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<td>Petition for Emission Control Reliability Improvements</td>
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<td><strong>Description:</strong></td>
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<td><strong>Filer:</strong></td>
<td>Joe Douglas</td>
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<td><strong>Organization:</strong></td>
<td>Orange Grove Energy, L.P.</td>
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<td><strong>Submitter Role:</strong></td>
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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 OGE, 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@orangegroveenergy.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,

R. Garcia
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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Appendix B  Orange Grove Energy SCR/COC Reliability Improvement Project Authority to Construct Permit Applications to SDAPCD
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.
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 NO₃, 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.
Figure 2.1
SCR/COC Reliability Improvement Project
Orange Grove Power Plant Site
Figure 2. SCR/COC Reliability Improvement Project
Work Area

Orange Grove Power Plant
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 NOx.
emissions. The NOx 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

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<th>TYPE (SIZE)</th>
<th>QUANTITY</th>
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<td>Crane (50 Ton)</td>
<td>1</td>
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<tr>
<td>Fork Lift (10,000 lb)</td>
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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

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<th>RESOURCE</th>
<th>ENVIRONMENTAL EFFECT</th>
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| 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)

<table>
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<th>RESOURCE</th>
<th>ENVIRONMENTAL EFFECT</th>
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| 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


Appendix A

Orange Grove Power Plant Site Layout
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-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.

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
GENERAL PERMIT OR REGISTRATION APPLICATION FORM

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**

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

**Authority to Construct Mailing Address**

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

**Permit To Operate Mailing Address**

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

**Invoice Mailing Address**

- **Name:** Orange Grove Energy, L.P. (Attn: Ramiro Garcia)
- **Mailing Address:** 35435 East Pala del Norte Road
- **City:** Pala  
- **State:** CA  
- **Zip:** 92059
- **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  
- **Zip:** 92059

**Parcels No.:** 110-072-26  

**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**  

**Date:** 3/9/2016

**Print Name** Paul Peterson  

**Company** J-Power USA

**Phone:** (847) 908-2811  

**E-mail:** ppeterson@jpowerusa.com

**Internal Use Only**

**Date**  

**Staff Initials:**  

**Amt Rec’d $**

**Fee Schedule:**

**RNP:**  

**EMF:**  

**NBF:**  

**TA:**

**GEN_APP_Form_Rev Date:** Feb. 2015

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

<table>
<thead>
<tr>
<th>Catalyst Manufacturer</th>
<th>Existing Catalyst</th>
<th>New Catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson Matthey</td>
<td>Johnson Matthey</td>
<td>Johnson Matthey or Advanced Catalyst System</td>
</tr>
<tr>
<td>Type</td>
<td>Metal Foil</td>
<td>Metal Foil</td>
</tr>
<tr>
<td>Number of Catalyst Layers</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Number of Elements per Unit</td>
<td>121</td>
<td>100</td>
</tr>
<tr>
<td>CO Reduction Efficiency</td>
<td>90%</td>
<td>≥90%</td>
</tr>
</tbody>
</table>

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 NOX emissions. The NOX 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 NOX as the existing catalyst.
Table 2.2: SCR Catalyst Specifications

<table>
<thead>
<tr>
<th>Catalyst Manufacturer</th>
<th>Existing Catalyst</th>
<th>New Catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HALDOR TOPSOE</td>
<td>Cormetech or Ceram</td>
</tr>
<tr>
<td>Type</td>
<td>Corrugated (DNX-920)</td>
<td>Honeycomb</td>
</tr>
<tr>
<td>Number of Catalyst Layers</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>Number of Modules per Layer</td>
<td>27 (988 ft³)</td>
<td>30</td>
</tr>
<tr>
<td>NOx Reduction Efficiency</td>
<td>90%</td>
<td>≥90%</td>
</tr>
</tbody>
</table>

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:
- Inspection of all physical work, including but not limited to, casing integrity, welds, flange connections, and SCR and CO catalyst installation;
- Inspection to verify ammonia system valve lineup;
- Air-testing of Ammonia Injection Grid using dilution air fans to confirm there is no plugging;
- Exhaust plenum inspection; and
- 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 NOx water injection occurs at 5 MW (Minute 5).
g. Verify the gas turbine outlet exhaust NOx concentration is at or below 25 ppmvd at 15% $O_2$ (Minute 7).

