | 3.8490 | 3.7541 | 3.6883 | 3.6689 | 3.4851 | 3.8693 | 3.8961 | 3.8987 | 3.8490 | 3.7541 | 3.6883 |
| Water (H2O) | Vol % | 8.5244 | 9.3146 | 8.2792 | 7.6675 | 8.1203 | 8.8695 | 7.5709 | 7.8922 | 8.5244 | 9.3146 | 8.2792 | 7.6675 | 8.1203 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3802 | 28.2940 | 28.4028 | 28.4611 | 28.4056 | 28.3219 | 28.4473 | 28.4470 | 28.3802 | 28.2940 | 28.4028 | 28.4611 | 28.4056 |
| Dry O2% | Vol % | 13.4912 | 13.4207 | 13.6019 | 13.8324 | 13.9235 | 13.9028 | 14.3536 | 13.5942 | 13.4912 | 13.4207 | 13.6019 | 13.8324 | 13.9235 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 8.26 | 8.09 | 6.71 | 5.27 | 4.95 | 4.97 | 5.19 | 8.37 | 7.92 | 7.76 | 6.48 | 5.04 | 4.76 |
| TEG Temp at CO | °F (+/- 25°F) | 708.5 | 708.3 | 700.3 | 688.3 | 683.7 | 684.2 | 684.8 | 662.8 | 662.8 | 662.4 | 646.3 | 641.8 | 638.9 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E053.44%.65.3F.1U | E054.48%.107F.1U | E055.100%.20F.2U | E056.100%.32F.2U | E057.100%.59F.2U | E058.100%.59F.2U | E059.100%.65.8F.2U | E060.100%.68F.2U | E061.100%.74F.2U | E062.100%.85F.2U | E063.100%.100F.2U | E064.100%.110F.2U | E065.100%.59F.2U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 44 | 48 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 2,702,000 | 2,731,000 | 4,389,000 | 4,360,000 | 4,310,000 | 4,313,000 | 4,307,000 | 4,305,000 | 4,259,000 | 4,163,000 | 3,970,000 | 3,797,000 | 4,310,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.9089 | 74.7837 | 74.8833 | 74.6521 | 74.2941 | 74.2949 | 74.1444 | 73.8758 | 73.8714 | 73.8454 | 72.2150 | 74.6375 | 74.0854 |
| Argon (Ar) | Vol % | 0.8829 | 0.8934 | 0.8946 | 0.8918 | 0.8875 | 0.8875 | 0.8857 | 0.8825 | 0.8825 | 0.8822 | 0.8627 | 0.8916 | 0.8850 |
| Oxygen (O2) | Vol % | 12.6697 | 13.2669 | 12.3663 | 12.2842 | 12.1814 | 12.1811 | 12.2152 | 12.1608 | 12.1980 | 12.2463 | 11.8160 | 12.5460 | 12.0560 |
| Carbon Dioxide (CO2) | Vol % | 3.6689 | 3.4851 | 3.9563 | 3.9664 | 3.9696 | 3.9699 | 3.9320 | 3.9229 | 3.9034 | 3.8753 | 3.8710 | 3.8313 | 4.0048 |
| Water (H2O) | Vol % | 8.8695 | 7.5709 | 7.8996 | 8.2055 | 8.6674 | 8.6666 | 8.8227 | 9.1580 | 9.1447 | 9.1508 | 11.2353 | 8.0935 | 8.9688 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3219 | 28.4473 | 28.4541 | 28.4215 | 28.3713 | 28.3714 | 28.3509 | 28.3134 | 28.3130 | 28.3098 | 28.0814 | 28.4215 | 28.3415 |
| Dry O2% | Vol % | 13.9028 | 14.3536 | 13.4269 | 13.3822 | 13.3374 | 13.3370 | 13.3972 | 13.3867 | 13.4258 | 13.4798 | 13.3116 | 13.6508 | 13.2438 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 4.78 | 4.99 | 13.93 | 13.75 | 13.55 | 13.57 | 13.56 | 13.58 | 13.32 | 12.73 | 11.65 | 10.49 | 13.56 |
| TEG Temp at CO | °F (+/- 25°F) | 639.2 | 636.5 | 726.6 | 729.9 | 736.4 | 736.5 | 736.9 | 737.2 | 736.3 | 734.1 | 731.3 | 724.1 | 736.8 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E066.100%.65.8F.2U | E067.100%.65.8F.2U | E068.100%.68F.2U | E069.100%.74F.2U | E070.100%.85F.2U | E071G.100%.85F.2U | E072.100%.100F.2U | E073.100%.110F.2U | E074.100%.20F.1U | E075.100%.32F.1U | E076.100%.59F.1U | E077.100%.59F.1U | E078.100%.65.8F.1U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,302,000 | 4,306,000 | 4,301,001 | 4,299,000 | 4,269,001 | 4,286,000 | 4,077,000 | 4,268,000 | 4,389,000 | 4,360,000 | 4,310,000 | 4,313,000 | 4,307,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.8910 | 73.9055 | 73.6893 | 73.5941 | 73.2909 | 73.4002 | 71.8849 | 73.6347 | 74.8833 | 74.6521 | 74.2941 | 74.2949 | 74.1444 |
