RACT Evaluation Report – Provo City Power – Power Plant

UTAH $PM_{2.5}$ SIP RACT

Provo City Nonattainment Area

Utah Division of Air Quality

Major New Source Review Section

October 1, 2014

1.2.J PROVO CITY POWER

1. Emission Limitations and Stack Testing:

Emissions to the atmosphere from the indicated emission point shall not exceed the following rates and concentrations:

A. Boiler no. 4 (100,000 lb. steam)

NO_x 82.4 lbs/hr 560 ppmdv

B. Boiler no. 5 (100,000 lb. steam)

NO_x 82.4 lbs/hr 560 ppmdv

C. For each of the four 2.5 MW dual fuel internal combustion engines

NO_x 59.13 lbs/hr 1,660 ppmdv

Stack testing to show compliance with the above emission limitations shall be performed (for both Boilers and all four Engines) within 180 days after promulgation of this regulation, and every three years thereafter.

2. Visible Emissions:

Visible emissions from the boilers shall not exceed 0% opacity, and visible emissions from the engines shall not exceed 10% opacity except for 15 minute at startup when the boilers are cold or when the engines are cold and fired on straight fuel oil.

3. Production Limitations:

The following production limits shall not be exceeded without prior approval in accordance with Section 3.1, UACR:

<u>For the sum of the Boilers:</u>

A. Total Annual Production: 40,000 MW-hrs

B. Maximum Daily Production: 160 MW-hrs

<u>For each of the Engines:</u>

A. Total Annual Production: 8,000 MW-hrs

B. Annual Hours of Operation: 800 hrs

C. Daily Hours of Operation: 12.0 hrs

Energy production shall be determined by Watt Hour meters which shall if necessary be installed on the boiler generators. Similarly, hours of operation for the engines shall be determined by meters on each of the engines which shall be installed if necessary.

4. Fuel Requirements:

A. The owner/operator shall use only natural gas as a fuel in the boilers. If any other fuel is to be used, an approval order shall be required in accordance with Section 3.1, UACR.

B. The amount of fuel oil burned per year in the internal combustion engines shall not exceed 5 percent on the basis of heat input, The engines shall not be fired on straight fuel oil except for the first 15 minutes of startup when straight fuel oil may be burned. The remainder of the fuel burned shall be natural gas. Oil percentage shall be determined by reading the two meters on the engines (one for gas and one for oil) and then examining the BTU content of each of the fuels.

C. The sulfur content of any fuel oil burned in the dual fuel engines shall not exceed 0.45 percent by weight sulfur as determined by ASTM Method D-4294-89. The sulfur content shall be tested if directed by the Executive Secretary.

5. Allowable Emissions:

"Allowable emissions" as defined in Section 1.12, UACR, for this source (the entire plant) are hereby established at 14.5 tons/yr for particulate, 14.5 tons/yr for PM_{10}, 4.0 tons/yr for SO_2, and 254.0 tons/yr for NO_x.

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQE-AN107950012-15

May 6, 2015

Todd L. Sperry
Provo City Power
Department of Energy
251 West 800 North
Provo, UT 84601

Dear Mr. Sperry:

Re: Approval Order: Administrative Amendment to Update AO Conditions with Section IX.H.13.f of the SIP
Project Number: N10795-0012

The attached document is the Approval Order for the above-referenced project. Future correspondence on this Approval Order should include the engineer's name as well as the DAQE number as shown on the upper right-hand corner of this letter. The project engineer for this action is John Jenks, who may be reached at (801) 536-4459.

