I. General Comments:

A. Company Information

1. Tucson Electric Power (TEP) – Irvington Generating Station

2. Source Address: 3950 East Irvington Road, Tucson, AZ 85714.
   Mailing Address: 88 East Broadway Blvd, Mail Stop HQW705, Tucson Arizona or P.O. Box 711, Mail Stop HQW705, Tucson, AZ 85702.

B. Background

PDEQ received an application for a Prevention of Significant Deterioration (PSD) Authorization and Significant Revision to the Class I air quality permit (#1052) for the TEP – Irvington Generating Station (TEP-IGS or IGS) also known as the “H. Wilson Sundt Generating Station” on August 3, 2017 (revised December 2017). This TSD has been updated for this modification (See Attachment E for Previous TSD documents).

TEP’s objective for the proposed facility modification is to support a more responsive and sustainable resource portfolio for power production. TEP is expanding solar and wind resources with the goal of supplying at least 30 percent of retail energy load from renewable resources by 2030. Operational challenges associated with renewable resources require TEP to develop systems to manage the intermittency and variability of energy generated by renewable resources. TEP reports recent completion of three energy storage projects designed to partially overcome these operational challenges by providing grid balancing resources. To accomplish this in part, TEP is proposing to install up to ten natural-gas fired reciprocating internal combustion engines (RICE) at IGS. The proposed RICE units will provide capacity and will mitigate power fluctuations.

The fundamental business purpose of the proposed project is to modernize and expand the IGS to allow TEP to provide reliable, efficient, grid-balancing resources which can ramp up quickly and provide 100% of the effective load carrying capacity (ELCC) during peak periods of any length. The selection of RICE units to meet this business purpose is discussed in detail in TEP’s 2017 Integrated Resource Plan (IRP).

In summary, TEP selected RICE units because they provide flexible, fast-responding power and assist in mitigating power fluctuations associated with renewable resources.1

TEP identified installation of RICE units at IGS as the best option to expand generation and integrate renewable resources.2 Because renewable resources produce power intermittently and TEP requires back up generation capability with fast start times (capable of being on-line at full load within 5 minutes); operation across a range of loads; and fast ramping (capable of ramping from 30% to 100% load in 40 seconds). According to TEP’s 2017 IRP, a Flexible Generation Technology Assessment was conducted which found that the RICE technology is the preferred technology to provide capacity and assist in

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2 The “2017 Flexible Generation Technology Assessment” prepared for TEP (March 2017), included a review of various technologies including simple cycle gas turbines, reciprocating engines, combined cycle gas turbines, solar photovoltaic, wind generation and battery storage technologies. According to TEP’s 2017 IRP, RICE units were selected because of their fast response, flexibility, and efficiency.
mitigating renewable energy intermittency and variability.\footnote{Information obtained from the footnote on page 22 of the TEP 2017 IRP located at: http://www.tep.com/wp-content/uploads/2017/04/TEP-2017-Integrated-Resource.pdf. Accessed on 15 September 2017.}  A September 2013 report by the National Renewable Energy Laboratory (NREL), noted that challenges associated with renewable energy (i.e., solar and wind power) integration include uncertainty and variability in power supply as well as difficulty balancing electric grid loads. The presence of wind and solar power sources on electric grids can cause coal or natural gas fired plants to cycle on and off more frequently to accommodate fluctuations in renewable energy power generation. Cycling on and off increases wear on the coal and natural gas fired units and decreases energy efficiency. These challenges can be overcome using a number of integration techniques, including advanced forecasting, energy storage, demand response, and flexible power generation sources such as natural gas combustion turbines and RICE units.\footnote{Integrating Variable Renewable Energy: Challenges and Solutions, National Renewable Energy Laboratory, NREL/TP-6A20-60451, September, 2013 (Available at: https://www.nrel.gov/docs/fy13osti/60451.pdf).}

For the reasons described above, TEP has not proposed to install energy storage or other power production technologies such as combustion turbines at IGS. Implementation of either of these options would fundamentally redefine the project. Section 2.1 of TEP’s “Application for a Prevention of Significant Deterioration (PSD) Authorization and Significant Revision to Class 1 Air Quality Permit for Irvington Generating Station provides additional details regarding the proposed project.

Pursuant to PSD requirements, an air dispersion modeling impact analysis, an additional impact analysis, and a Best Available Control Technology (BACT) determination were conducted as part of the permit application process for the RICE project. BACT-based emission limitations were determined for the RICE and for fugitive emissions of volatile organic compounds (VOC) and greenhouse gasses (GHG) expressed as carbon dioxide-equivalent (CO2e). The PSD permit conditions in this permit are denoted by reference to 40 Code of Federal Regulations (CFR) §52.21 as the underlying authority (i.e., applicable requirement). All other conditions are not PSD permit conditions.

History

TEP-IGS is an electric utility power generating station that generates electricity by fossil fuel combustion (natural gas, liquid fuel) and landfill gas combustion. The original construction of TEP-IGS did not provide any capacity to fire coal as an alternate fuel and was regulated by the Pima County Health Services Department. In 1980 the Department of Energy (DOE) promulgated regulations that required certain large power plants to convert their operations to have the additional capacity to fire coal. Since Arizona Revised Statutes (ARS) provide that the State has original jurisdiction for coal fired electrical generating stations, the Arizona Department of Environmental Quality (ADEQ) assumed oversight from Pima County and implemented the permitting and air quality regulation of TEP-IGS. TEP applied for and received an installation permit for the coal conversion project (See Attachment F for the Arizona Department of Health Services Installation Permit (# 1156)).

