RACT Evaluation Report – Payson City Power

UTAH $PM_{2.5}$ SIP RACT

Provo City Nonattainment Area

Utah Division of Air Quality

Major New Source Review Section

October 1, 2014

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-AN108230006-14

July 7, 2014

Ron Crump
Payson City Corporation
439 West Utah Ave.
Payson, UT 84651

Dear Mr. Crump:

Re: Approval Order: Installation of Oxidation Catalysts Under R307-401-12
Project Number: N10823-0006

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:sa

cc: Mike Owens
Utah County Health Department

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STATE OF UTAH

Department of Environmental Quality

Division of Air Quality

APPROVAL ORDER: Installation of Oxidation Catalysts Under R307-401-12

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

APPROVAL ORDER NUMBER

DAQE-AN108230006-14

Date: July 7, 2014

Payson City Corporation
Payson City Power
Source Contact:
Brian Stevenson
Phone: (801) 465-5270
Email: brians@payson.org

Bryce C. Bird
Director

Abstract

On February 4, 2014, Payson City Corporation submitted a NOI to install oxidation catalysts on four enterprise engine generators at the Payson City Light and Power Generation Facility located in Payson, Utah. Payson is located in Utah County, a nonattainment area for PM_{10} and $PM_{2.5.}$ The Payson City Light and Power Facility is a listed source in both the PM_{10} and $PM_{2.5}$ sections of the Utah SIP as it is a major source of NO_x emissions. The Facility operates under an existing Title V permit (Permit No. 4900080003).

The new oxidation catalysts are designed to meet the HAP emission reduction requirements of 40 CFR 63, Subpart ZZZZ. The same oxidation process also reduces emissions of VOC and CO. Concurrent with the installation of the oxidation catalysts, the source has opted to take a reduction in total hours of operation to 12,600 hours per year. This limitation applies on all four engines combined, resulting in a reduction in total NO_x emissions of approximately 25 percent. Although more complete combustion of VOC and CO is achieved with the installation of the oxidation catalysts, total CO_2, and overall GHG emissions as well, have dropped slightly with the decrease in fuel consumption from reduced operation. No other changes in equipment or processes have occurred as a result of this project.

The installation of the oxidation catalysts was included as RACT for the Payson City Light and Power Facility as part of the overall control strategy for the Provo, Utah $PM_{2.5}$ Nonattainment Area. The overall reduction in VOC emissions has been previously included in that attainment demonstration. As the installation of the oxidation catalysts represents a strict emission decrease, this project qualifies as a Reduction in Air Contaminants under R307-401-12. No public comment period or public review is required under R307-401-7. The AO has been administratively changed to reflect the new equipment.

With the completion of the project, potential annual emissions have changed by the following amounts (all values are in tons per year): NO_x -68, VOC -51.5, CO -75.2, HAPs -7.1 and GHG -3,968. The resulting PTE at the Payson City Light and Power Facility can be calculated at the following ton per year amounts: PM_{10} = 25.0, $PM_{2.5}$ (a subset of PM_{10}) = 25.0, NO_x = 200.0, SO_2 = 3.3, CO = 44.8, VOC = 51.5, HAPs = 6.2, GHG = 15,867 as 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:	**Permitted Location:**
Payson City Corporation 439 West Utah Ave. Payson, UT 84651	Payson City Power 1100 N. 100 E. Payson, UT 84651

UTM coordinates: 437,060 m Easting, 4,432,650 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 **Payson City Power**
Permitted Source

II.A.2 **Dual Fuel Internal Combustion Engine (Unit 1)**
Unit Description: 2,650 kW with automatic air/fuel ratio controller and oxidation catalysts

II.A.3 **Dual Fuel Internal Combustion Engine (Unit 2)**
Unit Description: 2,650 kW with automatic air/fuel ratio controller and oxidation catalysts

II.A.4 **Dual Fuel Internal Combustion Engine (Unit 3)**
Unit Description: 2,093 kW with automatic air/fuel ratio controller and oxidation catalysts

II.A.5 **Dual Fuel Internal Combustion Engine (Unit 4)**
Unit Description: 1,800 kW with automatic air/fuel ratio controller and oxidation catalysts

II.A.6 **Diesel Generator (Unit 5)**
Unit Description: 186 hp

II.A.7 **Natural Gas Boiler (Unit 6)**
Unit Description: 0.812 MMBtu/hr. No unit-specific applicable requirements.

