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Docket Number:	08-AFC-04C
Project Title:	Orange Grove Energy Project - Compliance
TN #:	211004
Document Title:	Petition for Emission Control Reliability Improvements
Description:	N/A
Filer:	Joe Douglas
Organization:	Orange Grove Energy, L.P.
Submitter Role:	Applicant
Submission Date:	4/12/2016 8:12:48 AM
Docketed Date:	4/12/2016

April 4, 2016

Mr. Joe Douglas
(Docket No. 08-AFC-4C)
California Energy Commission
1516 Ninth Street (MS-2000)
Sacramento, CA 95814

Subject: **Petition for Approval of Emission Control System Reliability Improvements Orange Grove Energy Center (Docket No. 08-AFC-4C)**

Dear Mr. Douglas:

In follow up to our meeting on February 23, 2016, and in accordance with Condition of Certification COMPLIANCE-14 and California Code of Regulations (CCR) Title 20 Section 1769, Orange Grove Energy, L.P. (OGE) is hereby requesting approval to conduct maintenance work on the emission control systems at the Orange Grove Energy Center (OGEC) that will include like-kind replacement of some components to improve reliability. The objective of the proposed work is to restore worn parts of the emission control systems and to optimize the design of system components using like-kind part replacement where needed to improve resistance to wear and long-term reliability of the emission control systems. A complete description of the proposed work and other information required pursuant to 20 CCR 1769 follows.

Complete Description of the Proposed Modification

A complete description of the proposed maintenance work is provided in Attachment 1.

Necessity for the Proposed Modification

The oncoming of renewable energy sources and other factors in recent years have changed the operating profile of peaker plants such as OGEC. The plant has experienced substantially more cycling (including starts, partial load operation and shutdown) than was anticipated and is showing wear as a result. An outage is planned for November 2016 and most of the needed work is maintenance, repair and replacement with no design improvements needed. Some emission control system components or portions thereof will be replaced with like-kind design instead of the existing design. The like-kind design replacement is needed to improve resistance to wear and long-term reliability of emission control systems. Attachment 1 describes results of recent internal inspections and performance evaluations of the emission control systems and provides a more detailed description of the necessity of planned work.

Timing of Information

The need for the proposed work is based on information that has only become available after the Certification proceedings including changes to typical peaker plant cycling and observations following five years of equipment operation.

No Changes to Basis of the Final Decision

The proposed work would not affect any basis of the Final Decision. No change is proposed to power plant output or emissions. The like-kind replacement components will be designed to meet all of the emission limits in the Conditions of Certification and the San Diego County Air Pollution Control District Permits to Operate. Attachment 1 includes information demonstrating that proposed work includes adequate measures to ensure compliance with existing permit conditions while improvements are implemented that will enhance OGE's routine air quality compliance and equipment reliability. Performance of the proposed work is consistent with the existing CEC Final Decision requirement of Condition of Certification AQ-1 which states: "[t]his equipment shall be properly maintained and kept in good operating condition at all times." Except for the planned replacement using like-kind parts, planned work could occur under the authorization of the existing CEC Final Decision (as amended), and the like-kind part replacement does not affect any basis of the Final Decision.

Potential Impacts and Mitigation Measures

Attachment 1 identifies potential impacts and factors that limit adverse impacts to a less then significant level.

Compliance with LORS

The replacement equipment and work would be designed to comply with applicable LORS. Relevant LORS and compliance methods are identified in Attachment 1.

Effects on the Public

The like-kind replacement components will be designed to meet all of the emission limits in the Conditions of Certification and the San Diego County Air Pollution Control District Permits to Operate. There would be no significant adverse effect on the public. Short term impacts associated with the installation period are identified in Attachment 1 and are no different from impacts that could occur with replacement of existing design components that could be performed under the existing Final Decision (as amended). There would be no change in plant operations or emissions, so there would be no long-term adverse effect to the public.

Approval to proceed with proposed work would benefit the public by increasing the reliability of the OGEC, which is used by the California Independent System Operator to support stability of the electric grid.

Property Owners

A list of adjacent property owners can be provided upon request.

Potential Effects on Nearby Property Owners, the Public, and Parties in the Proceeding

The like-kind replacement components will be designed to meet all of the emission limits in the Conditions of Certification and the San Diego County Air Pollution Control District Permits to Operate. With no change to plant operations or emission control performance specifications, there would be no adverse long-term effect on nearby property owners, the public, or parties in the proceeding. Short term impacts associated with the installation period are identified in Attachment 1 and are no different from impacts that could occur with replacement of existing design components that could be performed under the existing Final Decision (as amended). Therefore, installation work would have no adverse effect on nearby property owners, the public, or parties in the proceeding compared to current conditions.

Fee

A $5,000 check for the processing fee is included in Attachment 2.

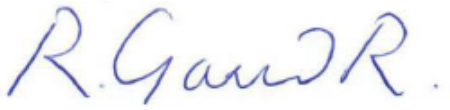
Closing

OGEC believes this letter and enclosed supporting documentation includes all the information necessary to process our request for approval of the proposed maintenance work. Should you have any questions or require additional information, please contact me at (760) 615-2026 or via e-mail at rgarcia@orangegroveenerygy. com.

With OGEC's outage scheduled for November 2016 and planning and commitments required to be made in advance, time is of the essence in gaining CEC approval for the planned maintenance work and improvements.

Thank you in advance for your time processing this petition and support to OGEC's commitment of enhancing long term environmental compliance and equipment reliability.

Sincerely,



Ramiro Garcia
Compliance Manager
Orange Grove Energy

Attachments

cc. Jim Kiefer, J-POWER
Makoto Kaneko, J-POWER
John Hutson, OGEC
Joseph Stenger, TRC
File: 300.6.2

Attachment 1

Work Description,
Analysis of Impacts, and LORS
Compliance

ATTACHMENT 1

EMISSION CONTROL SYSTEM RELIABILITY IMPROVEMENT PROJECT

Work Description,
Analysis of Impacts, and LORS Compliance

Orange Grove Energy Center

California Energy Commission Docket No. 08-AFC-4C

April 2016

Prepared For:
Orange Grove Energy, L.P.
35435 East Pala Del Norte Road
Pala, CA 92059

Prepared By:

9685 Research Drive
Irvine, CA 92618

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1.0 BACKGROUND

1.1 INTRODUCTION

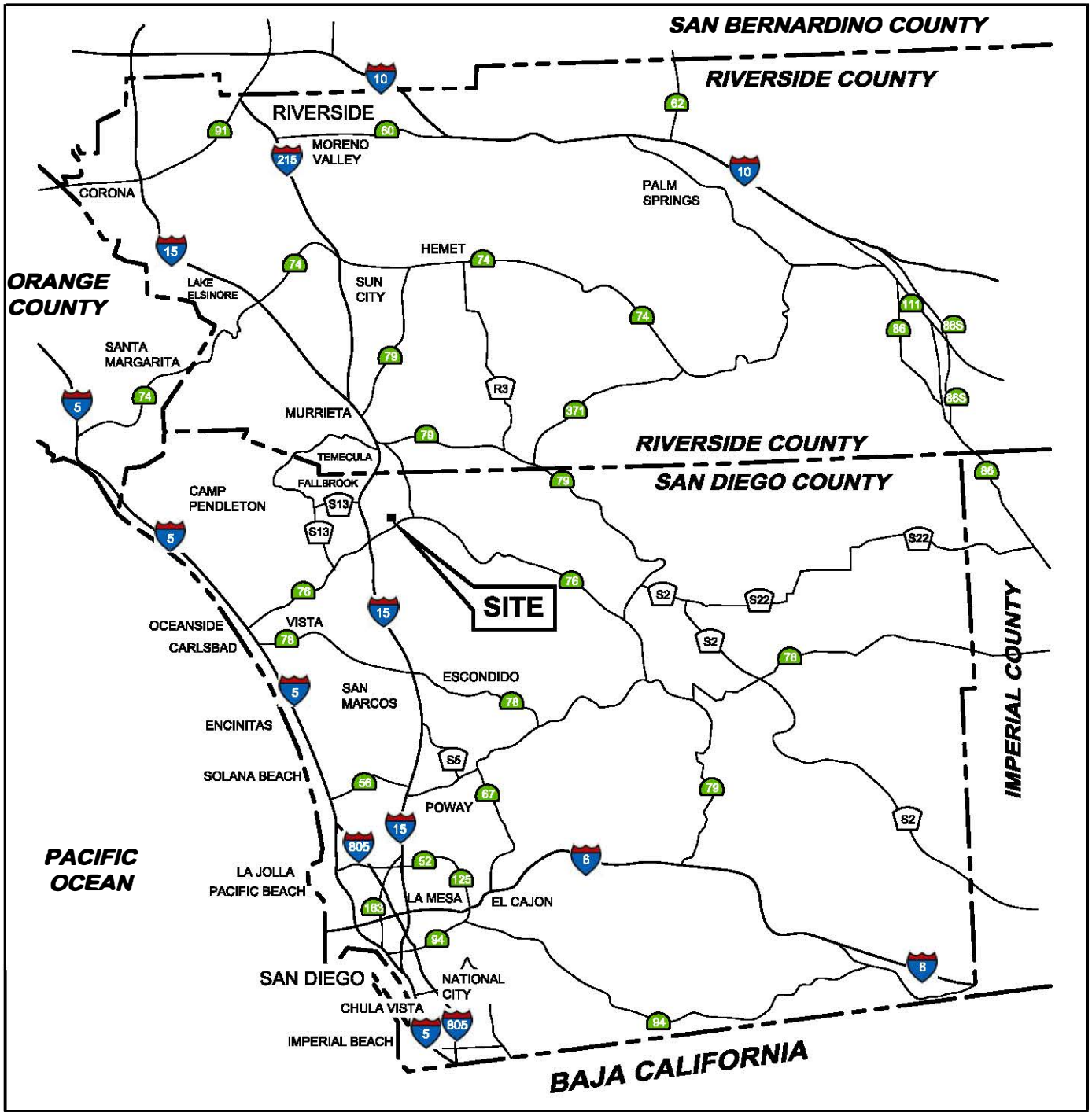
The Orange Grove Energy Center (OGEC) is a peaker power plant located near State Route 76 (SR-76) in unincorporated San Diego County approximately three miles east of Interstate 15 near Pala, California (Figure 1.1). The plant has operated since 2010 with two identical simple-cycle natural gas fired General Electric LM6000 PC spray-intercooled (SPRINT) combustion turbine generators (Units 1 and 2) and ancillary facilities for a nominal output of 99.6 megawatts (MW). The OGEC is owned by Orange Grove Energy, L.P. (OGE) and operated and maintained by North American Energy Services. Construction and operation of OGEC, including maintenance and repair of existing facilities and equipment as needed, was authorized by the Orange Grove Project Final Commission Decision issued by the California Energy Commission (CEC) in April 2009 (CEC, 2009) and amended in April 2012 (CEC, 2012). OGE is now pursuing approval for like-kind replacement of components in the emission control systems at OGEC to improve reliability of the existing permitted emission control systems. The proposed like-kind replacement will occur in conjunction with other maintenance and repairs to the emission control system including same-kind replacement of additional components that can occur under the existing CEC Decision. This narrative has been prepared to provide details of the like-kind replacement work, potential environmental impacts, and compliance with applicable laws, ordinances, regulations and standards (LORS). The work on the emission control systems will be coordinated with other planned outage maintenance to occur under the existing CEC Decision and scheduled for November 2016, pending requisite approvals.

As described in following sections, the planned work will not result in changes to plant operations, turbine specifications (i.e., output) or an increase in emissions over the current permit limits. The work activities required for the like-kind replacement will be no different from work activities that would be required for same-kind replacement that could occur under the existing CEC Decision. Activities will be within the existing fenced power plant site so there will be no disturbance to sensitive lands. No change is proposed to any existing Condition of Certification.

1.2 NECESSITY

The oncoming of renewable energy sources and other factors in recent years have changed the operating profile of peaker plants such as the OGEC. The plant has experienced substantially more cycling (including starts, partial load operation, and shutdown) than was anticipated during the original design and is showing wear as a result.

After five years of operation, portions of the casing elements of the selective catalytic reduction (SCR) and carbon monoxide catalyst (COC) emission control system are showing signs of premature aging, including surface rust and need for several small repairs. Recent internal inspection of the SCR and COC emission control systems revealed loss of insulation resulting in the external hot-spots on casing elements and the need for repair. OGE believes the loss of insulation is due to highly turbulent flow from the gas turbine and insufficient compression on insulation materials to keep them in place.



TRC	PROJECT: 192592	SITE LOCATION MAP
	FACILITY: ORANGE GROVE ENERGY PROJECT SAN DIEGO COUNTY, CALIFORNIA	FIGURE 1.1

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In addition, deteriorations are being observed in both the carbon monoxide (CO) and oxides of nitrogen (NOx) removal efficiency, which is normal and expected over time as the catalysts degrade. Multiple sources indicate that the lives of these catalysts are also adversely impacted by cycling operation.

Additionally, gas turbine exhaust flow, cooling air, and ammonia flow distributions are inconsistent across the inlet to the reactor beds. Improvements to flow distribution can be implemented to add reliability to the operation of the emissions control systems. The following section describes the maintenance, repairs and like-kind replacement of components of the SCR and CO emission control systems to address the above issues and improve reliability of the system. The proposed maintenance, repair, and like-kind replacement work is referred to herein as the Project. Maintenance and repairs can occur under the existing CEC Decision but the like-kind replacement of equipment components will require CEC approval pursuant to Condition of Certification COMPLIANCE-14 and California Code of Regulations Title 20 Section 1769.

The objective for the Project is to restore worn parts of the OGEC emissions control systems and optimize the design of system components using like-kind part replacement where needed to improve resistance to wear and long-term reliability of the emission control systems.

1.3 OTHER PERMITS

San Diego Air Pollution Control District (SDAPCD) Rule 10, in part, requires any person altering or replacing any article, machine, or equipment used for emission control to first obtain written authorization from SDAPCD. Separate Authority to Construct permit applications for Units 1 and 2, respectively, were submitted to the SDAPCD for the Project on March 11, 2016, requesting no modifications to existing Permits to Operate and that Authority to Construct permits be issued for the Project with only the following conditions:

1. All conditions of permits 2011-PTO-000889 and 2011-PTO-000890 shall remain in effect.
2. This Authority to Construct/startup authorization shall be considered the final permitting document for this application and acknowledges that the maintenance work and reliability improvements, as described in the application, have been deemed to satisfy all District rules and regulations.

Hauling of oversize loads associated with the Project will require oversize load permits from Caltrans that will be obtained by the contractor. The oversize loads and associated permit requirement for the Project will not be any different than if same-type replacement were proposed, which could occur under the existing CEC Decision.

No other permits or approvals are required for the Project.

2.0 EXISTING OPERATIONS AND FACILITIES

The OGEC is accessed from SR-76 via Pala Del Norte Road, a paved private road (Figure 2.1). A detailed layout of the existing facility is shown in Appendix A, and Keynote E on the layout depicts the location of the emission control systems. Emissions from the turbines are controlled with water injection and SCR for NO_x, and an oxidation catalyst for CO. OGE operates the turbines and emission control systems in compliance with Conditions of Certification in the CEC Decision and approved amendment (CEC 2009 and 2012) and SDAPCD Permits to Operate Nos. APCD 2011-PTO-000889 and APCD 2011-PTO-000890 and Title V Operating Permit APCD 2013-TVP-00037. The CEC Decision accounts for normal maintenance over the life of the power plant. The types of outage and installation activities required to install the like-kind components will be no different from what would occur with same-kind component replacement that could occur under the existing CEC Decision. Therefore, approval of the like-kind replacement will not have any installation-related impacts compared to existing permitted conditions.

The power plant is completely surrounded by a security fence consisting of six feet of chain link fabric tight to the ground topped with 1-foot high security wire. Inside the fencing, areas that are not occupied by equipment or structures are graveled or landscaped with species selected for water savings and fire prevention. The fenced area provides adequate space for all laydown required to complete installation Project. No work is proposed outside of the existing fenced power plant site. The planned work and laydown/staging areas are shown in Figure 2.2.

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Fenceline

Site Boundary

SCR/COC Reliability Improvement Project
Orange Grove Power Plant Site
Figure 2.1

N

0 100 200 Feet

TRC

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.; TRC, 2015

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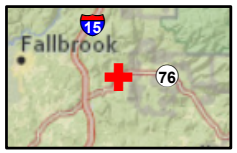


Fenceline
Maintenance Work Area
Laydown / Staging
Site Boundary

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.; TRC, 2015

SCR/COC Reliability Improvement Project
Work Area
Figure 2.2

N
0 50 100
Feet

TRC

3/2/2016

3.0 PROJECT DESCRIPTION

This section describes the planned maintenance, repairs and like-kind replacement of components to the CO and SCR emission control systems. The like-kind replacement will meet all of the following requirements in SDAPCD Rule 11(d)(5)(ii) for like-kind replacement:

- Equipment is identical in function;
- Equipment is similar in design;
- The actual air contaminant emissions are the same in nature; and
- Equipment has a capacity, production rate, and actual air contaminant emissions that are equal to or less than those of the currently permitted equipment.

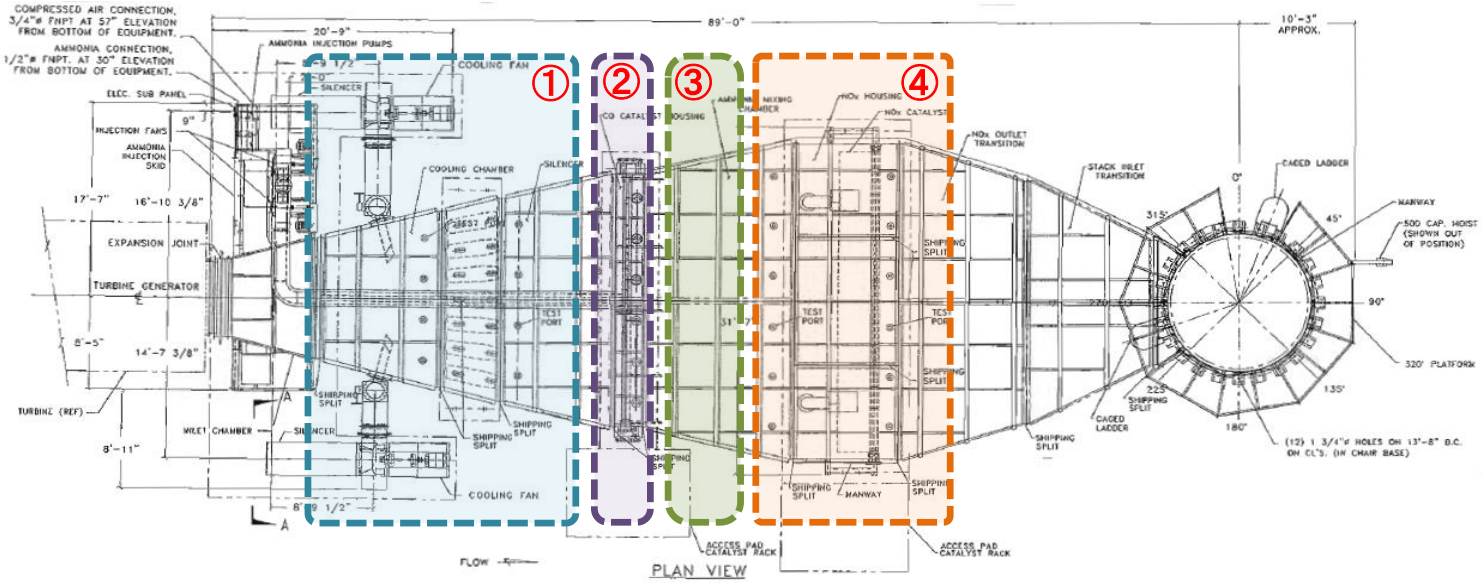
The Project will not affect the OGEC's ability to comply with LORS or any Condition of Certification or Verification. The proposed work will:

- Not result in an increase in any operating emissions;
- Not make any change to the gas turbine specifications, including, but not limited to, output;
- Not make any change to the existing foundation or stacks, including stack height; and
- Improve the operating and compliance reliability of the existing emissions control systems.

3.1 SCOPE

The schematic shown on the following page depicts the existing emission control system design with reference to the areas of the systems described further below. Identical emission control systems occur on each of the two generating units.

COC and SCR System Areas



Area 1 – CO Catalyst Upstream

Computational fluid dynamics flue gas flow modelling will be conducted to determine optimal configuration for gas flow distribution of turbine exhaust. Modelling is anticipated to show that the nozzles used for injecting clean ambient air to cool down the exhaust gas should be adjusted to optimize cooling. Also, the current perforated plate installed upstream of the CO catalyst will be replaced with a like-kind perforated plate with sizes and locations of the holes optimized for performance based on modelling. Damage to sound silencers will be repaired.

Area 2 – CO Catalyst Housing

The top and side casings will be repaired with new steel material and re-insulated with lagging plate. The bottom casing will be repaired and reinsulated with lagging plate. The CO catalyst will be replaced with a new, like-kind catalyst designed to achieve the existing permit limit for CO emissions. The CO catalyst frame and sealing structure (between catalyst frame and lagging plate) will be replaced with a new like-kind frame and sealing structure.

Area 3 – Ammonia Injection Grid

The Ammonia Injection Grid (AIG) will be replaced with a like-kind system. Ammonia injection hardware, such as injection pumps, upstream of the AIG and ammonia flow rates will remain unchanged. The new grid will have enhanced ammonia distribution in the SCR allowing more consistent mixing of ammonia, and more reproducible traction stoichiometry, resulting in more reliable emission control. The top of the existing ductwork will be modified to accommodate the installation.

Area 4 – SCR Housing

The top and side casings will be repaired with new steel material and re-insulated with lagging plate. A hatch will be installed in the top casing to facilitate future catalyst replacement. The bottom casing will be repaired and reinsulated with lagging plate. The SCR catalyst will be replaced with a new, like-kind catalyst designed to achieve the existing permit limit for NO_x

emissions. The NO_x catalyst frame and sealing structure (between catalyst frame and lagging plate) will be replaced with a new like-kind frame and sealing structure. Existing purge fans will be slightly relocated on the top casing.

3.2 INSTALLATION

Access will occur from SR- 76 via the existing paved private Pala Del Norte Road. Laydown and staging will occur within the fenced and maintained power plant site (Figure 2.2). No work is proposed outside of the power plant property and no new foundations, grading or land disturbance will be required. Replacement components will come to the site pre-painted. Installation activities, including mobilization and demobilization, are expected to occur over a period of approximately four weeks. The average size of the work crew is estimated to be approximately 28.

As part of mitigation measures included in the CEC Decision, the OGEC turbines and emissions control equipment are designed with surrounding sound barrier walls on three sides. The walls are designed with removable concrete panels supported by piles. It is expected that work will occur with a crane without need for removal of the sound barrier wall panels.

The installation work will be scheduled sequentially for the two generating units so that one unit remains operational while the other is being repaired. Work is expected to proceed according to the following schedule:

- Ten days staging and pre-assembly for Units 1 and 2;
- Five days to remove and replace parts on Unit 1;
- 12 hours tuning Unit 1 following replacement work;
- Following tuning of Unit 1, five days to remove and replace parts on Unit 2;
- 12 hours tuning Unit 2 following replacement work; and
- Five days demobilization.

Alternatively, removal and replacement of parts and tuning could occur on Unit 2 and then Unit 1. The units will be started and the equipment tuned following procedures designed to ensure that emissions remain within existing permit limits as further described in Section 4.2.

Anticipated equipment needs to complete the work are provided in Table 3.2-1.

TABLE 3.2-1

EQUIPMENT NEEDS

TYPE (SIZE)	QUANTITY
Crane (50 Ton)	1
Fork Lift (10,000 lb)	1

The crane will be lowered for any extended period of non-use to minimize attractiveness as a nesting or perching site. Equipment delivery to the Project will be planned to minimize the term of onsite laydown to limit the potential for invasion by wildlife. No aspect of the work activities or scope will result in impacts different from those that could occur for maintenance and repair with identical part replacement. Therefore, no aspect of the work activities will result in impacts to environmental resource compared to maintenance that could occur under the existing CEC Decision.

4.0 ENVIRONMENTAL INFORMATION

4.1 INTRODUCTION

The Project will restore worn parts of the OGEC emissions control systems and optimize the design of system components using like-kind part replacement where needed to improve resistance to wear and long-term reliability. The like-kind replacement will be designed to meet the emission limits in the existing Conditions of Certification and SDAPCD Permits to Operate. Approval of the proposed work will not adversely affect any person or environmental resource compared to existing conditions. Instead, there will be a long-term benefit to the public of increased plant reliability. The following subsections describe the minor environmental effects of the proposed Project demonstrating that there is no adverse impact compared to existing conditions. Table 4.1-1 provides a summary of environmental effects.