| Argon (Ar) | Vol % | 0.8827 | 0.8829 | 0.8803 | 0.8792 | 0.8755 | 0.8768 | 0.8587 | 0.8796 | 0.8946 | 0.8918 | 0.8875 | 0.8875 | 0.8857 |
| Oxygen (O2) | Vol % | 12.0459 | 12.0491 | 12.0288 | 12.0357 | 12.0030 | 12.0298 | 11.6576 | 12.3610 | 12.3663 | 12.2842 | 12.1814 | 12.1811 | 12.2152 |
| Carbon Dioxide (CO2) | Vol % | 3.9833 | 3.9837 | 3.9644 | 3.9479 | 3.9231 | 3.9244 | 3.9063 | 3.7882 | 3.9563 | 3.9664 | 3.9696 | 3.9699 | 3.9320 |
| Water (H2O) | Vol % | 9.1971 | 9.1788 | 9.4371 | 9.5431 | 9.9075 | 9.7687 | 11.6924 | 9.3364 | 7.8996 | 8.2055 | 8.6674 | 8.6666 | 8.8227 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3146 | 28.3166 | 28.2866 | 28.2735 | 28.2314 | 28.2467 | 28.0346 | 28.2816 | 28.4541 | 28.4215 | 28.3713 | 28.3714 | 28.3509 |
| Dry O2% | Vol % | 13.2660 | 13.2668 | 13.2823 | 13.3054 | 13.3230 | 13.3322 | 13.2011 | 13.6340 | 13.4269 | 13.3822 | 13.3374 | 13.3370 | 13.3972 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.55 | 13.57 | 13.57 | 13.59 | 13.48 | 13.58 | 12.35 | 13.55 | 13.49 | 13.32 | 13.07 | 13.08 | 13.07 |
| TEG Temp at CO | °F (+/- 25°F) | 737.0 | 737.0 | 737.3 | 737.5 | 737.3 | 737.5 | 734.3 | 729.0 | 687.3 | 690.2 | 693.6 | 693.7 | 693.8 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E079.100%.68F.1U | E080.100%.74F.1U | E081.100%.85F.1U | E082.100%.100F.1U | E083.100%.110F.1U | E084.100%.59F.1U | E085.100%.65.8F.1U | E086.100%.65.8F.1U | E087.100%.68F.1U | E088.100%.74F.1U | E089.100%.85F.1U | E090.100%.85F.1U | E091.100%.100F.1U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,305,000 | 4,259,000 | 4,163,000 | 3,970,000 | 3,797,000 | 4,310,000 | 4,302,000 | 4,306,000 | 4,301,001 | 4,299,000 | 4,269,001 | 4,286,000 | 4,077,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.8758 | 73.8714 | 73.8454 | 72.2150 | 74.6375 | 74.0854 | 73.8910 | 73.9055 | 73.6893 | 73.5941 | 73.2909 | 73.4002 | 71.8849 |
| Argon (Ar) | Vol % | 0.8825 | 0.8825 | 0.8822 | 0.8627 | 0.8916 | 0.8850 | 0.8827 | 0.8829 | 0.8803 | 0.8792 | 0.8755 | 0.8768 | 0.8587 |
| Oxygen (O2) | Vol % | 12.1608 | 12.1980 | 12.2463 | 11.8160 | 12.5460 | 12.0560 | 12.0459 | 12.0491 | 12.0288 | 12.0357 | 12.0030 | 12.0298 | 11.6576 |
| Carbon Dioxide (CO2) | Vol % | 3.9229 | 3.9034 | 3.8753 | 3.8710 | 3.8313 | 4.0048 | 3.9833 | 3.9837 | 3.9644 | 3.9479 | 3.9231 | 3.9244 | 3.9063 |
| Water (H2O) | Vol % | 9.1580 | 9.1447 | 9.1508 | 11.2353 | 8.0935 | 8.9688 | 9.1971 | 9.1788 | 9.4371 | 9.5431 | 9.9075 | 9.7687 | 11.6924 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3134 | 28.3130 | 28.3098 | 28.0814 | 28.4215 | 28.3415 | 28.3146 | 28.3166 | 28.2866 | 28.2735 | 28.2314 | 28.2467 | 28.0346 |
| Dry O2% | Vol % | 13.3867 | 13.4258 | 13.4798 | 13.3116 | 13.6508 | 13.2438 | 13.2660 | 13.2668 | 13.2823 | 13.3054 | 13.3230 | 13.3322 | 13.2011 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.08 | 12.82 | 12.23 | 11.22 | 10.06 | 13.08 | 13.06 | 13.08 | 13.07 | 13.08 | 12.95 | 13.05 | 11.90 |