Although the initial plan was to convert each electric utility steam generating unit (EUSGU or EGU) at the station, only Unit I4 was converted. Since the change was mandated by a government order, New Source Review (NSR) requirements were not applicable [Ref. definition for “major modification” in Pima County Code (PCC) and Arizona Administrative Code (AAC) – c.ii]. The NSPS definition for “modification” also exempts mandatory coal conversion projects [Ref. 40 CFR 60.145(e)(4) and CAA Sec 111(a)(8)]. For this reason, 40 CFR Part 60, Subpart D requirements did not apply to Unit I4 or the coal preparation plant.

In the late 1990’s TEP requested that jurisdiction over TEP-IGS be returned to the Pima County Department of Environmental Quality (PDEQ); the transfer was completed shortly after the Arizona Department of Environmental Quality (ADEQ) issued a 5-year Class I permit to TEP IGS (issue date July 26, 1999). PDEQ’s authority to have jurisdiction over the generating station and any standards adopted
by ADEQ affecting coal fired EUSGUs is through a delegation agreement signed between PDEQ and ADEQ.

Notice of PDEQ’s final permit decision on PSD Permit No. 1052 for the Irvington Generating Station Project was made on December 3, 2018. By its own terms, and consistent with 40 CFR 124.15(b), the effective date of the permit was delayed as the result of the filing of a petition for review of PDEQ’s permit decision with the EPA’s Environmental Appeals Board (“EAB”).

On December 3, 2018, the EAB denied the petition for review of this permit. Please see Tucson Electric Power, PSD Appeal No. 18-02 (EAB December 3, 2018), (Order Denying Review). Thus, in accordance with 40 CFR 124.19 (l) (2), PDEQ served the final permit decision for this PSD permit.

Changes Since Issuance of Previous Permit(s)

The permit issued on January 6, 2017: This significant revision to the Class I, Title V air quality permit is an authorization to construct a major modification. This modification allows the installation of up to ten (10) RICE and the associated ancillary equipment. The ancillary equipment includes natural gas piping and electrical circuit breakers.

A minor revision to the PSD air quality permit was processed in August, 2019 for the installation and operation of a diesel fired generator for emergency power supply. This unit would be the third emergency standby diesel generator (EGEN3) to be located next to the existing simple cycle internal combustion turbines (ICT’s). Rated 600 ekJ (900 bhp) at full load, the generator is to be used in the event of a power failure to provide emergency power to critical loads on existing ICTs, steam turbine units and upcoming RICE units.

Application for Significant Permit Revision Dated November 5th, 2020

TEP submitted a significant permit revision application under PCC 17.12.120 for the removal for the continuous opacity monitoring system (COMS) installed on Unit I4. The COMS was installed to satisfy Installation Permit #1156, issued in November 1981, to support the conversion to coal as a fuel for Unit I4. Since Unit I4 no longer burns coal or fuel oil, there is no regulatory requirement for COMS on a gas-fired EGU, and TEP has demonstrated long standing continuous compliance over unit I4 for a period of two and half years, at all load levels across the unit operating spectrum. PDEQ has determined that this regulatory compliance demonstration is satisfactory and is consistent with the control of the units’ opacity limit and thus the COMS is no longer warranted. Unit I4 remains subject to an average optical density opacity limit of 20%. This opacity limit will endure after the COMS is removed.

Application for a Minor Permit Revision Dated March 30, 2021

TEP submitted a minor permit revision application under PCC 17.12.110 for the addition of a fourth Emergency Internal Combustion Engine. The standby diesel generator (EGEN4) is to be located next to the Operations Center and is to be used in the event of a power failure to provide emergency power to critical equipment at the Operations Center. Rated at 2000 kW at full load, the generator is subject to the New Source Performance Standards (NSPS) contained in the Code of Federal Regulations (CFR) at 40 CFR Part 60 Subpart III. This rule provides emission limitations for NOX, CO and PM and describes requirements for monitoring and recordkeeping. EGEN4 is identified in the permit alongside EGEN2-3, Section XII (page 49) of the permit. The addition of this generator does not change existing monitoring, reporting or recordkeeping requirements in the permit; furthermore, the addition of EGEN4 does not increase the potential to emit of any regulated pollutant above significant levels. The emission estimates are summarized in Table 4-1 and 4-2 of the permit revision application, and are presented overpage.
40 CFR Part 60 Subpart III limits the operation of maintenance checks and readiness testing to no more than 100 hours/year. The rule does not limit the emergency run hours of EGEN4 in true emergency situations.

C. Attainment Classification

TEP-IGS is located in a region that is designated as attainment for all criteria pollutants.
II. Source Description

A. Process Description

TEP-IGS currently generates electricity using two fossil fuel fired processes: (1) Steam Turbine Cycle and (2) Combustion Turbine Cycle. This PSD modification approves the construction and operation of a third fossil fuel fired process: RICE. The proposed RICE are 18-cylinder, four-stroke, lean-burn natural gas fired spark-ignited RICE; each with an air-cooled generator to produce electricity. In addition, there are several support facilities, some of which contain applicable requirements that are addressed by the permit.