Note that the gas turbine is designed to achieve NOx 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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>13.25</td>
<td>25</td>
<td>2.5</td>
<td>4.3</td>
<td>141.2</td>
</tr>
<tr>
<td>CO</td>
<td>12.05</td>
<td>N/A</td>
<td>6.0</td>
<td>6.1</td>
<td>182.2</td>
</tr>
<tr>
<td>VOC</td>
<td>1.95</td>
<td>N/A</td>
<td>2.0</td>
<td>1.3</td>
<td>36.5</td>
</tr>
<tr>
<td>Ammonia</td>
<td>N/A</td>
<td>N/A</td>
<td>5.0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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 – NOx 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 NOx 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°F 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 NOx 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

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

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 therefore 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 NOx and SO2 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 SO₂, 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 CO₂. 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 NOₓ emissions from stationary gas turbines rated greater than or equal to 10 MW with post-combustion controls to 9 ppmv (at 15 percent O₂, 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-PT0-000889 and ACCD2011-PT0-000890) 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.

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
Project Work Scope

IHI Corporation
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 H₂O (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

<table>
<thead>
<tr>
<th>Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flue gas flow rate</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Flue gas temperature</td>
</tr>
<tr>
<td>Flue gas composition</td>
</tr>
<tr>
<td>NOx (ppmvd @ 15% O₂)</td>
</tr>
<tr>
<td>CO (ppmvd @ 15% O₂)</td>
</tr>
<tr>
<td>O₂ vol.% (vol.%-dry)</td>
</tr>
<tr>
<td>H₂O Vol.%</td>
</tr>
<tr>
<td>CO₂ Vol.%</td>
</tr>
<tr>
<td>Particulates (mg/m³N)</td>
</tr>
</tbody>
</table>

2.2 Guarantee

<table>
<thead>
<tr>
<th>Guarantee Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR System</td>
</tr>
<tr>
<td>Outlet NOx (ppmvd @ 15% O₂)</td>
</tr>
<tr>
<td>Outlet NOx (lbs/hr)</td>
</tr>
<tr>
<td>Slip NH₃ (ppmvd @ 15% O₂)</td>
</tr>
<tr>
<td>COC System</td>
</tr>
<tr>
<td>Outlet CO (ppmvd @ 15% O₂)</td>
</tr>
<tr>
<td>Outlet CO (lbs/hr)</td>
</tr>
<tr>
<td>Outlet VOC (ppmvd @ 15% O₂)</td>
</tr>
</tbody>
</table>
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 [N₂] and moisture [H₂O].

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

\[
4\text{NO} + 4\text{NH}_3 + \text{O}_2 \rightarrow \text{(Catalyst)} \rightarrow 4\text{N}_2 + 6\text{H}_2\text{O}
\]

\[
\text{NO} + \text{NO}_2 + 2\text{NH}_3 \rightarrow \text{(Catalyst)} \rightarrow 2\text{N}_2 + 3\text{H}_2\text{O}
\]

\[
4\text{NH}_3 + 5\text{O}_2 \rightarrow \text{(Catalyst)} \rightarrow 4\text{NO} + 6\text{H}_2\text{O}
\]
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 NH3 is injected at downstream of COC. For maximizing flue gas and injected NH3 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 \times 8^H \times 1^{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.
<table>
<thead>
<tr>
<th>Catalyst manufacturer name</th>
<th>Existing catalyst</th>
<th>New catalyst</th>
<th>New catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Corrugated (DNX-920)</td>
<td>Honeycomb (CM21™)</td>
<td>Honeycomb</td>
</tr>
<tr>
<td>Cell pitch</td>
<td>-</td>
<td>0.082 in (2.1 mm)</td>
<td>0.098 in (2.5 mm)</td>
</tr>
<tr>
<td>Active Catalyst Materials</td>
<td>Ti-V-W</td>
<td>Ti-V-W</td>
<td>Ti-V-W</td>
</tr>
<tr>
<td>Number of Catalyst layers</td>
<td>One</td>
<td>One</td>
<td>One</td>
</tr>
<tr>
<td>Number of Modules per Unit</td>
<td>27 (988 ft³ (28m³))</td>
<td>30 (529 ft³ (15m³))</td>
<td>30 (600 ft³ (17m³))</td>
</tr>
<tr>
<td>Dimensions of Module</td>
<td>-</td>
<td>58.5 in (1,486 mm) in width</td>
<td>57.1 in (1,450 mm) in width</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>50.8 in (1,292 mm) in height</td>
<td>50.5 in (1,284 mm) in height</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>18.1 in (460 mm) in depth*2</td>
<td>22.3 in (567 mm) in depth*2</td>
</tr>
<tr>
<td>NOx reduction rate</td>
<td>90%</td>
<td>≥90%</td>
<td>≥90%</td>
</tr>
</tbody>
</table>