Sincerely,

Bryce C. Bird
Director

BCB:JJ:jc

cc: Mike Owens
Utah County Health Department

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STATE OF UTAH

Department of Environmental Quality

Division of Air Quality

APPROVAL ORDER: Administrative Amendment to Update AO Conditions with Section IX.H.13.f of the SIP

Prepared By: John Jenks, Engineer
Phone: (801) 536-4459
Email: jjenks@utah.gov

APPROVAL ORDER NUMBER

DAQE-AN107950012-15

Date: May 6, 2015

Provo City Power
Power Plant

Source Contact:
Todd L. Sperry
Phone: (801) 852-6840
Email: todd@umpa.cc

Bryce C. Bird
Director

Abstract

On February 2, 2015, Utah Municipal Power Agency (UMPA) requested two changes in the AO, DAQE-AN107950011-14, issued to the Provo City Power (PCP) power generation facility located in Provo City, Utah County, Utah. Utah County is a non-attainment area for PM_{10} and PM2.5. Provo is a maintenance area for CO. PCP is a major Title V source currently operating under Operating Permit #4900018003. PCP is also a listed source under Section IX.H.13 Source-Specific Emission Limitations, Fine Particulate Matter, $PM_{2.5}$ SIP for the Provo, UT, Nonattainment Area.

UMPA's request involves the removal of the visible emissions requirement currently required for the "boilers" listed in AO condition II.B.1.a.A. The large boilers previously referenced by this condition were removed in the prior permitting action, and the only remaining small boiler serves as an internal heating unit. It is fired exclusively on natural gas and cannot be used for power generation. UMPA also wishes to change the language of condition II.B.1.g. Currently paragraph five of that condition requires the use of watt-hour meters for determination of power production from each engine. This is unnecessary holdover language that has since been superseded by the language of Section IX.H.13.f of the SIP.

The total PTE of the PCP facility will be unaffected by this permitting action and will remain at the following ton per year values: PM_{10} = 14.5, PM2.5 (a subset of PM10) = 11.6, SO2 = 4.0, NO_x = 254.0, CO = 56.3, VOC = 7.5 and total HAPs = 3.4. Greenhouse gas emissions are estimated at 13,955 tons per year CO_2e.

This air quality AO authorizes the project with the following conditions and failure to comply with any of the conditions may constitute a violation of this order. This AO is issued to, and applies to the following:

Name of Permittee:

Provo City Power
Department of Energy
251 West 800 North
Provo, UT 84601

Permitted Location:

Provo City Power- Power Plant
702 North 300 West
Provo, UT 84601

UTM coordinates: 443,455 m Easting, 4,454,710 m Northing, UTM Zone 12
SIC code: 4911 (Electric Services)

Section I: GENERAL PROVISIONS

I.1 All definitions, terms, abbreviations, and references used in this AO conform to those used in the UAC R307 and 40 CFR. Unless noted otherwise, references cited in these AO conditions refer to those rules. [R307-101]

I.2 The limits set forth in this AO shall not be exceeded without prior approval. [R307-401]

I.3 Modifications to the equipment or processes approved by this AO that could affect the emissions covered by this AO must be reviewed and approved. [R307-401-1]

I.4 All records referenced in this AO or in other applicable rules, which are required to be kept by the owner/operator, shall be made available to the Director or Director's representative upon request, and the records shall include the two-year period prior to the date of the request. Unless otherwise specified in this AO or in other applicable state and federal rules, records shall be kept for a minimum of five (5) years. [R307-401-8]

I.5 At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO, including associated air pollution control equipment, in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable

operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded. [R307-401-4]

I.6 The owner/operator shall comply with UAC R307-107. General Requirements: Breakdowns. [R307-107]

I.7 The owner/operator shall comply with UAC R307-150 Series. Inventories, Testing and Monitoring. [R307-150]

Section II: SPECIAL PROVISIONS

II.A The approved installations shall consist of the following equipment:

II.A.1 **Provo City Power Generation Facility**
Permitted Source

II.A.2 **Engine Generator #1**
2,585 kW dual-fuel internal combustion engine, w/ oxidation catalyst

II.A.3 **Engine Generator #2**
2,585 kW dual-fuel internal combustion engine, w/ oxidation catalyst

II.A.4 **Engine Generator #3**
2,585 kW dual-fuel internal combustion engine, w/ oxidation catalyst

II.A.5 **Engine Generator #4**
2,585 kW dual-fuel internal combustion engine, w/ oxidation catalyst