II.A.8 **Emergency flare (Unit 7)**
Unit Description: Pre-1969 unit. No unit-specific applicable requirements.

II.A.9 **Miscellaneous Emission Units 1 (Misc. 1)**
Unit Description: includes following units: Thirteen Natural Gas Space Heaters (less than 0.5 MMBtu/hr each), Natural Gas Water Heater (1 MMBtu/hr). No unit-specific applicable requirements.

II.A.10 **Miscellaneous Emission Units 1 (Misc. 2)**
Unit Description: includes following units: Three Above Ground Storage Tanks, Two Diesel Day Tanks, Two Diesel Tanks, Two Glycol Tanks, One Glycol Surge Tank, Two Underground Diesel Storage Tanks. No unit-specific applicable requirements.

II.A.11 **Miscellaneous Emission Units 1 (Misc. 3)**
Unit Description: includes following units: Steam Cleaner, Two Parts Cleaners, Sand Blaster, Gas Dispensers, Cooling Tower, Oil/Water Separator and Diesel Fuel Pump. No unit-specific applicable requirements.

II.B Requirements and Limitations

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

II.B.1.a Payson City Power shall use natural gas as the primary fuel in all of the dual fuel engines. Diesel fuel oil #1 or #2, or a combination of #1 and #2, may be used only during: a 15-minute start-up and shut-down period; as backup fuel during periods of natural gas curtailment; for maintenance firings; for break-in firing; system electrical power outages; and as pilot fuel. Natural gas curtailment is defined as period when the natural gas provider/supplier imposes a curtailment or interruption of service, and the curtailment is involuntary and beyond the control of the permittee.

An operation log shall be used to record the engine running time during start-up, shut-down, natural gas curtailment, maintenance firing, break-in firing, system electrical power outages, and normal operation.

[R307-401-8]

II.B.1.b Payson City Power shall only use #1 or #2 diesel fuel or a combination of #1 or #2 diesel fuel in the emergency generators. [R307-401-8]

II.B.1.c Payson 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.d For all stack testing performed the following applies, unless otherwise specified in this AO:

Frequency: The source shall be tested every three years based on the date of the last stack test.

A stack test protocol shall be provided at least 30 days prior to the test. A pretest conference shall be held if directed by the Director. The emission point shall be designed to conform to the requirements of 40 CFR 60, Appendix A, Method 1, and Occupational Safety and Health Administration (OSHA) approvable access shall be provided to the test location. The production rate during all compliance testing shall be no less than 90% of the maximum production rate achieved in the previous three (3) years.

Methods:

Volumetric Flow Rate: 40 CFR 60, Appendix A, Method 2 or other EPA-approved testing methods acceptable to the Director

CO Emissions: 40 CFR 60, Appendix A, Method 10 or other EPA-approved testing methods acceptable to the Director

NO_x Emissions: 40 CFR 60 Appendix A, Method 7E or other EPA-approved testing methods acceptable to the Director.

Calculations: To determine mass emission rates (g/kW-hr) the pollutant concentration as determined by the appropriate methods above shall be multiplied by the volumetric flow rate, divided by the engine's power output during the test and multiplied by any necessary conversion factors.

The results of stack testing shall be submitted to the Director within 60 days of completion of the testing. Reports shall clearly identify results as compared to permit limits and indicate compliance status.

[R307-401]

II.B.2 **<u>Conditions on Dual Fuel Internal Combustion Engine (Unit 1)</u>**

II.B.2.a The stack exhaust temperature shall be maintained between 775 degrees F and 875 degrees F.

The exhaust temperature after the turbo charger shall be continuously monitored by the sensor associated with automatic air/fuel ratio controller. The monitoring data shall be recorded hourly.

[R307-401-8]

II.B.2.b Emissions of CO shall be no greater than 0.348 lb/MMBtu.

Emissions of NO_x shall be no greater than 4.96 g/kW-hr.

[R307-401-8]

II.B.3 **Conditions on Dual Fuel Internal Combustion Engine (Unit 2)**

II.B.3.a The stack exhaust temperature shall be maintained between 775 degrees F and 875 degrees F. [R307-401-8]

II.B.3.b Emissions of CO shall be no greater than 0.348 lb/MMBtu.