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Table 4.1-1: Summary of Environmental Effects

RESOURCE	ENVIRONMENTAL EFFECT
Air Quality	• Short-term impact will be limited to negligible fuel burning emissions from two pieces of equipment while installation is occurring. The level of emissions will not exceed those that occur from maintenance work that can be needed periodically and performed under authorization of the existing CEC Decision. • Like-kind replacement will be designed to meet the same emissions limits. Therefore, approval will result in no adverse long-term impact. • Approval will result in beneficial long-term effect from increased power plant emission control system reliability.
Geologic Hazards and Resources	• Approval will result in no change compared to existing permitted conditions. The like-kind parts will be required to meet applicable seismic design LORS and the design will be subject to approval by the CBO.
Agriculture and Soils	• Approval will not affect soils or agriculture. The work and staging areas occur on a graded building pad with gravel surfacing.
Water Resources	• Approval will not affect water resources. There will be no change in plant water consumption, no impact to any drainage, and installation work will be required to follow BMPs in the existing OGEC Storm Water Management Plan. Therefore, will be no difference from existing permitted conditions.
Biological Resources	• Approval will not change short-term noise and human presence impacts compared to existing conditions. Activities will be similar to maintenance work that can be needed periodically and performed under authorization of the existing CEC Decision. Mitigation already required by existing Conditions of Certification will ensure that impacts during installation are less than significant. • Approval will result in no long-term impact to biological resources since no change to operations will occur.
Cultural Resources	• Approval will not affect cultural resources. The work and staging areas occur on a graded building pad with gravel surfacing. No excavation is proposed.
Paleontological Resources	• Approval will not affect paleontological resources. The work and staging areas occur on a graded building pad with gravel surfacing. No excavation is proposed.
Land Use	• Approval will not result in any land use conflict since work will occur on an existing power plant.
Socioeconomics	• Approval will result in no adverse socioeconomic effect. • Approval will result in benefits from short-term worker payroll and demands for goods and services, and taxes.
Traffic and Transportation	• Approval will not change short-term traffic or transportation impacts compared to existing conditions. Minor worker and delivery traffic trips will not exceed that which can occur from maintenance work that can be needed periodically and performed under authorization of the existing CEC Decision. • Approval will result in no change in long-term impacts since no change to operations will occur.

Table 4.1-1: Summary of Environmental Effects
(Continued)

RESOURCE	ENVIRONMENTAL EFFECT
Noise Control	• Approval will not change short-term noise levels compared to existing conditions. Noise related to installation will not be different from noise which occurs periodically from maintenance work performed under authorization of the existing CEC Decision. • Approval will result in no change in long-term impacts since no change to operations will occur.
Visual Resources	• Approval will result in no change to visual resources since the emissions control equipment is shielded from view by sound barrier walls.
Waste Management	• Approval will result in no change to waste management since waste streams that will be generated by installation work will be identical types to those generated by existing permitted operations and maintenance. The waste streams that will be generated are already addressed in the existing OGEC Operations Waste Management Plan. • Approval will result in no change in long-term impacts since no change to operations will occur.
Hazardous Materials Handling	• Approval will result in no change to hazardous material handling. Installation work will not require types or quantities of hazardous materials different from those required for existing permitted operations and maintenance. • Approval will result in no change in long-term impacts since no change to operations will occur.
Public Health	• Short-term impacts will be limited to negligible fuel burning emissions during installation. The level of emissions will not exceed those that can occur from maintenance work that can be needed periodically and performed under authorization of the existing CEC Decision. Approval will result in no change in long-term impacts since no change to operations will occur.
Worker Safety	• Approval will have no adverse effect on worker safety. The same worker safety standards will apply that apply to existing operations and maintenance. OGEC has worker safety programs in place and the contractor performing installation will also be required to have safety programs in accordance with applicable regulations and standards. • Approval will result in a beneficial effect of reduced thermal hazard from exhaust housing surface temperatures.

4.2 AIR QUALITY

A key goal of the Project is to improve reliability of the emissions control system. The like-kind replacement components will be designed to meet all of the emission limits in the Conditions of Certification and SDAPCD Permits to Operate. Written approval from SDAPCD must be obtained for the Project pursuant to SDAPCD Rule 10. Appendix B provides a copy of Authority to Construct permit applications submitted to SDAPCD. Those applications include a detailed description of measures to be taken during tuning of the units after the proposed work is completed, specifications for the like-kind catalyst replacements, and other information demonstrating that emissions will stay within limits included in existing permits. Therefore,

there will be no adverse impact to air quality from startup, tuning or operation following repair and installation work.

Installation will not require earthwork or ground disturbance. Equipment needs (Table 3.2-1) are too minor to result in significant emissions. Furthermore, fuel burning equipment needs will be no greater than what can occur from maintenance work that can be needed periodically and performed under authorization of the existing CEC Decision..

4.3 GEOLOGIC HAZARDS AND RESOURCES

The Project will not affect any geologic resources. There will be no change in geologic hazards at the site. The replacement components will be designed to comply with applicable seismic requirements from the California Building Code and will be subject to review and approval by the CBO. With adherence to building code requirements, risks from geologic hazards will be less than significant.

4.4 AGRICULTURE AND SOILS

Because all work will be onsite, no land disturbance will occur. There will be no impact to agriculture or soils. No agriculture or soils LORS will apply to the work.

4.5 WATER RESOURCES

Proposed work will have no impact on water resources. No land disturbance will occur and the work and laydown areas are concrete and gravel surfaced so there will be no need for a storm water discharge permit for Project activities. There will be no change to drainage areas, project drainage controls, or impermeable surfaces, so the Project will not affect the OGEC's ability to comply with the

The existing Final Storm Water Management Plan (SWMP) approved pursuant Condition of Certification SOIL & WATER-5 and the County stormwater ordinance includes Best Management Practices (BMPs) that will apply to the installation activities and will ensure storm water quality is not impacted (OGE, 2009a). These same BMPs are included in the OGEC Drainage, Erosion, and Sediment Control Plan (DESCP) approved by the CPM for power plant construction and operation pursuant to Condition of Certification SOIL & WATER-3 (OGE, 2009b). Relevant BMPs that will be implemented under the existing SWMP and DESCP include California Stormwater Quality Association (CASQA) Standard BMP WM-1 (Material Delivery and Storage) and WM-2 (Material Use) requiring that hazardous materials be minimized and managed in a manner to prevent contact with storm water, and CASQA Standard BMP WM-4 for Spill Prevention and Control. These measures will limit the potential for stormwater contact with pollutants and ensure compliance with LORS related to stormwater.

4.6 BIOLOGICAL RESOURCES

The Project will not require any new surface disturbance and will not affect power plant operations or currently permitted emissions. Considering these factors, the Project will not result in any long-term impact to any biological resources. Installation work, including laydown, will occur within the existing power plant fence and will not result in any habitat disturbance. Short-term noise impacts could occur in habitats adjacent to the power plant site, including Diegan coastal sage scrub habitat that may be utilized by the federally and state protected California gnatcatcher, but work will not generate noise or human presence levels any greater than can occur for maintenance that can be needed periodically and performed under authorization of the existing CEC Decision. Therefore, there will be no increase in impact compared to existing

conditions. Plant maintenance activities such as the proposed work are required to occur under the CPM-approved Worker Environmental Awareness Program (OGE, 2009c) including training of workers on sensitivity and protection of biological resources. With the proposed work having no effect on power plant operations and installation work being short-term and occurring entirely within the existing graded and fenced power plant site, the Worker Environmental Awareness Program will ensure compliance with LORS for biological resource protection.

4.7 CULTURAL RESOURCES

Proposed work, including laydown, will be located on a graded building pad within the fenced power plant site. No excavation is proposed. There will be no impact on cultural resources. No cultural resource LORS will apply.

4.8 PALEONTOLOGICAL RESOURCES

Proposed work, including laydown, will be located on a graded building pad within the fenced power plant site. No excavation is proposed. There will be no impact on paleontological resources. No paleontological LORS will apply.

4.9 LAND USE

Proposed work, including laydown, will be located within the fenced power plant site. There will be no impact to the existing power plant land use, which is consistent with San Diego County land use LORS.

4.10 SOCIOECONOMICS

The Project will not result in any adverse socioeconomic impact nor any need for new public facilities or services. The Project will provide a less than significant socioeconomic benefit to the area and region via worker payroll, goods and services during the installation period, and taxes. The Project will not affect any minority-based or low-income-based populations.

4.11 TRAFFIC AND TRANSPORTATION

The Project will not affect power plant operations so there will be no long-term change in traffic impacts. An average of 28 workers are expected to be needed for the installation, as well as an average of one or two deliveries per day. Not accounting for any carpooling, this could result in an estimated 30 round-trips per day on SR-76 and Pala Del Norte Road. This short-term and low volume traffic generation will not result in a significant traffic impact and is no greater than what can occur for maintenance that can be needed periodically and performed under authorization of the existing CEC Decision.

Oversize load permits will be obtained by the contractor as needed for equipment deliveries. Work will not require loads any larger than original plant construction or that would be required for repair or replacement of existing components. All loads will comply with Caltrans oversize load permit requirements.

4.12 NOISE CONTROL

The Project will have no effect on plant operations noise. Sound wall barrier panels will be unchanged and will continue to mitigate power plant noise levels to meet CEC and County standards. With the limited equipment anticipated to be used and limited scope of installation activities, noise levels will be no greater than occurs periodically from maintenance performed under authorization of the existing CEC Decision.

4.13 VISUAL RESOURCES

Under the County of San Diego General Plan adopted in 2011 after the CEC Decision, SR-76 in the project vicinity is a County Designated Scenic Highway. There are no State Designated Scenic Highways in the area but SR-76 is identified by the State as eligible to be a Designated Scenic Highway (Caltrans, 2016).

Sound barrier walls hide the units from public views so there will be no change in power plant appearance. Tall equipment (e.g., crane) work will be visible from SR-76 during the installation period but this will be less than significant due to the short (approximately four week) duration. Furthermore, it will be no different than work that can occur for maintenance that can be needed periodically and performed under authorization of the existing CEC Decision. With no long-term impacts, there are no relevant LORS for visual resources.

4.14 WASTE MANAGEMENT

The OGEC operates under an Operations Waste Management Plan submitted to the CEC in March of 2010 pursuant to Condition of Certification WASTE-7 in the CEC Decision (OGE, 2010). The Operations Waste Management Plan includes a detailed description of OGEC operation and maintenance waste streams and methods for managing each waste stream, including waste minimization and recycling. The project will not affect operations so there will be no impact on waste streams generated by plant operations. Wood, paper, plastic, spent catalyst, and other waste streams that will be generated by equipment installation are addressed in the existing Operations Waste Management Plan so no changes to the plan are needed. Compliance with the Operations Waste Management Plan will ensure compliance with applicable LORS.

4.15 HAZARDOUS MATERIALS HANDLING

The Project will have no effect on power plant operations so there will be no long-term effect related to hazardous materials handling. The proposed installation work will require short-term use of hazardous materials such as fuel, lubricating oil, hydraulic fluid, and compressed gasses. No bulk fuel or oil storage will be required. Accidental release or exposure risks associated with hazardous materials will be no different from ongoing operations and maintenance activities. All workers handling hazardous materials are required to be trained in proper handling of hazardous materials to prevent unhealthful exposure pursuant to California Occupational Safety and Health Administration (CalOSHA) requirements in 8 California Code of Regulation (CCR). The installation work will occur under BMPs for preventing storm water from coming in contact with hazardous materials pursuant to requirements of the SWMP and DESCP for the power plant site (Orange Grove Energy L.P., 2009a and b). Relevant BMPs that will be implemented under the SWMP and DESCP include CASQA Standard BMP WM-1 (Material Delivery and Storage) and WM-2 (Material Use) requiring that hazardous materials be minimized and managed in a manner to prevent contact with storm water, and CASQA Standard BMP WM-4 for Spill Prevention and Control. In the event of an accidental spill of a hazardous material, reporting would occur pursuant to existing laws and regulations and the spill would be cleaned up to prevent impacts to human health or the environment consistent with the Spill Prevention, Control and Countermeasures (SPCC) Plan and Hazardous Materials Business Plan in place at OGEC. With no bulk fuel or oil storage required, BMPs for preventing storm water from coming in contact with hazardous materials, existing laws and regulations for worker training, and response plans in place for potential accidental hazardous materials releases, risk related to the hazardous materials usage for installation work is less than significant.

4.16 PUBLIC HEALTH

The Project will have no effect on operations so there will be no long-term effect to public health. Installation of the new components will use only one or two pieces of equipment at any time and, therefore, will generate minor quantities of fuel burning emissions in an area where there are no sensitive receptors nearby. This minimal level of equipment activity will be short term and will not affect public health. Emissions will be no greater than what can occur from maintenance that can be needed periodically and performed under authorization of the existing CEC Decision..

4.17 WORKER SAFETY

The proposed insulation system design will help maintain safe working conditions at the power plant by preventing employee exposure to hot surfaces. The replacement components are expected to provide a long-term benefit to site worker safety and will help to ensure long-term compliance with Federal and State requirements to minimize hazards in the workplace (OSHA of 1970 General Duty clause) and protect workers from contact with hot surfaces (8 CCR 3308, Hot Pipes and Surfaces).

During installation, OGE will require the installation contractor to maintain a comprehensive site-specific health and safety program to protect workers during installation. This program will be required to meet or exceed applicable federal and state safety regulations and standards. Administrative procedures, personal protective equipment, injury prevention, occupational health, fire protection and prevention, and equipment safety are example parts of the health and safety program that will be required.

5.0 MODIFICATIONS TO CONDITIONS OF CERTIFICATION

No change is required to any Conditions of Certification.

6.0 NEARBY PARCELS

A map of County Assessor's parcels and owner information for lands surrounding the site will be provided if needed.

7.0 REFERENCES

California Energy Commission, 2009. *Final Commission Decision, Orange Grove Project Application for Certification (08-AFC-4), San Diego County*, April 2009.

California Energy Commission, 2012. *Order No. 12-0314-1m, Order Approving Petition to Amend the Orange Grove Energy Project.* March 14, 2012.

Caltrans, 2016. *California Scenic Highway Mapping System.* www.dot.ca.gov/hq/LandArch/16_livability/scenic_highways/index.htm. Site visited March 15, 2016.

Orange Grove Energy, L.P., 2008. *Application for Certification, Orange Grove Project*. June, 2008.

Orange Grove Energy, L.P., 2009a. *Final Storm Water Management Plan for Priority Projects (SWMP), Orange Grove Project*. April 2009.

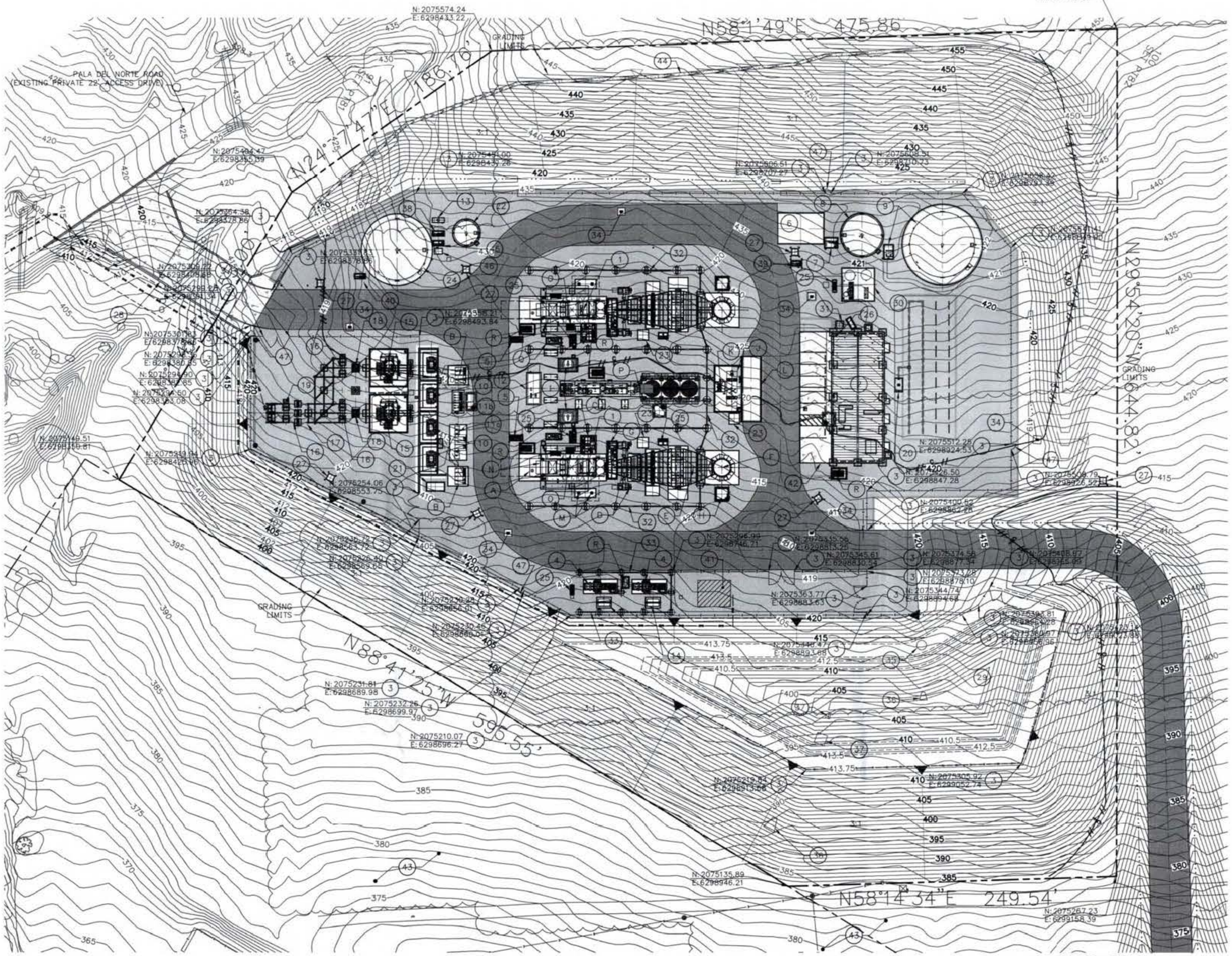
Orange Grove Energy, L.P., 2009b. *Drainage, Erosion, and Sediment Control Plan for Orange Grove Energy, L.P., Orange Grove Project*. April 27, 2009.

Orange Grove Energy, L.P., 2009c. *Worker Environmental Awareness Program (WEAP) for Biological Resources*. Undated cover, final transmitted to the CEC Compliance Project Manager on June 10, 2009.

Orange Grove Energy, L.P., 2010. *Operations Waste Management Plan, Orange Grove Energy Center, CEC Docket No. 08-AFC-4c*. March 2010.

Appendix A

Orange Grove Power Plant Site Layout



SITE LAYOUT PLAN

PLAN NORTH IS 29°55'46" CCW OF TRUE NORTH

SCALE IN FEET (40 0 40 80)

KEYNOTES:

1. COMBUSTION TURBINE (CT), GENERATOR, AND AUXILIARY EQUIPMENT. (FOR EACH UNIT): (HEIGHT = 43' AT THE TOP OF VBV DUCT).
   - A. MAIN TURBINE GENERATOR SKID ENCLOSURE.
   - B. 13.8KV ELECTRICAL SWITCHGEAR.
   - C. CT AUXILIARY EQUIPMENT SKID.
   - D. TEMPERING AIR FANS (2).
   - E. EMISSION CONTROL SYSTEM-SCR (HEIGHT = ±33').
   - F. STACK (HEIGHT = 80').
   - G. AMMONIA VAPORIZATION SKID.
   - H. CEMS ENCLOSURE WITH TRANSFORMER AND CALIBRATION GAS STORAGE
   - I. CT LUBE OIL COOLER.
   - J. AMMONIA STORAGE TANK (COMMON TO BOTH CT UNITS).
   - K. AMMONIA FORWARDING PUMP SKID (COMMON TO BOTH CT UNITS).
   - L. AMMONIA UNLOADING PAD, SPILL CONTAINMENT (COMMON TO BOTH CT UNITS).
   - M. TURBINE REMOVAL SUPPORTS.
   - N. AIR INLET FILTER (HEIGHT = 34').
   - O. SPRINT SKID.
   - P. INLET AIR CHILLER AND COOLING TOWER (COMMON TO BOTH CT UNITS) (HEIGHT = 30').
   - Q. WATER INJECTION SKID.
   - R. OILY DRAIN TANK.
2. SERVICE BUILDING FOR CONTROL ROOM, ELECTRICAL EQUIPMENT, FIRE PUMPS, COMPRESSED AIR. (HEIGHT = 18').
3. SITE SECURITY CHAINLINK FENCE AND GATES.
4. FUEL GAS COMPRESSORS.
5. GAS COALESCING FILTER SKID.
6. CONCRETE PAD FOR TEMPORARY WATER TREATMENT TRAILER.
7. DEMIN. WATER PUMP SKID AND RELATED EQUIPMENT.
8. DEMIN. WATER STORAGE TANK (HEIGHT = 24').
9. RAW WATER/FIREWATER STORAGE TANK & PUMP SKID (HEIGHT = 44').
10. AUXILIARY TRANSFORMERS.
11a. 4160V ELECTRICAL SWITCHGEAR.
11b. 480V ELECTRICAL SWITCHGEAR.
12. BLACKSTART GENERATOR.
13. IRRIGATION BOOSTER PUMP.
14. FUEL GAS COMPRESSOR RECYCLE FIN-FAN COOLER.
15. 13.8KV-69KV GENERATOR STEP-UP TRANSFORMER (GSU).
16. 69KV DISCONNECT SWITCH AND SUPPORTS.
17. 69KV CT/VT METERING UNIT.
18. 69KV CIRCUIT BREAKER.
19. 69KV TRANSITION STRUCTURE & POTHEAD.
20. UNDERGROUND SANITARY SYSTEM.
21. TRANSFORMER DELUGE VALVE ENCLOSURE.
22. WASTEWATER STORAGE TANK (HEIGHT = 24').
23. COMBINATION SAFETY SHOWER & EYE WASH UNIT.
24. RECLAIM WATER STORAGE TANK (HEIGHT = 36').
25. 480V MCC.
26. FIRE PUMP ROOM.
27. YARD FIRE HYDRANTS WITH HYDRANT MOUNT FIRE MONITORS.
28. BRIDGE.
29. STORMWATER DETENTION BASIN.
30. RO WATER TREATMENT AREA.
31. DIESEL STORAGE TANK – DIESEL FIRE PUMP.
32. GAS TURBINE SOUND WALL (HEIGHT = 48').
33. GAS COMPRESSOR SOUND WALL (HEIGHT = 24').
34. AREA INLET.
35. STORM MANHOLE.
36. STORM END SECTION.
37. STORMWATER OUTLET CONTROL STRUCTURE.
38. TANK TRANSFER PUMP SKID.
39. FRESH WATER UNLOADING PUMP SKID.

KEYNOTES CONT.:

40. RECLAIM WATER UNLOADING PUMP SKID.
41. SDG&E GAS METERING STATION (MSA).
42. SERVICE BUILDING CONCRETE PARKING.
43. TEMPORARY CONSTRUCTION PARKING AND GRADING.
44. BROW DITCH (CONCRETE).
45. COOLING TOWER MAKEUP PUMP SKID.
46. SERVICE WATER BOOSTER PUMP SKID.
47. FENCE MAN GATE (MIN. EVERY 500').