1. Steam Turbine Cycle (Existing)

There are three distinct units in this process: (1) Boiler; (2) Turbine; and (3) Generator.

a. Boiler

Water is converted to steam via combustion of fuel and heat transfer. Steam is routed to turbines while the exhaust gasses and pollutants produced during combustion are released to the ambient atmosphere after passing through air pollution controls (if required). The concentrations of pollutants released into the atmosphere depend on the fuel fired. Typical pollutants are Particulate Matter (PM), Sulfur Dioxides (SO₂), Nitrogen Oxides (NOₓ), Carbon Monoxide (CO), and Volatile Organic Compounds (VOC). Specific pollutant emission rates are provided in Section IV of this document.

b. Turbine

Steam exiting the boilers enters a turbine unit. The high-pressure steam passes through rotating blades which cause the turbine shaft to rotate converting the thermal energy of the steam into mechanical energy. After passing through the turbine, the steam is sent through a condenser and is recirculated to the boiler. The only process material used by the turbine unit is steam; thus there are no emissions.

c. Generator

The turbine drives the generator which, in turn, produces electrical energy. There are no process materials and no emissions from these units.

2. Combustion Turbine Cycle (Existing)

There are two distinct units in this process: (1) Combustion Turbine; and (2) Generator

a. Combustion Turbine

Fuel and air are mixed and injected into a combustion chamber where they are ignited. The hot combustion gases pass over the turbine blades. The resulting movement of the blades causes the shaft to rotate. Exhaust gasses and pollutants produced during combustion are released to the ambient atmosphere after passing through air pollution controls (if required). Emissions resulting from combustion typically include PM, SO₂, NOₓ, CO and VOC. Representative emission rates are provided in Section IV of this document.
b. Generator.

The turbine drives the generator which, in turn, produces electrical energy. There are no process materials and no emissions from these units.

3. RICE (Proposed to be added in this modification)

a. Engine.

Combustion engines used for electric power generation are internal combustion engines in which an air-fuel mixture is compressed by a piston and ignited within a cylinder. The expansion of hot gases pushes a piston within a cylinder, which converts the linear movement of the piston into the rotating movement of a crankshaft to generate power. Each movement of the piston within a cylinder is called a stroke. Electric power generation, four-stroke engines are predominately used. A four-stroke engine completes an induction stroke, a compression stroke, a power stroke, and an exhaust stroke, with two revolutions of the crankshaft, in each repetition of the cycle. RICE are described by the number of strokes to complete one power cycle and the type of combustion: spark-ignited (“SI”), as in a typical gasoline-powered vehicle, or compression-ignited (“CI”), also known as diesel engines. SI RICE are further characterized by whether the engine is operated fuel-lean (i.e., with an air-to-fuel ratio significantly greater than the stoichiometric ratio required for complete combustion) or fuel-rich (i.e., with an air-to-fuel ratio equal to or slightly greater than the stoichiometric ratio).

b. Generator.

The engine drives the generator which, in turn, produces electrical energy. There are no process materials and no emissions from these units.

4. Support Facilities

Other equipment, operations and process that function as support facilities are turbine starter engines, emergency generators, and cooling towers. Pollutants include PM, SO₂, NOₓ, CO, and VOC.

Support equipment for the RICE include circuit breakers and natural gas piping. Pollutants emitted include GHG.

B. Operating Capacity and Schedule

TEP-IGS requires the flexibility to operate 24 hours a day, 365 days a year. The net capacity of each power production unit is as follows:

1. Fossil Fuel Fired Steam Generating Units:
   a. UNIT I1 – 81 MW
   b. UNIT I2 – 81 MW
   c. UNIT I3 – 104 MW
   d. UNIT I4 – 156 MW

2. Stationary Combustion Turbines:
   a. UNIT IGT1 – 24 MW
   b. UNIT IGT2 – 24.5 MW
   c. UNIT IGT3 – < 25 MW (Reserved for future installation See Alternate Operating Scenarios)
3. RICE:
   a. RICE01 – 19 MW
   b. RICE02 – 19 MW
   c. RICE03 – 19 MW
   d. RICE04 – 19 MW
   e. RICE05 – 19 MW
   f. RICE06 – 19 MW
   g. RICE07 – 19 MW
   h. RICE08 – 19 MW
   i. RICE09 – 19 MW
   j. RICE10 – 19 MW

C. Applicability Categories

The following categories are addressed by the permit:

1. Facility General Provisions
2. RICE (RICE01, RICE02, RICE03, RICE04, RICE05, RICE06, RICE07, RICE08, RICE09, and RICE10)
3. NSPS Subpart JJJ Requirements for RICE (RICE01 through RICE10)
4. NESHAP Subpart ZZZ Requirements for RICE (RICE01 through RICE10)
5. Electric Steam Generating Units EUG’s (Units - I1, I2 and I3)
6. Electric Steam Generating Units (I4)
7. Unit I4 – Regional Haze Implementation Plan
8. Cooling Towers (I1E, I2D, I3D, and I4E)
9. Stationary Rotating Machinery (IGT1, IGT1A, IGT2, and IGT2A)
10. Emergency Generators – Local Requirements (EGEN1 and EGEN2)
11. NESHAP Subpart ZZZZ Requirements for Emergency Generators (EGEN1, IGT1A, and IGT2A)
12. NSPS Emergency Generator Requirements (EGEN2-4)
13. Nonpoint Fugitive Dust Sources
14. Use of Paints
15. Abrasive Blasting

D. Air Pollution Control Equipment

Air Pollution Control Equipment is required for the following equipment and processes:

1. RICE Units RICE01 through RICE10
   Oxidation catalyst will be required to be installed and operated to control VOC and CO emissions. Selective catalytic reduction (SCR) is required to be installed and operated to control NOX emissions.

2. UNIT IGT3
   Upon purchasing the unit, the Permittee is required to install and operate a water injection system or its equivalent to control NOX emissions.
III. Regulatory History

TEP is currently in compliance with permit and regulatory requirements.

A. Testing & Inspections

Inspections have been conducted regularly since PDEQ took over jurisdiction from ADEQ. The last completed inspection was concluded in 2014.