Emissions of NO_x shall be no greater than 4.96 g/kW-hr.

[R307-401-8]

II.B.4 **Conditions on Dual Fuel Internal Combustion Engine (Unit 3)**

II.B.4.a The stack exhaust temperature shall be maintained between 725 degrees F and 825 degrees F. [R307-401-8]

II.B.4.b Emissions of CO shall be no greater than 0.348 lb/MMBtu.

Emissions of NO_x shall be no greater than 7.69 g/kW-hr.

[R307-401-8]

II.B.5 **Conditions on Dual Fuel Internal Combustion Engine (Unit 4)**

II.B.5.a The stack exhaust temperature shall be maintained between 725 degrees F and 825 degrees F. [R307-401-8]

II.B.5.b Emissions of CO shall be no greater than 0.348 lb/MMBtu.

Emissions of NO_x shall be no greater than 8.76 g/kW-hr.

[R307-401-8]

II.B.6 **Conditions on Dual Fuel Internal Combustion Engines (Units 1-4)**

II.B.6.a Emissions of CO shall be no greater than 44.8 tons per rolling 12-month period for all Unit Engines combined.

Compliance with the emission limitation shall be determined by the following equation:

Emissions (tons/rolling 12-month period) = (Emission factor in lb/MMBtu) x (total heat input in MMBtu/rolling 12-month period)

The emission factor shall be derived from the most recent emission test results required by this permit.

Emissions for each pollutant shall be the sum of emissions from each engine. Within the first 10 days of each month a new 12-month total shall be calculated using data from the previous 12 months.

Emissions of NO_x shall be no greater than 1.54 ton per day and 200 tons per rolling 12-month period for all Unit Engines combined.

Compliance with the NO_x emission limitation shall be determined by the following equation:

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

The emission factor shall be derived from the most recent emission test results. The source shall be tested every three years based on the date of the last stack test. Emission for NO_x shall be the sum of emissions from each engine and shall be calculated on a daily basis.

The number of kilowatt hours generated by each engine shall be recorded on a daily basis.

[R307-401-8]

II.B.6.b Visible emissions shall be no greater than 10 percent 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 opacity except for 15 minutes at start-up and shutdown. [R307-401-8]

II.B.6.c Total hours of operation shall not exceed 12,600 hours per rolling 12-month period for all Unit Engines combined.

An hour meter shall be used to continuously monitor the hours of operation for the affected equipment. Readings shall be taken monthly to determine the total operating hours for that month. Compliance with the 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]

II.B.7 **<u>Conditions on Diesel Generator (Unit 5)</u>**

II.B.7.a Hours of operation shall be less than 504 hours per 12 month period.

An hour meter shall be used to continuously monitor the hours of operation for the affected equipment. Readings shall be taken monthly to determine the total operating hours for that month. Compliance with the 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]

II.B.7.b Visible emissions shall be no greater than 20 percent opacity. [R307-401-8]

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.

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 6, 2014
Incorporates	Additional Information Submitted dated March 20, 2014
Supersedes	DAQE-931-96 dated September 22, 1996

ADMINISTRATIVE CODING

The following information is for UDAQ internal classification use only:

Utah County
CDS A
NSR, Nonattainment or Maintenance Area, Title V (Part 70) major source, PM_{10} SIP / Maint Plan, MACT (Part 63)

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
PAYSON CITY 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: Payson City Power Plant
Address: 1100 N 100 E, Payson, Utah, Utah County
Owner/Operator: Payson City Corporation
UTM coordinates: 437,060 East 4,432,650 North Zone 12

1.2 Facility Process Summary

Payson City Corporation operates the Payson City Power Plant (PCPP) a peaking power plant consisting of four dual-fuel internal combustion (IC) engines. Engines #1 and #2 are rated at 2,650 kW each. Engine #3 is rated at 2,093 kW, while engine #4 is rated at 1,800 kW. The site also consists of a small emergency generator (186 hp), a small natural gas-fired boiler (0.812 MMBtu/hr), and several above-ground storage tanks. A grandfathered emergency flare acts as a safety device during tank filling operations. Two cooling towers cool the exhaust from the IC engines.