EMISSION COORDINATES SYMBOL

DESCRIPTION	NORTHING	EASTING
COMBUSTION TURBINE #1 (NORTH)	2075491	6298683
COMBUSTION TURBINE #2 (SOUTH)	2075387	6298743
DIESEL FIRE PUMP (±2')	2075517	6298766
BLACK START GENERATOR (±2')	2075379	6298582

REV.	DATE	DESCRIPTION	DWN	CHK
0	6-11-09	ISSUED FOR CONSTRUCTION	RAD	WHR

PERMITS

REZONE PERMIT NO. NOT APPLICABLE
SPECIAL USE PERMIT NO. NOT APPLICABLE
TENTATIVE MAP NO. NOT APPLICABLE
NOI/WDID NO. 9_37C354807

BENCH MARK

DESCRIPTION: 3 1/2" brass disk "M.W.D. OF SOUTHERN CA S.D.6-69 1993"
LOCATION: S.E. CORNER OF MANHOLE IN SDCWA R.O.W.
RECORD FROM: FIELD BOOK 4047-04-079
ELEVATION: 318.88' DATUM: NAVD88 AND NAD83
N/E: N:2071814.32 E:6297457.67

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

Sealed Only When Signed in Blue Ink

REGISTERED PROFESSIONAL ENGINEER THOMAS F. HEAUSLER No. C040363 Exp. 3-31-11 CIVIL STATE OF CALIFORNIA 6-11-09

Sega ®

Engineers – Architects – Technicians
Design – Construction – Field Service

16041 Foster
P.O. Box 1000
Stilwell, Kansas 66085-1000

ORANGE GROVE ENERGY L.P.
Schaumburg, IL

ORANGE GROVE PROJECT

SITE LAYOUT PLAN

DESIGN BY: B. ROMINES	CHECKED BY: J. BONDANK
DRAWN BY: B. GASPERS	DATE: 9-12-07
CLIENT I.D. ICC00101	SEGA PROJECT NO. 07-201

CADD FILE NAME: 07201-C100.dwg

DRAWING NO. C100 REV. 0

PRIVATE CONTRACT

3 SHEET | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 52 SHEET

GRADING PLAN FOR: THE CONSTRUCTION AND OPERATION OF THE ORANGE GROVE POWER PLANT, AN ELECTRIC GENERATOR FACILITY. ALSO, THE INSTALLATION OF A 10" NATURAL GAS PIPELINE TO PROVIDE THE PLANT WITH FUEL ENERGY.
CALIFORNIA COORDINATE INDEX 434-1736/434-1737

APPROVED FOR MOHAMAD FAKHRREDDINE COUNTY ENGINEER BY:
ENGINEER OF WORK THOMAS F. HEAUSLER C040363 R.C.E. 3-31-11

L-15454
GRADING PERMIT NO.

SEGA INC. PHONE NUMBER: (913) 681-2881

N:\2007\07201\dwgs\ce\07201-C100.dwg 6/10/09 2:48pm jsee

Appendix B

Orange Grove Energy SCR/COC Reliability Improvement Project
Authority to Construct Permit Applications to SDAPCD

March 11, 2016

Mr. John Annicchiarico
San Diego Air Pollution Control District
10124 Old Grove Rd
San Diego, CA

Subject: **Application for Authority to Construct (ATC)**
SCR/COC Reliability Improvement Project Project
Permits to Operate: APCD2011-PTO-000890 and 891

Dear Mr. Annicchiarico:

Orange Grove Energy (OGE) is pleased to provide the attached application for an Authority to Construct (ATC) permit for the SCR/COC Reliability Improvement Project (Project).

The application package includes a) the General Permit or Registration Form, b) the Project Narrative, c) the Technical Specifications and Work Plan, d) the Application Fee Estimate provided by San Diego Air Pollution Control District (SDAPCD), and e) a $2,673 check for the application fee. Sections 1 and 2 in the Project Narrative provide details on the project scope and schedule. Section 3 includes a brief analysis of estimated emissions for two operating scenarios during startup, the first being the “expected scenario” provided by the equipment supplier, IHI, and the second being an unlikely “worst case scenario”. Section 4 provides a discussion of regulatory compliance.

The objective of the Project is to restore worn parts of the emissions control systems and optimize the design of system components using like-kind part replacement where needed to improve resistance to wear and long-term reliability of the emission control systems. The attached application clearly demonstrates that measures would be taken to ensure compliance with existing permit conditions while the improvements are implemented and that, following implementation, OGE’s routine air quality compliance and equipment reliability will be enhanced.

In planning the implementation of this Project, our central focus has been to ensure that all existing SDAPCD permit limits will be complied with during and after commissioning of these improvements to the two Units. We emphasize that no changes are proposed for plant generation output and there will be no increase in emissions.

The proposed work would not affect the OGE's ability to comply with existing operating permit conditions. The proposed work would:

- Not result in an increase in any operating emissions;
- Not make any change to the gas turbine specifications including, but not limited to, output.
- Not make any change to the existing foundation or stacks, including stack height; and
- Improve the operating and compliance reliability of the existing emissions control systems.

In addition, this project is consistent with the existing operating permit condition (both ACCD2011-PTO-000889 and ACCD2011-PTO-000890) which states:

1. *This equipment shall be properly maintained and kept in good operating condition at all times.*

OGE respectfully requests an Authority to Construct be issued for this project, with no modifications to existing operating permits, including the following conditions SDAPCD has issued in the past for projects of this nature.

1. All conditions of permits 2011-PT0-000889 and 2011-PT0-000890 shall remain in effect.

2. This Authority to Construct/startup authorization shall be considered the final permitting document for this application and acknowledges that the maintenance work and reliability improvements, as described in the application, have been deemed to satisfy all District rules and regulations.

OGE believes the enclosed application form and supporting documentation includes all the information necessary to process our application and issue the ATC. Should you have any questions or need additional information, please contact me at (760) 615-2026 or via e-mail at rgarcia@orangegroveenergy.com.

Thank you in advance for your time and support to our commitment of enhancing long term environmental compliance and equipment reliability.

Sincerely,

Ramiro Garcia
Compliance Manager
Orange Grove Energy

Attachment

cc: Joe Douglas, CEC
Jim Kiefer, J POWER USA
John Hutson, OGE
Tim Henggeler, TRC

File: 300.1.1.1.4

SDAPCD Application Form

Internal Use Only	
APP Record ID APCD20	-APP-
SITE Record ID APCD20	-SITE-

GENERAL PERMIT OR REGISTRATION APPLICATION FORM

APCD AIR POLLUTION CONTROL DISTRICT COUNTY OF SAN DIEGO

Submittal of this application does not grant permission to construct or to operate equipment except as specified in Rule 24(c) or (d)

REASON FOR SUBMITTAL OF APPLICATION:

- ☐ New Installation
- ☐ Amendment to Existing Authority to Construct or Application
- ☐ Change of Permit Conditions
- ☐ Registration of Portable Equipment
- ☐ Existing Unpermitted Equipment or Rule 11 Change
- ☐ Change of Equipment Location
- ☐ Change Permit to Operate Status to Inactive
- ☐ Modification of Existing Permitted Equipment
- ☐ Change of Equipment Ownership ***(please provide proof of ownership)***
- ☐ Banking Emissions
- ☒ Other (Specify) Maintenance and Replacement of Parts

List affected APP/PTO Record ID(s): APCD2011-PTO-000889, APCD2011-PTO-000890, APCD2013-TVP-00037

APPLICANT INFORMATION

Name of Business (DBA) Orange Grove Energy, L.P.

Does this organization own or operate any other APCD permitted equipment at this or any other adjacent locations? ☒Yes ☐No

If yes, list assigned Site Record IDs listed on your Permits APCD2011-PTO-000890, APCD2011-PTO-000891, APCD2011-PTO-000892

Name of Legal Owner (if different from DBA) N/A

Equipment Owner			**Authority to Construct Mailing Address**		
Name: Orange Grove Energy, L.P.			Name: Orange Grove Energy, L.P.		
Mailing Address: 35435 East Pala del Norte Road			Mailing Address: 35435 East Pala del Norte Road		
City: Pala	State: CA	Zip: 92059	City: Pala	State: CA	Zip: 92059
E-Mail Address: rgarcia@orangegroveenergy.com			E-Mail Address: rgarcia@orangegroveenergy.com		

Permit To Operate Mailing Address			**Invoice Mailing Address**		
Name: Orange Grove Energy, L.P. (Attn: Ramiro Garcia)			Name: Orange Grove Energy, L.P. (Attn: Ramiro Garcia)		
Mailing Address: 35435 East Pala del Norte Road			Mailing Address:		
City: Pala	State: CA	Zip: 92059	City: Pala	State: CA	Zip: 92059
E-Mail Address: rgarcia@orangegroveenergy.com			E-Mail Address: rgarcia@orangegroveenergy.com		

EQUIPMENT/PROCESS INFORMATION: Type of Equipment: ☒ Stationary ☐ Portable, *if portable please enter below the equipment storage address*. If portable, will operation exceed 12 consecutive months at the same location ☐ Yes ☐ No

Equipment Location Address 35435 East Pala del Norte Road City Pala State:CA

Parcel No. 110-072-26 Zip 92059 Phone (760) 615-2010 E-mail:rgarcia@orangegroveenergy.com

Site Contact Compliance Manager Phone (760) 615-2010

General Description of Equipment/Process: SCR/COC Reliability Improvement Project

Application Submitted by ☒ Owner ☐ Operator ☐ Contractor ☐ Consultant Affiliation

EXPEDITED APPLICATION PROCESSING: ☒ **I hereby request Expedited Application Processing and understand that:**

a) Expedited processing will incur additional fees and permits will not be issued until the additional fees are paid in full (see Rule 40(d)(8)(iv) for details) b) Expedited processing is contingent on the availability of qualified staff c) Once engineering review has begun this request cannot be cancelled d) Expedited processing does not guarantee action by any specific date nor does it guarantee permit approval.

I hereby certify that all information provided on this application is true and correct.

SIGNATURE [signature] Date 3/9/2016

Print Name Paul Peterson Company J-Power USA

Phone (847) 908-2811 E-mail Address ppeterson@jpowerusa.com

Internal Use Only

Date _____ Staff Initials: _____ Amt Rec'd $ _____ Fee Schedule _____

RNP: _____ EMF: _____ NBF: _____ TA: _____

10124 Old Grove Rd. – San Diego - California 92131-1649 – (858) 586-2600
www.sdapcd.org

Project Narrative
IHI Technical Specs and Scope of Work

Project Narrative

For the Orange Grove Energy

SCR/COC Reliability Improvement Project

March 2016

Prepared For:
Orange Grove Energy, L.P.
35435 East Pala del Norte Road
Pala, CA 92059

Prepared By:


TRC Solutions, Inc.
9685 Research Drive
Irvine, CA 92618

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1.0 PROJECT BACKGROUND

1.1 INTRODUCTION

Orange Grove Energy Center (OGEC) is a peaker power plant located in Pala, San Diego County, California that has been in operation since June of 2010. The plant operates two (2) identical natural gas fired simple cycle turbines for a nominal output of 99.6 megawatts (MW). The generating units are General Electric (GE) LM6000PC Sprint Gas Turbines. The facility is owned by Orange Grove Energy, L.P. (OGE) and operated and maintained by North American Energy Services (NAES). This narrative has been prepared to accompany Authority to Construct permit applications being submitted to San Diego County Air Pollution Control District (SDAPCD) pursuant to SDAPCD Rule 10 for proposed maintenance, repairs and like-kind replacement of components to improve reliability of the existing permitted OGEC emissions control systems. Section 2.0 below provides details on the scope of the proposed work.

As described below, the proposed work would not result in changes to plant operations, turbine specifications (i.e., output) or an increase in emissions over the current permit limits. Accordingly, OGE requests an Authority to Construct be issued with no additional or revisions to current permit conditions.

1.2 PURPOSE

The oncoming of renewable energy sources and other factors in recent years have changed the operating profile of peaker plants such as the OGEC. The plant has experienced substantially more cycling (including starts, partial load operation, and shutdown) than was anticipated during the original design and is showing wear as a result.

After five years of operation, portions of the casing elements of the selective catalytic reduction (SCR) and carbon monoxide catalyst (COC) emission control system are showing signs of premature aging, including surface rust and need for several small repairs. Internal inspection of the SCR and COC emission control systems revealed loss of insulation, which would result in the external hot-spots, and the need for repair. OGE believes the loss of insulation resulting in hot spots is due to highly turbulent flow from the gas turbine and insufficient compression on insulation material to keep them in place.

In addition, deteriorations are being observed in both the carbon monoxide (CO) and oxides of nitrogen (NOx) removal efficiency, which is normal and expected over time as the catalysts degrade. Multiple sources have indicated that the lives of these catalysts are also adversely impacted by cycling operation.

Additionally, gas turbine exhaust flow, cooling air, and ammonia flow distributions are inconsistent across the inlet to the reactor beds. Improvements to flow distribution will add reliability to the operation of the emissions control systems. The following section describes the maintenance, repairs and like-kind replacement of components of the SCR and CO emission control systems to address the above issues and improve reliability of the system. The proposed work is referred to herein as the Project.

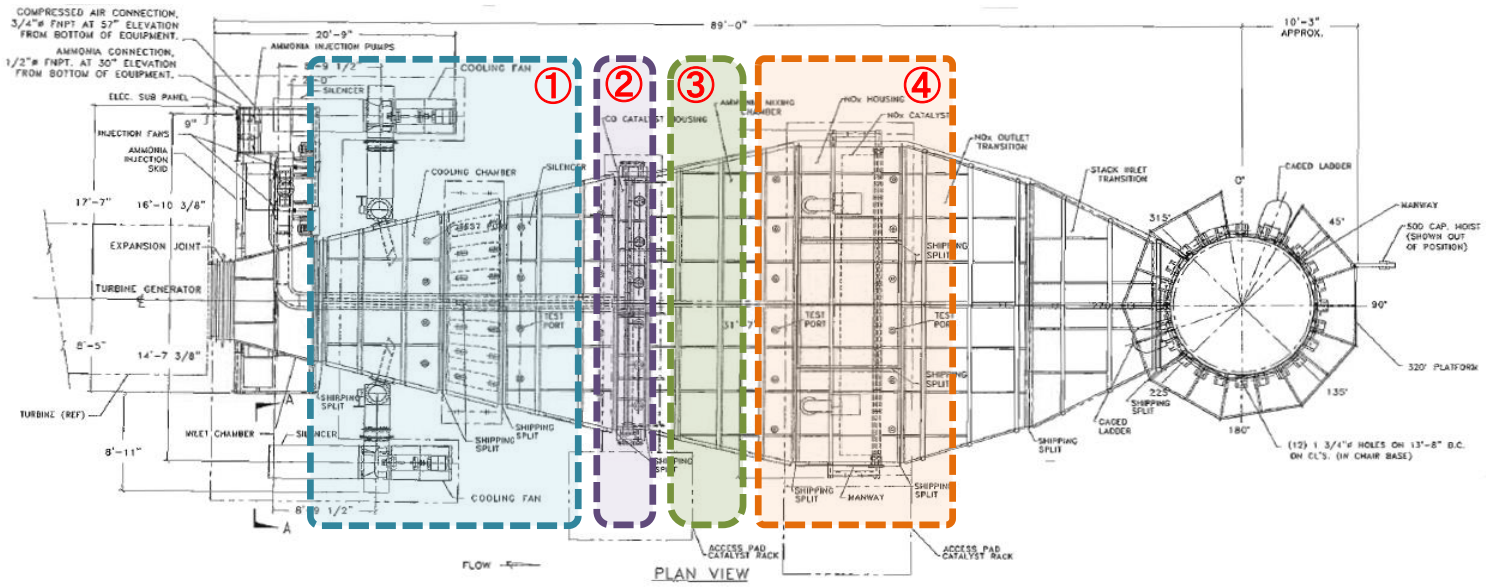
The objective for the Project is to restore worn parts of the OGEC emissions control systems and optimize the design of system components using like-kind part replacement where needed to improve resistance to wear and long-term reliability of the emission control systems.

2.0 PROJECT SCOPE

2.1 SYSTEM REPAIR AND MAINTENANCE

Work would occur on the four sections of the gas turbine exhaust system as shown in Figure 2.1. The red numbers in the Figure correspond to work areas described in the subsections that follow.

Figure 2.1: COC and SCR Work Plan Areas



The technical specifications and work plan provided by IHI, the manufacturer of the SCR and COC systems, are included in Appendix A. The proposed work does not include any changes to the gas turbines including, but not limited to, output, and does not include any change to the existing foundation or stacks.

2.1.1 Area 1: COC Upstream

Computational fluid dynamics modelling of flue gas flow will be conducted to determine optimal configuration for gas flow distribution of turbine exhaust. Modelling is anticipated to show that the nozzles used for injecting clean ambient air to cool down the exhaust gas should be adjusted to optimize cooling. Also, the current perforated plate installed upstream of the CO catalyst will be replaced with a like-kind perforated plate with sizes and locations of the holes optimized for performance based on modelling. Damaged sound silencers located between the turbine and CO catalyst will be repaired. The objective is more consistent flow and temperature of exhaust gas upstream of the CO catalyst.

2.1.2 Area 2: CO Catalyst Housing

The top and side casings will be repaired with new steel material and re-insulated with lagging plate. The bottom casing will be repaired and reinsulated with lagging plate. The CO catalyst

will be replaced with a new, like-kind catalyst designed to achieve the existing permit limit for CO emissions. The CO catalyst frame and sealing structure (between catalyst frame and lagging plate) will be replaced with a new like-kind frame and sealing structure.

A comparison of specifications between the existing and replacement catalyst is provided in Table 2.1. While the replacement catalyst will be a different model than the existing catalyst, it will be identical in function, similar in design, and at least as efficient at controlling CO as the existing catalyst.

Table 2.1: CO Catalyst Specifications

	Existing Catalyst	New Catalyst
Catalyst Manufacturer	Johnson Matthey	Johnson Matthey or Advanced Catalyst System
Type	Metal Foil	Metal Foil
Number of Catalyst Layers	1	1
Number of Elements per Unit	121	100
CO Reduction Efficiency	90%	≥90%

2.1.3 Area 3: Ammonia Injection Grid ("AIG")

The AIG will be replaced with a like-kind system. Ammonia injection hardware, such as injection pumps, upstream of the AIG and ammonia flow rates will remain unchanged. The new grid will have enhanced ammonia distribution in the SCR allowing more consistent mixing of ammonia, and more reproducible reaction stoichiometry, resulting in more reliable emission control. The top of the existing ductwork will be modified to accommodate the installation.

2.1.4 Area 4: SCR Housing

The top and side casings will be repaired with new steel material and re-insulated with lagging plate. A hatch will be installed in the top casing to facilitate future catalyst replacement. The bottom casing will be repaired and re- insulated with lagging plate. The SCR catalyst will be replaced with a new, like-kind catalyst designed to achieve the existing permit limit for NO_X emissions. The NO_X catalyst frame and sealing structure (between catalyst frame and lagging plate) will be replaced with a new like-kind frame and sealing structure. Existing purge fans will be slightly relocated on the top casing.

A comparison of specifications between the existing and replacement catalyst is provided in Table 2.2. While the replacement catalyst will be a different model than the existing catalyst, it will be identical in function, similar in design, and at least as efficient at controlling NO_X as the existing catalyst.

Table 2.2: SCR Catalyst Specifications

	Existing Catalyst	New Catalyst
Catalyst Manufacturer	HALDOR TOPSOE	Cormetech or Ceram
Type	Corrugated (DNX-920)	Honeycomb
Number of Catalyst Layers	1.5	1
Number of Modules per Layer	27 (988 ft^3)	30
NOx Reduction Efficiency	90%	≥90%

2.2 UNITS STARTUP AND TUNING

Upon completion of installation and repair work on the emission control systems, the Units will be started up. Startup and tuning will take place with only one Unit at a time. This project will be completed in compliance with existing operating permit conditions (APCD2013-TVP-00037, APCD2011-PTO-000889, and APCD2011-PTO-000890) without the need to add to or modify these conditions.

2.2.1 Pre-startup

Operators will perform inspections of the Unit prior to initial startup. Confined space procedures will be followed as necessary.

Pre-startup tasks will include:

a. Inspection of all physical work, including but not limited to, casing integrity, welds, flange connections, and SCR and CO catalyst installation;
b. Inspection to verify ammonia system valve lineup;
c. Air-testing of Ammonia Injection Grid using dilution air fans to confirm there is no plugging;
d. Exhaust plenum inspection; and
e. Gas turbine generator package inspection.

2.2.2 Startup

Once the pre-startup inspection is complete, startup will begin. Prior to startup, operators will be stationed as follows.

Inside

- Control room gas turbine board
- Control room continuous emission monitoring system (CEMS) data acquisition and handling system (DAHS) computer

Outside

- North side gas turbine exhaust plenum

- South side gas turbine exhaust plenum
- Top of gas turbine exhaust plenum

Startup will occur according to the following sequence.

a. Startup gas turbine generator (Minute 0).
b. Verify gas turbine generator breaker closes (Minute 2).
c. Set turbine generator to the minimum power (P_{MIN}) setting of 23 megawatts (MW), which is approximately 46% of full load.
d. Verify gas turbine generator holds at 3 to 4 MW's for warm-up of catalyst (Minute 3 to 4).
e. Verify ammonia flow commences after SCR inlet temperature reaches 650°F (Minute 5).
f. Verify NO_X water injection occurs at 5 MW (Minute 5).
g. Verify the gas turbine outlet exhaust NO_X concentration is at or below 25 ppmvd at 15% O_2 (Minute 7).
   Note that the gas turbine is designed to achieve NO_X concentration at or below 25 ppmvd at 15% O_2 via water injection and without the use of SCR.

The Unit will reach its P_{MIN} setting of about 23 MW within 10 minutes. The operating permits for both Units provide emissions limits for a 30 minute startup period. The CEMs / DAHS calculates minute by minute the total emissions during startup and will be used to demonstrate compliance with the startup emission limits. If at any time emissions are not within an acceptable range to maintain compliance, Orange Grove Energy will shut down the Unit. The issue will be investigated and addressed prior to initiating startup again. If the Unit is not shut down, adjustments will continue to be made to optimize performance.

Emissions will again be evaluated prior to the 30 minute mark, which is the end of the startup period. If downstream emissions are not within an acceptable range to maintain compliance with permitted operating limits following startup, the Unit will be shut down.

2.2.3 Diagnostic Step

Thirty minutes after initial startup, the CEMS will enter a calibration mode, which will last for 20 minutes. Operation will continue at P_{MIN} until operators and the Plant Manager are confident the system is working and has stabilized. Once the Unit has operated satisfactorily, and for at least one hour at P_{MIN} following the startup period, the next step (Section 2.2.4) can commence.

2.2.4 Full load

The Unit will be brought up to full load (approximately 48 MW) and operated for a tuning period of approximately 10 hours. During this time, operation of the emissions control systems will continue to be optimized.

2.3 PROJECT SCHEDULE

The project is currently scheduled to take place in November, 2016. Below is a summary of project schedule during November, 2016.

- Ten days staging and pre-assembly for Unit 1 and Unit 2;
- Five days to remove and replace parts on Unit 1;
- 12 hours tuning Unit 1 following replacement work;
- Following tuning of Unit 1, five days to remove and replace parts on Unit 2;
- 12 hours tuning Unit 2 following replacement work; and
- Five days demobilization

Alternatively, work may begin on Unit 2 instead of Unit 1, with Unit 1 work following.

3.0 EMISSIONS ANALYSIS DURING STARTUP AND INITIAL TUNNING

Below is a brief discussion of estimated emissions for two operating scenarios during startup, the first being the expected scenario provided by the equipment supplier, IHI, and the second being an unlikely worst case scenario. Calculations for the worst case scenario are based on engine performance data from the manufacturer (General Electric) which is provided in Appendix B. The relevant emissions limits from the current operating permits are provided in Table 3.1.

Table 3.1: Relevant Operating Permit Emission Limits (per stack)

Pollutant	Startup [lbs/event]	Startup [ppmvd]	Operating [ppmvd]	Operating [lbs/hr]	Operating [lbs/day]
NOx	13.25	25	2.5	4.3	141.2
CO	12.05	N/A	6.0	6.1	182.2
VOC	1.95	N/A	2.0	1.3	36.5
Ammonia	N/A	N/A	5.0	N/A	N/A

Assumptions

- Startup, tuning, and optimization will take place only on one Unit at a time, and it will take no longer than 12 hours per unit.
- Startup will occur only after completion of the work described in Section 2.1 System Repair and Maintenance and Section 2.2.1 Pre-Startup. This means that the appropriate amount of CO catalyst will be in place before starting tuning; therefore, exceedance of CO emission above the current permit limits is not expected for any reasonably foreseeable scenario.
- Tuning of the Ammonia Injection Grid will be the major activity during startup and initial tuning. As a part of the tuning procedure, all ammonia injection valves are kept open when a Unit starts up. Unless there is a human error – for example, the valves are closed by mistake – NO_X from the gas turbine will be treated with sufficient amount of ammonia in the SCR reactor. The amount of ammonia that will be injected through the Ammonia Injection Grid will be controlled automatically with the existing control system. Despite this, the worst case emissions scenario described below assumes no ammonia flow is present.