II.A.6 **Miscellaneous Emission Units**
Includes: natural gas fired boiler (3.4 MMBtu/hr), 2 portable kerosene heaters, underground diesel storage tank (50,000 gallons), 4 diesel day tanks, diesel fuel pumps, 3 Stoddard solvent parts washers

II.B Requirements and Limitations

II.B.1 **Conditions on Permitted Source**

II.B.1.a Visible emissions from all dual fuel internal combustion engines shall not exceed 10 percent (10%) opacity except for 15 minutes at start-up and shutdown. When straight diesel fuel is used, visible emissions shall be no greater than 20 percent (20%) opacity except for operation not exceeding 3 minutes in any hour.

Opacity observations of emissions from stationary sources shall be conducted according to 40 CFR 60, Appendix A, Method 9. [R307-309-4, R307-401-8]

II.B.1.b Provo City Power shall use only natural gas as a fuel in the boilers. [R307-401-8]

II.B.1.c Provo City Power shall use natural gas as the primary fuel in all of the dual fuel engines. Distillate fuel oil may be used only during a 15-minute start-up and 15 minutes shut-down period; backup fuel during periods of natural gas curtailment; for maintenance firings; for break in firing; system electrical power outages; and as pilot fuel. The sulfur content of any fuel oil burned in the dual fuel engines shall not exceed 0.45 percent by weight sulfur as determined by ASTM Method D-4294-89. Pilot fuel is used to ignite the gaseous portion of the fuel charge and shall be used according to the manufacture's specifications. Natural gas curtailment is defined as a period when the natural gas provider/supplier imposes a curtailment

or interruption of service, and the curtailment is involuntary and beyond the control of Provo City Power. [R307-401-8]

II.B.1.d Provo City Power can demonstrate compliance with the requirements of R307-203-1(1) for any diesel fuel (fuel oil #2 or better) purchased by maintenance of fuel purchase invoices and certification by the fuel supplier that the fuel meets the ultra-low sulfur diesel (ULSD) definition of 15 ppm sulfur. [R307-203-1]

II.B.1.e Total daily Hours of Operation of the four 2.5 MW Dual Fuel engines shall not exceed 48 hours. Hours of operation for the engines shall be determined by meters on each of the engines. [R307-401-8]

II.B.1.f Emissions to the atmosphere from the indicated emission point shall not exceed the following rates and concentrations:

A. For each of the four 2.5 MW dual fuel internal combustion engines

NO_x	10.4 g/kW-hr	1,660 ppmdv

Each engine shall be tested every 8760 hours of operation and at least once every five years, whichever comes first. Emissions of NO_x shall be tested by 40 CFR 60 Appendix A, Method 7E or the most recent version of another EPA-approved test method if approved by the Director. [R307-401-8, SIP Section IX.H.13]

II.B.1.g NO_x emissions shall be no greater than 2.45 tons per day and 254 tons per rolling 12-month period for all four engine generators combined.

Compliance with the emission limitations shall be determined by the following equations:

Emissions (tons/day) = (Power production in kW-hr/day) x (Emission factor in gram/kW-hr) x (1 lb/453.59 g) x (1 ton/2000 lbs)

Emissions (tons/rolling 12-month period) = (Power production in kW-hr/rolling 12-month period) x (Emission factor in gram/kW-hr) x (1 lb/453.59 g) x (1 ton/2000 lbs)

The emission factors for NO_x shall be derived from the most recent emission test results. Total plant emissions shall be the sum of emissions from each engine. The amount of kilowatt-hours generated by each engine shall be recorded on a daily basis.

Compliance with the 12-month limitation shall be determined on a rolling 12-month total. Each month a new 12-month total shall be calculated using data from the previous 12 months. [R307-401-8, SIP Section IX.H.13]

II.B.1.h If NO_x emissions from the engines exceed 200 tons per rolling 12-month period, Provo City Power shall submit a report of the emissions to the Director within 30 days of such calculation. After notifying the Director, Provo City Power shall submit a plan for approval within 90 days to install a continuous emission monitoring system (CEM) for NO_x. The plan shall propose specifications for the installation, calibration and maintenance of a CEM. The CEM shall be on line within 12 months following the approval of the plan. [R307-170]

Section III: APPLICABLE FEDERAL REQUIREMENTS

In addition to the requirements of this AO, all applicable provisions of the following federal programs have been found to apply to this installation. This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including UAC R307.