B. Excess Emissions

NOV PC1611-057 was issued on November 15, 2016 for alleged violations of the opacity standard for IGS U4. On November 15, 2016, a Settlement Agreement was reached and was executed on March 16, 2017 to resolve the alleged violation.

IV. Emission Estimates

The following table summarizes IGS annual potential to emit of air pollutants by each emission unit and by facility-wide total. The emission estimate is to establish “major source” status of IGS pursuant to CAA Sec 501(2). Other use with the estimate may include comparing source potential-to-emit with emissions inventory and test data, or with emission rates allowable by relevant standards. This emission estimate is not meant to establish any baseline emission levels. These emission figures are not meant to be emission limitations of any form.

The majority of IGS air emissions come from the boiler units. Although natural gas is the primary fuel consumed by the boilers, Units I1-I3 are permitted to co-fire natural gas with fuel oils and Unit I4 is permitted to co-fire natural gas with landfill gas. To accommodate the co-firing scenario, a fuel mix of 85% natural gas and 15% diesel was used in calculating emissions for Units I1-I3. Similarly, a fuel mix of 95% natural gas and 5% landfill gas was used for Unit I4.

The emissions from the new RICE units are calculated based on 8,760 hours of operation per year for each of the ten RICE. The potential emission calculations were developed using emission factors for startup and non-startup operation. Per the vendor supplied documentation, cold startups occur after the RICE has not been operational for 2 to 3 days. The vendor supplied documentation is included in Attachment A. The potential emissions from the RICE were calculated assuming up to 5 cold startups per day. Although this is physically impossible because the unit will not be “cold” if it has been operational within the same day, this assumption provides a conservative estimate of startup emissions. Startups are assumed to be 30 minutes in duration and the remainder of the startup hour is assumed to be half of an operating hour. Daily emission calculations include 5 startups and 21.5 hours of operation per day. An example calculation using PM10 is:

\[
\frac{1.8 \text{ lb}}{\text{startup}} \times \frac{5 \text{ startups}}{\text{day}} + \frac{2.37 \text{ lb}}{\text{hr}} \times \frac{21.5 \text{ hr}}{\text{day}} = \frac{60.0 \text{ lb}}{\text{day}}
\]

\[
\frac{60.0 \text{ lb}}{\text{day}} \times \frac{365 \text{ day}}{\text{yr}} + \frac{2000 \text{ lb}}{\text{ton}} = \frac{10.9 \text{ tons}}{\text{yr}}
\]
The permit application calculated the potential emissions of NOx based on the New Source Performance Standard (NSPS) emission limit of 1.0 g/hp-hr, resulting in an emission rate of 59.1 lb NOx/hr. The RICE vendor also provided emission factors for NOx during startup and non-startup operation. As noted in Table 1 below, the lb/hr NOx emission calculations were developed using the NSPS emission limit. The NSPS limit is incorporated in the permit as an enforceable condition. TEP also requested a limitation on annual NOx emissions of 170.0 tons/year. Therefore, the enforceable limitation on NOx emissions is 170.0 tons/year.

The emission factors used to develop the emission calculations are noted in the Table 1 below.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Fuel Based</th>
<th>NSPS Limit</th>
<th>Proposed BACT Limit</th>
<th>Vendor Supplied Startup Emission Factor</th>
<th>Vendor Supplied Controlled Emission Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb/MMBtu</td>
<td>g/(HP-hr)</td>
<td>lb/hr</td>
<td>lb/event</td>
<td>lb/hr</td>
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<tr>
<td>PM</td>
<td>7.71E-05</td>
<td>---</td>
<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>PM10</td>
<td>---</td>
<td>---</td>
<td>2.37</td>
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<td>CO</td>
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<td>4.43</td>
<td>9.1</td>
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<td>VOC</td>
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<td>4.3</td>
<td>2.07</td>
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<td>---</td>
<td>1.00E+00</td>
<td>---</td>
<td>10.3(^5)</td>
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<td>2.10E-03</td>
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<td>---</td>
</tr>
<tr>
<td>Sulfuric Acid Mist</td>
<td>3.20E-04</td>
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</tbody>
</table>

The summarized RICE potential to emit is included in the IGS Facility Wide Potential to Emit Summary Table below (Table 2. Assumptions are presented in the Table 2 footnotes. The detailed RICE project emission calculations and calculation methodology are included in Attachment B.

The Facility is voluntarily accepting a NOx emission cap of 170.0 tons/year to ensure that the RICE project net emissions increase for NOx is 30.6 tpy, which is well below the 40 tpy significance threshold. The permit requires the permanent shut down of Unit I1 and Unit I2 (existing Units) prior to startup of the first RICE. The NOx emission cap of 170.0 tpy applies to the ten RICE to be installed at the IGS. The 170.0 tpy limit is the combined total NOx emissions for all ten RICE.

For Title V air permitting purposes, the major source threshold is 100 tpy of any criteria air pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy of any HAPs combination. As shown in the Table 2, IGS is a major Title V source for the following air pollutants: PM\(_{10}\), PM\(_{2.5}\), SO\(_2\), NOx, CO, VOC, and HAPs.