Operating Scenarios

a. Expected Scenario
   The expected scenario during startup and tuning is based on information provided by the engineering company that was contracted for this Project, IHI. In the first three minutes of operation, the NO_X emissions concentration is expected to increase up to approximately 56 ppmvd, at which level it will remain as the exhaust gas heats up the SCR catalyst. Once the SCR catalyst reaches approximately 650^oF about 5 minutes after startup, ammonia flow will commence. The ammonia flow will stabilize over the next 10 to 15 minutes. Once the

temperature reached 800°F, the system will be capable of reducing NOx concentrations to at or below 2.5 ppmvd. During this startup scenario, emissions comply with Permit to Operate conditions for startup and are within operating permit condition requirements within the allowed 30 minute startup duration.

b. Worst Case Scenario
The worst case scenario is that one Unit will have no ammonia injection during the start-up due to an unforeseen malfunction or error. Were this to occur, the latest the Unit would be shut down would be 30 minutes from startup. The worst case scenario assumes ammonia injection starts immediately after 30 minutes at the end of the startup period. The Unit is then operated at the P_{MIN} setting for 60 minutes, followed by 10 hours of operation at full load. This scenario is unlikely but is included as a conservative example of how OGE would maintain compliance with existing operating permit conditions with no need for new permit conditions. Calculations for the Worst Case Scenario in Section 6 are based on engine performance data from the manufacturer, which was previously submitted to the California Energy Commission

Table 3.2 provides an emission estimate for the Worst Case Scenario. The table shows emission amounts if the SCR provides no control for NO_X for the entire first 30 minutes of startup and tuning. It is very unlikely that such a condition will continue for this duration because performance will be monitored closely and adjustments made as issues arises. If situations occur that cannot be rectified in a timely manner, the Unit will be shut down to minimize emissions.

Table 3.2: Estimated Emissions - Worst Case Scenario

	Unit 1 Tuning	Unit 2 Tuning	Total Amount
NO_X			
0 – 30 min: Maximum emission rate [lb/hr]	24.0	24.0	-
0 – 30 min: Maximum concentration [ppmvd]	25.0	25.0	-
0 – 30 min: Total [lbs]	12.0	12.0	24.0
30 – 90 min: Maximum emission rate [lb/hr]	2.4	2.4	-
30 – 90 min: Maximum concentration [ppmvd]	2.5	2.5	-
30 – 90 min: Total [lbs]	2.4	2.4	4.8
90 – 690 min: Maximum emission rate [lb/hr]	4.3	4.3	-
90 – 690 min: Maximum concentration [ppmvd]	2.5	2.5	-
90 – 690 min: Total [lbs]	43.5	43.5	87.0
Total NO_X Emissions [lbs]	**57.9**	**57.9**	**115.8**
CO			
0 – 30 min: Maximum emission rate [lb/hr]	3.5	3.5	-
0 – 30 min: Maximum concentration [ppmvd]	6.0	6.0	-
0 – 30 min: Total [lbs]	1.7	1.7	3.5
30 – 90 min: Maximum emission rate [lb/hr]	3.5	3.5	-
30 – 90 min: Maximum concentration [ppmvd]	6.0	6.0	-
30 – 90 min: Total [lbs]	3.5	3.5	7.0
90 – 690 min: Maximum emission rate [lb/hr]	6.3	6.3	-
90 – 690 min: Maximum concentration [ppmvd]	6.0	6.0	-
90 – 690 min: Total [lbs]	63.2	63.2	126.4
Total CO Emissions [lbs]	**68.4**	**68.4**	**136.8**
VOC			
0 – 30 min: Maximum emission rate [lb/hr]	0.5	0.5	-
0 – 30 min: Maximum concentration [ppmvd]	1.4	1.4	-
0 – 30 min: Total [lbs]	0.2	0.2	0.5
30 – 90 min: Maximum emission rate [lb/hr]	0.5	0.5	-
30 – 90 min: Maximum concentration [ppmvd]	1.4	1.4	-
30 – 90 min: Total [lbs]	0.5	0.5	1.0
90 – 690 min: Maximum emission rate [lb/hr]	1.2	1.2	-
90 – 690 min: Maximum concentration [ppmvd]	1.4	1.4	-
90 – 690 min: Total [lbs]	12.3	12.3	24.6
Total VOC Emissions [lbs]	**13.0**	**13.0**	**26.0**
Ammonia			
0 – 30 min: Maximum emission rate [lb/hr]	0.0	0.0	-
0 – 30 min: Maximum concentration [ppmvd]	0.0	0.0	-
0 – 30 min: Total [lbs]	0.0	0.0	0.0
30 – 90 min: Maximum emission rate [lb/hr]	2.1	2.1	-
30 – 90 min: Maximum concentration [ppmvd]	5.0	5.0	-
30 – 90 min: Total [lbs]	2.1	2.1	4.2
90 – 690 min: Maximum emission rate [lb/hr]	2.9	2.9	-
90 – 690 min: Maximum concentration [ppmvd]	5.0	5.0	-
90 – 690 min: Total [lbs]	28.8	28.8	57.6
Total Ammonia Emissions [lbs]	**30.9**	**30.9**	**61.8**

4.0 REGULATORY COMPLIANCE

4.1 FEDERAL

4.1.1 New Source Review (NSR)

Authority: CAA §171-193, 42 USC §7501 et seq.; 40 CFR Parts 51 and 52.
Administering Agency: SDAPCD, with EPA Region 9 oversight

Requirement: NSR requires pre-construction review and permitting of new or modified major stationary sources of air pollution to allow industrial growth without interfering with the attainment and maintenance of national ambient air quality standards (NAAQS). NSR jurisdiction has been delegated to the SDAPCD for all non-attainment pollutants.

Conformance: Refer to local regulations discussed below in Section 4.2.

4.1.2 Prevention of Significant Deterioration (PSD) Program

Authority: CAA §160-169A, 42 USC §7470-7491; 40 CFR Parts 51 and 52.
Administering Agency: EPA Region 9

Requirements: Requires pre-construction review and permitting of new or modified major stationary sources of air pollution to prevent significant deterioration of ambient air quality. PSD applies to pollutants for which ambient concentrations do not exceed the corresponding NAAQS (i.e., attainment pollutants). The PSD program allows new sources of air pollution to be constructed, or existing sources to be modified, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I areas (e.g., national parks and wilderness areas).

Conformance: The threshold to trigger PSD is 250 tons per year or more of any regulated NSR pollutant. This project will not result in a change to operating emissions and therefor PSD requirements will not apply.

4.1.3 Acid Rain Program

Authority: CAA §401 (Title IV), 42 USC §7651.
Administering Agency: SDAPCD, with EPA Region 9 oversight

Requirement: Requires the monitoring and reporting of emissions of acidic compounds and their precursors. The principal source of these compounds is the combustion of fossil fuels. Therefore, Title IV established national standards to monitor, record, and in some cases limit SO_2 and NO_x emissions from electrical power generating facilities. These standards are implemented at the local level with federal oversight.

Conformance: Refer to local regulations discussed below in Section 4.2.

4.1.4 Title V Operating Permits Program

Authority: CAA §501 (Title V), 42 USC §7661.
Administering Agency: SDAPCD, with EPA Region 9 oversight

Requirements: Requires the issuance of operating permits that identify all applicable federal performance, operating, monitoring, recordkeeping, and reporting requirements. Title V applies to major facilities (NSPS, NESHAP), Phase II acid rain facilities, subject solid waste incinerator facilities, and any facility listed by EPA as requiring a Title V permit. SDAPCD has received delegated authority for this program.

Conformance: This project will not result in a change to operating emissions and therefore no modifications to the existing Title V permit are necessary.

4.1.5 National Standards of Performance for New Stationary Sources

Authority: Clean Air Act §111, 42 USC §7411; 40 CFR Part 60.
Administering Agency: SDAPCD, with EPA Region 9 oversight

Requirements: Establishes standards of performance to limit the emission of criteria pollutants (air pollutants for which EPA has established NAAQS) from new or modified facilities in specific source categories. These standards are implemented at the local level with federal oversight. The applicability of these regulations depends on the equipment size, process rate, and/or the date of construction, modification, or reconstruction of the affected facility. The NSPS Subpart KKKK, Standards of Performance for Stationary Gas Turbines set limits on NO_x and SO_2 emissions.

Conformance: These standards are incorporated into existing permit conditions issued by SDAPCD. No changes to operating permit conditions are required.

4.2 SAN DIEGO AIR POLLUTION CONTROL DISTRICT RULES AND REGULATIONS

Authority: H&SC §4000 et seq., H&SC §40200 et seq., indicated SDAPCD Rules.
Administering Agency: SDAPCD with EPA Region 9 and CARB oversight

4.2.1 Rule 10 – Permits Required

SDAPCD Rule 10 specifies that any person building, erecting, altering or replacing any article, machine, equipment or other contrivance, the use of which may cause the issuance of air contaminants or the use of which may eliminate or reduce or control the issuance of air contaminant, shall first obtain written authorization for such construction from SDAPCD.

4.2.2 Rule 20.1 – New Source Review (NSR) – General Provisions

Rule 20.1(b)(2)(i) provides and exemption to the provisions of Rules 20.1, 20.2, 20.3 and 20.4 for repair or routine maintenance of an existing emissions unit provided the changes are not

contrary to any permit condition and do not result in an increase to emissions. This project meets this criteria and is exempt from the provisions of Rules 20.1, 20.2, 20.3 and 20.4.

4.2.3 Rule 20.2 – NSR – Non-Major Stationary Sources

This project is exempt from Rule 20.2 requirements per Rule 20.1. Furthermore Rule 20.2 is not applicable as this project will not result in an increase in emissions and therefore is not considered a modified stationary source or modified emissions. Therefore, NSR standards under (d)(1) Best Available Control Technology (BACT), (d)(2) Air Quality Impact Analysis (AQIA), (d)(3) Prevention of Significant Deterioration (PSD), and (d)(4) Public Notice and Comment are not applicable.

Rule 20.2 (a) Applicability

This rule applies to any new or modified stationary source, to any new or modified emission unit and to any relocated emission unit being moved from a stationary source provided that after completion of the project, the stationary source is not a major stationary source.

Rule 20.1 (c) Definitions

(38) "Modified Emission Unit" means any physical or operational change which results or may result in an increase in an emission unit's potential to emit, *including those air contaminants not previously emitted. The following shall not be considered a modified emission unit, provided such a change is not contrary to any permit condition, and the change does not result in an increase in the potential to emit of any air contaminant:*

(ii) Repair or routine maintenance of an existing emission unit.

(39) "Modified Stationary Source" means a stationary source where a new or modified emission unit is or will be located or where a change in the aggregation of emission units occurs, *including, but not limited to, the movement of a relocated emission unit to or from a stationary source or where a modification of an existing unit occurs. The following shall not be considered a modification of a stationary source:*

(i) The replacement of an emission unit, provided there is no increase in the unit's potential to emit or in the potential to emit of any other unit at the stationary source.

4.2.4 Rule 50 – Visible Emissions

Rule 50 prohibits visible emissions as dark as, or darker than, Ringelmann No. 1 for periods greater than 3 minutes in any hour. This requirement is included in the existing permit to operate and will not be impacted by this project. No new requirements or changes to existing requirements are required.

4.2.5 Rule 51 – Nuisance

Rule 51 prohibits the discharge from a facility of air pollutants that cause injury, detriment, nuisance, or annoyance to the public, or that damage business or property. This requirement is included in the existing permit to operate and will not be impacted by this project. No new requirements or changes to existing requirements are required.

4.2.6 Rule 52 – Particulate Matter Emission Standards

This rule prohibits PM emissions in excess of 0.10 grains per dry standard cubic foot (gr/dscf). This requirement is included in the existing permit to operate and will not be impacted by this project. No new requirements or changes to existing requirements are required.

4.2.7 Rule 53 – Combustion Contaminants

Rule 53 prohibits sulfur emissions, calculated as SO_2, in excess of 0.05 percent by volume (500 parts per million by volume [ppmv]), and combustion particulate emissions in excess of 0.10 gr/dscf at 12 percent CO_2. This requirement is included in the existing permit to operate and will not be impacted by this project. No new requirements or changes to existing requirements are required.

4.2.8 Rule 62 – Sulfur Content of Fuels

Rule 62 prohibits the burning of gaseous fuel with a sulfur content of more than 10 gr/100 scf and liquid fuel with a sulfur content of more than 0.05 percent sulfur by weight. This requirement is included in the existing permit to operate and will not be impacted by this project. No new requirements or changes to existing requirements are required.

4.2.9 Rule 69 – Electrical Generating Steam Boilers

This rule does not apply to this project as it does not involve new or replacement electrical generating steam boilers. No new requirements or changes to existing requirements are required.

4.2.10 Rule 69.3.1 – Stationary Gas Turbines

Limits NO_x emissions from stationary gas turbines rated greater than or equal to 10 MW with post-combustion controls to 9 ppmv (at 15 percent O_2, corrected for efficiency). The existing operating permit includes conditions that are more stringent and will not be impacted by this project. No new requirements or changes to existing requirements are required.

5.0 CONCLUSION

The proposed work would not affect the OGE's ability to comply with existing operating permit conditions. The proposed work would:

- Not result in an increase in any operating emissions;
- Not make any change to the gas turbine specifications including, but not limited to, output.
- Not make any change to the existing foundation or stacks, including stack height; and
- Improve the operating and compliance reliability of the existing emissions control systems.

In addition, this project is consistent with the existing operating permit condition (both ACCD2011-PTO-000889 and ACCD2011-PTO-000890) which states:

1. *This equipment shall be properly maintained and kept in good operating condition at all times.*

OGE requests an Authority to Construct be issued for this project, with no modifications to existing operating permits, including the following conditions SDAPCD has issued in the past for projects of this nature.

1. All conditions of permits 2011-PT0-000889 and 2011-PT0-000890 shall remain in effect.

2. This Authority to Construct/startup authorization shall be considered the final permitting document for this application and acknowledges that the CO and SCR reliability improvements, as described in the application, have been deemed to satisfy all District rules and regulations.

Appendix A

IHI Technical Specifications and Work Plan

IHI INC.

Power Plant Engineering Division
7285 West 132nd Street, Suite 200, Overland Park, KS 66213
TEL: (913) 632-0100 FAX: (913) 632-0185

Date: March 10th, 2016
Ref No: OGE-I-010002

To: J-POWER USA Development Co., Ltd.
Attn: Mr. Makoto Kaneko, Assistant Director of Engineering

Subject: Project Work Scope (RevA) for Orange Grove Energy SCR/COC Reliability Improvement Project

Dear Mr. Kaneko,

In accordance with your request, we are pleased to submit "KE20-001 Project Work Scope (RevA)" for Orange Grove Energy SCR/COC Reliability Improvement Project. This document was added "Technical Description". This document include following information;

(1) Technical Description
(2) Project Work Scope
(3) Division of responsibilities
(4) General arrangement of SCR/COC equipment (Drawing No. : K200-145_Rev0 and K200-146_revA)
(5) Concept drawing of repair part (Drawing No. : K200-151_Rev0)

If you have any queries, please do not hesitate to contact us at any time.

Glenn Lansford
Senior Vice President - Managing Director
IHI INC.
Tel. 913-632-0110
Cell. 913-901-7565
Email. galansford@ihi-us.com

配布先	
J-Power USA	1
OGE	1
エネボ保PJ	
エネボ基設	
エネボRR	
エネ品管部	
エネ調ボ管	
相生調ロジ	
相品管部	
エネ海営部	
PPED	1
IHI Inc.調達	
合計	3

NO	DATE	DESCRIPTION	DRAWN	DESIGNED	CHECKED	APPROVED
A	Mar.10 2016	Added Technical Description (Page 2~9)	A.T.	Atsuko T.	T. Ito	K. Yoshitake 10 Mar '16
0	Mar.4 2016	First Issued	A.T	Atsuko.T	T.Ito	K.Yoshitake

SCALE -

1ST ANGLE PROJECTION

3RD ANGLE PROJECTION

J-POWER USA Development Co., Ltd.
Orange Grove Energy SCR/COC Reliability Improvement Project

Project Work Scope

OGE

IHI

Project Gr
Maintenance Service Dept.
Energy Systems Center
Energy & Plant Operations

JOB NO 5124-A84

CODE NO KE20-001

REV A

TECHNICAL DESCRIPTION

1. DESIGN CONDITION

1.1 DESIGN CONDITIONS FOR SCR & COC SYSTEM

(1) Fuel for Gas Turbine

Natural gas

(2) Exhaust gas conditions

Design conditions of G/T exhaust gas is based on the Design Condition table.

(3) Other requirements

a. Catalyst Design Life

20,000 hours as cumulative operating time OR Five (5) years as annual 4,000 hours operating time from first flue gas contact OR Sixty-Six (66) months from catalyst delivery, whichever occurs first

b. Gas side pressure drop

10 inch H_2O (from G/T outlet to stack outlet)

2. GUARANTEE

In case that the SCR catalyst and the CO catalyst will be replaced with new one on this project, IHI will guarantee the performance of SCR and COC are shown in the following table.

2.1 Design Condition

	Design Value
Flue gas flow rate	1,185,309 lb/h (537,600 kg/h, 420,038 m^3N/h)
Flue gas temperature	800
Flue gas composition	
NOx (ppmvd @ 15% O_2)	25
CO (ppmvd @ 15% O_2)	60
O_2 vol.% (vol.%-dry)	14.3 (15.3)
H_2O Vol.%	6.5
CO_2 Vol.%	5
Particulates (mg/m^3N)	None

2.2 Guarantee

	Guarantee Value
SCR System	
Outlet NOx (ppmvd @ 15% O_2)	≤ 2.5
Outlet NOx (lbs/hr)	≤ 4.3
Slip NH_3 (ppmvd @ 15% O_2)	≤ 5
COC System	
Outlet CO (ppmvd @ 15% O_2)	≤ 6
Outlet CO (lbs/hr)	≤ 6.1
Outlet VOC (ppmvd @ 15% O_2)	-

3. WARRANTY

(1) Subject to the provisions hereinafter set forth, IHI undertakes to remedy, by making necessary repair or delivery replacement parts at its cost and expense, any defect in any part thereof which is due to defective material and/or poor workmanship on the parts of IHI, provided that such defect is discovered and notified to IHI within twelve (12) months after the date of completion works, whichever occurs first.

(2) The Purchaser shall notify IHI in writing, as promptly as possible after discovery, of any defect for which claim is made under this warranty.

(3) IHI shall not be liable for any other defects whatsoever in parts than the defects as specified in above paragraph (1), nor shall IHI in any circumstance be liable for any consequential damages, such as loss of time, product, earnings or profits directly or indirectly occasioned by reason of the defects as specified in above paragraph (1), or due to repair or replacement or other works done to the equipment to remedy such defect.

(4) IHI shall not be liable for the defects arising out of;
   a. Natural wear and tears, corrosion and erosion
   b. Ill handling, negligence, improper operation and improper maintenance
   c. Any change or modification of any or whole of parts on the part of the Purchaser.
   d. Ill storage that is not in accordance with IHI's storage procedure

4. Description of IHI SCR System

4.1 IHI SCR PROCESS

IHI dry type de-nitrification system is designed on the basis of Selective Catalytic Reduction process using ammonia as the reducing agent.

For LM6000PC GT simple cycle plant, IHI adopts De-NOx catalyst that has honeycomb type configuration.

Also it has reliability and optimum performance over a long period of operation time.

The principle of the de-nitrification system is a simple process; flue gas to be treated is combined with injected ammonia as the reducing agent, and passes through catalyst layer(s). Thus, NOx is decomposed to harmless nitrogen [N_2] and moisture [H_2O].

The chemical reaction formula of this process is shown as follows:

$$\mathbf{4NO + 4NH_3 + O_2 \rightarrow (Catalyst) \rightarrow 4N_2 + 6H_2O}$$

$$\mathbf{NO + NO_2 + 2NH_3 \rightarrow (Catalyst) \rightarrow 2N_2 + 3H_2O}$$

$$\mathbf{4NH_3 + 5O_2 \rightarrow (Catalyst) \rightarrow 4NO + 6\,H_2O}$$

4.2 SCR & COC Reactor

(1) General Specification

One (1) 100% capacity reactor / per one (1) unit, in total two (2) reactors are provided for this Project. GT exhaust flue gas is introduced into horizontal inlet duct section having flow distribution device.

At first, flue gas is treated at CO Catalyst and NH_3 is injected at downstream of COC.

For maximizing flue gas and injected NH_3 mixing, adequate retention time will be considered between AIG and SCR catalyst inlet duct section design.

After NOx will be treated at SCR section, clean flue gas is discharged to atmosphere thorough stand-alone stack located in downstream of SCR & COC reactor.

The SCR & COC reactor already equipped metallic expansion joint in GT outlet part. The expansion joint will absorb the reactor movement which is caused by the thermal expansion.

The SCR catalyst layers are designed for installation of 30 catalyst modules (5 x 6 Module arrangement) on supporting beams and/or frameworks of the reactor.

Total one (1) catalyst layer is provided.

Total thirty (30) catalyst modules per one (1) unit are provided for this Project.

Access manholes are located at COC inlet, COC outlet, SCR outlet, and stack. Catalyst access doors are also located on the top of SCR Housing for loading / unloading SCR catalyst.

(2) SCR Catalyst & CO Catalyst Module

a. SCR Catalyst

The Catalyst for this project is Titania-based ceramic honeycomb catalyst. The cell pitch is 0.082 inch (2.1 mm) and height is 14.69 inch (373mm). The catalyst blocks are shop-assembled and delivered in Carbon steel basket for convenient handling such as installing into and removing from SCR reactor. Each catalyst module contain 9^{W} x 8^{H} x1^{Stack} =Total 72 catalyst blocks with size of 58.5in (1,486mm) in width, 50.8in (1,292mm) in height and 18.1in (460mm) in depth.

* Determining the final dimension of catalyst is pending the selection of catalyst manufacturer.

	Existing catalyst	New catalyst	New catalyst
Catalyst manufacturer name	HALDOR TOPSOE	Cormetech*1	Ceram*1
Type	Corrugated (DNX-920)	Honeycomb (CM21^{TM})	Honeycomb
Cell pitch	-	0.082 in (2.1 mm)	0.098 in (2.5 mm)
Active Catalyst Materials	Ti-V-W	Ti-V-W	Ti-V-W
Number of Catalyst layers	One	One	One
Number of Modules per Unit	27 (988 ft^3 ($28m^3$))	30 (529 ft^3 ($15m^3$))	30 (600 ft^3 ($17m^3$))
Dimensions of Module	-	58.5 in (1,486 mm) in width	57.1 in (1,450 mm) in width
	-	50.8 in (1,292 mm) in height	50.5 in (1,284 mm) in height
	-	18.1 in (460 mm) in depth*2	22.3 in (567 mm) in depth*2
NOx reduction rate	90%	≥90%	≥90%

b. CO Catalyst (COC)

	Existing catalyst	New catalyst	New catalyst
Catalyst manufacturer name	Johnson Matthey	Johnson Matthey*1	Advanced Catalyst System*1
Type	Metal Foil (- cpsi)	Metal Foil (200 cpsi)	Metal Foil (230 cpsi)
Active Catalyst Materials	-	Precious Metal	Precious Metal
Number of Catalyst layers	One	One	One
Number of Element per Unit	121	100	100
CO reduction rate	90%	≥90%	≥90%

*1 Determining the final dimension of catalyst is pending the selection of catalyst manufacturer.

*2 depth: Flow direction

(3) Ammonia Injection Grid (AIG)

The Ammonia Injection Grid (AIG) consists of multi-injection pipes which have a large number of pipe nozzles. In order to cope with unavoidable imbalance of flue gas flow velocity distribution in duct, ammonia injection pipes are divided into 12 groups. Each injection pipes have a manual flow regulating valve so that ammonia flow rate of each injection pipe will be adjusted.

The AIG consists of manifolds, branch pipes with nozzles, and distributed plate which are configured and spaced for the ammonia/air mixture into the flue gas flow. Because, the NH_3 concentration in flue gas at the catalyst layer inlet will be in proportion to the imbalance of flue gas flow.

The AIG will be properly supported to prevent thermal distortion and damage due to vibration induced by the exhaust gas flow.

The location of the AIG will be such that thorough mixing of the ammonia and NOx and can be effected prior to passing through the catalyst.

5. SUB VENDER LIST

1) This list indicates potential subcontractors, one of which is to be considered the most appropriate and competitive and finally selected by IHI.

2) The list would be expanded as additional subcontractors which would be identified and approved by IHI.

3) All the licensees and/or subsidiaries of the listed subcontractors herein are to be considered the same as the subcontractors nominated.