NSPS (Part 60), A: General Provisions

NSPS (Part 60), IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
MACT (Part 63), A: General Provisions
MACT (Part 63), ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
Title V (Part 70) major source

PERMIT HISTORY

This AO is based on the following documents:

Is Derived From	Source Submitted NOI dated February 2, 2015
Supersedes	DAQE-AN107950011-14 dated November 10, 2014

ADMINISTRATIVE CODING

The following information is for UDAQ internal classification use only:

Utah County
CDS A
MACT (Part 63), Nonattainment or Maintenance Area, Title V (Part 70) major source, $PM_{2.5}$ Moderate Area SIP, PM_{10} SIP / Maint Plan, Major criteria source, NSPS (Part 60)

ACRONYMS

The following lists commonly used acronyms and associated translations as they apply to this document:

40 CFR	Title 40 of the Code of Federal Regulations
AO	Approval Order
BACT	Best Available Control Technology
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDS	Classification Data System (used by EPA to classify sources by size/type)
CEM	Continuous emissions monitor
CEMS	Continuous emissions monitoring system
CFR	Code of Federal Regulations
CMS	Continuous monitoring system
CO	Carbon monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent - 40 CFR Part 98, Subpart A, Table A-1
COM	Continuous opacity monitor
DAQ	Division of Air Quality (typically interchangeable with UDAQ)
DAQE	This is a document tracking code for internal UDAQ use
EPA	Environmental Protection Agency
FDCP	Fugitive dust control plan
GHG	Greenhouse Gas(es) - 40 CFR 52.21 (b)(49)(i)
GWP	Global Warming Potential - 40 CFR Part 86.1818-12(a)
HAP or HAPs	Hazardous air pollutant(s)
ITA	Intent to Approve
LB/HR	Pounds per hour
MACT	Maximum Achievable Control Technology
MMBTU	Million British Thermal Units
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NO_x	Oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
PM_{10}	Particulate matter less than 10 microns in size
$PM_{2.5}$	Particulate matter less than 2.5 microns in size
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
R307	Rules Series 307
R307-401	Rules Series 307 - Section 401
SO_2	Sulfur dioxide
Title IV	Title IV of the Clean Air Act
Title V	Title V of the Clean Air Act
TPY	Tons per year
UAC	Utah Administrative Code
UDAQ	Utah Division of Air Quality (typically interchangeable with DAQ)
VOC	Volatile organic compounds

RACT EVALUATION REPORT
PROVO CITY POWER – POWER PLANT

1.0 INTRODUCTION AND FACILITY DESCRIPTION

The following is an updated version of the original RACT evaluation that was completed on October 1, 2013 as a part of the Technical Support Documentation for Section IX, Parts H.11, 12 and 13 of the Utah SIP; to address the Salt Lake City PM2.5 and Provo, Utah PM2.5 Nonattainment Areas.

1.1 Facility Identification

Name: Provo City Power – Power Plant
Address: 702 North 300 West, Provo, Utah, Utah County
Owner/Operator: Provo City Power
UTM coordinates: 443,455 East 4,454,710 North Zone 12

1.2 Facility Process Summary

Provo City Power (PCP) operates a power plant consisting of four 2,585 kW dual-fuel internal combustion (IC) engines. There is also four diesel day-tanks, and a small emergency generator located on site. The power plant is operated as a peaking and supplemental power plant to provide electrical power to municipal power customers in and around the City of Provo. The plant is defined as a Title V major source located in Utah County, and within the Provo, Utah $PM_{2.5}$ nonattainment area.

Operation of the plant is dependent on local demand and cost of utility power. The IC engines operate primarily on natural gas, with ultra-low sulfur diesel fuel used for start-up.