\(^5\) 10.3 lb/event is the cold start emission factor for NOx, which is more conservative than the 3.5 lb/event emission factor used during warm startup periods. The 10.3 lb/event emission factor will be used for calculating emissions during all startup periods, even those that occur when the engine is already warm.
Table 2: IGS Facility Wide Potential to Emit (tons/year) Summary

<table>
<thead>
<tr>
<th>Source</th>
<th>PM-10</th>
<th>PM-2.5</th>
<th>SO2</th>
<th>NOx</th>
<th>CO</th>
<th>CO2</th>
<th>VOC</th>
<th>Lead</th>
<th>Total HAPs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb/hr</td>
<td>lb/hr</td>
<td>ppm</td>
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<td>ppm</td>
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<tr>
<td>Boiler Unit II(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>85% Natural Gas</td>
<td>0.09</td>
<td>2.07</td>
<td>6.09</td>
<td>2.52</td>
<td>6.09</td>
<td>6.09</td>
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</tr>
<tr>
<td>85% Diesel Fuel #2</td>
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<td>16.35</td>
<td>3.77</td>
<td>16.35</td>
<td>149.59</td>
<td>833.31</td>
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<tr>
<td>85% Diesel Fuel #6</td>
<td>3.61</td>
<td>28.97</td>
<td>6.86</td>
<td>28.97</td>
<td>1.06</td>
<td>8.17</td>
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<tr>
<td>85% Diesel Fuel #6</td>
<td>3.61</td>
<td>16.17</td>
<td>3.69</td>
<td>16.17</td>
<td>142.98</td>
<td>626.24</td>
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<tr>
<td>85% Natural Gas</td>
<td>0.87</td>
<td>10.67</td>
<td>8.07</td>
<td>10.67</td>
<td>8.07</td>
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<td></td>
</tr>
<tr>
<td>85% Diesel Fuel #2</td>
<td>3.84</td>
<td>18.81</td>
<td>3.84</td>
<td>18.81</td>
<td>148.59</td>
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<tr>
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<td>18.81</td>
<td>3.84</td>
<td>18.81</td>
<td>148.59</td>
<td>856.82</td>
<td>27.90</td>
<td>122.22</td>
<td></td>
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<tr>
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<td>18.81</td>
<td>3.84</td>
<td>18.81</td>
<td>148.59</td>
<td>856.82</td>
<td>27.90</td>
<td>122.22</td>
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<tr>
<td>Boiler Unit IV</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>95% Natural Gas</td>
<td>11.64</td>
<td>50.97</td>
<td>11.64</td>
<td>50.97</td>
<td>9.28</td>
<td>14.17</td>
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<td>5% Landfill Gas</td>
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<td>2.94</td>
<td>0.67</td>
<td>2.94</td>
<td>1.32</td>
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<td>Facility Wide</td>
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<tr>
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<td>6.09</td>
<td>2.52</td>
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<td>PM-2.5</td>
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<td>3.77</td>
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<td>856.82</td>
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<td>856.82</td>
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<tr>
<td>Total</td>
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<td>148.59</td>
<td>856.82</td>
<td>27.90</td>
<td>122.22</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Notes:
(1) Almost all PM emissions are calculated using AP-42 emission factors where an enforceable permit limit becomes the limiting factor. In that case, the permit limit is to be used for the emission calculation. 8,760 hours per year is used in the PTE calculations for all operations except the operation of emergency generation for which 500 hours per year was used and of startup engines for which 346 hours per year was used.
(2) Source fuel compositions are estimated from the fuel purchase invoices.
(3) This summary table only presents PTE results from the operating scenario where, on an annual basis, Boilers II-33 burn a blend of 85% natural gas and 15% fuel oil #2, Boiler I4 burns a blend of 95% natural gas and 5% landfill gas, and all turbine units burn natural gas. Boiler Units II-33 are permitted to burn natural gas, fuel oil #2 through #6 or equivalent (including bio-diesel), and landfill gas. Boiler Unit I4 is permitted to burn natural gas or combustion of natural gas and landfill gas. For turbine units, RICE1 and RICE2 are permitted to fire or co-fire natural gas and fuel oil #2 or equivalent including bio-diesel. Emissions for the RICE units are calculated based on 8,760 hours of operation per year for each of the two RICE. Minimum hourly emission rates for the RICE may include startup emissions and therefore the hourly emission rates are not indicative of the hourly emission rates for non-startup operation.
(4) The existing fossil fuel fired units (Units 1 and Unit 2) will be permanently shut down prior to startup of the first RICE unit.
V. Applicable Requirements

A. Standards addressed by the permit:

1. Pima County State Implementation Plan (SIP):
   - Rule 301 Planning, Construction, or Operating without a Permit
   - Rule 302 Non-Compliance with Applicable Standards
   - Rule 315 Roads and Streets
   - Rule 316 Particulate Materials
   - Rule 318 Vacant Lots and Open Spaces
   - Rule 321 Standards and Applicability
   - Rule 343 Visibility Limiting Standard
   - Rule 344 Odor Limiting Standards

2. Code of Federal Regulations Title 40:
   - Part 52 Approval and Promulgation of Implementation Plans
   - Part 60 Subpart A General Provisions
   - Part 60 Subpart KKKK Standards of Performance for Stationary Combustion Turbines (IGT3)
   - Part 60 Subpart JJJJ Standards of Performance for Stationary Spark Ignition Internal Combustion Engines
   - Part 60 Subpart GG Standards of Performance for Stationary Gas Turbines (IGT3)
   - Part 60 Appendix B Performance Specifications
   - Part 63 Subpart A General Provisions
   - Part 63 Subpart ZZZZ NESHAPS for Stationary Reciprocating Internal Combustion Engines
   - Part 63 Subpart Q NESHAPS for Industrial Process Cooling Towers
   - Part 64 Compliance Assurance Monitoring
   - Part 72 Subpart A Acid Rain Program General Provisions
   - Part 75 Continuous Emission Monitoring
   - Part 75 Appendix A Specifications and Test Procedures
   - Part 75 Appendix B Quality Assurance and Quality Control
   - Part 75 Appendix D Optional SO2 Emissions Data Protocol for Gas and Oil Fired Units
   - Part 75 Appendix E Conversion Procedures
   - Part 75 Appendix G Determination of CO2 Emissions