4) Manufacturing locations for each item, especially for those of major system equipment, are to be the final subcontractor selection stage as the engineering works proceed on.

5) The Sub-subcontractor (subcontractor's subcontractor) shall not be subject to the Owner's approval.

Item	Sub Vender	Country
Reactor (Casing, Ductwork, Steel structure, Piping and etc.)	TOPP'S mechanical INC.	NE, USA
CO catalyst	Advanced catalyst	TN, USA
	Johnson Matthey	PA, USA
SCR catalyst	Cormetech	NC, USA
	Ceram	KS, USA

IHI
Realize your dreams

No.	Items		Description	IHI	OGE	Remarks
1	COC upstream area	CFD analysis	CFD modeling and analysis will be performed to optimize the flue gas flow distribution at upstream of COC.	X		
		Cooling nozzle	The existing nozzle will be modified based on the results of CFD analysis.	X		K200-151 Page8
		Sound barriers at GT outlet	The perforated plate will be re-installed to the sound barriers, and then the sound barrier defected part will be repaired.	X		K200-151 Page2
		Flow distributor	Replacement / modification of the flow distributor will be made based on the result of CFD analysis.	X		K200-151 Page3
2	COC Housing	Top casing	The top casing will be repaired with new steel materials, and re-insulated with lagging plate.	X		K200-151 Page5
		Sides casing	The side casings will be repaired with new steel materials, and re-insulated with lagging plate.	X		K200-151 Page5
		Bottom casing	The existing bottom casing will be re-utilized with appropriate repair, and re-insulated with lagging plate.	X		K200-151 Page5
		New Sealing Structure (between Outer Catalyst frame and lagging plate)	The new sealing structure will be applied.	X		K200-151 Page5
		CO catalyst	The new CO catalyst will be installed.	X		K200-151 Page5
		Catalyst frame	The new catalyst frame will be installed.	X		K200-151 Page5
3	Expansion Joint at Flue Gas Intake Duct for the Ammonia supply skid	Expansion joint at ammonia skid inlet	Out of scope of IHI The damaged existing expansion joint will be repaired by OGE prior to new AIG operation to prevent AIG nozzle plugging.		X	
4	AIG	AIG	The new AIG with adjustable valves will be installed.	X		K200-151 Page4
		AIG inlet pipe	The new metal expansion joint for Ammonia gas pipe will be installed.	X		K200-151 Page4
		Piping support	Necessary piping support under our supply will be provided.	X		K200-151 Page4
		Casing of AIG area	Top of the existing ductwork will be partially modified for AIG installation.	X		K200-151 Page4
5	NOx Housing	Top casing	The top casing will be repaired with new steel materials, and re-insulated with lagging plate. Hatch for catalyst installation will be installed.	X		K200-151 Page6,7
		Sides casing	The side casings will be repaired with new steel materials, and re-insulated with lagging plate.	X		K200-151 Page6,7
		Bottom casing	The existing bottom casing will be re-utilized with appropriate repair, and re-insulated with lagging plate.	X		K200-151 Page6,7
		New Sealing Structure (between Outer Catalyst frame and lagging plate)	The new sealing structure will be applied.	X		K200-151 Page6,7
		SCR catalyst	The new SCR catalyst will be installed.	X		K200-151 Page6,7
		Catalyst frame	The new catalyst frame with better sealing between the frame and catalyst will be installed. The new catalyst frame DOES NOT include the future layer and future space.	X		K200-151 Page6,7
		Purge fans	The existing purge fans will be relocated.	X		K200-146
		Support of purge fans	The purge fans support will be installed.	X		K200-146
		power cable and I & C cable	Modification work of power cable and I & C cable will be carried by OGE.		X	
6	Stack inlet duct	Expansion joint at stack inlet	There will be NO thermal expansion joint at stack inlet part.	N/A		
7	Adjustment of Ammonia injection flow distribution (One time)		IHI will fine-tune ammonia injection flow distribution.	X		
8	Performance testing		IHI will conduct flue gas analysis for performance testing.	X		
9	Site work		Please see Attachment-1.	Please see Attachment-1.		

Attachment-1

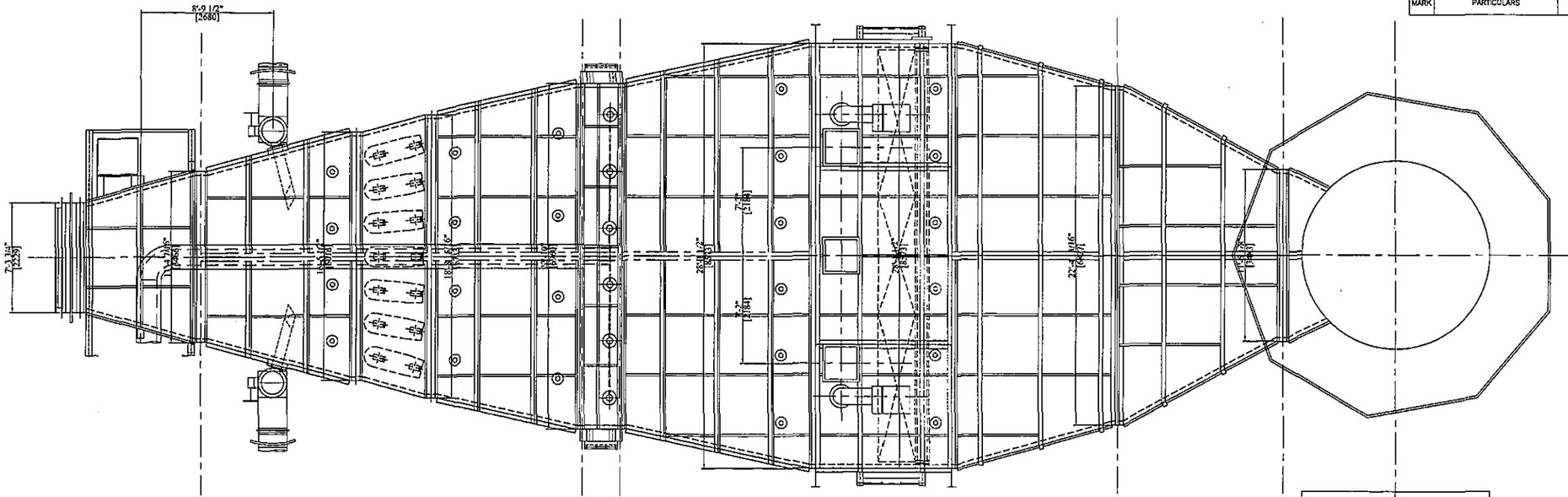
Division of Responsibilities (rev 2, as of 2/2/2016)

Items	IHI	OGE
1. Safety		
(a) Personal safety equipment (including but not limited to: hard hats, safety eye protection, gloves, fall harnesses, boots, portable tie off devices for fall protection, respirators, face shields, welding hoods, welding aprons, etc.)	X	
(b) OGE safety orientation for labor force		X
(c) First aid facility, fire protection and rescue team		X
(d) Isolate and tag out turbine and auxiliary equipment	X	X
(e) Safety equipment including signs and barriers	X	X
(f) Confined space monitoring equipment and personnel		X
(g) Confined space entry attendant		X
(h) Confined space rescue services and rescue equipment		X
(i) Forklift operator – OSHA certification required (will require competencies review of the OGE forklift when arrives onsite).	X	
(j) Manlift operator (if necessary) – OSHA Certification required	X	
2. Tooling		
(a) Normal tools needed to perform the work scope defined in the Purchase Order. (Including all ladders) All tools must be in good working and physical condition. Tools must be inspected prior to use by each technician.	X	
(b) Special tools needed to perform the work scope defined in the Purchase Order	X	
3. Other Equipment		
(a) Normal facility service required for maintenance such as light, heat, service water, compressed air and electronic power		X
(b) Welding machine	X	
(c) Engine driven air compressor and fuel	X	
(d) Supplementary lighting and fuel	X	
(e) Load tested crane and certified operator with crew and fuel	X	
(f) Forklifts, manlifts, flat bed trailers, trucks and fuel	X	
4. Consumables		
(a) Consumable gas (e.g. Oxygen, Acetylene, Argon, etc.)	X	
(b) Lubricants, as necessary	X	
(c) Expendable materials (e.g. rags, cleaning fluids, etc.)	X	
(d) Cribbing, lumber, blocking and plywood material for equipment laydown	X	
5. Services		
(a) Labor needed for the work scope defined in the Purchase Order	X	
(b) Commissioning engineer for tuning AIG	X	
(c) Construction manager on site for 24 hours/day during construction	X	
(d) Operator to perform all normal functions of power plant during commissioning		X
(e) Daily status update report during construction	X	

(f) Welding	X	
(g) Welding inspector		X
(h) Disconnect, tag out and reconnect electrical apparatus		X
(i) Disconnect and reconnect existing plant wiring		X
(j) Disconnect and reconnect of instrumentation, including CEMS' probes		X
(k) Material and labor for removal and installation of insulation	X	
(l) Material and labor for removal and installation of scaffolding (including scaffolding for flow gas testing for final performance verification)	X	
(m) Labor and equipment needed for on-site machining and painting, if any	X	
6. Infrastructure		
(a) Office area for field engineers and crew foremen		X
(b) Break facilities for crew	X	
(c) Sanitary facilities with wash stations	X	X
(d) Parking space for all labor		X
7. Other		
(a) Transportation of all pre-fabricated components	X	
(b) Transportation of catalyst	X	
(c) Receiving, off-loading and proper storage of all pre-fabricated components, catalyst and associated materials	X	
(d) Laydown area		X
(e) All construction waste removal	X	

Attachment-2

MARK	PARTICULARS	MATERIAL	NO REQUIRED			MASS (kg)		REMARKS
			WORKING	SPARE	TOTAL	PER ONE	TOTAL	



Before

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0	Jan.12 2016	First issue	—		—	

SCALE 1/50

1ST ANGLE PROJECTION

3RD ANGLE PROJECTION

J-POWER USA Development Co., Ltd.
MODIFICATION OF AIR POLLUTION CONTROL SYSTEM (ACS) OF
LM6000PC GT SIMPLE CYCLE UNIT 1 & 2 AT ORANGE GROVE POWER STATION

ARRANGEMENT DRAWING
(EXISTED)

IHI
Refreshment & Renovation Group
Boiler Design Department
Energy System Center
Energy & Plant Operations

DRAWING NO
JOB NO 99000937-7248
CODE NO K200-145
REV 0
1/1

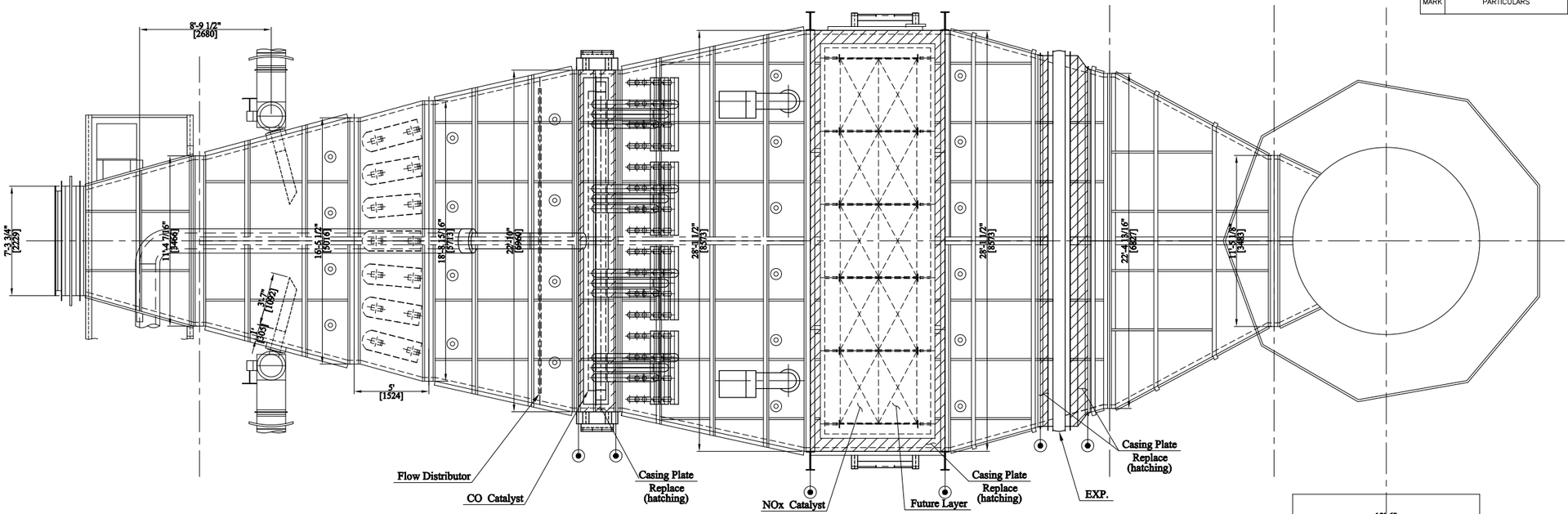
IHI Corporation

配布先
答先殿

エネボ管設計	
エネボ(PJ)	1
エネボ(内)	
エネボ設品	
エネ品管部	
エネボ製図	1
エネボ計電	
エネボ配計	
エネ土建部	
エネボ(社)	
エネボ本体	
エネボ機器	
エネボ設計	
エネボ技品	
エネ調ボ管	
エネ調設注	
エネ建設工	
エネ建工(組)	
相生計画	
相生技設	
相生調ボ3	
相品管部	
相工技	
相工務	
IPC(本)	
IPC(相)	
現地	
控	
合計	2

ATTACHMENT 3

MARK	PARTICULARS	MATERIAL	NO REQUIRED			MASS (kg)		REMARKS
			WORKING	SPARE	TOTAL	PER ONE	TOTAL	



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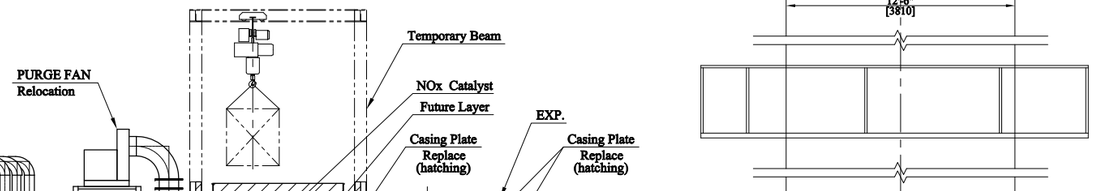

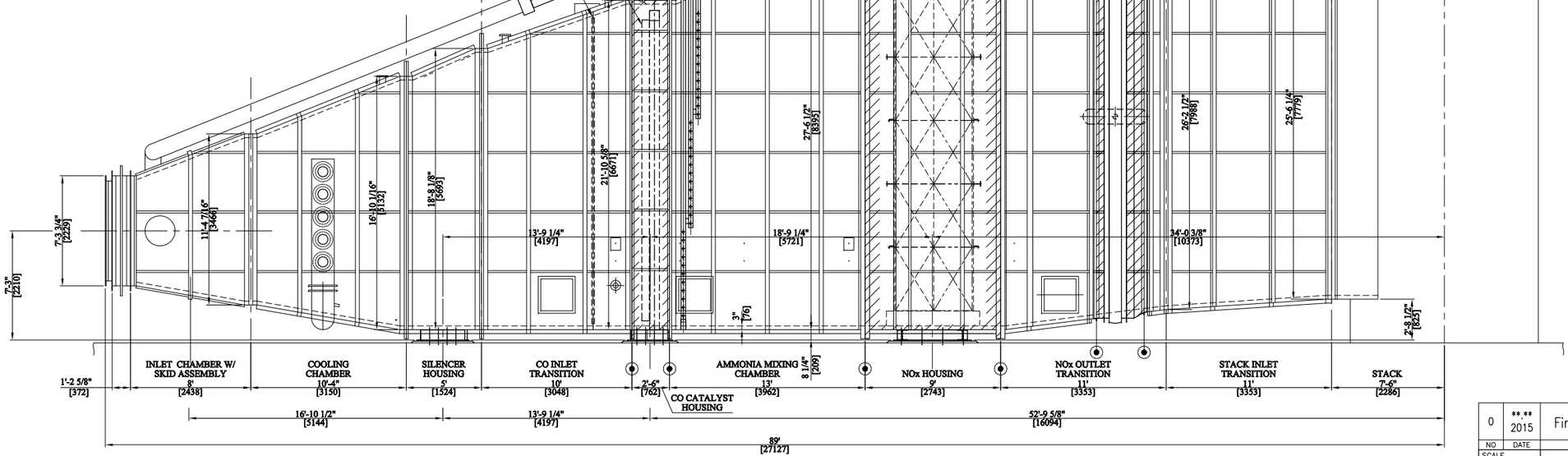

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FOR REFERENCE

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SCALE 1/50
1ST ANGLE PROJECTION
3RD ANGLE PROJECTION

J-POWER USA Development Co., Ltd.
MODIFICATION OF AIR POLLUTION CONTROL SYSTEM (ACS) OF LM6000PC GT SIMPLE CYCLE UNIT 1 & 2 AT ORANGE GROVE POWER STATION

ARRANGEMENT DRAWING (REMODEL)

IHI Energy & Plant Operations, Energy System Center, Refreshment & Renovation Group, Boiler Design Department

DRAWING NO
JOB NO 99000937-7248
CODE NO K200-146
REV 0

配布先
客先殿
エネプ服営部
エネプ技営PJ
エネプ技営PJ(動)
エネプ環境品
エネプ品管部
エネプ水計画
エネプ制電
エネプ燃部
エネプ土建
エネプ材部
エネプ水本体
エネプ水艤設
エネプ水詳配
エネプ水搭品
エネプ調管
エネプ調達
エネプ建計工
エネプ建計工(動)
相生計画
相生技設
相生調ロジ
相品管部
相 工 技
相 工 務
IPC(本)
IPC(相)
現　地
控
合　計

000STD-A1Y-0

IHI Corporation

ATTACHMENT 4

A4

配布先	
客先殿	
エネプ国営部	
エネプボ保PJ	
エネプボ保PJ(相)	
エネプボ保技品	
エネプ品管部	
エネプボ計画	
エネプ制電	
エネプ燃部	
エネプ土建	
エネプ材部	
エネプボ本体	
エネプボ機設	
エネプボ鉄配	
エネプボ技品	
エネプ調管	
エネプ調達	
エネプ建計工	
エネプ建計工(相)	
相生計画	
相生技設	
相生調ロジ	
相品管部	
相工技	
相工務	
IPC(本)	
IPC(相)	
現地	
控	
合計	

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0	**.**.2015	First issue				

SCALE

1ST ANGLE PROJECTION

3RD ANGLE PROJECTION

J-POWER USA Development Co., Ltd.
MODIFICATION OF AIR POLLUTION CONTROL SYSTEM (ACS) OF
LM6000PC GT SIMPLE CYCLE UNIT 1 & 2 AT ORANGE GROVE POWER STATION

CONFIGURATION DETAIL

IHI

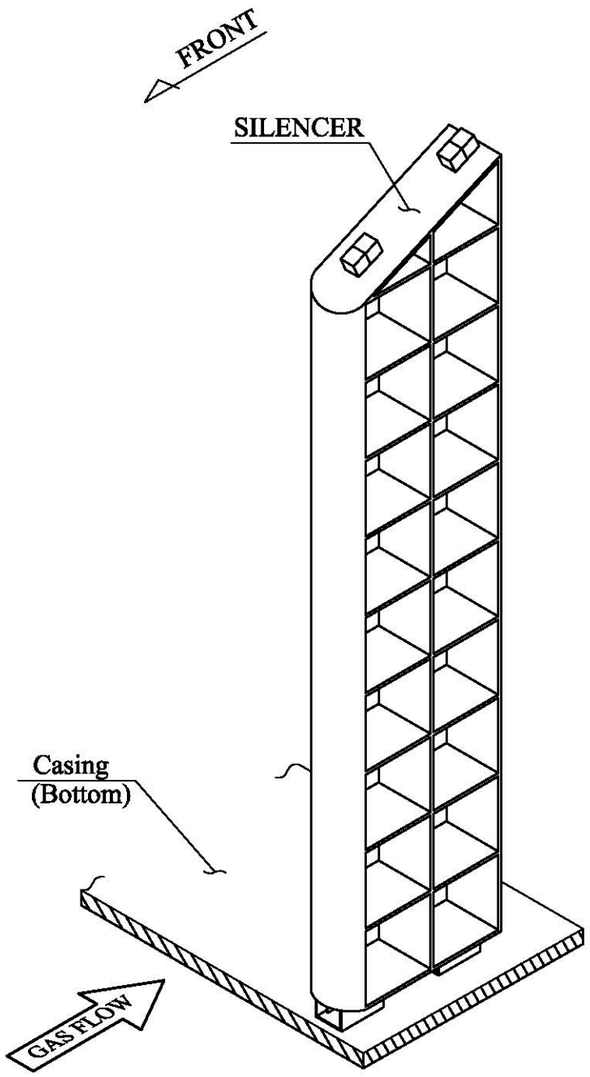
Energy & Plant Operations
Energy System Center
Refreshment & Renovation Group
Boiler Design Department

DRAWING NO		REV
JOB NO	CODE NO	0
99000937-7248	K200-151	1/8

000STD-A4Y-0

IHI Corporation

Conceptual



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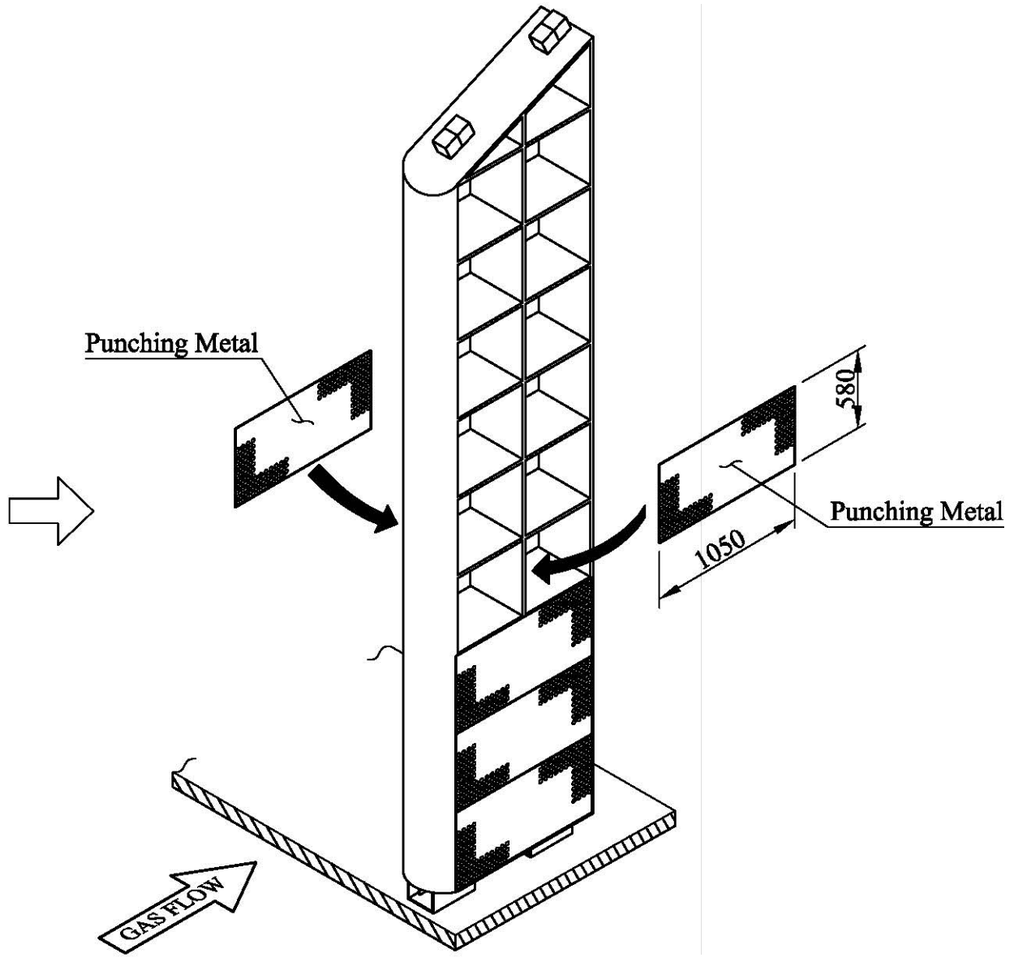