1.3 Facility Criteria Air Pollutant Emissions Sources

As previously discussed the facility consists of the following emission sources:
2,585 kW dual-fuel fired IC engine (IC #1)
2,585 kW dual-fuel fired IC engine (IC #2)
2,585 kW dual-fuel fired IC engine (IC #3)
2,585 kW dual-fuel fired IC engine (IC #4)
Diesel day-tank #1
Diesel day-tank #2
Diesel day-tank #3
Diesel day-tank #4
Emergency generator (Em Gen)

1.4 RACT Cut-off Threshold

A RACT cut-off threshold was established generally for all facilities based on Utah DAQ's existing small source exemption rule R307-401-9. This rule exempts sources of pollution with emissions less than 5 tpy from permitting requirements. Therefore, sources with baseline actual emissions which fall below this threshold could be exempted from evaluation under this general establishment.

However, PCP is a municipal power plant which operates both as a peaking plant and as part of the general municipal power generator network which means it operates well below its established allowable (permitted) emissions. In PCP's 2008 baseline inventory, nearly all of its emission sources were at or below the 5 tpy emission threshold. Instead of using actual emissions for purposes of evaluating RACT, a PTE basis will be used for these sources. This brings the IC engines back into evaluation.

The diesel day-tanks and emergency generator have both potential and actual emissions which remain below the 5 tpy threshold. These sources will not be included for evaluation.

Diesel day-tanks: VOCs < 1 tpy
Em Gen: PM_{10} < 1.0 tpy, $PM_{2.5}$ < 1.0 tpy, NOx < 1.0 tpy, SO2 < 1.0 tpy, VOC < 1.0 tpy.

2.0 RACT Evaluation

2.1 Dual-fuel Fired IC Engines

Rather than evaluating the four dual-fuel fired IC engines individually, DAQ has chosen to evaluate all four IC engines as a group.

These engines are all fired on ultra-low sulfur diesel fuel for start-up, and then switched to natural gas for primary operation. Generally each engine is operated a similar number of hours per year, in order to balance wear and tear and limit maintenance time.

The 2008 baseline actual emissions for all four engines combined were estimated at the following values:

$PM_{2.5}$ = 0.3 tpy
SO_2 = 0.01 tpy
NOx = 20.1 tpy
VOC = 2.4 tpy

$PM_{2.5}$

Available Control Technology

No additional add-on control technology has been identified by DAQ that can further reduce direct particulate emissions from natural gas combustion. All particulate generated from natural gas combustion is considered to be PM1. Typical add-on control

devices – such as fabric filtration, electrostatic precipitation, or cyclonic separation – have extremely limited effectiveness in such an environment.

Since no additional available controls have been identified for the control of particulate emissions, the only remaining control is the default "no control" option of exclusive firing on pipeline quality natural gas.

During the start-up condition when firing on diesel fuel, diesel particulate filters are the only identified add-on control option for control of particulate emissions.

Technically Infeasible RACT Controls

No vendor has been found that will supply diesel particulate filters for diesel engines of the age of those at PCP. The vendors have all supplied the same reason – "the extreme age of these engines lead to fouling and plugging of the diesel particulate filters and rapid degradation of their performance."

For this reason, diesel particulate filters are considered technically infeasible.

Evaluation and Ranking of Technically Feasible RACT Controls

N/A – the only remaining control technique, no add-on controls, does not require ranking or further evaluation.

Selection of RACT Controls

No additional control required. Combustion of pipeline quality natural gas as fuel for control of particulate emissions is recommended as RACT. Diesel fuel may be used for startup periods.

SO_2

Available Control Technology

Similarly, no additional add-on control technology has been identified by DAQ that can further reduce emissions of SO_2 from IC engines. Pipeline quality natural gas is inherently low in sulfur. During the period when diesel fuel is used for startup, ultra-low sulfur diesel fuel is required, which has a sulfur content of 0.0015%.