| TEG Temp at CO | °F (+/- 25°F) | 694.1 | 692.7 | 690.0 | 686.5 | 670.6 | 693.9 | 693.9 | 694.0 | 694.2 | 694.3 | 693.8 | 694.1 | 690.0 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E092.100%.110F.1U | E093.75%.32F.2U | E094.75%.59F.2U | E095.75%.65.8F.2U | E096.75%.110F.2U | E097.45%.32F.2U | E098.44%.59F.2U | E099.44%.65.8F.2U | E100.48%.110F.2U | E101.75%.32F.1U | E102.75%.59F.1U | E103.75%.65.8F.1U | E104.75%.110F.1U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 75 | 75 | 75 | 75 | 45 | 44 | 44 | 48 | 75 | 75 | 75 | 75 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,268,000 | 3,523,000 | 3,421,000 | 3,381,000 | 3,042,000 | 2,803,000 | 2,702,000 | 2,705,000 | 2,719,000 | 3,523,000 | 3,421,000 | 3,381,000 | 3,042,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.6347 | 74.7240 | 74.3501 | 74.1757 | 74.6296 | 74.8231 | 74.5085 | 74.3487 | 74.9189 | 74.7240 | 74.3501 | 74.1757 | 74.6296 |
| Argon (Ar) | Vol % | 0.8796 | 0.8927 | 0.8882 | 0.8861 | 0.8915 | 0.8938 | 0.8901 | 0.8882 | 0.8950 | 0.8927 | 0.8882 | 0.8861 | 0.8915 |
| Oxygen (O2) | Vol % | 12.3610 | 12.4881 | 12.3412 | 12.3047 | 12.5236 | 12.7694 | 12.7929 | 12.7992 | 13.3462 | 12.4881 | 12.3412 | 12.3047 | 12.5236 |
| Carbon Dioxide (CO2) | Vol % | 3.7882 | 3.8726 | 3.8961 | 3.8908 | 3.8417 | 3.7432 | 3.6883 | 3.6632 | 3.4633 | 3.8726 | 3.8961 | 3.8908 | 3.8417 |
| Water (H2O) | Vol % | 9.3364 | 8.0226 | 8.5244 | 8.7426 | 8.1136 | 7.7705 | 8.1203 | 8.3007 | 7.3766 | 8.0226 | 8.5244 | 8.7426 | 8.1136 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.2816 | 28.4330 | 28.3802 | 28.3559 | 28.4203 | 28.4489 | 28.4056 | 28.3836 | 28.4666 | 28.4330 | 28.3802 | 28.3559 | 28.4203 |
| Dry O2% | Vol % | 13.6340 | 13.5774 | 13.4912 | 13.4836 | 13.6294 | 13.8453 | 13.9235 | 13.9578 | 14.4091 | 13.5774 | 13.4912 | 13.4836 | 13.6294 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.02 | 8.67 | 8.26 | 8.10 | 6.55 | 5.29 | 4.95 | 4.98 | 5.15 | 8.34 | 7.92 | 7.76 | 6.33 |
| TEG Temp at CO | °F (+/- 25°F) | 680.2 | 707.8 | 708.4 | 707.8 | 699.2 | 688.4 | 683.6 | 683.9 | 684.0 | 663.2 | 662.7 | 662.0 | 645.4 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E105.45%.32F.1U | E106.44%.59F.1U | E107.44%.65.8F.1U | E108.48%.110F.1U | E109.100%.20F.2U.BYP | E110.100%.28F.2U.BYP | E111.100%.59F.2U.BYP | E112.100%.59F.2U.BYP | E113.100%.65.3F.2U.BYP | E114.100%.70F.2U.BYP | E115.100%.77F.2U.BYP | E116.100%.89F.2U.BYP | E117.100%.100F..2U.BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 45 | 44 | 44 | 48 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 2,803,000 | 2,702,000 | 2,705,000 | 2,719,000 | 4,389,000 | 4,368,000 | 4,310,000 | 4,313,000 | 4,298,001 | 4,306,000 | 4,236,000 | 4,120,000 | 3,970,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 74.8231 | 74.5085 | 74.3487 | 74.9189 | 74.8833 | 74.7507 | 74.2941 | 74.2949 | 73.7015 | 74.4168 | 74.0318 | 73.7824 | 72.2150 |
| Argon (Ar) | Vol % | 0.8938 | 0.8901 | 0.8882 | 0.8950 | 0.8946 | 0.8930 | 0.8875 | 0.8875 | 0.8804 | 0.8890 | 0.8844 | 0.8814 | 0.8627 |
| Oxygen (O2) | Vol % | 12.7694 | 12.7929 | 12.7992 | 13.3462 | 12.3663 | 12.3152 | 12.1814 | 12.1811 | 12.0736 | 12.3438 | 12.2624 | 12.2463 | 11.8160 |
| Carbon Dioxide (CO2) | Vol % | 3.7432 | 3.6883 | 3.6632 | 3.4633 | 3.9563 | 3.9641 | 3.9696 | 3.9699 | 3.9434 | 3.9039 | 3.8926 | 3.8667 | 3.8710 |
| Water (H2O) | Vol % | 7.7705 | 8.1203 | 8.3007 | 7.3766 | 7.8996 | 8.0771 | 8.6674 | 8.6666 | 9.4012 | 8.4465 | 8.9288 | 9.2232 | 11.2353 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.4489 | 28.4056 | 28.3836 | 28.4666 | 28.4541 | 28.4353 | 28.3713 | 28.3714 | 28.2886 | 28.3895 | 28.3357 | 28.3011 | 28.0814 |