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Silencer Housing	DRAWING NO		REV
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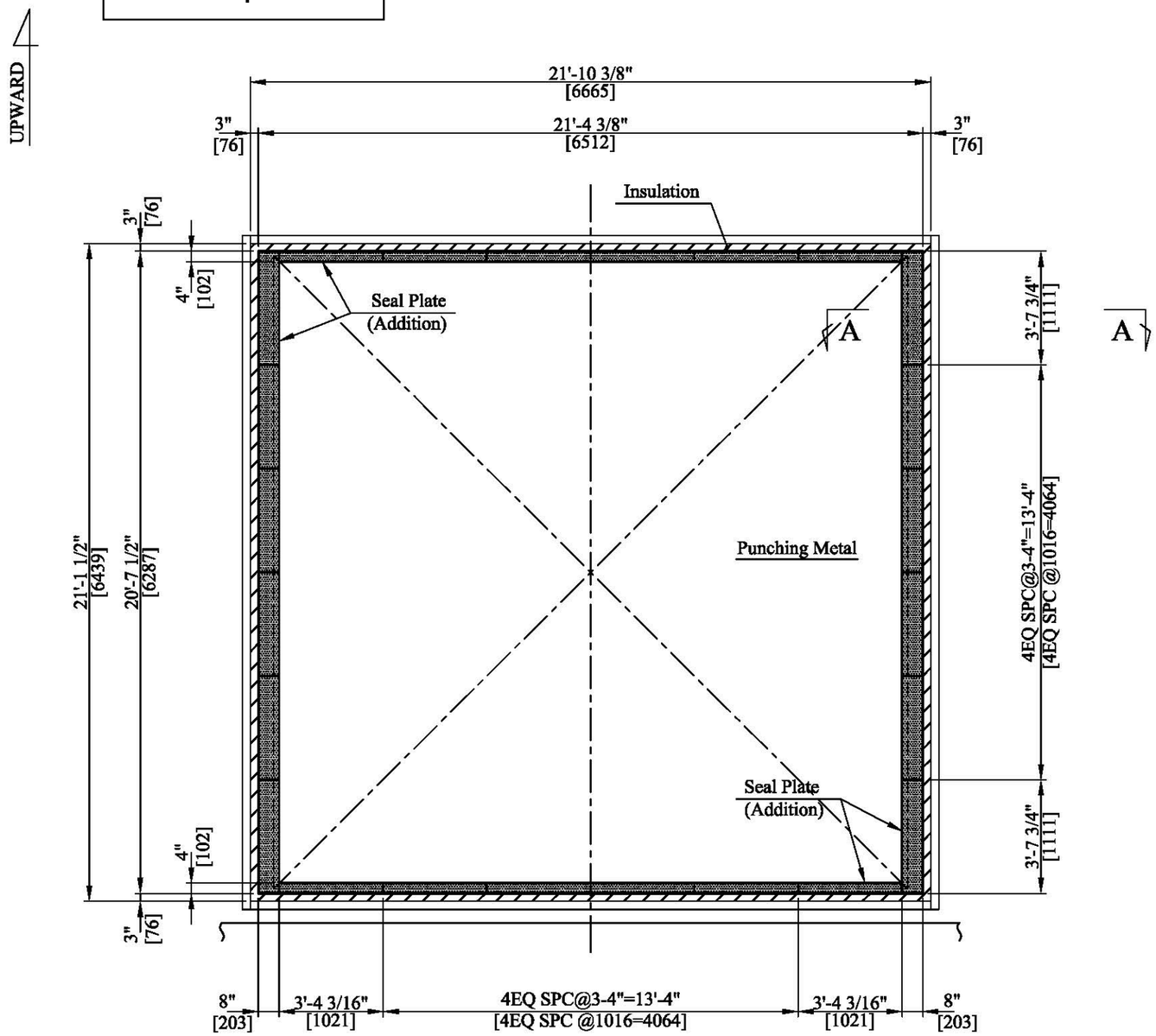
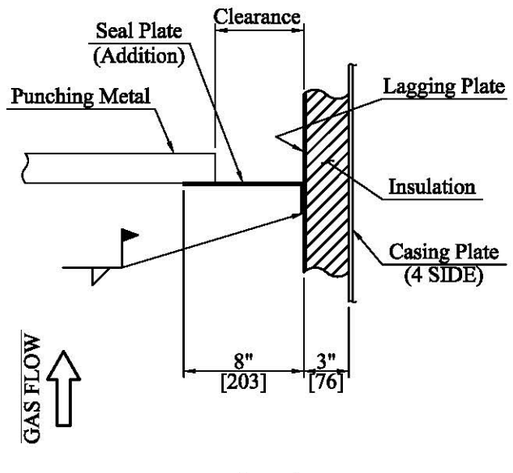
IHI Corporation

Conceptual





A - A

Flow Distributor	DRAWING NO		REV
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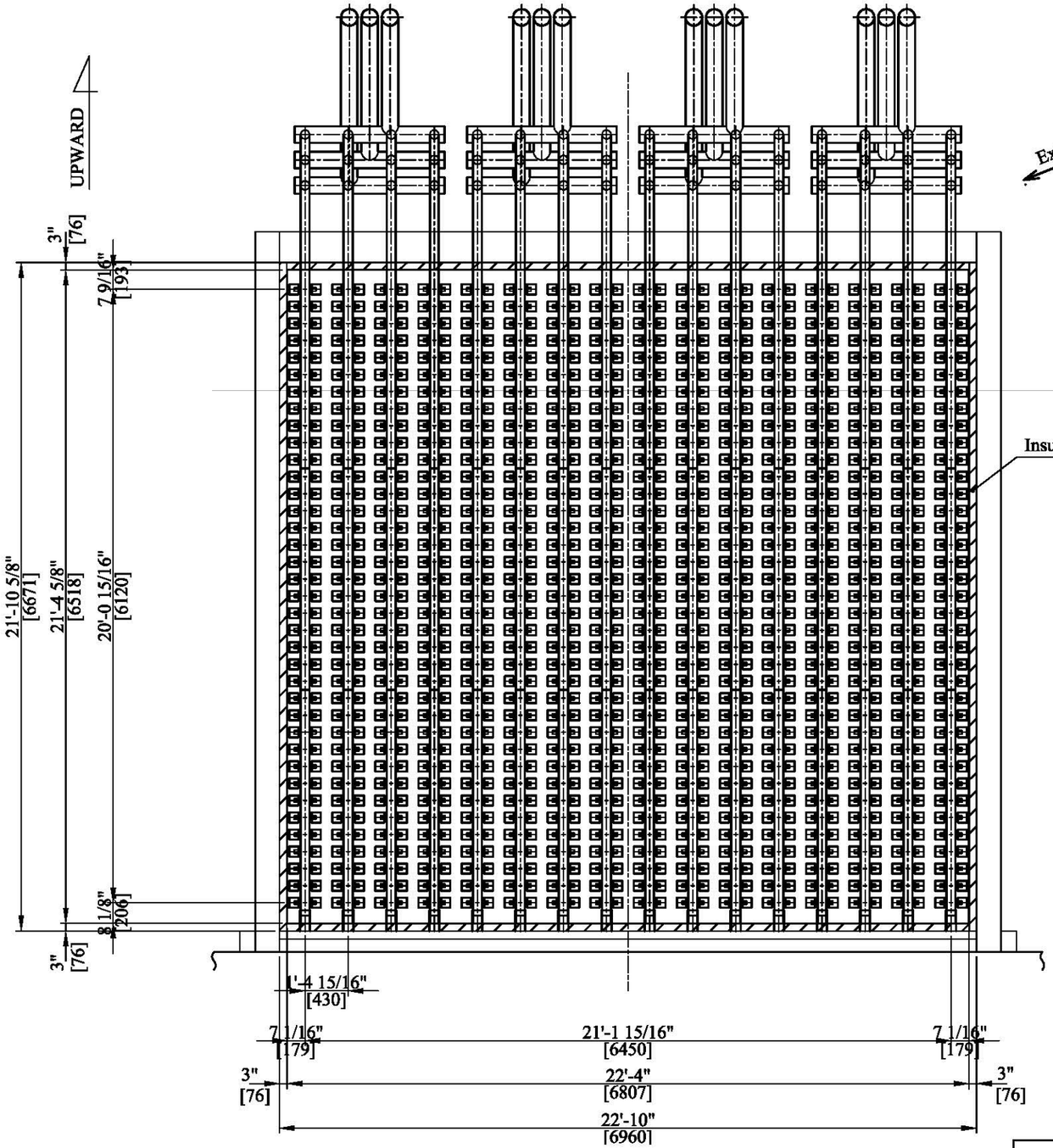
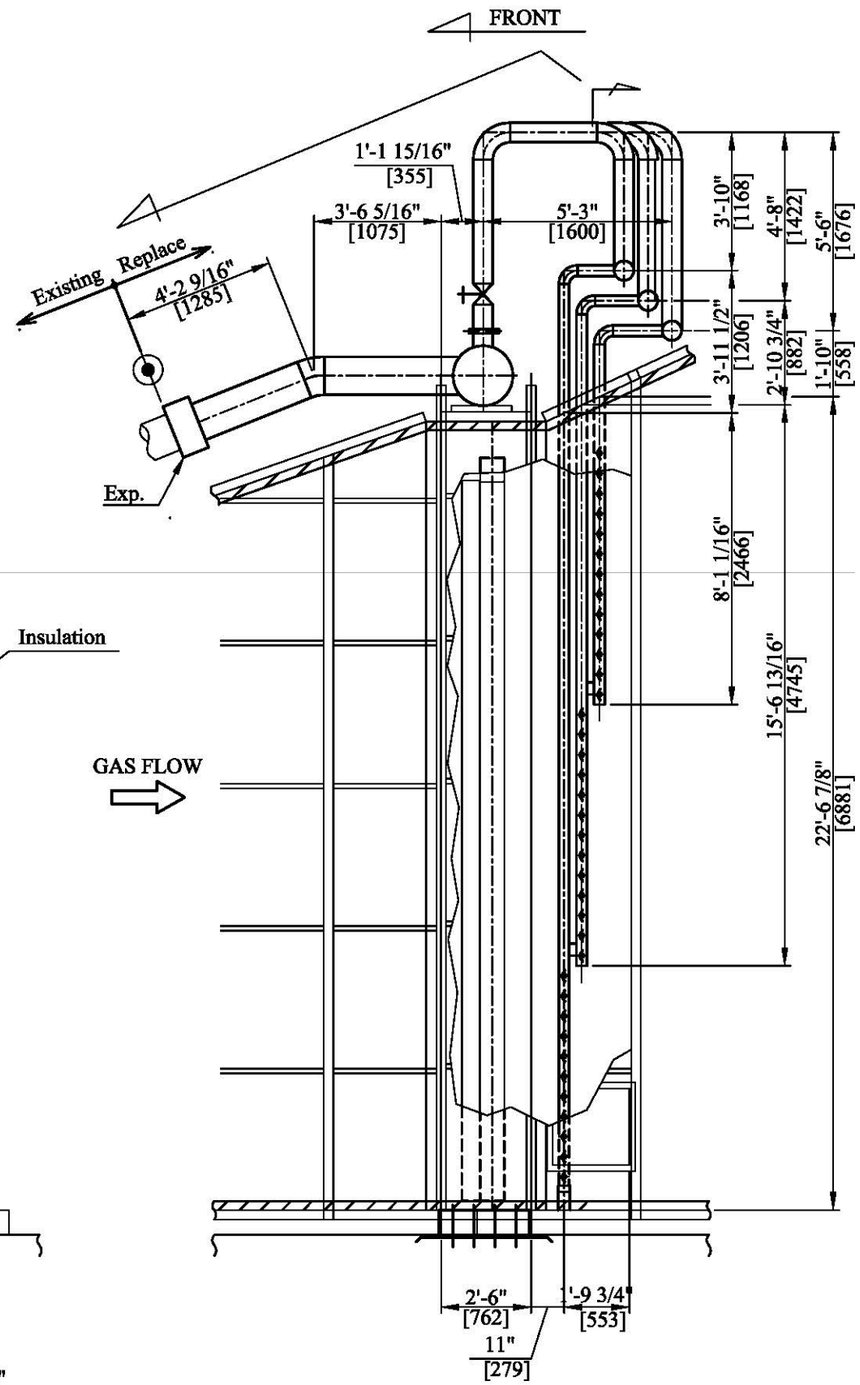
000STD-A3N-0

IHI Corporation

Conceptual

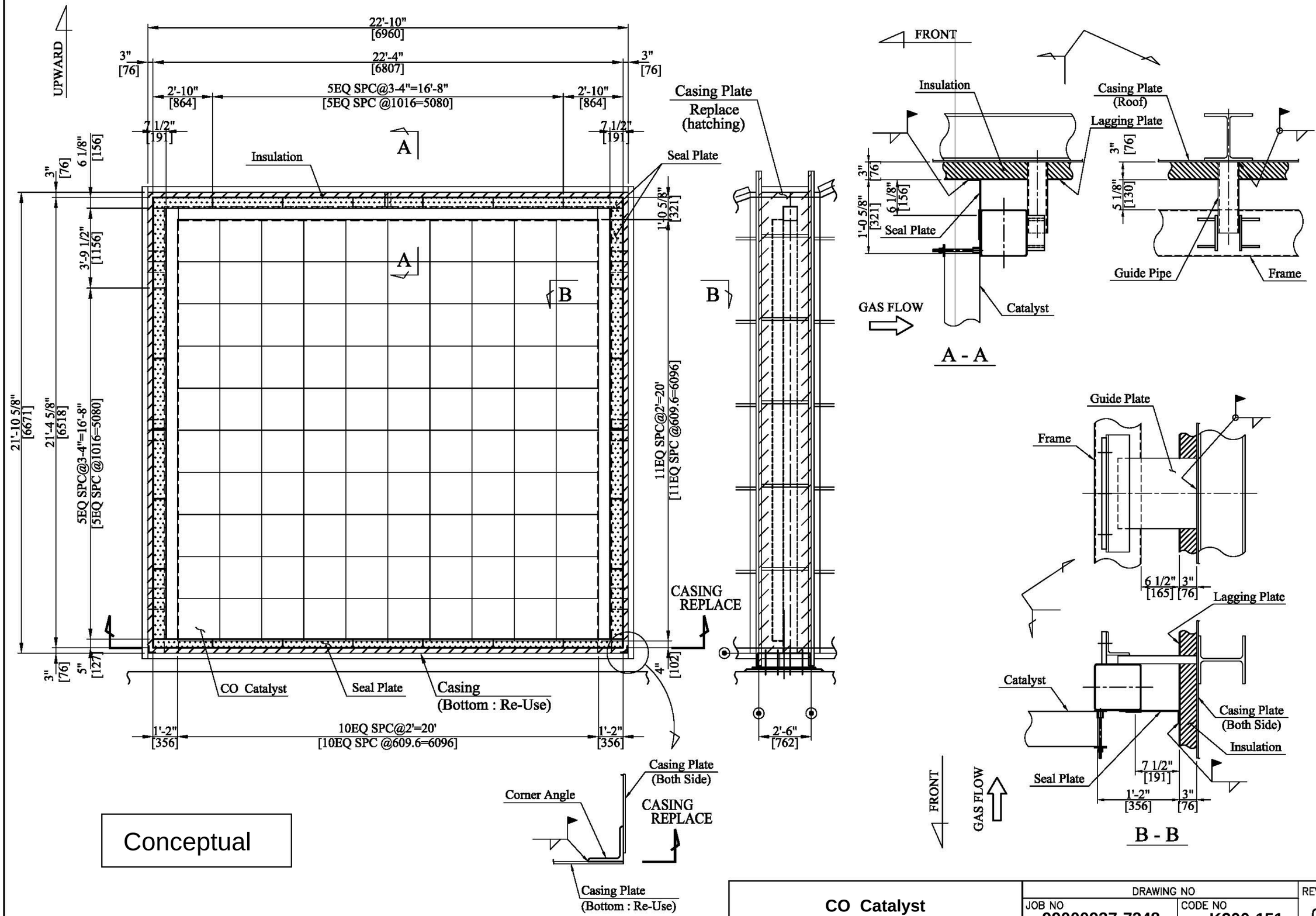




Ammonia Injection Grid	DRAWING NO		REV
	JOB NO 99000937-7248	CODE NO K200-151	0

000STD-A3N-0

IHI Corporation



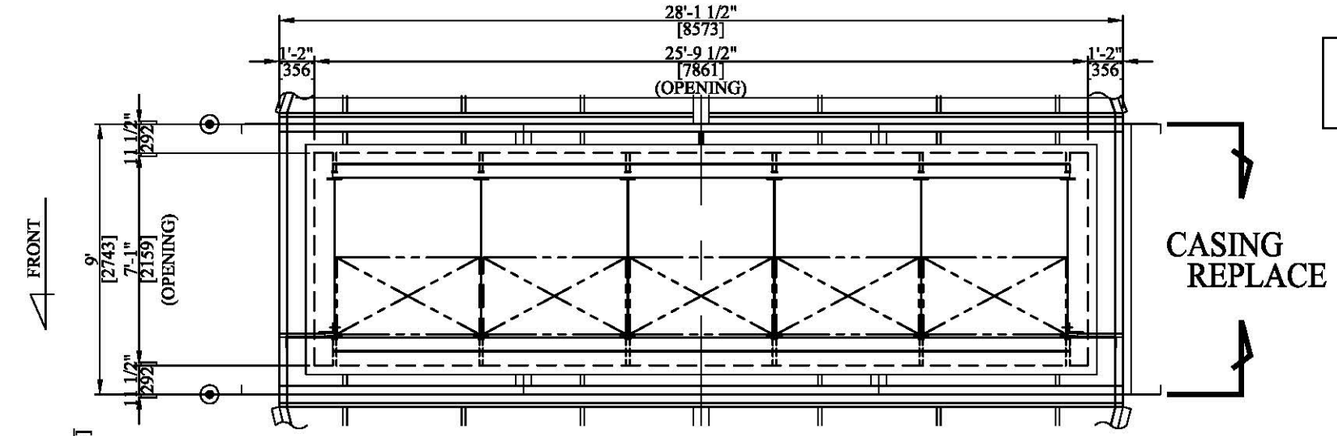
Conceptual

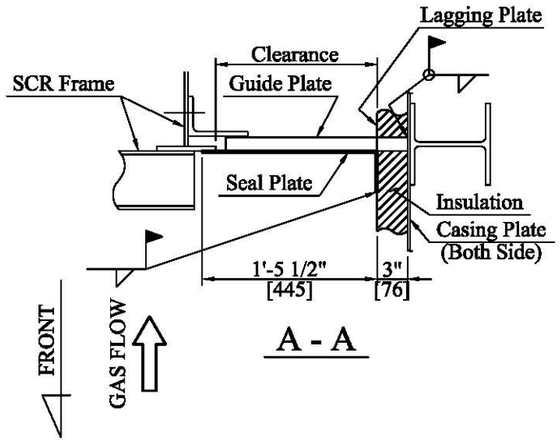
	DRAWING NO		REV
CO Catalyst	JOB NO 99000937-7248	CODE NO K200-151	0