**b. CO Catalyst (COC)**

<table>
<thead>
<tr>
<th>Catalyst manufacturer name</th>
<th>Existing catalyst</th>
<th>New catalyst</th>
<th>New catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Metal Foil (- cpsi)</td>
<td>Metal Foil (200 cpsi)</td>
<td>Metal Foil (230 cpsi)</td>
</tr>
<tr>
<td>Active Catalyst Materials</td>
<td>-</td>
<td>Precious Metal</td>
<td>Precious Metal</td>
</tr>
<tr>
<td>Number of Catalyst layers</td>
<td>One</td>
<td>One</td>
<td>One</td>
</tr>
<tr>
<td>Number of Element per Unit</td>
<td>121</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>CO reduction rate</td>
<td>90%</td>
<td>≥90%</td>
<td>≥90%</td>
</tr>
</tbody>
</table>

*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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Sub Vender</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactor (Casing, Ductwork, Steel structure, Piping and etc.)</td>
<td>TOPPS mechanical INC.</td>
<td>NE, USA</td>
</tr>
<tr>
<td>CO catalyst</td>
<td>Advanced catalyst</td>
<td>TN, USA</td>
</tr>
<tr>
<td></td>
<td>Johnson Matthey</td>
<td>PA, USA</td>
</tr>
<tr>
<td>SCR catalyst</td>
<td>Cormetech</td>
<td>NC, USA</td>
</tr>
<tr>
<td></td>
<td>Ceram</td>
<td>KS, USA</td>
</tr>
<tr>
<td>No.</td>
<td>Items</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>1</td>
<td>OGO upstream area</td>
<td><strong>CFD analysis</strong> CFD modeling and analysis will be performed to optimize the gas flow distribution at upstream of COG.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Oiling nozzle</strong> The existing nozzle will be modified based on the results of CFD analysis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Sound barriers at GT outlet</strong> The perforated plate will be re-installed to the sound barriers, and then the sound barrier defected part will be repaired.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Flow distributor</strong> Replacement / modification of the flow distributor will be made based on the result of CFD analysis.</td>
</tr>
<tr>
<td>2</td>
<td>OGO Housing</td>
<td><strong>Top casing</strong> The top casing will be repaired with new steel materials, and re-insulated with lagging plate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Sides casing</strong> The side casings will be repaired with new steel materials, and re-insulated with lagging plate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Bottom casing</strong> The existing bottom casing will be re-utilized with appropriate repair, and re-insulated with lagging plate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>New Sealing Structure (between Outer Catalyst frame and lagging plate)</strong> The new sealing structure will be applied.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>CNG catalyst</strong> The new CNG catalyst will be installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Catalyst frame</strong> The new catalyst frame will be installed.</td>
</tr>
<tr>
<td>3</td>
<td>Expansion Joint at Flue Gas Intake Duct for the Ammonia supply skid</td>
<td><strong>Expansion joint at ammonia skid inlet</strong> 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>AIG</strong> The new AIG with adjustable valves will be installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>AIG inlet pipe</strong> The new metal expansion joint for Ammonia gas pipe will be installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Piping support</strong> Necessary piping support under our supply will be provided.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Casing of AIG area</strong> Top of the existing ductwork will be partially modified for AIG installation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Top casing</strong> The top casing will be repaired with new steel materials, and re-insulated with lagging plate. Hatch for catalyst installation will be installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Sides casing</strong> The side casings will be repaired with new steel materials, and re-insulated with lagging plate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Bottom casing</strong> The existing bottom casing will be re-utilized with appropriate repair, and re-insulated with lagging plate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>New Sealing Structure (between Outer Catalyst frame and lagging plate)</strong> The new sealing structure will be applied.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SCR catalyst</strong> The new SCR catalyst will be installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Catalyst frame</strong> 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Purge fans</strong> The existing purge fans will be relocated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Support of purge fans</strong> The purge fans support will be installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>power cable and I &amp; C cable</strong> Modification work of power cable and I &amp; C cable will be carried by OGE.</td>
</tr>
<tr>
<td>4</td>
<td>NOx Housing</td>
<td><strong>Stack inlet duct</strong> Expansion joint at stack inlet There will be NO thermal expansion joint at stack inlet port.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td><strong>Adjustment of Ammonia injection flow distribution (One time)</strong> IHI will fine-tune ammonia injection flow distribution.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td><strong>Performance testing</strong> IHI will conduct flue gas analysis for performance testing.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td><strong>Site work</strong> Please see Attachment-1.</td>
</tr>
</tbody>
</table>
## Division of Responsibilities (rev 2, as of 2/2/2016)