3. Pima County Code (PCC) Title 17, Chapter 17:
   - 17.04.340 Words, phrases, and terms
   - 17.04.210 Planning, Constructing, or Operating Without a Permit
   - 17.09.030 Applicability – Classes of Permits
   - 17.11.190 Permits Containing Synthetic Emission Limitations and Standards
   - 17.11.200 Existing Source Emission Monitoring
   - 17.12.040 Permit Contents for Class I Permits
   - 17.12.050 Establishment of an Emissions Cap for Class I Permits
   - 17.12.070 Acid Rain Provisions
   - 17.16.020 Noncompliance with Applicable Standards
   - 17.16.030 Odor Limiting Standards
   - 17.16.040 Standards and Applicability (Includes NESHAP)
   - 17.16.050 Visibility Limiting Standards
   - 17.16.060 Fugitive Dust Producing Activities
   - 17.16.080 Vacant Lots and Open Spaces
   - 17.16.090 Roads and Streets
   - 17.16.100 Particulate Materials
   - 17.16.110 Storage Piles
   - 17.16.130 Applicability
17.16.160 Standards of Performance for Fossil-Fuel Fired Steam Generators and General Fuel Burning Equipment
17.16.165 Standards of Performance for Fossil-Fuel Fired Industrial and Commercial Equipment
17.16.340 Standards of Performance for Stationary Rotating Machinery
17.16.430 Standards of Performance for Unclassified Sources
17.16.490 Standards of Performance for New Stationary Sources
17.16.560 Permits for Sources Located in Nonattainment Areas
17.16.590 Permits for Sources Located in Attainment and Unclassifiable Areas
17.16.600 Air Quality Impact Analysis and Monitoring Requirements
17.16.630 Visibility Protection

4. Installation Permit #1156 – October 14, 1981 by Arizona Department of Health Services (Attachment F)

B. Standards which are not applicable:

1. PSD/NSR

   RICE01 through RICE10 have netted out of PSD (40 CFR 52.21) for NOx.

   RICE01 through RICE10 are exempt from 40 CFR Parts 74, 75, and 76.

C. Promulgated standards which will be or may be applicable not addressed by the permit:

   No promulgated standards which may be applicable have been identified that are not addressed by the permit.

D. Promulgated standards which will be or may be applicable after issuance of the permit that have been addressed by the permit:

   No promulgated standards which may be applicable after issuance have been addressed by the permit.

VI. Previous Permit Conditions

   No previous permit conditions were removed from the permit as part of this modification.

VII. Applicability Determinations

1. Prevention of Significant Deterioration (PSD)

   The regulated air pollutants which will be emitted by the RICE units include CO, NOx, VOC, SO2, PM, PM less than or equal to 10 micrometers (µm) in diameter (PM10), PM less than or equal to 2.5 µm in diameter (PM2.5), GHG, and HAPs. The project is located in an area designated as “attainment” or “unclassifiable” with respect to the National Ambient Air Quality Standards (NAAQS) for nitrogen dioxide (NO2), CO, SO2, PM10, PM2.5, and lead. The project may be subject to PSD review for NOx, CO, VOC, PM10, PM2.5, and GHG. The objective of the PSD program is to prevent significant adverse environmental impact from emissions into the atmosphere from a proposed new major source or major modification at an existing major source in an attainment area by limiting allowable degradation of air quality to below levels that would be considered “significant.”

   There are two criteria for determining PSD applicability. The first is whether the proposed project is sufficiently large, in terms of potential emissions, to be a “major stationary source” or a “major modification” at an existing major source. TEP is an existing “Major Stationary Source” per 40 CFR
52.21(b)(1) of the federal PSD regulations because the facility is one of the 28 designated stationary source categories with potential emissions of 100 tpy or more of any regulated NSR pollutant.

The second criteria for PSD applicability under 40 CFR 52.21 requires that if a source or modification qualifies as major, its existing location must be formally designated as “attainment” or “unclassifiable” for any pollutant for which a national ambient air quality standard exists under the PSD program. TEP is located in an area classified as either “attainment” or “unclassifiable” with respect to the NAAQS for SO2, NO2, CO, PM10, PM2.5 and lead. Therefore, the Project meets both criteria and may be subject to PSD review for these pollutants. In addition, EPA’s Tailoring Rule requires that if GHG emissions (expressed as CO2e) are greater than or equal to 75,000 tons per year for a project that triggers PSD review for another pollutant, then GHG emissions are also considered a PSD pollutant. Since potential GHG emissions from the Project will exceed 75,000 tpy, GHG emissions may also be subject to PSD review and need to be included in any PSD determination of BACT.

A major modification is defined as a physical change or change in the method of operation at an existing major source that would result in both a significant emissions increase and a significant net emissions increase of a regulated NSR pollutant. The RICE project will result in the emissions increases as shown in the Table 3 below. The significant emissions increase analysis looks only at the emissions increases from the RICE project. The project will result in a significant emission increase of NOx, VOC, CO, PM10, PM2.5, and GHG.

Because the project results in a significant emission increase, a significant net emissions increase analysis was conducted. The significant net emissions increase evaluates increases and decreases from “contemporaneous” projects at the source. EPA explains in Federal Register Volume 67, Number 251, Tuesday December 31, 2002 that “if your calculations show that a significant emissions increase will result from a modification, you have the option of taking into consideration any contemporaneous emissions changes that may enable you to “net out” of [PSD] review, that is, show that the net emissions increase at the major stationary source will not be significant.”