Most sulfur control technologies require the use of some sort of acid reducing agent such as lime slurry or limestone injection. This leads to residual solid or liquid waste which requires subsequent disposal. The remaining control techniques rely on reducing emissions of particulates and allowing any residual sulfur to be captured with the particulate. With so little SO_2 (or particulate) being generated in the first place, further reductions of SO_2 using either active or passive control techniques are therefore next to impossible.

Technically Infeasible RACT Controls

N/A – no additional controls identified.

Evaluation and Ranking of Technically Feasible RACT Controls

N/A – no additional controls identified.

Selection of RACT Controls

No additional control required. Combustion of pipeline quality natural gas as fuel for control of SO_2 emissions is recommended as RACT. Ultra-low sulfur diesel fuel may be used for startup periods.

<u>VOC</u>

Available Control Technology

Only one add-on control technology has been identified by DAQ to reduce emissions of VOC from IC engines – the use of oxidation catalysts. An oxidation catalyst is similar in design and operation to a catalytic control system on a passenger vehicle, in that an inline, self-regenerating, catalyst system is placed within the exhaust stream prior to the final stack, so that emissions of CO and VOC can be further oxidized to CO2 and water. Oxidation of VOC can approach efficiencies of 70%, depending on initial concentrations and stack characteristics.

Technically Infeasible RACT Controls

N/A – oxidation catalysts are technically feasible; therefore this section does not apply.

Evaluation and Ranking of Technically Feasible RACT Controls

Installation of an oxidation catalyst on the IC engines at PCP would reduce emissions of VOC by at best 1.4 tpr. Actual emission reductions will likely be slightly less than 1.4 tpy, depending on the actual amount of startup operation. Estimates of the cost of an oxidation catalyst are again about $100,000 installed per engine, or $400,000 total. Annualizing and dividing, yields a RACT "cost" of approximately $85,000/ton.

Selection of RACT Controls

Owing to the high RACT cost for adding an oxidation catalyst on the IC engines at PCP, the addition of an oxidation catalyst is not justified. However, PCP is required to install oxidation catalysts to meet the CO emission requirements of 40 CFR 63, Subpart ZZZZ. Therefore, while not economically justified, oxidation catalysts will be installed at PCP. The VOC emission reductions obtained from this installation can be credited.

<u>NOx</u>

Available Control Technology

The following technologies have been identified as potential control methodologies for control of NOx emissions: good combustion practices (GCP – no additional controls, but proper operation of existing equipment); low emission combustion (LEC); selective non-catalytic reduction (SNCR); and selective catalytic reduction as potential NOx emission control technologies.

Technically Infeasible RACT Controls

Low emission combustion controls would require a redesign of the existing equipment. As this source is a municipal power plant, it is subject to the funding requirements of the City of Provo. Therefore, direct replacement of the existing equipment is considered technically infeasible (although please see the RACT analysis for Direct Replacement of Existing Equipment).

Selective non-catalytic reduction is the simple injection of ammonia into the exhaust stream. This is technically feasible.

Selective catalytic reduction is the same, although with the addition of a catalyst bed to facilitate reduction at a lower exhaust stream temperature. This is also technically feasible.

Evaluation and Ranking of Technically Feasible RACT Controls

The remaining three control methodologies are then ranked in terms of control effectiveness.

1. SCR
2. SNCR
3. GCP

Both SCR and SNCR require ammonia injection, which generates ammonia slip – a source of particulate emissions. Direct particulate emissions are of greater impact on attainment demonstration than NOx emissions. Although the exact ratio is subject to

debate depending on numerous factors; in general, the prevention of direct particulate emissions is good – especially for a relatively small reduction in NOx emissions.

While the exact cost for installation of either an SCR or SNCR unit has not been determined at PCP, at best a retrofit SCR unit would be about 50% effective in controlling NOx emissions. The IC engines at PCP do not generate the high concentration, high temperature exhaust required for a maximum high-efficiency SCR

unit to operate. Retrofit units would be placed into the exhaust stream as space allows, not as optimal temperature and mixing requirements would dictate. Similar sized engines operating in limited use mode show a best case reduction of 12.5 tons of NOx at a control value of $7,500/ton for SCR and 7 tons of NOx for $12,000/ton for SNCR, but this was for an engine with annual actual emissions of greater than 25 tons per year.