| Dry O2% | Vol % | 13.8453 | 13.9235 | 13.9578 | 14.4091 | 13.4269 | 13.3973 | 13.3374 | 13.3370 | 13.3264 | 13.4826 | 13.4646 | 13.4906 | 13.3116 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 5.06 | 4.76 | 4.79 | 4.94 | 13.83 | 13.73 | 13.54 | 13.55 | 13.53 | 13.56 | 13.18 | 12.49 | 11.65 |
| TEG Temp at CO | °F (+/- 25°F) | 641.7 | 638.8 | 638.9 | 636.0 | 726.0 | 727.9 | 735.0 | 735.1 | 735.8 | 735.0 | 734.0 | 731.8 | 730.5 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E118.100%.107F.2 U.BYP | E119.100%.59F.2U. BYP | E120.100%.65.3F.2 U.BYP | E121.100%.65.8F.2 U.BYP | E122.100%.70F.2U. BYP | E123.100%.77F.2U. BYP | E124.100%.95F.2U. BYP | E125.100%.89F.2U. BYP | E126.100%.100F.2 U.BYP | E127.100%.107F.2 U.BYP | E128.100%.20F.1U. BYP | E129.100%.28F.1U. BYP | E130.100%.59F.1U. BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 3,858,000 | 4,310,000 | 4,296,000 | 4,306,000 | 4,308,000 | 4,301,001 | 4,269,001 | 4,264,000 | 4,077,000 | 4,266,000 | 4,389,000 | 4,368,000 | 4,310,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 74.5179 | 74.0854 | 73.6239 | 73.9055 | 73.9880 | 73.6507 | 73.2909 | 73.2865 | 71.8849 | 73.5754 | 74.8833 | 74.7507 | 74.2941 |
| Argon (Ar) | Vol % | 0.8902 | 0.8850 | 0.8795 | 0.8829 | 0.8839 | 0.8798 | 0.8755 | 0.8755 | 0.8587 | 0.8789 | 0.8946 | 0.8930 | 0.8875 |
| Oxygen (O2) | Vol % | 12.5100 | 12.0560 | 12.0151 | 12.0491 | 12.0640 | 12.0480 | 12.0030 | 12.0072 | 11.6576 | 12.2818 | 12.3663 | 12.3152 | 12.1814 |
| Carbon Dioxide (CO2) | Vol % | 3.8333 | 4.0048 | 3.9625 | 3.9837 | 3.9874 | 3.9494 | 3.9231 | 3.9204 | 3.9063 | 3.8204 | 3.9563 | 3.9641 | 3.9696 |
| Water (H2O) | Vol % | 8.2486 | 8.9688 | 9.5191 | 9.1788 | 9.0767 | 9.4720 | 9.9075 | 9.9105 | 11.6924 | 9.4436 | 7.8996 | 8.0771 | 8.6674 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.4047 | 28.3415 | 28.2775 | 28.3166 | 28.3281 | 28.2814 | 28.2314 | 28.2308 | 28.0346 | 28.2728 | 28.4541 | 28.4353 | 28.3713 |
| Dry O2% | Vol % | 13.6347 | 13.2438 | 13.2792 | 13.2668 | 13.2683 | 13.3086 | 13.3230 | 13.3280 | 13.2011 | 13.5626 | 13.4269 | 13.3973 | 13.3374 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 10.85 | 13.55 | 13.52 | 13.57 | 13.60 | 13.62 | 13.48 | 13.46 | 12.34 | 13.52 | 13.45 | 13.35 | 13.02 |
| TEG Temp at CO | °F (+/- 25°F) | 724.9 | 735.4 | 735.8 | 735.6 | 735.4 | 735.9 | 735.8 | 735.7 | 733.3 | 729.7 | 683.4 | 685.3 | 689.7 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E131.100%.59F.1U.BYP | E132.100%.65.3F.1U.BYP | E133.100%.70F.1U.BYP | E134.100%.77F.1U.BYP | E135.100%.89F.1U.BYP | E136.100%.100F.1U.BYP | E137.100%.107F.1U.BYP | E138.100%.59F.1U.BYP | E139.100%.65.3F.1U.BYP | E140.100%.65.8F.1U.BYP | E141.100%.70F.1U.BYP | E142.100%.77F.1U.BYP | E143.100%.85F.1U.BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 75 | 44 | 100 | 100 | 75 | 48 | 100 | 75 | 44 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,313,000 | 4,298,001 | 4,306,000 | 4,236,000 | 4,120,000 | 3,970,000 | 3,858,000 | 4,310,000 | 4,296,000 | 4,306,000 | 4,308,000 | 4,301,001 | 4,269,001 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 74.2949 | 73.7015 | 74.4168 | 74.0318 | 73.7824 | 72.2150 | 74.5179 | 74.0854 | 73.6239 | 73.9055 | 73.9880 | 73.6507 | 73.2909 |