A significant net emissions increase analysis was conducted for NOx. The RICE project will involve constructing new emissions units (RICE01 through RICE10) and shutting down existing emission units I1 and I2. The permit requires Units I1 and I2 to be permanently shut down prior to startup of the first RICE unit. The net emissions increase, considering the Unit I1 and I2 shutdown and the proposed NOx limit of 170.0 TPY for all 10 RICE, results in a net NOx emission increase of less than the significant emission rate. Therefore, PSD is not applicable to NOx.

### Table 3

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Project Emissions (TPY)</th>
<th>Emission Decreases from I1 and I2 Shutdown (TPY)</th>
<th>Net Emissions Increase (TPY)</th>
<th>PSD Significant Emission Rate (SER) (TPY)</th>
<th>PSD Review Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>170.0</td>
<td>139.4</td>
<td>30.6</td>
<td>40</td>
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<tr>
<td>PM10</td>
<td>109.4</td>
<td>-</td>
<td>109.4</td>
<td>15</td>
<td>Y</td>
</tr>
<tr>
<td>PM2.5</td>
<td>109.4</td>
<td>-</td>
<td>109.4</td>
<td>10</td>
<td>Y</td>
</tr>
<tr>
<td>PM</td>
<td>0.5</td>
<td>-</td>
<td>0.5</td>
<td>25</td>
<td>N</td>
</tr>
<tr>
<td>SO2</td>
<td>14.2</td>
<td>-</td>
<td>14.2</td>
<td>40</td>
<td>N</td>
</tr>
<tr>
<td>CO</td>
<td>256.9</td>
<td>-</td>
<td>256.9</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td>VOC</td>
<td>215.4</td>
<td>-</td>
<td>215.4</td>
<td>40</td>
<td>Y</td>
</tr>
<tr>
<td>GHG</td>
<td>792,630</td>
<td>-</td>
<td>792,630</td>
<td>75,000</td>
<td>Y</td>
</tr>
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</table>
TEP did not claim any creditable decreases for PM10, PM2.5, CO, VOC, and GHG. Therefore, the significant emission increase is equal to the significant net emission increase and the modification triggered PSD for PM10, PM2.5, CO, VOC, and GHG for the RICE. Because the project is a major modification for CO, VOC, PM10, PM2.5, and GHG, these five pollutants trigger a BACT determination. The project requires a PSD air impact analysis for VOC, CO, PM10, and PM2.5. The air impact analysis is required to evaluate the project impacts with regard to the National Ambient Air Quality Standards (NAAQS), PSD Class II increments, and PSD Class I increments at the eastern and western units of Saguaro National Park (SNP) and Galiuro Wilderness Area (GWA).

A PSD air quality dispersion modeling analysis was prepared for the three criteria pollutants that trigger PSD review (CO, PM10, PM2.5). Because the resulting NOx emissions are below the NOx significant emission rate of 40 tons per year, the NOx emissions do not trigger New Source Review under PSD regulations and air dispersion modeling was not performed for NOx. The dispersion modeling analysis was performed using AERMOD and included:

- An analysis of existing background monitoring concentrations relative to the NAAQS to confirm that significant impact levels (SILs) can be used in the analysis;
- Dispersion modeling to determine whether ambient impacts caused by the Project emissions exceed the SILs;
- An assessment of the proposed Project’s impacts to soils, vegetation, and visibility;
- An assessment of regional population growth and associated emissions that may be caused by the proposed Project; and
- An assessment of the proposed Project’s potential to affect increments, visibility, or other air quality related values (AQRVs) in Class I areas.

The modeling demonstration was conducted based on a merged stack configuration. As a result, the Project is required to construct the RICE exhaust stacks in a manner consistent with the merged stack model approach. The RICE exhaust stacks must be configured into two groups of five stacks per group. Within each group of five there are two clusters, one of three stacks and one of two stacks each separated by slightly less than one diameter (outside edge to outside edge) from the other stack(s) in the cluster for a total of four clusters (of either two or three stacks) in two groups.

The modeling analysis demonstrates that the Project does not result in air quality impacts above the SILs for CO, PM10 and PM2.5 and does not cause or contribute to an exceedance of any NAAQS or PSD increments for these pollutants. Similarly, an analysis of Project emissions of VOC in relation to emission rates in prior modeling analyses was used to demonstrate that the Project does not result in air quality impacts above the SILs for ozone and does not cause or contribute to an exceedance of the ozone NAAQS. The detailed Air Impact Analysis documentation is included Attachment C.

Because the project is a major modification for CO, VOC, PM10, PM2.5, and GHG, these five pollutants require BACT emission limits. A full top-down BACT analysis was conducted to identify BACT for each pollutant. Before initiating the BACT analysis for a given emission unit and a given pollutant, the minimum acceptable level of control allowed under an applicable New Source Performance Standard (NSPS) or National Emission Standard for Hazardous Air Pollutants (NESHAP) as identified as the BACT “baseline”. Next, an evaluation was conducted using the five-step “top-down” approach recommended by the United States Environmental Protection Agency (USEPA). The five steps of a top-down BACT analysis are:

Step 1: Identify all available control technologies with practical potential for application to the emission unit and regulated pollutant under evaluation;

Step 2: Eliminate all technically infeasible control technologies;
Step 3: Rank remaining control technologies by effectiveness and tabulate a control hierarchy;

Step 4: Evaluate most effective controls and document results; and

Step 5: Select BACT, which will be the most effective practical option not rejected, based on economic, environmental, and/or energy impacts.