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 Payson. 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:
2,650 kW dual-fuel fired IC engine (IC #1)
2,650 kW dual-fuel fired IC engine (IC #2)
2,093 kW dual-fuel fired IC engine (IC #3)
1,800 kW dual-fuel fired IC engine (IC #4)
0.812 MMBtu/hr natural gas-fired boiler (boiler #1)
Diesel and glycol storage tanks (tanks)

Emergency flare (flare)
186 hp emergency generator (Em Gen)
Cooling towers (cooling towers #1, #2)

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, PCPP 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 PCPP's 2008 baseline inventory, all of its emission sources were 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 storage tanks, natural gas-fired boiler, emergency generator, emergency flare, and cooling towers have both potential and actual emissions which remain below the 5 tpy threshold. These sources will not be included for evaluation.

Diesel storage tanks: VOCs < 1 tpy
Natural gas-fired boiler: $PM_{2.5}$ < 1 tpy, NOx < 1 tpy, SO_2 < 1 tpy, VOC < 1 tpy
Emergency generator: $PM_{2.5}$ < 1 tpy, NOx < 1 tpy, SO_2 < 1 tpy, VOC < 1 tpy
Emergency flare: $PM_{2.5}$ < 1 tpy, NOx < 1 tpy, SO_2 < 1 tpy, VOC < 1 tpy
Cooling towers: $PM_{2.5}$ < 1 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.

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

$PM_{2.5}$ = 0.1 tpy
SO_2 = 0.08 tpy
NOx = 4.0 tpy

VOC = 2.0 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 PCPP. 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 SO2 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 SO2 emissions is recommended as RACT. Ultra-low sulfur diesel fuel may be used for startup periods.

VOC

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 oxidation catalysts on the IC engines at PCPP would reduce emissions of

VOC by at best 1.4 tons per year based on the 2008 baseline actual emissions. Estimates of the cost of an oxidation catalyst are about $100,000 installed per engine, or $400,000 total for four engines. Annualizing and dividing, yields a RACT "cost" of approximately $51,165/ton.

Selection of RACT Controls

Owing to the extremely high RACT cost for adding oxidation catalysts on the four IC engines at PCPP, the addition of oxidation catalysts is not economically justified. However, it is likely that PCPP will be required to install oxidation catalysts to meet the CO emission requirements of 40 CFR 63, Subpart ZZZZ. Should subsequent testing require such installation, the VOC emission reductions obtained can be credited.

NOx

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 Payson. Therefore, direct replacement of the existing equipment is considered economically 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 PCPP, at best a retrofit SCR unit would be about 50% effective in controlling NOx emissions. The IC engines at PCPP 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 PCPP have extremely limited emissions of NOx (less than 0.1 tpy total), 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.

2.2 Direct Replacement of Equipment

The final control option is to outright replace the dual-fueled IC engines. These are available control options which would involve replacing each 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

PCPP is a municipal power plant, and therefore subject to the funding concerns of the City of Payson. 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 Reduction through RACT implementation

In summary, the recommendation is to make no changes to the existing equipment or operations at PCPP. The operations at PCPP generate so few actual emissions at any additional add-on controls are not economically justified. However, the requirements of 40 CFR 63 Subpart ZZZZ will shortly require that all engines of this type meet a CO emission limitation as a surrogate for HAP emissions. Although these engines have not yet demonstrated compliance with the requirements of subpart ZZZZ, experience has shown that without add-on control such as an oxidation catalyst, the engines will be unable to meet the CO emission limitation. Therefore, PCPP will need to install oxidation catalysts on the four IC engines.

Total emission reductions expected = 1.4 tons VOC, to be achieved by the 2017 projection year.

4.0 Startup / Shutdown

In order to minimize emissions generated during startup and shutdown of the IC engines, PCPP 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 $PM_{2.5}$ 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 PCPP’s four engines, this

value is 1872. 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

PCPP has completed installing the oxidation catalysts on all four IC engines as of June 2014. Testing has been completed and the units are now fully operational with all required controls in place. No implementation schedule is required.

6.0 References

Payson City Corporation – Major Source RACT Determination
Payson City Corporation – SIP for $PM_{2.5}$, dated April 1, 2014
Fairbanks Morse Engine emission estimations
Caterpillar performance estimates

RACT Evaluation Report – Payson City Power

UTAH $PM_{2.5}$ SIP RACT

Provo City Nonattainment Area

Supporting Information