The IC engines at PCP have limited emissions of NOx (less than 6 tpy maximum each), with much of these emissions being generated during startup and shutdown modes when neither SCR nor SNCR would achieve any emission reductions.

Selection of RACT Controls

Based on the above evaluation, add-on SCR or SNCR controls are not economically or environmentally justified. The remaining control methodology, GCP is therefore recommended.

2.3 Direct Replacement of Equipment

The final control option is to outright replace the dual-fueled IC engines. This is an available control option which would involve replacing an emission unit with an equivalent, but lower emitting more modern unit.

<u>Emission Reductions</u>

Available Control Technology

Direct replacement of an emission unit is obviously an available control option.

Technically Infeasible RACT Controls

N/A – Direct replacement of an emission unit is technically feasible.

Evaluation and Ranking of Technically Feasible RACT Controls

PCP is a municipal power plant, and therefore subject to the funding concerns of the City of Provo. Funding would require issuing new bonds for the replacement of little used, existing equipment.

Selection of RACT Controls

Based on the above evaluations, replacement of existing equipment is not economically justified. No changes are recommended

3.0 Conclusion- Emissions Reductions through RACT implementation

In summary, the only changes to the existing arrangement of equipment at PCP, is the

installation of oxidation catalysts on the four dual-fueled IC engines. PCP submitted a NOI for this permitting change in October, 2012. The oxidation catalysts have been installed and are already operational. The total reduction in VOC emissions is estimated at 1.4 tons per year, based on current projections of actual emissions.

4.0 Startup / Shutdown

In order to minimize emissions generated during startup and shutdown of the IC engines, PCP is required to maintain a defined emission minimization plan. The plan is similar in scope to those at all the smaller municipal power generation facilities, and consists of two main components: limiting the total duration of startup and shutdown periods on an annual and daily basis, and ensuring that startups and shutdowns are summed across all of the IC engines at the facility.

As most startup and/or shutdown periods are of very short duration, standard stack testing cannot be used to obtain emission totals when operating in these modes. Similarly, requiring use of expensive, expanded operating range CEM equipment to obtain emission information is of limited use when the ultimate goal is emission reduction through limiting the total amount of time the IC engines are operating outside of steady-state.

In order to ensure a level of equity between the three municipal power generators in the Provo, Utah PM2.5 Nonattainment Area the same set of assumptions were used to "scale up" existing operations. Each facility reported a similar number of total plant startups – approximately 150 to 200 per annum. This value was scaled up by calculating the following:

(Operational days/week) x (Potential Startups/day) x (Weeks/year) = startups per engine

(3) x (3) x (52) = 468 startups per year per engine at the facility. For PCP's four engines, this value is 1824. Using a base assumption of 15 minutes as the amount of time required for startup and shutdown (or 30 minutes for both periods combined), a limit of six (6) hours per day and 936 hours per year can be assigned for total startup and shutdown events for all engines combined.

5.0 Implementation Schedule

PCP completed installation of the oxidation catalysts on all four IC engines. Testing has been completed and the units are fully operational with all controls in place. No implementation schedule is required.

PCP has indicated that they are no longer operating the natural gas-fired boilers (Boilers #1, #2 and #3), and these items have been permanently removed from service. This RACT review has been updated to remove reference to these units.

6.0 References

Provo City Power Major Point Source RACT Evaluation and Notice of Intent – dated October 2, 2012
UMPA PM2.5 SIP Reasonably Available Control Technology response – dated April 28, 2014
UMPA PM2.5 SIP Reasonably Available Control Technology revised response – dated May 28, 2014
Fairbanks Morse Engine emission estimations
Caterpillar performance estimates

RACT Evaluation Report – Provo City Power – Power Plant

UTAH $PM_{2.5}$ SIP RACT

Provo City Nonattainment Area

Supporting Information