For existing sources that trigger PSD, 40 CFR §52.21(j)(3) states that BACT applies to each proposed emissions unit at which a net emissions increase would result from the change. The proposed project will result in a net emissions increase in PM10; PM2.5; CO; VOC; and GHG. The BACT review applies to the following proposed emission units and associated pollutants:

- RICE units – PM10, PM2.5, CO, VOC, GHG (carbon dioxide [CO₂], nitrous oxide [N₂O], methane [CH₄])
- Natural gas piping – GHG (CH₄)
- High voltage circuit breakers – GHG (sulfur hexafluoride [SF₆])

PM10/PM2.5 BACT for the RICE is determined to be 2.5 pounds PM10/PM2.5 per hour for non-startup operation. PM10/PM2.5 BACT for startup is: 1) minimize time spent at idle, 2) 30-minute startup duration limit, and 3) operation according to manufacturer specifications for minimizing emissions. Although 2.5 lb/hr is deemed BACT for non-startup operation, the PM10/PM2.5 emission limit in the permit (2.37 lb/hr) is based on the BACT determination and the dispersion modeling analysis. The dispersion modeling analysis includes startup emissions and requires an emission limit of 2.37 lb/hr to demonstrate compliance (see Attachment D for details). It is notable that the NEO California Power Plant (now California Power Holdings, LLC) contains a PM10 limit that was not considered in the BACT determination. The Tehama County APCD established a 0.02 g/hp-hr PM10 BACT limit for the NEO California Power RICE. This limit is more stringent than the PM10/PM2.5 BACT limit established for the TEP RICE units, which is 0.04 g/hp-hr. However, based on conversations with Tehama County APCD, the RICE units have not been tested to confirm this emission limit. Therefore, the NEO California RICE units are using a calculated emission rate of 0.02 g/bhp-hr, as opposed to stack testing to demonstrate compliance. Therefore, the 0.02 g/hp-hr PM10 emission limit is not considered to be demonstrated in practice, and thus, the 0.02 g/hp-hr PM10 emission rate is not included in the BACT analysis for the TEP RICE.

BACT for the RICE during non-startup operations is established to be 4.43 pounds of CO per hour and 4.49 pounds of VOC per hour. The CO and VOC BACT requirements for startup are to 1) minimize time spent at idle, 2) limit startup periods to no more than 30-minutes, and 3) operation according to manufacturer specifications for minimizing emissions. The CO and VOC emission limits in the permit reflect the BACT determination (4.43 lb/hr and 4.49 lb/hr, respectively). Table 4 details the BACT emission rates.
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>RICE Units</td>
<td>PM10/PM2.5&lt;br&gt;(condensable and filterable)</td>
<td>Non-startup:&lt;br&gt;2.5 pounds/hour</td>
<td>6 hours (average of 3 120-minute test runs)</td>
<td>Minimize engine’s time spent at idle; startup duration limited to 30 minutes; natural gas fuel; operate per manufacturer specifications</td>
<td>Performance tests for condensable and filterable PM10/PM2.5; recordkeeping requirements</td>
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<tr>
<td></td>
<td>CO</td>
<td>Non-startup:&lt;br&gt;4.43 pounds/hour</td>
<td>1-hour (average of 3 1-hour test runs)</td>
<td>Maintain oxidation catalyst inlet temperature between 450°F and 1350 oF. Minimize time at idle and limit startup duration to 30 minutes.</td>
<td>Performance test, continuously monitor inlet catalyst temperature and pressure drop across catalyst</td>
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<tr>
<td></td>
<td>VOC</td>
<td>Non-startup:&lt;br&gt;4.49 pounds/hour</td>
<td>1-hour (average of 3 1-hour test runs)</td>
<td>Same as above</td>
<td>Same as above</td>
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<tr>
<td></td>
<td>GHG (CO₂)</td>
<td>1,100 lb of CO₂ per MW-hour (gross)</td>
<td>12-month rolling average</td>
<td>Good combustion practices</td>
<td>Performance testing, Monitor fuel flow, Monitor gross energy output for each engine</td>
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<tr>
<td>Natural Gas Piping</td>
<td>GHG (CH₄)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>AVO LDAR with daily inspections and repair within 15 days</td>
<td>Recordkeeping requirements</td>
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<tr>
<td>Circuit Breakers</td>
<td>GHG (SF₆)</td>
<td>Vendor-guaranteed leak rate of 0.5 % or less per year; density monitor alarm; written LDAR program for circuit breakers</td>
<td>Recordkeeping requirements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The GHG BACT for the RICE is established to be 1,100 lb of CO₂ per megawatt (MW)-hour (gross). This limitation applies during all operating conditions (startup and non-startup) and is included directly in the permit as an emission limit.

GHG BACT for the natural gas piping is determined to be an audio, visual, olfactory (AVO) leak detection and repair (LDAR) program with daily monitoring. GHG BACT for the circuit breakers is determined to be a leak rate of 0.5 % or less per year, a density monitor alarm, and an LDAR program.

The full BACT analysis is included in Attachment D.
ATTACHMENT A

Vendor Supplied Emission Data
ATTACHMENT B

Emission Calculations
ATTACHMENT C

Air Impact Analysis
ATTACHMENT D

BACT Analysis
ATTACHMENT E

Previous TSDs Issued May 18, 2007, Revised July 13, 2010, October 29, 2010, and January 6, 2017
ATTACHMENT F

Arizona Department of Health Services
Installation Permit (# 1156)