| Argon (Ar) | Vol % | 0.8875 | 0.8804 | 0.8890 | 0.8844 | 0.8814 | 0.8627 | 0.8902 | 0.8850 | 0.8795 | 0.8829 | 0.8839 | 0.8798 | 0.8755 |
| Oxygen (O2) | Vol % | 12.1811 | 12.0736 | 12.3438 | 12.2624 | 12.2463 | 11.8160 | 12.5100 | 12.0560 | 12.0151 | 12.0491 | 12.0640 | 12.0480 | 12.0030 |
| Carbon Dioxide (CO2) | Vol % | 3.9699 | 3.9434 | 3.9039 | 3.8926 | 3.8667 | 3.8710 | 3.8333 | 4.0048 | 3.9625 | 3.9837 | 3.9874 | 3.9494 | 3.9231 |
| Water (H2O) | Vol % | 8.6666 | 9.4012 | 8.4465 | 8.9288 | 9.2232 | 11.2353 | 8.2486 | 8.9688 | 9.5191 | 9.1788 | 9.0767 | 9.4720 | 9.9075 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3714 | 28.2886 | 28.3895 | 28.3357 | 28.3011 | 28.0814 | 28.4047 | 28.3415 | 28.2775 | 28.3166 | 28.3281 | 28.2814 | 28.2314 |
| Dry O2% | Vol % | 13.3370 | 13.3264 | 13.4826 | 13.4646 | 13.4906 | 13.3116 | 13.6347 | 13.2438 | 13.2792 | 13.2668 | 13.2683 | 13.3086 | 13.3230 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.04 | 13.00 | 13.02 | 12.59 | 11.98 | 11.17 | 10.42 | 13.03 | 12.99 | 13.04 | 13.06 | 13.06 | 12.93 |
| TEG Temp at CO | °F (+/- 25°F) | 689.8 | 690.3 | 689.5 | 688.1 | 685.5 | 683.8 | 674.1 | 690.0 | 690.3 | 690.2 | 690.0 | 690.2 | 690.1 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E144.100%.89F.1U.BYP | E145.100%.100F.1U.BYP | E146.100%.100F.1U.BYP | E147.75%.28F.2U.BYP | E148.75%.59F.2U.BYP | E149.75%.65.3F.2U.BYP | E150.75%.107F.2U.BYP | E151.45%.28F.2U.BYP | E152.44%.59F.2U.BYP | E153.44%.65.3F.2U.BYP | E154.48%.107F.2U.BYP | E155.75%.28F.1U.BYP | E156.75%.59F.1U.BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 75 | 75 | 75 | 75 | 45 | 44 | 44 | 48 | 75 | 75 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,264,000 | 4,077,000 | 4,266,000 | 3,533,000 | 3,421,000 | 3,378,000 | 3,074,000 | 2,802,000 | 2,702,000 | 2,702,000 | 2,731,000 | 3,533,000 | 3,421,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.2865 | 71.8849 | 73.5754 | 74.8233 | 74.3501 | 73.7353 | 74.5059 | 74.9117 | 74.5085 | 73.9089 | 74.7837 | 74.8233 | 74.3501 |
| Argon (Ar) | Vol % | 0.8755 | 0.8587 | 0.8789 | 0.8938 | 0.8882 | 0.8808 | 0.8901 | 0.8949 | 0.8901 | 0.8829 | 0.8934 | 0.8938 | 0.8882 |
| Oxygen (O2) | Vol % | 12.0072 | 11.6576 | 12.2818 | 12.5213 | 12.3412 | 12.1706 | 12.4758 | 12.7718 | 12.7929 | 12.6697 | 13.2669 | 12.5213 | 12.3412 |
| Carbon Dioxide (CO2) | Vol % | 3.9204 | 3.9063 | 3.8204 | 3.8693 | 3.8961 | 3.8987 | 3.8490 | 3.7541 | 3.6883 | 3.6689 | 3.4851 | 3.8693 | 3.8961 |
| Water (H2O) | Vol % | 9.9105 | 11.6924 | 9.4436 | 7.8922 | 8.5244 | 9.3146 | 8.2792 | 7.6675 | 8.1203 | 8.8695 | 7.5709 | 7.8922 | 8.5244 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.2308 | 28.0346 | 28.2728 | 28.4470 | 28.3802 | 28.2940 | 28.4028 | 28.4611 | 28.4056 | 28.3219 | 28.4473 | 28.4470 | 28.3802 |
| Dry O2% | Vol % | 13.3280 | 13.2011 | 13.5626 | 13.5942 | 13.4912 | 13.4207 | 13.6019 | 13.8324 | 13.9235 | 13.9028 | 14.3536 | 13.5942 | 13.4912 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 12.92 | 11.89 | 12.98 | 8.68 | 8.24 | 8.08 | 6.70 | 5.26 | 4.95 | 4.98 | 5.19 | 8.34 | 7.90 |