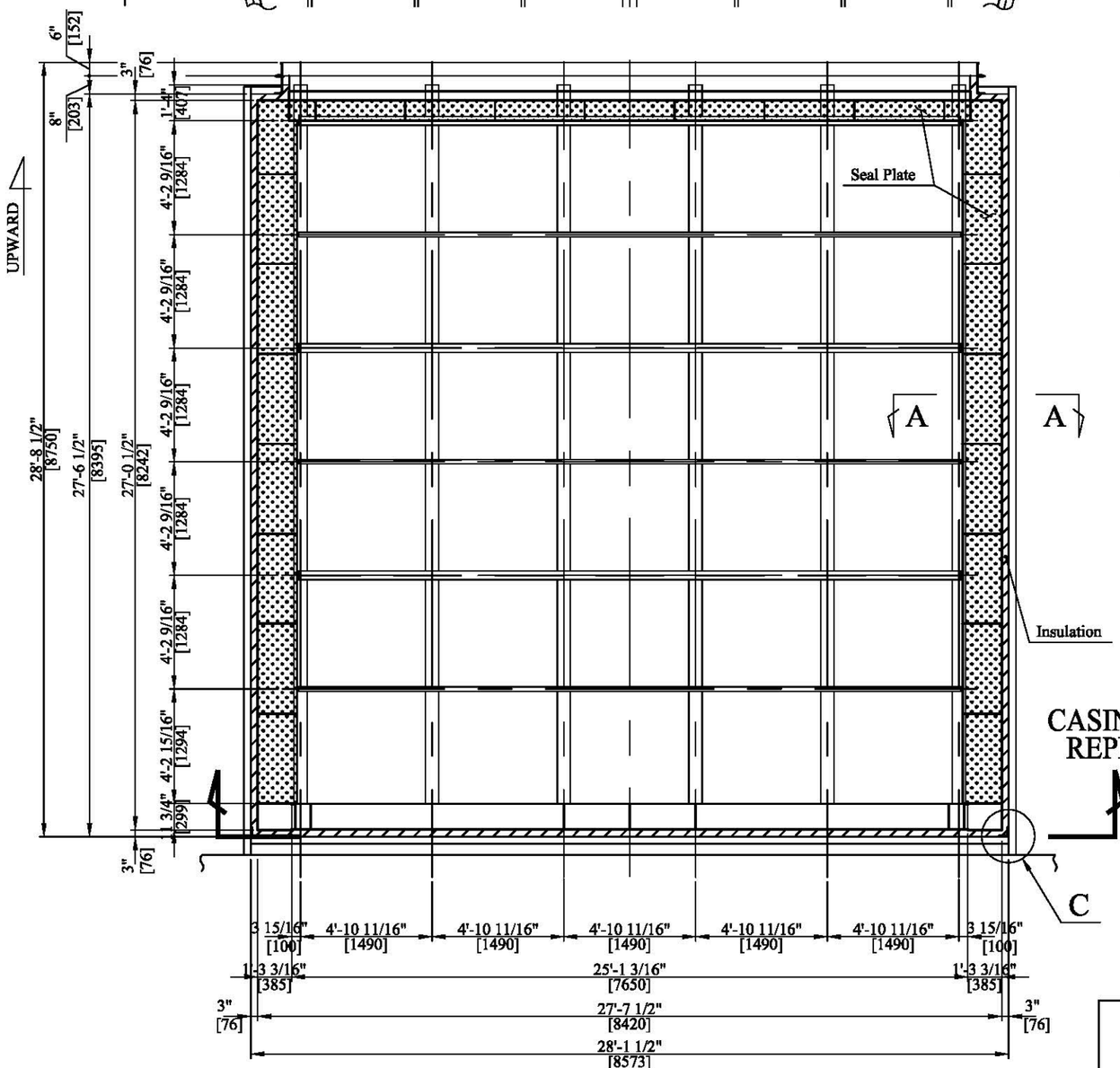
000STD-A3N-0

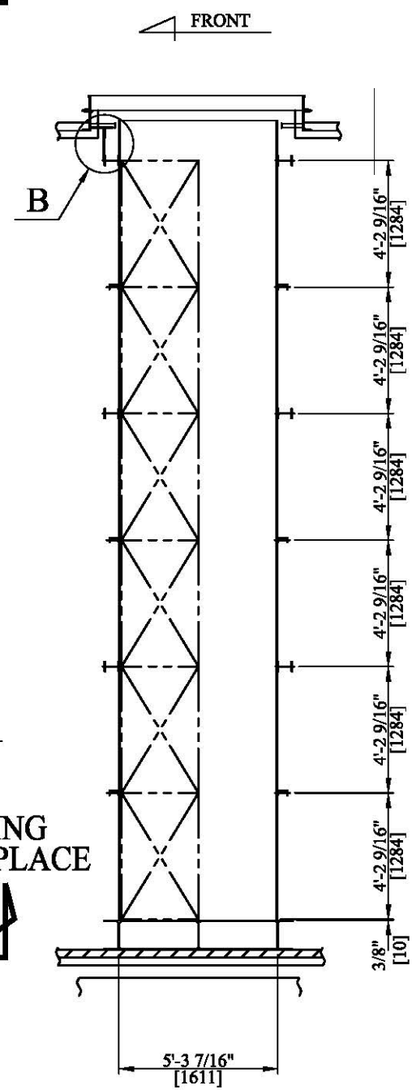
IHI Corporation

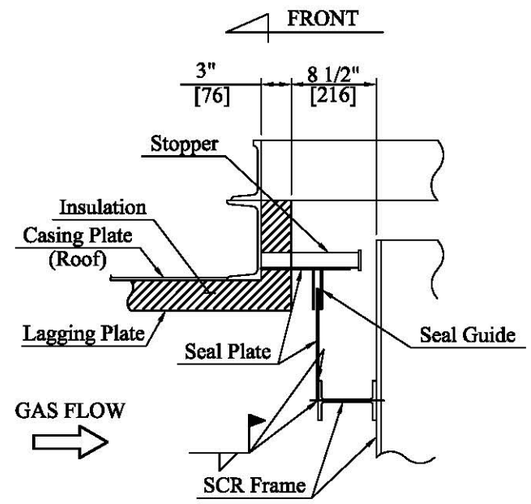
Conceptual

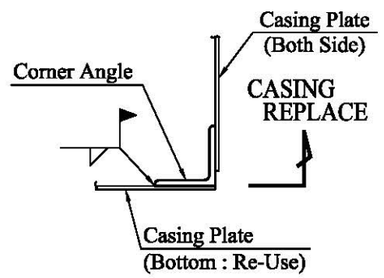










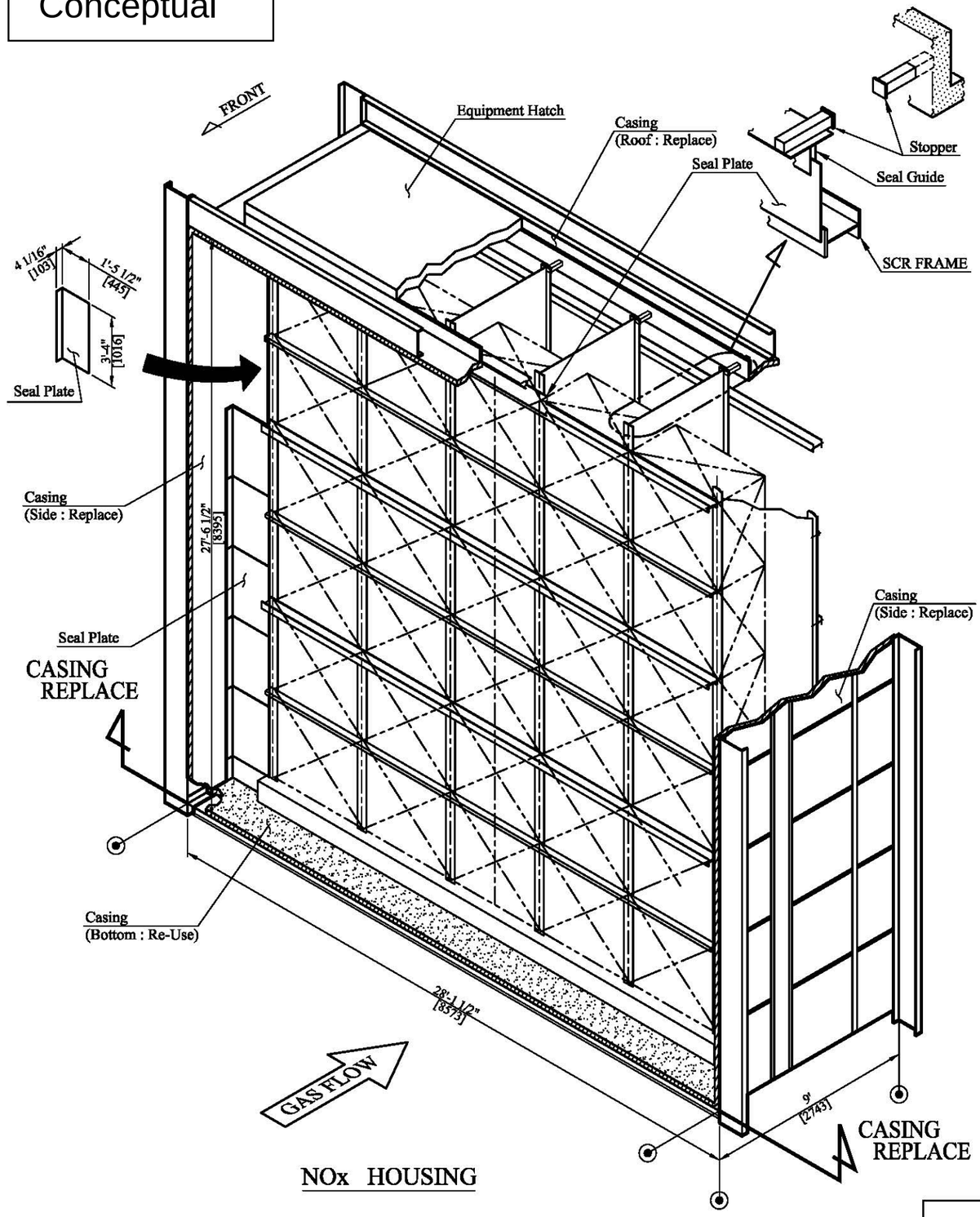


NOx Housing (1/2)	DRAWING NO		REV
	JOB NO 99000937-7248	CODE NO K200-151	0

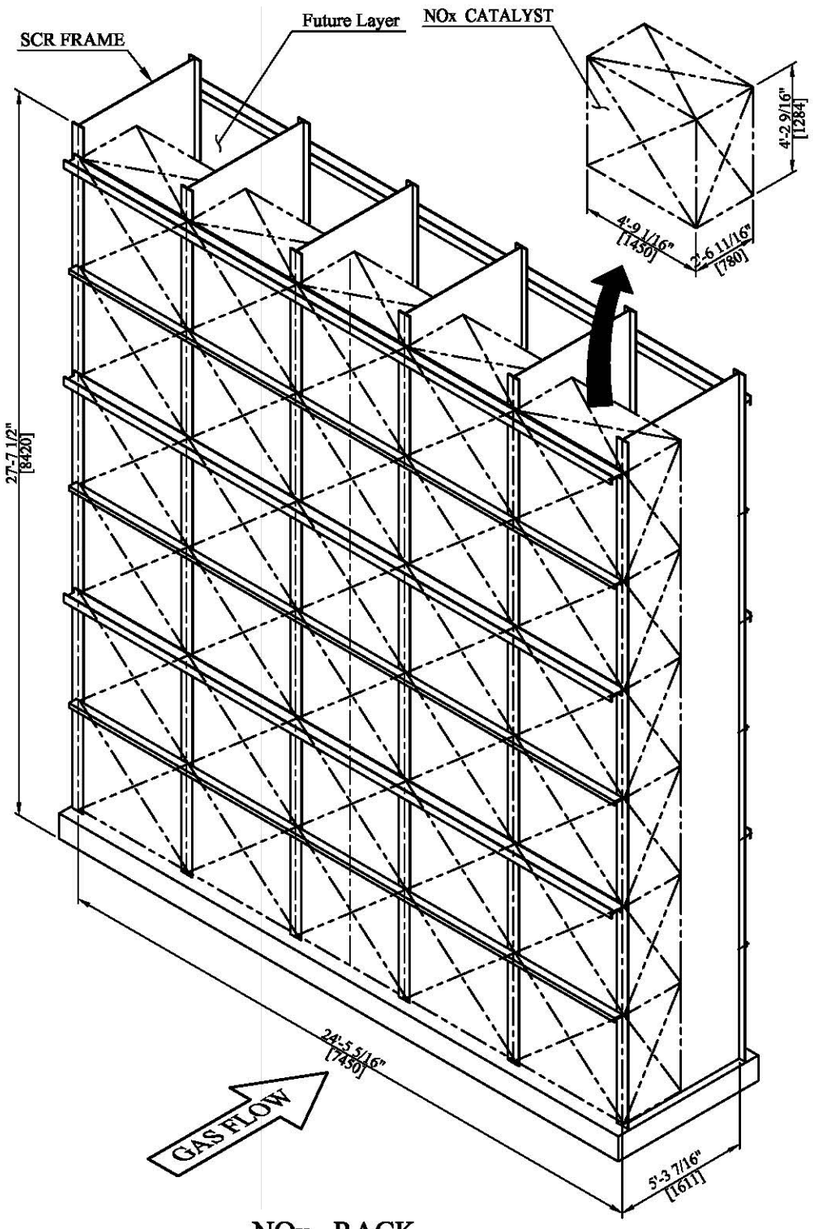
000STD–A3N–0

IHI Corporation

Conceptual



NOx HOUSING



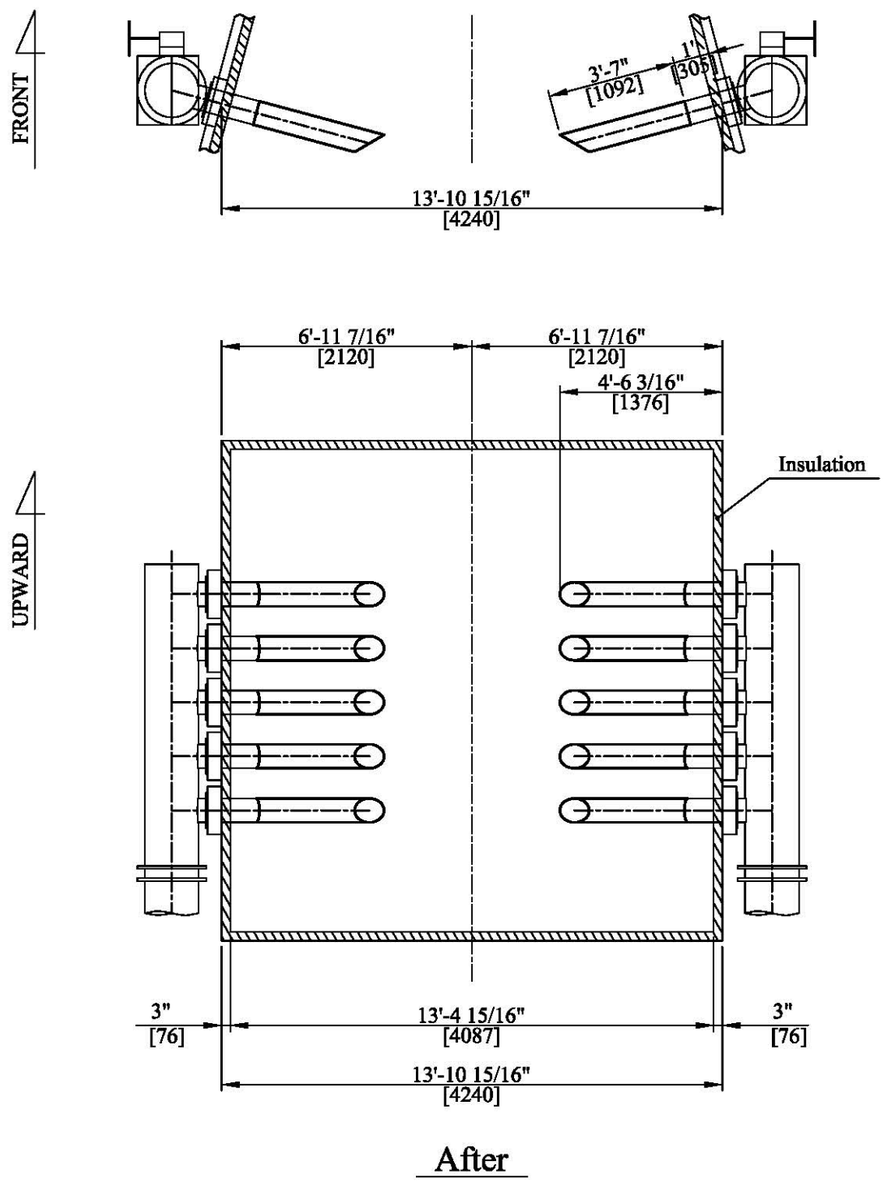
NOx RACK

NOx Housing (2/2)	DRAWING NO		REV
	JOB NO 99000937-7248	CODE NO K200-151	0

000STD-A3N-0

IHI Corporation

Conceptual



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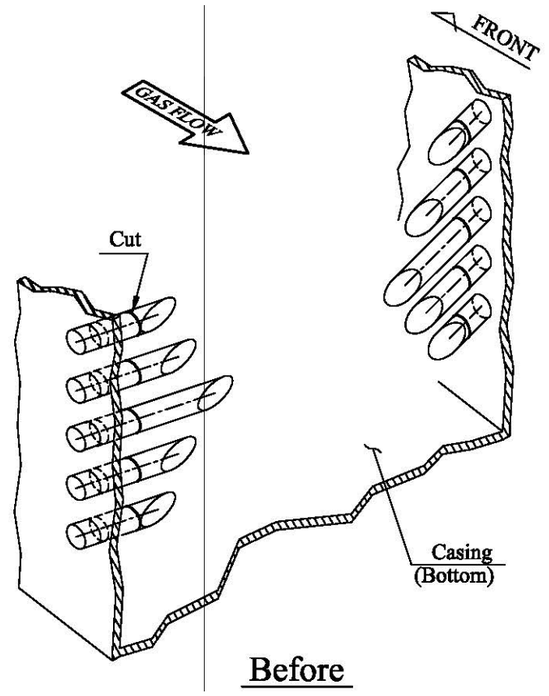

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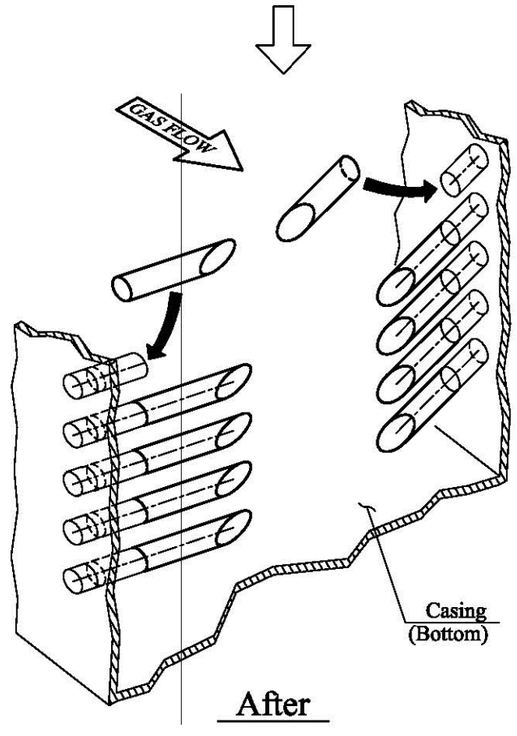

After

COOLING CHAMBER	DRAWING NO		REV
	JOB NO 99000937-7248	CODE NO K200-151	0

000STD-A3N-0

IHI Corporation

Appendix B

GE Turbine Data

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN

GE Energy

Performance By: **Jennifer Woods Mikolas**
Project Info: **Jpower - Perf Runs Over Guar Emissions Range**

Engine: **LM6000 PC-SPRINT w/ FIGV at -5 Degrees**
Deck Info: **G0125O - 8fk.scp** Date: **10/30/2007**
Generator: **MEID 800LL04 60Hz, 13.8kV, 0.9PF (14849)** Time: **4:06:43 PM**
Fuel: **Gas Fuel #10-1, 19000 Btu/lb,LHV** Version: **3.5.18**

			NOx, lbs	CO, lbs
Startup Ramp Rate:	12607 kW/min	Total Emissions at Startup	**3.1**	**1.1**

Case #	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**
Ambient Conditions																																			
Dry Bulb, °F	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
Wet Bulb, °F	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5
RH, %	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0
Altitude, ft	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0	410.0
Ambient Pressure, psia	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480	14.480
Engine Inlet																																			
Comp Inlet Temp, °F	46.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
RH, %	95.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0
Conditioning	CHILL	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
Tons or kBtu/hr	1476	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pressure Losses																																			
Inlet Loss, inH20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Volute Loss, inH20	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Exhaust Loss, inH20	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Time, min	10.0000	9.37	9.20	9.04	8.87	8.70	8.53	8.36	8.19	8.02	7.86	7.69	7.52	7.35	7.18	7.01	6.84	6.79	6.78	6.72	6.66	6.60	6.54	6.48	6.42	6.36	6.30	6.24	6.18	6.12	6.06	6.00	6.00	6.00	2
kW, Gen Terms	**50428**	**42526**	**40402**	**38276**	**36149**	**34024**	**31898**	**29767**	**27642**	**25515**	**23390**	**21264**	**19137**	**17010**	**14883**	**12756**	**10631**	**10000**	**9811**	**9063**	**8314**	**7565**	**6816**	**6066**	**5316**	**4566**	**3815**	**3064**	**2312**	**1560**	**807**	**55**	**37**	**37**	**37**
Est. Btu/kW-hr, LHV	**8530**	**8782**	**8879**	**9004**	**9139**	**9285**	**9460**	**9649**	**9891**	**10196**	**10449**	**10848**	**11352**	**11981**	**12829**	**13994**	**15633**	**15850**	**16049**	**16912**	**17925**	**19130**	**20587**	**22405**	**24720**	**27787**	**31967**	**38171**	**48458**	**68681**	**126864**	**1791884**	**2554175**	**2604638**	**2604638**
Guar. Btu/kW-hr, LHV	**8660**	**8916**	**9015**	**9141**	**9278**	**9426**	**9604**	**9795**	**10042**	**10351**	**10608**	**11013**	**11524**	**12164**	**13024**	**14207**	**15872**	**16092**	**16293**	**17169**	**18198**	**19422**	**20900**	**22746**	**25097**	**28210**	**32454**	**38752**	**49196**	**69727**	**128796**	**1819171**	**2593071**	**2644303**	**2644303**
Fuel Flow																																			
MMBtu/hr, LHV	430.1	373.5	358.7	344.6	330.3	315.9	301.7	287.2	273.4	260.1	244.4	230.7	217.2	203.8	190.9	178.5	166.2	158.5	157.5	153.3	149.0	144.7	140.3	135.9	131.4	126.9	122.0	116.9	112.0	107.1	102.4	97.7	95.2	95.2	95.2
lb/hr	22639	19656	18882	18138	17387	16626	15881	15116	14390	13692	12863	12140	11434	10726	10049	9395	8747	8342	8287	8066	7844	7617	7385	7153	6917	6678	6419	6155	5897	5639	5392	5141	5012	5009	5009
lb/min	377	328	315	302	290	277	265	252	240	228	214	202	191	179	167	157	146	139	138	134	131	127	123	119	115	111	107	103	98	94	90	86	84	83	83
scfm	7578	6580	6320	6071	5819	5566	5315	5060	4817	4582	4306	4064	3827	3591	3363	3145	2928	2792	2775	2701	2625	2549	2472	2394	2315	2236	2149	2060	1973	1887	1804	1721	1677	1677	1677
MMBtu	24.3	19.8	18.7	17.7	16.7	15.8	14.9	14.1	13.3	12.5	11.8	11.1	10.4	9.8	9.3	8.7	8.2	8.1	8.0	7.9	7.7	7.6	7.4	7.3	7.2	7.0	6.9	6.8	6.7	6.6	6.5	6.4	6.4	6.4	0.0
scf	25651.4	20901.9	19793.2	18727.5	17703.2	16722.3	15783.8	14885.3	14032.4	13219.8	12447.4	11721.2	11035.5	10389.9	9784.1	9216.6	8686.6	8540.0	8498.1	8333.5	8173.0	8017.1	7865.6	7718.6	7576.1	7438.4	7305.2	7177.2	7054.3	6936.6	6823.9	6716.3	6713.9	6713.9	0.0
NOx Control	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**	**NONE**
Water Injection																																			
lb/hr	20240	15801	14660	13572	12514	11522	10559	9561	8693	7875	9941	8948	8031	7127	6270	5504	4739	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temperature, °F	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPRINT	**LPC**	**LPC**	**LPC**	**LPC**	**LPC**	**LPC**	**LPC**	**LPC**	**LPC**	**LPC**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
lb/hr	8287	8755	8755	8755	8755	8755	8755	8755	8755	8755	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Control Parameters																																			
HP Speed, RPM	10436	10520	10447	10381	10309	10238	10178	10124	10044	9970	10001	9937	9867	9790	9714	9638	9563	9545	9538	9509	9481	9454	9425	9396	9367	9337	9297	9255	9208	9156	9088	9020	8987	8986	8986
LP Speed, RPM	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
PS3 - CDP, psia	458.3	410.2	400.2	389.5	378.7	367.8	357.0	346.3	335.3	323.0	311.2	299.3	286.5	273.2	260.9	247.7	233.6	229.3	228.0	222.9	217.8	212.5	207.0	201.2	195.4	189.5	185.1	180.9	176.6	172.1	167.8	163.0	160.7	160.6	160.6
T3CRF - CDT, °F	971	999	988	976	962	947	934	920	905	892	954	937	919	901	884	866	849	843	841	835	829	822	816	809	802	795	787	778	770	761	753	745	740	740	740
T48IN, °R	2038	2029	2006	1985	1964	1942	1919	1893	1870	1852	1865	1840	1818	1794	1769	1747	1728	1739	1737	1729	1720	1712	1704	1696	1688	1680	1659	1637	1615	1593	1573	1551	1540	1539	1539
T48IN, °F	1578	1569	1546	1526	1505	1482	1460	1434	1411	1393	1405	1381	1358	1335	1310	1288	1268	1279	1277	1269	1261	1252	1244	1237	1228	1220	1200	1177	1155	1133	1113	1092	1080	1080	1080
Exhaust Parameters																																			
Temperature, °F	840.3	863.0	852.5	845.1	836.8	827.3	818.4	807.2	798.9	795.2	811.8	803.8	798.0	793.1	789.1	789.6	794.4	807.5	807.8	809.3	810.3	812.2	814.0	817.2	820.1	822.9	814.6	804.2	794.6	785.0	777.3	768.4	763.3	763.1	763.1
lb/sec	297.8	267.0	262.1	256.6	251.0	245.3	239.6	234.2	228.2	221.0	213.1	206.4	198.9	190.9	183.7	175.5	166.5	163.4	162.6	159.3	156.1	152.7	149.1	145.3	141.5	137.6	135.2	133.1	130.8	128.5	125.9	123.5	122.2	122.2	122.2
lb/hr	1072059	961095	943733	923672	903588	883233	862715	843039	821590	795586	767141	742665	715912	687277	661229	631877	599570	588189	585311	573595	562093	549629	536823	523065	509236	495338	486862	479138	470974	462563	453402	444439	439909	439820	439820
Energy, Btu/s- Ref 0 °R	100311	91884	89334	86802	84231	81583	79003	76368	73815	71181	69214	66488	63679	60804	58219	55597	52910	52107	51864	50880	49897	48861	47784	46678	45547	44400	43324	42243	41170	40086	39017	37934	37375	37360	37360
Energy, Btu/s- Ref T2 °F	62403	55070	53229	51503	49737	47903	46142	44296	42592	40974	40242	38464	36704	34937	33362	31867	30415	30190	30054	29510	28958	28388	27791	27200	26586	25958	25202	24418	23654	22890	22168	21424	21037	21026	21026
Cp, Btu/lb-R	0.2771	0.2788	0.2780	0.2773	0.2766	0.2758	0.2750	0.2742	0.2734	0.2730	0.2719	0.2712	0.2706	0.2700	0.2694	0.2691	0.2689	0.2673	0.2673	0.2673	0.2673	0.2673	0.2673	0.2674	0.2675	0.2675	0.2671	0.2665	0.2660	0.2655	0.2651	0.2646	0.2643	0.2643	0.2643
Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)																																			
NOx ppmvd Ref 15% O2	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	79	78	76	73	70	67	65	62	59	56	53	50	47	44	41	40	40	40
NOx as NO2, lb/hr	43	38	36	35	33	32	30	29	28	26	25	23	22	21	19	18	17	50	50	47	44	41	38	35	33	30	27	25	22	20	18	16	15	15	15
NOx, lb/min	0.72	0.63	0.60	0.58	0.56	0.53	0.51	0.48	0.46	0.44	0.41	0.39	0.37	0.34	0.32	0.30	0.28	0.84	0.83	0.78	0.73	0.68	0.63	0.59	0.54	0.50	0.46	0.41	0.37	0.34	0.30	0.27	0.25	0.25	0.25
CO ppmvd Ref 15% O2	20	7	7	7	7	7	7	7	7	7	11	11	11	10	10	10	9	6	6	7	8	9	10	11	12	13	15	18	21	24	28	33	36	36	36
CO, lb/hr	21.23	6.78	6.57	6.27	6.00	5.78	5.41	4.98	4.71	4.41	6.53	6.01	5.66	5.22	4.69	4.33	3.83	2.44	2.49	2.72	2.93	3.13	3.35	3.59	3.86	4.16	4.52	5.01	5.62	6.34	7.07	7.94	8.44	8.45	8.45
CO, lb/min	0.35	0.11	0.11	0.10	0.10	0.10	0.09	0.08	0.08	0.07	0.11	0.10	0.09	0.09	0.08	0.07	0.06	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.08	0.08	0.09	0.11	0.12	0.13	0.14	0.14	0.14
CO2, lb/hr	57198.54	49688.16	47739.35	45866.93	43976.45	42062.26	40186.39	38260.76	36432.34	34670.15	32594.24	30772.52	28989.14	27204.22	25495.38	23842.55	22204.38	21187.93	21047.55	20489.04	19924.44	19350.70	18762.63	18174.85	17574.75	16967.88	16314.33	15649.22	14996.91	14345.58	13719.34	13084.32	12759.38	12751.30	12751.30
CO2, lb/min	953.31	828.14	795.66	764.45	732.94	701.04	669.77	637.68	607.21	577.84	543.24	512.88	483.15	453.40	424.92	397.38	370.07	353.13	350.79	341.48	332.07	322.51	312.71	302.91	292.91	282.80	271.91	260.82	249.95	239.09	228.66	218.07	212.66	212.52	212.52
HC ppmvd Ref 15% O2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	4	4	4
HC, lb/hr	1.36	1.18	1.13	1.09	1.04	1.00	0.95	0.91	0.86	0.82	0.77	0.73	0.69	0.64	0.60	0.56	0.52	0.50	0.50	0.48	0.47	0.46	0.44	0.43	0.42	0.40	0.39	0.37	0.35	0.39	0.44	0.50	0.54	0.54	0.54
VOC ppmvd Ref 15% O2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
VOC, lb/hr	1.21	1.05	1.01	0.97	0.93	0.89	0.85	0.81	0.77	0.73	0.69	0.65	0.61	0.57	0.54	0.50	0.47	0.44	0.44	0.43	0.42	0.41	0.39	0.38	0.37	0.36	0.34	0.33	0.31	0.30	0.29	0.31	0.33	0.33	0.33
VOC, lb/min	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01
PM10, lb/hr	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
PM10, lb/min	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
SOX as SO2, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Emissions From Startup To Full Load																																			
NOx, lbs	**3.1**	2.6	2.5	2.4	2.3	2.2	2.1	2.1	2.0	1.9	1.8	1.8	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	0.0
CO, lbs	**1.1**	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0
VOC, lbs	**0.1**	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.022	0.0
PM10, lbs	**0.4**	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN

GE Energy

Performance By: **Jennifer Woods Mikolas**
Project Info: **Jpower - Perf Runs Over Guar Emissions Range**

Engine: **LM6000 PC-SPRINT w/ FIGV at -5 Degrees**
Deck Info: **G0125O - 8fk.scp**
Generator: **MEID 800LL04 60Hz, 13.8kV, 0.9PF (14849)**
Fuel: **Gas Fuel #10-1, 19000 Btu/lb,LHV**

Date: **10/30/2007**
Time: **4:06:43 PM**
Version: **3.5.18**

			NOx, lbs	CO, lbs
Startup Ramp Rate:	0 kW/min	Total Emissions at Startup	**0.0**	**0.0**

Case #	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**
Maximum Emissions																																			
NOx ppmvd Ref 15% O2	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**79**	**78**	**76**	**73**	**70**	**67**	**65**	**62**	**59**	**56**	**53**	**50**	**47**	**44**	**41**	**40**	**40**	**40**
NOx as NO2, lb/hr	**43**	**38**	**36**	**35**	**33**	**32**	**30**	**29**	**28**	**26**	**25**	**23**	**22**	**21**	**19**	**18**	**17**	**50**	**50**	**47**	**44**	**41**	**38**	**35**	**33**	**30**	**27**	**25**	**22**	**20**	**18**	**16**	**15**	**15**	**15**
CO ppmvd Ref 15% O2	**42**	**18**	**31**	**31**	**16**	**18**	**31**	**31**	**16**	**18**	**31**	**31**	**16**	**18**	**31**	**31**	**16**	**18**	**31**	**31**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
CO, lb/hr	**43.90**	**16.41**	**27.40**	**26.32**	**12.61**	**13.87**	**23.03**	**21.91**	**10.43**	**11.41**	**18.64**	**17.59**	**8.28**	**8.93**	**14.55**	**13.60**	**6.33**	**6.94**	**11.99**	**11.67**	**5.67**	**5.51**	**5.34**	**5.17**	**5.00**	**4.83**	**4.64**	**4.45**	**4.26**	**4.07**	**3.89**	**3.71**	**3.61**	**3.61**	**3.61**
HC ppmvd Ref 15% O2	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**11**	**12**	**12**	**12**
HC, lb/hr	**6.05**	**5.25**	**5.04**	**4.84**	**4.64**	**4.44**	**4.24**	**4.03**	**3.84**	**3.65**	**3.43**	**3.24**	**3.05**	**2.86**	**2.68**	**2.50**	**2.33**	**2.22**	**2.21**	**2.15**	**2.09**	**2.03**	**1.96**	**1.90**	**1.84**	**1.78**	**1.71**	**1.64**	**1.57**	**1.50**	**1.43**	**1.54**	**1.65**	**1.65**	**1.65**
VOC ppmvd Ref 15% O2	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**
VOC, lb/hr	**1.21**	**1.05**	**1.01**	**0.97**	**0.93**	**0.89**	**0.85**	**0.81**	**0.77**	**0.73**	**0.69**	**0.65**	**0.61**	**0.57**	**0.54**	**0.50**	**0.47**	**0.44**	**0.44**	**0.43**	**0.42**	**0.41**	**0.39**	**0.38**	**0.37**	**0.36**	**0.34**	**0.33**	**0.31**	**0.30**	**0.29**	**0.31**	**0.33**	**0.33**	**0.33**
PM10, lb/hr	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**	**2.70**
PM10, lb/hr (Prorated to flowrate)	**2.70**	**2.47**	**2.40**	**2.34**	**2.27**	**2.20**	**2.13**	**2.07**	**2.00**	**1.93**	**1.88**	**1.80**	**1.73**	**1.65**	**1.58**	**1.51**	**1.44**	**1.42**	**1.41**	**1.39**	**1.36**	**1.33**	**1.30**	**1.27**	**1.24**	**1.21**	**1.18**	**1.15**	**1.12**	**1.10**	**1.07**	**1.04**	**1.02**	**1.02**	**1.02**
SO2, lb/hr (Using fuel input)	**1.00**	**0.87**	**0.84**	**0.80**	**0.77**	**0.74**	**0.70**	**0.67**	**0.64**	**0.61**	**0.57**	**0.54**	**0.51**	**0.48**	**0.44**	**0.42**	**0.39**	**0.37**	**0.37**	**0.36**	**0.35**	**0.34**	**0.33**	**0.32**	**0.31**	**0.30**	**0.28**	**0.27**	**0.26**	**0.25**	**0.24**	**0.23**	**0.22**	**0.22**	**0.22**
Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)																																			
AR	1.2184	1.2129	1.2146	1.2162	1.2177	1.2193	1.2208	1.2225	1.2240	1.2253	1.2341	1.2358	1.2373	1.2389	1.2405	1.2419	1.2433	1.2539	1.2539	1.2540	1.2542	1.2543	1.2544	1.2545	1.2546	1.2548	1.2551	1.2556	1.2560	1.2564	1.2568	1.2572	1.2574	1.2574	1.2574
N2	71.6258	71.2996	71.3951	71.4823	71.5707	71.6568	71.7424	71.8385	71.9212	71.9943	72.5085	72.6049	72.6907	72.7779	72.8711	72.9503	73.0287	73.6433	73.6449	73.6513	73.6585	73.6649	73.6717	73.6771	73.6834	73.6902	73.7099	73.7322	73.7538	73.7755	73.7954	73.8168	73.8283	73.8286	73.8286
O2	14.4895	14.6245	14.8108	14.9685	15.1350	15.3088	15.4820	15.6803	15.8524	15.9827	16.2939	16.4743	16.6312	16.7863	16.9595	17.1001	17.2228	17.5529	17.5622	17.5979	17.6387	17.6745	17.7126	17.7431	17.7781	17.8163	17.9278	18.0538	18.1756	18.2990	18.4112	18.5329	18.5976	18.5994	18.5994
CO2	5.3354	5.1700	5.0586	4.9657	4.8669	4.7623	4.6581	4.5384	4.4344	4.3578	4.2488	4.1419	4.0493	3.9583	3.8558	3.7733	3.7034	3.6022	3.5960	3.5720	3.5447	3.5207	3.4951	3.4747	3.4512	3.4255	3.3507	3.2661	3.1842	3.1013	3.0259	2.9440	2.9005	2.8992	2.8992
H20	7.3261	7.6895	7.5174	7.3640	7.2065	7.0495	6.8935	6.7172	6.5651	6.4370	5.7116	5.5401	5.3885	5.2357	5.0704	4.9317	4.7991	3.9414	3.9366	3.9186	3.8979	3.8798	3.8605	3.8452	3.8274	3.8081	3.7516	3.6877	3.6258	3.5633	3.5064	3.4447	3.4119	3.4109	3.4109
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0020	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0009	0.0008	0.0008	0.0008	0.0007	0.0007	0.0006	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0008	0.0008	0.0009	0.0010	0.0012	0.0014	0.0016	0.0018	0.0019	0.0019	0.0019
HC	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
NOX	0.0028	0.0027	0.0026	0.0026	0.0025	0.0025	0.0024	0.0024	0.0023	0.0023	0.0022	0.0022	0.0021	0.0021	0.0020	0.0020	0.0019	0.0059	0.0058	0.0056	0.0053	0.0051	0.0049	0.0046	0.0044	0.0042	0.0039	0.0036	0.0033	0.0030	0.0027	0.0025	0.0024	0.0024	0.0024
Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)																																			
AR	0.9647	0.9639	0.9631	0.9625	0.9619	0.9613	0.9606	0.9599	0.9592	0.9587	0.9579	0.9572	0.9567	0.9561	0.9555	0.9550	0.9546	0.9538	0.9538	0.9536	0.9535	0.9533	0.9532	0.9531	0.9529	0.9528	0.9523	0.9519	0.9514	0.9509	0.9505	0.9500	0.9498	0.9498	0.9498
N2	80.8723	80.7945	80.7300	80.6761	80.6191	80.5593	80.5000	80.4322	80.3736	80.3301	80.2558	80.1962	80.1447	80.0942	80.0377	79.9923	79.9536	79.8831	79.8799	79.8675	79.8533	79.8408	79.8276	79.8170	79.8048	79.7916	79.7527	79.7088	79.6663	79.6234	79.5845	79.5422	79.5198	79.5192	79.5192
O2	14.3230	14.5086	14.6621	14.7903	14.9258	15.0679	15.2089	15.3702	15.5097	15.6129	15.7894	15.9312	16.0536	16.1737	16.3081	16.4162	16.5082	16.6695	16.6773	16.7072	16.7413	16.7712	16.8030	16.8285	16.8576	16.8895	16.9824	17.0871	17.1883	17.2905	17.3834	17.4839	17.5373	17.5388	17.5388
CO2	3.8347	3.7292	3.6411	3.5675	3.4897	3.4081	3.3271	3.2345	3.1544	3.0952	2.9936	2.9122	2.8419	2.7729	2.6958	2.6338	2.5809	2.4873	2.4828	2.4657	2.4461	2.4290	2.4107	2.3961	2.3794	2.3611	2.3078	2.2476	2.1894	2.1306	2.0772	2.0194	1.9886	1.9877	1.9877
H20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0022	0.0008	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0007	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008	0.0009	0.0010	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0021	0.0021
HC	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
NOX	0.0028	0.0027	0.0026	0.0026	0.0025	0.0025	0.0024	0.0023	0.0023	0.0022	0.0022	0.0021	0.0021	0.0020	0.0019	0.0019	0.0019	0.0057	0.0056	0.0054	0.0051	0.0049	0.0047	0.0045	0.0042	0.0040	0.0037	0.0034	0.0031	0.0029	0.0026	0.0024	0.0023	0.0023	0.0023
Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)																																			
AR	0.8548	0.8488	0.8507	0.8524	0.8541	0.8558	0.8575	0.8593	0.8610	0.8624	0.8722	0.8741	0.8758	0.8775	0.8793	0.8809	0.8825	0.8943	0.8944	0.8945	0.8947	0.8948	0.8950	0.8951	0.8952	0.8954	0.8958	0.8963	0.8968	0.8973	0.8977	0.8982	0.8984	0.8984	0.8984
N2	71.6553	71.1533	71.3047	71.4428	71.5831	71.7204	71.8569	72.0106	72.1429	72.2596	73.0723	73.2280	73.3667	73.5078	73.6588	73.7873	73.9144	74.9033	74.9062	74.9170	74.9295	74.9404	74.9520	74.9613	74.9719	74.9836	75.0175	75.0558	75.0929	75.1304	75.1646	75.2015	75.2212	75.2218	75.2218
O2	12.6906	12.7773	12.9503	13.0975	13.2528	13.4146	13.5760	13.7608	13.9214	14.0443	14.3761	14.5469	14.6959	14.8437	15.0084	15.1428	15.2613	15.6303	15.6389	15.6716	15.7090	15.7418	15.7768	15.8047	15.8368	15.8718	15.9741	16.0897	16.2016	16.3148	16.4179	16.5298	16.5862	16.5909	16.5909
CO2	3.3976	3.2842	3.2160	3.1592	3.0986	3.0341	2.9699	2.8959	2.8314	2.7842	2.7256	2.6591	2.6015	2.5449	2.4809	2.4295	2.3860	2.3322	2.3282	2.3129	2.2953	2.2799	2.2635	2.2504	2.2353	2.2188	2.1707	2.1164	2.0637	2.0104	1.9619	1.9092	1.8811	1.8803	1.8803
H20	11.3970	11.9330	11.6751	11.4450	11.2083	10.9720	10.7368	10.4705	10.2405	10.0467	8.9508	8.6890	8.4572	8.2234	7.9699	7.7569	7.5533	6.2339	6.2265	6.1983	6.1660	6.1377	6.1076	6.0836	6.0559	6.0257	5.9373	5.8374	5.7407	5.6428	5.5537	5.4571	5.4057	5.4042	5.4042
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0020	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0009	0.0008	0.0008	0.0008	0.0007	0.0007	0.0006	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0008	0.0008	0.0009	0.0009	0.0011	0.0012	0.0014	0.0016	0.0018	0.0020	0.0020
HC	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
NOX	0.0025	0.0024	0.0023	0.0023	0.0022	0.0022	0.0022	0.0021	0.0021	0.0020	0.0020	0.0019	0.0019	0.0018	0.0018	0.0018	0.0017	0.0053	0.0052	0.0050	0.0048	0.0046	0.0044	0.0042	0.0040	0.0038	0.0035	0.0032	0.0030	0.0027	0.0025	0.0023	0.0021	0.0021	0.0021

Aero Energy Fuel Number **10-1 (GEDEF)**

	Volume %	Weight %
Hydrogen	0.0000	0.0000
Methane	84.5000	71.8447
Ethane	5.5800	8.8924
Ethylene	0.0000	0.0000
Propane	2.0500	4.7909
Propylene	0.0000	0.0000
Butane	0.7800	2.4027
Butylene	0.0000	0.0000
Butadiene	0.0000	0.0000
Pentane	0.1800	0.6883
Cyclopentane	0.0000	0.0000
Hexane	0.1700	0.7764
Heptane	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000
Carbon Dioxide	0.6700	1.5628
Nitrogen	5.9300	8.8044
Water Vapor	0.0000	0.0000
Oxygen	0.1400	0.2374
Hydrogen Sulfide	0.0000	0.0000
Ammonia	0.0000	0.0000

Btu/lb, LHV	19000
Btu/scf, LHV	946
Btu/scf, HHV	1047
Btu/lb, HHV	20996
Fuel Temp, °F	77.0
NOx Scalar	0.998
Specific Gravity	0.65

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN

GE Energy

Performance By: **Jennifer Woods Mikolas**
Project Info: **Jpower - Perf Runs Over Guar Emissions Range**

Engine: **LM6000 PC-SPRINT w/ FIGV at -5 Degrees**
Deck Info: **G0125O - 8fk.scp**
Generator: **MEID 800LL04 60Hz, 13.8kV, 0.9PF (14849)**
Fuel: **Gas Fuel #10-1, 19000 Btu/lb,LHV**

Date: **10/30/2007**
Time: **4:06:43 PM**
Version: **3.5.18**

						NOx, lbs	CO, lbs																													
Startup Ramp Rate:	0 kW/min			Total Emissions at Startup		**0.0**	**0.0**																													
Case #	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**
Engine Exhaust																																			
Exhaust Avg. Mol. Wt., Wet Basis	28.0	28.0	28.0	28.0	28.0	28.0	28.1	28.1	28.1	28.1	28.2	28.3	28.3	28.3	28.3	28.3	28.4	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5
Exhaust Flow, ACFM	596000	544978	530476	515917	501126	485887	471000	455841	441028	425554	414097	398189	381673	364726	349490	333900	317830	313522	312057	306147	300241	294006	287530	280852	274032	267116	260818	254521	248240	241888	235587	229214	225922	225838	225838
Exhaust Flow, SCFM	228077	205379	201512	197078	192647	188176	183681	179356	174675	169025	162469	157209	151346	145155	139527	133217	126294	123284	122677	120208	117783	115158	112463	109570	106662	103742	101955	100312	98585	96807	94875	92985	92029	92010	92010
Exhaust Flow, Btu/lb	337	344	341	338	336	333	330	326	323	322	325	322	320	318	317	317	318	319	319	319	320	320	320	321	322	323	320	317	315	312	310	307	306	306	306
Exhaust Flow, Calories/s	25278465	23154756	22512243	21874216	21226141	20558822	19908726	19244683	18601325	17937490	17441918	16755063	16047026	15322722	14671250	14010450	13333349	13131012	13069618	12821864	12573969	12312889	12041595	11762964	11477945	11188782	10917584	10645329	10374772	10101635	9832256	9559442	9418495	9414844	9414844
Inlet Flow Wet, pps	287.3	259.6	259.6	260.0	260.2	260.1	259.8	259.4	259.2	260.3	252.1	253.0	254.8	256.8	258.0	259.9	261.9	262.3	262.5	263.0	263.4	263.9	264.3	264.7	265.0	265.3	265.2	265.0	264.8	264.6	264.4	264.0	263.9	263.8	263.8
Inlet Flow Dry, pps	285.5	256.4	256.3	256.7	256.9	256.8	256.5	256.1	256.0	257.0	248.9	249.8	251.6	253.5	254.7	256.6	258.6	259.0	259.1	259.6	260.0	260.5	260.9	261.3	261.7	261.9	261.8	261.7	261.5	261.3	261.0	260.7	260.5	260.5	260.5
Shaft HP	68776	58077	55202	52325	49448	46575	43703	40825	37957	35089	32226	29364	26504	23647	20793	17942	15097	14253	14000	13000	12000	11000	10000	9000	8000	7000	6000	5000	4000	3000	2000	1000	500	490	490
Generator Information																																			
Capacity kW	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499	57499
Efficiency	0.983	0.982	0.981	0.981	0.980	0.980	0.979	0.978	0.977	0.975	0.973	0.971	0.968	0.965	0.960	0.953	0.944	0.941	0.940	0.935	0.929	0.922	0.914	0.904	0.891	0.875	0.853	0.822	0.775	0.697	0.541	0.073	0.100	0.100	0.100
Inlet Temp, °F	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
Gear Box Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRQ48, Torque Limit Cold End	122777	105653	101476	97193	92955	88785	84667	80555	76402	72001	68604	64349	59935	55464	51081	46508	41789	40420	40004	38357	36718	35037	33353	31624	29906	28206	26853	25546	24244	22945	21660	20390	19754	19741	19741
Correct Control Parameters																																			
PS3/QA, psia	464.090	415.382	405.256	394.421	383.484	372.447	361.510	350.675	339.536	327.081	315.132	303.081	290.120	276.652	264.196	250.829	236.551	232.197	230.881	225.716	220.552	215.185	209.615	203.742	197.869	191.894	187.439	183.185	178.831	174.274	169.717	165.059	162.730	162.629	162.629
XN2SR3, rpm	6302	6301	6285	6272	6255	6239	6228	6222	6200	6182	6070	6062	6053	6040	6027	6015	6006	6008	6007	6002	5999	5996	5993	5990	5987	5986	5979	5972	5963	5951	5926	5904	5894	5893	5893
8th Stage Bleed																																			
Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Temperature, °R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CDP Bleed																																			
Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Est. Gas Pressure at Baseplate, psig	**606.1**	**538.1**	**522.4**	**506.4**	**490.3**	**474.0**	**458.0**	**441.8**	**425.8**	**409.0**	**391.4**	**374.7**	**357.5**	**339.8**	**323.3**	**306.2**	**288.5**	**281.0**	**279.4**	**273.2**	**266.9**	**260.3**	**253.6**	**246.6**	**239.5**	**232.4**	**226.3**	**220.4**	**214.4**	**208.3**	**202.2**	**196.2**	**193.0**	**193.0**	**193.0**
CardPack	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**	**8fk**
Exhaust CardPack	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**	**7f5**
NSI	**304**	**305**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**
NSI	**1716**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
NSI	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Application Fee Estimate

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

APPLICATION FEE ESTIMATE

Applicant DBA: Orange Grove Energy — Fee Schedule: 20F

APCD Engineer: Nick Horres — Estimate Date: 3/2/2016

Equipment Description: To permit a modification to an existing gas turbine emission control system
Assume no emission increase, no NSR, no AQIA or HRA

ACTIVITY	EMPLOYEE CLASSIFICATION	LABOR HOURS	COST	SUBTOTAL
Initial Evaluation Fee - T&M (Rule 40(d)(3)(i))				
Authority to Construct	Project Engineer	12.0	$1,800	
	Senior Engineer	0.5	$89	$1,889
Permit to Operate	Project Engineer	4.0	$600	
	Senior Engineer	0.5	$89	$689
Initial Evaluation Fee - Fixed Fee (Rule 40(d)(3))				
Authority to Construct/Permit to Operate			$0	$0
Additional Evaluation and Processing Fees (Rule 40(d)(5))				
New Source Review	Project Engineer		$0	
	Meteorologist		$0	$0
Toxics New Source Review	Project Engineer		$0	
	Air Resources Specialist		$0	$0
Title V	Project Engineer		$0	
	Senior Engineer		$0	$0
NESHAPS/ATCM/NSPS	Project Engineer		$0	$0
CEQA	Project Engineer		$0	$0
AB 3205 Notice	Project Engineer		$0	
	Public Notice Costs	-		$0
Testing or Test Witness	Senior Chemist		$0	
	Associate Engineer		$0	
	Associate Chemist (VOC)		$0	
	Source Test Technician		$0	
	RATA Test Witness DEFERRED	1.0	$6,534	Deferred
Miscellaneous Fees				
Processing Fee (Rule 40(d)(1)(ii))		1	$95	$95
Renewal Fee (Rule 40(e)(2)(ii))				$0
Emissions Fee (Rule 40(e)(2)(iv))			$116	$0
			ESTIMATE TOTAL:	$2,673

NOTES:

(1) To avoid possible processing delays, this document should be submitted with your application forms.

(2) The fees contained in this estimate are are based on APCD Rule 40.

(3) Final fee may be more or less than this estimate (see Rule 40(d)(1)(iii)).

(4) Emissions determined to be greater than 5 tons per year will be charged a emission fee on a ton per year basis. (see Rule 40 (e)(2)(iv)(A))

(5) Fees paid by credit card will be assessed a 2.2% processing fee (see Rule 40(d)(1)(v))

Attachment 2

CEC Processing Fee Check

Orange Grove Energy, L.P.		Payment Number	Check Date	Check Number
CALIF001	California Energy Commission	00000000000004204	03/23/2016	004036

Voucher Number	Invoice Number	Invoice Date	Outstanding Amt	Net Paid Amt	Discount Taken	Write Off	Net Check Amt
00000000000005347	032216 FEE	03/22/2016	$5,000.00	$5,000.00	$0.00	$0.00	$5,000.00
TOTALS:			$5,000.00	$5,000.00	$0.00	$0.00	$5,000.00

JPMorgan Chase Bank, N.A.
Chicago, IL

2-1/710
744452368

004036

Orange Grove Energy, L.P.
C/O J-POWER USA DEVELOPMENT CO
1900 EAST GOLF ROAD
SUITE 1030
SCHAUMBURG, IL 60173

DATE	AMOUNT
Mar 23, 2016	$5,000.00

Pay Five Thousand Dollars and 00 Cents

to the Order of:

California Energy Commission

Accounting Office
1516 Ninth Street, MS 2
Sacramento, CA 95814-5512

Security features. Details on back.

⑈004036⑈ ⑆071000013⑆ 744452368⑈