<table>
<thead>
<tr>
<th>Items</th>
<th>IHI</th>
<th>OGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Safety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(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.)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(b) OGE safety orientation for labor force</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(c) First aid facility, fire protection and rescue team</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(d) Isolate and tag out turbine and auxiliary equipment</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>(e) Safety equipment including signs and barriers</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>(f) Confined space monitoring equipment and personnel</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(g) Confined space entry attendant</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(h) Confined space rescue services and rescue equipment</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(i) Forklift operator – OSHA certification required (will require competencies review of the OGE forklift when arrives onsite)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(j) Manlift operator (if necessary) – OSHA Certification required</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>2. Tooling</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(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.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(b) Special tools needed to perform the work scope defined in the Purchase Order</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>3. Other Equipment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Normal facility service required for maintenance such as light, heat, service water, compressed air and electronic power</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(b) Welding machine</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(c) Engine driven air compressor and fuel</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(d) Supplementary lighting and fuel</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(e) Load tested crane and certified operator with crew and fuel</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(f) Forklifts, manlifs, flat bed trailers, trucks and fuel</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>4. Consumables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Consumable gas (e.g. Oxygen, Acetylene, Argon, etc.)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(b) Lubricants, as necessary</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(c) Expendable materials (e.g. rags, cleaning fluids, etc.)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(d) Cribbing, lumber, blocking and plywood material for equipment laydown</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>5. Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Labor needed for the work scope defined in the Purchase Order</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(b) Commissioning engineer for tuning AIG</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(c) Construction manager on site for 24 hours/day during construction</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(d) Operator to perform all normal functions of power plant during commissioning</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(e) Daily status update report during construction</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(f) Welding</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(g) Welding inspector</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(h) Disconnect, tag out and reconnect electrical apparatus</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(i) Disconnect and reconnect existing plant wiring</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(j) Disconnect and reconnect of instrumentation, including CEMS' probes</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(k) Material and labor for removal and installation of insulation</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(l) Material and labor for removal and installation of scaffolding (Including scaffolding for flow gas testing for final performance verification)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(m) Labor and equipment needed for on-site machining and painting, if any</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

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  |
   | (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  |
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本図書について以下のことをIHIの書面による事前に承諾なく行うことを
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(1) 非法（方法は問わず）
(2) 第三者への提示
(3) 供与目的以外への使用

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(1) ITS DISCLOSURE TO A THIRD PARTY IS
(2) ITS USE FOR ANY PURPOSES OTHER THAN THOSE FOR WHICH IT IS SUPPLIED.

IHI Corporation
Appendix B

GE Turbine Data
Estimated Average Engine Performance

NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN

<table>
<thead>
<tr>
<th>Engine</th>
<th>10/30/2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>4:06:43 PM</td>
</tr>
</tbody>
</table>

**Generator:**
- MEID 800LL04 60Hz, 13.8kV, 0.9PF (14849)

**Dry Bulb, °F:**
- 86.0

**Wet Bulb, °F:**
- 70.5

**Comp Inlet Temp, °F:**
- 46.0

**Exhaust Loss, inH20:**
- 12.00

**Guar. Btu/kW-hr, LHV:**
- 8660

**lb/sec:**
- 297.8

**Energy, Btu/s- Ref 0 °R:**
- 100311

**PM10, lb/hr:**
- 2.70

**SOX as SO2, lb/hr:**
- 0.00

**NOx, lbs:**
- 0.9

**PM10, lb/hr:**
- 2.70

**SOX as SO2, lb/hr:**
- 0.00

PM10, lb/hr:
- 2.70

SOX as SO2, lb/hr:
- 0.00

**NOx, lbs:**
- 0.9

**PM10, lb/hr:**
- 2.70

**SOX as SO2, lb/hr:**
- 0.00

**NOx, lbs:**
- 0.9
### APPENDIX 6.2-C

#### AIR QUALITY

|                | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Co            | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| SO2           | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| NO            | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| NO2           | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Pt             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Pd             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Hg             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Cu             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Zn             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Cd             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Ni             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Pb             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Cr             | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |

### Jpower - Perf Runs Over Guar Emissions Range

#### Engine:

**G0125O - 8fk.scp**

#### Fuel:

**3.5.18**

- **Startup Ramp Rate:** 0 kW/min

- **Total Emissions at Startup**:
  - NOx: 0.0 ppm vd Ref 15% O2
  - NO: 0.0 ppm vd Ref 15% O2
  - VOCs: 0.0 ppm vd Ref 15% O2

- **Maximum Emissions**:
  - NOx: 43383 ppm vd Ref 15% O2
  - NO: 8363 ppm vd Ref 15% O2
  - VOCs: 22222 ppm vd Ref 15% O2

- **Specific Gravity**: 0.65

### Jpower - Perf Runs Over Guar Emissions Range

#### Engine:

**G0125O - 8fk.scp**

#### Fuel:

**3.5.18**

- **Startup Ramp Rate:** 0 kW/min

- **Total Emissions at Startup**:
  - NOx: 0.0 ppm vd Ref 15% O2
  - NO: 0.0 ppm vd Ref 15% O2
  - VOCs: 0.0 ppm vd Ref 15% O2

- **Maximum Emissions**:
  - NOx: 43383 ppm vd Ref 15% O2
  - NO: 8363 ppm vd Ref 15% O2
  - VOCs: 22222 ppm vd Ref 15% O2

- **Specific Gravity**: 0.65

### Jpower - Perf Runs Over Guar Emissions Range

#### Engine:

**G0125O - 8fk.scp**

#### Fuel:

**3.5.18**

- **Startup Ramp Rate:** 0 kW/min

- **Total Emissions at Startup**:
  - NOx: 0.0 ppm vd Ref 15% O2
  - NO: 0.0 ppm vd Ref 15% O2
  - VOCs: 0.0 ppm vd Ref 15% O2

- **Maximum Emissions**:
  - NOx: 43383 ppm vd Ref 15% O2
  - NO: 8363 ppm vd Ref 15% O2
  - VOCs: 22222 ppm vd Ref 15% O2

- **Specific Gravity**: 0.65
## APPENDIX 6.2-C

### AIR QUALITY

Estimated Average Engine Performance: NOT FOR QUARANTIME, REFER TO PROJECT/AIR FOR DESIGN

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx, lbs</td>
<td>28.1</td>
</tr>
<tr>
<td>CO, lbs</td>
<td>28.5</td>
</tr>
<tr>
<td>Startup Ramp Rate:</td>
<td>Engine Exhaust</td>
</tr>
<tr>
<td>Exhaust Avg. Mol. Wt., Wet Basis</td>
<td>28.0</td>
</tr>
<tr>
<td>Exhaust Flow, ACFM</td>
<td>596000</td>
</tr>
<tr>
<td>Inlet Flow Wet, pps</td>
<td>287.3</td>
</tr>
<tr>
<td>Inlet Flow Dry, pps</td>
<td>285.5</td>
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<tr>
<td>Capacity kW</td>
<td>57499</td>
</tr>
<tr>
<td>Inlet Temp, °F</td>
<td>86.0</td>
</tr>
<tr>
<td>TRQ48, Torque Limit Cold End</td>
<td>122777</td>
</tr>
<tr>
<td>Correct Control Parameters</td>
<td>PS3JQA, psia</td>
</tr>
<tr>
<td>CDP Bleed Flow, pps</td>
<td>0.0</td>
</tr>
<tr>
<td>Exhaust CardPack 7f5</td>
<td>7f5</td>
</tr>
<tr>
<td>CEG Bleed Flow</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### ORANGE GROVE PROJECT