| TEG Temp at CO | °F (+/- 25°F) | 690.0 | 687.0 | 681.7 | 705.4 | 707.2 | 707.4 | 699.4 | 687.4 | 682.7 | 683.3 | 683.8 | 659.0 | 659.6 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E157.75%.65.3F.1U.BYP | E158.75%.107F.1U.BYP | E159.45%.28F.1U.BYP | E160.44%.59F.1U.BYP | E161.44%.65.3F.1U.BYP | E162.48%.107F.1U.BYP | E163.100%.20F.2U.BYP | E164.100%.32F.2U.BYP | E165.100%.59F.2U.BYP | E166.100%.59F.2U.BYP | E167.100%.65.8F.2U.BYP | E168.100%.68F.2U.BYP | E169.100%.74F.2U.BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 75 | 75 | 45 | 44 | 44 | 48 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 3,378,000 | 3,074,000 | 2,802,000 | 2,702,000 | 2,702,000 | 2,731,000 | 4,389,000 | 4,360,000 | 4,310,000 | 4,313,000 | 4,307,000 | 4,305,000 | 4,259,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.7353 | 74.5059 | 74.9117 | 74.5085 | 73.9089 | 74.7837 | 74.8833 | 74.6521 | 74.2941 | 74.2949 | 74.1444 | 73.8758 | 73.8714 |
| Argon (Ar) | Vol % | 0.8808 | 0.8901 | 0.8949 | 0.8901 | 0.8829 | 0.8934 | 0.8946 | 0.8918 | 0.8875 | 0.8875 | 0.8857 | 0.8825 | 0.8825 |
| Oxygen (O2) | Vol % | 12.1706 | 12.4758 | 12.7718 | 12.7929 | 12.6697 | 13.2669 | 12.3663 | 12.2842 | 12.1814 | 12.1811 | 12.2152 | 12.1608 | 12.1980 |
| Carbon Dioxide (CO2) | Vol % | 3.8987 | 3.8490 | 3.7541 | 3.6883 | 3.6689 | 3.4851 | 3.9563 | 3.9664 | 3.9696 | 3.9699 | 3.9320 | 3.9229 | 3.9034 |
| Water (H2O) | Vol % | 9.3146 | 8.2792 | 7.6675 | 8.1203 | 8.8695 | 7.5709 | 7.8996 | 8.2055 | 8.6674 | 8.6666 | 8.8227 | 9.1580 | 9.1447 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.2940 | 28.4028 | 28.4611 | 28.4056 | 28.3219 | 28.4473 | 28.4541 | 28.4215 | 28.3713 | 28.3714 | 28.3509 | 28.3134 | 28.3130 |
| Dry O2% | Vol % | 13.4207 | 13.6019 | 13.8324 | 13.9235 | 13.9028 | 14.3536 | 13.4269 | 13.3822 | 13.3374 | 13.3370 | 13.3972 | 13.3867 | 13.4258 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 7.73 | 6.47 | 5.03 | 4.75 | 4.78 | 4.99 | 13.83 | 13.70 | 13.55 | 13.57 | 13.58 | 13.60 | 13.34 |
| TEG Temp at CO | °F (+/- 25°F) | 659.7 | 646.6 | 639.5 | 636.8 | 637.0 | 637.0 | 726.0 | 729.1 | 735.1 | 735.1 | 735.5 | 735.8 | 734.8 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E170.100%.85F.2U.BYP | E171.100%.100F.2U.BYP | E172.100%.110F.2U.BYP | E173.100%.59F.2U.BYP | E174.100%.65.8F.2U.BYP | E175.100%.65.8F.2U.BYP | E176.100%.68F.2U.BYP | E177.100%.74F.2U.BYP | E178.100%.85F.2U.BYP | E179.100%.85F.2U.BYP | E180.100%.100F.2U.BYP | E181.100%.110F.2U.BYP | E182.100%.20F.1U.BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,163,000 | 3,970,000 | 3,797,000 | 4,310,000 | 4,302,000 | 4,306,000 | 4,301,001 | 4,299,000 | 4,269,001 | 4,286,000 | 4,077,000 | 4,268,000 | 4,389,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.8454 | 72.2150 | 74.6375 | 74.0854 | 73.8910 | 73.9055 | 73.6893 | 73.5941 | 73.2909 | 73.4002 | 71.8849 | 73.6347 | 74.8833 |
| Argon (Ar) | Vol % | 0.8822 | 0.8627 | 0.8916 | 0.8850 | 0.8827 | 0.8829 | 0.8803 | 0.8792 | 0.8755 | 0.8768 | 0.8587 | 0.8796 | 0.8946 |
| Oxygen (O2) | Vol % | 12.2463 | 11.8160 | 12.5460 | 12.0560 | 12.0459 | 12.0491 | 12.0288 | 12.0357 | 12.0030 | 12.0298 | 11.6576 | 12.3610 | 12.3663 |
| Carbon Dioxide (CO2) | Vol % | 3.8753 | 3.8710 | 3.8313 | 4.0048 | 3.9833 | 3.9837 | 3.9644 | 3.9479 | 3.9231 | 3.9244 | 3.9063 | 3.7882 | 3.9563 |
| Water (H2O) | Vol % | 9.1508 | 11.2353 | 8.0935 | 8.9688 | 9.1971 | 9.1788 | 9.4371 | 9.5431 | 9.9075 | 9.7687 | 11.6924 | 9.3364 | 7.8996 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.3098 | 28.0814 | 28.4215 | 28.3415 | 28.3146 | 28.3166 | 28.2866 | 28.2735 | 28.2314 | 28.2467 | 28.0346 | 28.2816 | 28.4541 |
| Dry O2% | Vol % | 13.4798 | 13.3116 | 13.6508 | 13.2438 | 13.2660 | 13.2668 | 13.2823 | 13.3054 | 13.3230 | 13.3322 | 13.2011 | 13.6340 | 13.4269 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 12.74 | 11.66 | 10.49 | 13.57 | 13.56 | 13.59 | 13.58 | 13.61 | 13.49 | 13.59 | 12.36 | 13.55 | 13.45 |
| TEG Temp at CO | °F (+/- 25°F) | 732.7 | 730.5 | 723.5 | 735.4 | 735.6 | 735.7 | 735.9 | 736.1 | 735.9 | 736.0 | 733.3 | 728.1 | 683.4 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E183.100%.32F.1U.BYP | E184.100%.59F.1U.BYP | E185.100%.59F.1U.BYP | E186.100%.65.8F.1U.BYP | E187.100%.68F.1U.BYP | E188.100%.74F.1U.BYP | E189.100%.85F.1U.BYP | E190.100%.100F.1U.BYP | E191.100%.110F.1U.BYP | E192.100%.59F.1U.BYP | E193.100%.65.8F.1U.BYP | E194.100%.65.8F.1U.BYP | E195.100%.68F.1U.BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,360,000 | 4,310,000 | 4,313,000 | 4,307,000 | 4,305,000 | 4,259,000 | 4,163,000 | 3,970,000 | 3,797,000 | 4,310,000 | 4,302,000 | 4,306,000 | 4,301,001 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 74.6521 | 74.2941 | 74.2949 | 74.1444 | 73.8758 | 73.8714 | 73.8454 | 72.2150 | 74.6375 | 74.0854 | 73.8910 | 73.9055 | 73.6893 |
| Argon (Ar) | Vol % | 0.8918 | 0.8875 | 0.8875 | 0.8857 | 0.8825 | 0.8825 | 0.8822 | 0.8627 | 0.8916 | 0.8850 | 0.8827 | 0.8829 | 0.8803 |
| Oxygen (O2) | Vol % | 12.2842 | 12.1814 | 12.1811 | 12.2152 | 12.1608 | 12.1980 | 12.2463 | 11.8160 | 12.5460 | 12.0560 | 12.0459 | 12.0491 | 12.0288 |
| Carbon Dioxide (CO2) | Vol % | 3.9664 | 3.9696 | 3.9699 | 3.9320 | 3.9229 | 3.9034 | 3.8753 | 3.8710 | 3.8313 | 4.0048 | 3.9833 | 3.9837 | 3.9644 |
| Water (H2O) | Vol % | 8.2055 | 8.6674 | 8.6666 | 8.8227 | 9.1580 | 9.1447 | 9.1508 | 11.2353 | 8.0935 | 8.9688 | 9.1971 | 9.1788 | 9.4371 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.4215 | 28.3713 | 28.3714 | 28.3509 | 28.3134 | 28.3130 | 28.3098 | 28.0814 | 28.4215 | 28.3415 | 28.3146 | 28.3166 | 28.2866 |
| Dry O2% | Vol % | 13.3822 | 13.3374 | 13.3370 | 13.3972 | 13.3867 | 13.4258 | 13.4798 | 13.3116 | 13.6508 | 13.2438 | 13.2660 | 13.2668 | 13.2823 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.32 | 13.02 | 13.04 | 13.03 | 13.04 | 12.78 | 12.22 | 11.21 | 10.04 | 13.03 | 13.01 | 13.04 | 13.02 |
| TEG Temp at CO | °F (+/- 25°F) | 686.2 | 689.7 | 689.8 | 690.0 | 690.3 | 689.0 | 686.6 | 683.8 | 670.9 | 690.0 | 690.1 | 690.2 | 690.4 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E196.100%.74F.1U.BYP | E197.100%.85F.1U.BYP | E198.100%.85F.1U.BYP | E199.100%.100F.1U.BYP | E200.100%.110F.1U.BYP | E201.75%.32F.2U.BYP | E202.75%.59F.2U.BYP | E203.75%.65.8F.2U.BYP | E204.75%.110F.2U.BYP | E205.45%.32F.2U.BYP | E206.44%.59F.2U.BYP | E207.44%.65.8F.2U.BYP | E208.48%.110F.2U.BYP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 100 | 100 | 100 | 100 | 100 | 75 | 75 | 75 | 75 | 45 | 44 | 44 | 48 |
| **Conditions Before CO Catalyst** | | | | | | | | | | | | | | |
| Exhaust Flow | lb/hr | 4,299,000 | 4,269,001 | 4,286,000 | 4,077,000 | 4,268,000 | 3,523,000 | 3,421,000 | 3,381,000 | 3,042,000 | 2,803,000 | 2,702,000 | 2,705,000 | 2,719,000 |
| Exhaust Composition | | | | | | | | | | | | | | |
| Nitrogen (N2) | Vol % | 73.5941 | 73.2909 | 73.4002 | 71.8849 | 73.6347 | 74.7240 | 74.3501 | 74.1757 | 74.6296 | 74.8231 | 74.5085 | 74.3487 | 74.9189 |
| Argon (Ar) | Vol % | 0.8792 | 0.8755 | 0.8768 | 0.8587 | 0.8796 | 0.8927 | 0.8882 | 0.8861 | 0.8915 | 0.8938 | 0.8901 | 0.8882 | 0.8950 |