APPLICATION FOR CERTIFICATION 6.2-C-11

---

Applicable Areas: Port and Marine Facilities

Location: Port and Marine Facilities

Date: September 30, 2007

Applicant: GE Energy Jpower

Project No: Jpower - Perf Runs Over Guar Emissions Range

Engine: 4:06:43 PM

Fuel: Gas Fuel #10-1, 19000 Btu/lb, LHV

Table: Startup Ramp Rate

| Engine Exhaust | Exhaust Avg. Mol. Wt., Wet Basis | 28.0 |
| Exhaust Flow, ACFM | 596000 |
| Inlet Flow Wet, pps | 287.3 |
| Inlet Flow Dry, pps | 285.5 |
| Capacity kW | 57499 |
| Inlet Temp, °F | 86.0 |
| TRQ48, Torque Limit Cold End | 122777 |
| Correct Control Parameters | PS3JQA, psia |
| CDP Bleed Flow, pps | 0.0 |
| Exhaust CardPack 7f5 | 7f5 |

---

**NOTICE:** All information provided is subject to change and should be verified with the appropriate authorities.
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

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>EMPLOYEE CLASSIFICATION</th>
<th>LABOR HOURS</th>
<th>COST</th>
<th>SUBTOTAL</th>
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</thead>
<tbody>
<tr>
<td><strong>Initial Evaluation Fee - T&amp;M (Rule 40(d)(3)(i))</strong></td>
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<tr>
<td>Authority to Construct</td>
<td>Project Engineer</td>
<td>12.0</td>
<td>$1,800</td>
<td>$1,800</td>
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<tr>
<td></td>
<td>Senior Engineer</td>
<td>0.5</td>
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<tr>
<td>Permit to Operate</td>
<td>Project Engineer</td>
<td>4.0</td>
<td>$600</td>
<td>$600</td>
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<tr>
<td></td>
<td>Senior Engineer</td>
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<td>$89</td>
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<tr>
<td><strong>Initial Evaluation Fee - Fixed Fee (Rule 40(d)(3))</strong></td>
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<td></td>
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<tr>
<td>Authority to Construct/Permit to Operate</td>
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<td></td>
<td>$0</td>
<td>$0</td>
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<tr>
<td><strong>Additional Evaluation and Processing Fees (Rule 40(d)(5))</strong></td>
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<tr>
<td>New Source Review</td>
<td>Project Engineer</td>
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<td>$0</td>
<td>$0</td>
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<tr>
<td></td>
<td>Meteorologist</td>
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<td>$0</td>
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<tr>
<td>Toxics New Source Review</td>
<td>Project Engineer</td>
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<tr>
<td></td>
<td>Air Resources Specialist</td>
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<tr>
<td>Title V</td>
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<tr>
<td></td>
<td>Senior Engineer</td>
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<tr>
<td>NESHAPS/ATCM/NSPS</td>
<td>Project Engineer</td>
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<tr>
<td>CEQA</td>
<td>Project Engineer</td>
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<td>AB 3205 Notice</td>
<td>Project Engineer</td>
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<td></td>
<td>Public Notice Costs</td>
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<td>-</td>
<td>$0</td>
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<tr>
<td>Testing or Test Witness</td>
<td>Senior Chemist</td>
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<td>$0</td>
<td>$0</td>
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<td></td>
<td>Associate Engineer</td>
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<td>$0</td>
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<tr>
<td></td>
<td>Associate Chemist (VOC)</td>
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<td></td>
<td>Source Test Technician</td>
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<td></td>
<td>RATA Test Witness</td>
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### Miscellaneous Fees

<table>
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<tr>
<th>Activity</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Processing Fee (Rule 40(d)(1)(iii))</td>
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<td>$95</td>
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<tr>
<td>Renewal Fee (Rule 40(e)(2)(ii))</td>
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<tr>
<td>Emissions Fee (Rule 40(e)(2)(iv))</td>
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<td>$116</td>
<td>$116</td>
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</tbody>
</table>

**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 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 an 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.
C/O J-POWER USA DEVELOPMENT CO
1900 EAST GOLF ROAD
SUITE 1030
SCHAUMBURG, IL 60173

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

JPMorgan Chase Bank, N.A.
Chicago, IL

2-1/710
744452368

DATE
Mar 23, 2016

AMOUNT
$5,000.00

"004036"
1071000013:
744452368"

Payment Number
00000000000004204
Check Date
03/23/2016
Check Number
004036

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

TOTALS:
$5,000.00
$5,000.00
$0.00
$0.00
$5,000.00