| Oxygen (O2) | Vol % | 12.0357 | 12.0030 | 12.0298 | 11.6576 | 12.3610 | 12.4881 | 12.3412 | 12.3047 | 12.5236 | 12.7694 | 12.7929 | 12.7992 | 13.3462 |
| Carbon Dioxide (CO2) | Vol % | 3.9479 | 3.9231 | 3.9244 | 3.9063 | 3.7882 | 3.8726 | 3.8961 | 3.8908 | 3.8417 | 3.7432 | 3.6883 | 3.6632 | 3.4633 |
| Water (H2O) | Vol % | 9.5431 | 9.9075 | 9.7687 | 11.6924 | 9.3364 | 8.0226 | 8.5244 | 8.7426 | 8.1136 | 7.7705 | 8.1203 | 8.3007 | 7.3766 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.2735 | 28.2314 | 28.2467 | 28.0346 | 28.2816 | 28.4330 | 28.3802 | 28.3559 | 28.4203 | 28.4489 | 28.4056 | 28.3836 | 28.4666 |
| Dry O2% | Vol % | 13.3054 | 13.3230 | 13.3322 | 13.2011 | 13.6340 | 13.5774 | 13.4912 | 13.4836 | 13.6294 | 13.8453 | 13.9235 | 13.9578 | 14.4091 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 13.04 | 12.94 | 13.03 | 11.89 | 13.00 | 8.64 | 8.25 | 8.09 | 6.57 | 5.28 | 4.95 | 4.99 | 5.15 |
| TEG Temp at CO | °F (+/- 25°F) | 690.5 | 690.1 | 690.4 | 687.0 | 678.3 | 706.1 | 707.2 | 706.9 | 698.4 | 687.5 | 682.7 | 683.0 | 683.1 |
| **Emissions At The Stack** | | | | | | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |

**Emissions Data**
**Table A**

VPI Project Number: V17506
Project Name: **Alamitos Energy Center**
Revision: 0
Date: 11-Nov-16

| VPI Case Number | Units | E209.75%.32F.1U.BYP | E210.75%.59F.1U.BYP | E211.75%.65.8F.1U.BYP | E212.75%.110F.1U.BYP | E213.45%.32F.1U.BYP | E214.44%.59F.1U.BYP | E215.44%.65.8F.1U.BYP | E216.48%.110F.1U.BYP |
|---|---|---|---|---|---|---|---|---|---|
| GTG Fuel | | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas | Natural Gas |
| CTG, Load | % | 75 | 75 | 75 | 75 | 45 | 44 | 44 | 48 |
| **Conditions Before CO Catalyst** | | | | | | | | | |
| Exhaust Flow | lb/hr | 3,523,000 | 3,421,000 | 3,381,000 | 3,042,000 | 2,803,000 | 2,702,000 | 2,705,000 | 2,719,000 |
| Exhaust Composition | | | | | | | | | |
| Nitrogen (N2) | Vol % | 74.7240 | 74.3501 | 74.1757 | 74.6296 | 74.8231 | 74.5085 | 74.3487 | 74.9189 |
| Argon (Ar) | Vol % | 0.8927 | 0.8882 | 0.8861 | 0.8915 | 0.8938 | 0.8901 | 0.8882 | 0.8950 |
| Oxygen (O2) | Vol % | 12.4881 | 12.3412 | 12.3047 | 12.5236 | 12.7694 | 12.7929 | 12.7992 | 13.3462 |
| Carbon Dioxide (CO2) | Vol % | 3.8726 | 3.8961 | 3.8908 | 3.8417 | 3.7432 | 3.6883 | 3.6632 | 3.4633 |
| Water (H2O) | Vol % | 8.0226 | 8.5244 | 8.7426 | 8.1136 | 7.7705 | 8.1203 | 8.3007 | 7.3766 |
| Total | Vol % | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 | 100.0000 |
| | | | | | | | | | |
| GT Exhaust Mol. Weight | lb/mol | 28.4330 | 28.3802 | 28.3559 | 28.4203 | 28.4489 | 28.4056 | 28.3836 | 28.4666 |
| Dry O2% | Vol % | 13.5774 | 13.4912 | 13.4836 | 13.6294 | 13.8453 | 13.9235 | 13.9578 | 14.4091 |
| CO | ppmvd @ 15% O2 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| **CO Catalyst Information** | | | | | | | | | |
| Static Pressure Upstream CO | In.WC. | 8.31 | 7.90 | 7.74 | 6.32 | 5.07 | 4.76 | 4.79 | 4.95 |
| TEG Temp at CO | °F (+/- 25°F) | 659.4 | 659.6 | 659.3 | 645.7 | 639.4 | 636.6 | 636.8 | 636.5 |
| **Emissions At The Stack** | | | | | | | | | |
| CO | ppmvd @ 15% O2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **CO Reduction** | | | | | | | | | |
| CO Reduction | % | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% | 83.3% |