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MOSS LANDING POWER PLANT PROJECT (99-AFC-04C)
DATA REQUESTS AND PROJECT RESPONSES

This document contains informal data requests staff developed in response to the Moss Landing Power Plant Petition to Amend filed on September 18, 2017 and the project owner's responses to those requests.

PERMIT MODIFICATION

BACKGROUND

On September 18, 2017, Dynegy Moss Landing (DML) filed a petition (MLPPP 2017) with the California Energy Commission (Energy Commission) requesting an amendment to the Air Quality Conditions of Certification for the Moss Landing Power Plant Project (MLPPP). MLPPP 2017 requests the following modification:

- Clarification of the definition of steam turbine cold start-ups;

The air quality conditions of certification approved for the Moss Landing Power Plant Project Decision (Decision) included separate emission limits for startup and shutdown periods and exempted these operations from steady-state emission limits. The conditions of certification defined startup and shutdown periods in terms of operating time.

The CEC amended the air quality conditions of certification in 2002 and 2004 to further address operations during periods when steady-state emission rates can not be achieved. The project owner filed an amendment (MLPPP 2003) to create separate emission limits for cold startups and tuning events. The approved order (CEC 2004) included language defining cold startups and allowed for higher emissions and longer durations than regular startup periods. CEC 2004 also approved time restrictions and emission limits for combustor tuning activities identical to cold startup periods. Additional restrictions were included in the amendment addressing the number of turbines that could operate simultaneously during cold startup and tuning periods.

CEC 2004 approved the addition of the short-term emission increases for these limited periods without any increases to the daily, quarterly, and annual emission limits. Modeling was included in MLPPP 2003 to demonstrate that impacts from the proposed increases for NOx and CO startup limits would remain below the state and federal 1-hour and 8-hour ambient air quality standards in effect at the time of the amendment. The worst-case hour scenario used in the modeling assumed one turbine operating for a steam turbine cold startup or combustor tuning event while the remaining three turbines operated at steady state.

The analysis for startup impacts in the Decision did not restrict multiple turbines from operating concurrently in startup mode. Therefore, CEC 2004 included the addition of Condition of Certification **AQ-48** restricting operations to only one gas turbine operating in support of a steam turbine cold start or combustor tuning at a time. In

addition, CEC 2004 included Condition of Certification **AQ-49** restricting operations to 30 hours per year for each turbine supporting a steam turbine cold startup or undergoing combustor tuning.

MLPPP 2003 included a discussion of the emission limits and assumptions applicable to steam turbine cold startup and combustor tuning periods. MLPPP 2003 stated that steam turbine cold startups and gas turbine combustor tuning activities potentially had longer, low-power load hold times. The analysis stated that the highest hour of emissions during one of these periods might be up to 25 percent higher than the total NOx over a start-up period. MLPPP 2003 stated that data collected from continuous emission monitoring systems (CEMS) during cold startups demonstrates that the majority of emissions occur during the first three hours of a startup period and quickly drop off after the third hour. In other words, emisisons during startup and tuning periods are not evenly distributed over time.

MLPPP 2017 requests changes to clarify the 30-hour annual operating restriction included Condition of Certification **AQ-49** would apply to tuning events and only turbine cold startups that last more than four hours or exceed the standard startup emission limits contained in Condition of Certification **AQ-17**. To achieve this, MLPPP 2017 proposes to amend the definition of cold startup in Condition of Certification **AQ-15**. Amending the definition in Condition of Certification **AQ-15** as requested in MLPPP 2017 instead of just clarifying the restriction in Condition of Certification **AQ-49** could impact other conditions of certification that include cold startup or combustor tuning operating limitations.

Condition of Certification **AQ-17** includes emission limits from the entire tuning or cold startup event. The maximum hourly emissions evaluated are not included in Condition of Certification **AQ-17**. As discussed above, the hourly emissions from a startup period are not evenly distributed over the allowed duration of the event. Therefore, staff has concerns changing the definition in Condition of Certification **AQ-15** could allow a scenario where two turbines were in startup operations at the same time and these emissions could be higher than the emissions analyzed in the previous impact analyses.

In response to MLPPP 2017, staff is requesting additional information to assess the potential for scenarios with increased NOx emission rates. Furthermore, staff is requesting additional information to determine if the change in definitions would affect the way the project owner reports emissions for other pollutants.

DATA REQUEST

1. Please provide information on the potential overlap of startup periods if the definition in Condition of Certification **AQ-15** is changed.

PROJECT OWNER RESPONSE:

I. <u>Clarification of the definition of steam turbine cold startups:</u>

a. Allowing a "steam turbine cold startup" (following a shutdown, or offline period, of 72 hours or more) to be excluded from normal cold startup limitations based on meeting the total time and total emission limitations of a normal startup will not cause issues with the hourly emission scenarios used in the CEC analysis for the approved order CEC 2004.

b. **Explanation**

i. **Define steam turbine cold startup** - The permit defines steam turbine cold startup periods as:

1. start-up periods that last more than four (4) hours, **OR**
2. exceed the normal startup emissions limits, **AND**
3. follow a shutdown of the steam turbine for at least 72 hours

ii. **Startup periods that last more than four (4) hours:** - cold startups take longer because of additional limitations imposed by the manufacturer (GE). The initial cold metal temperatures of the steam turbine (relative to the steam temperature) require acceleration limits (rpm/min), load rate limits (%/min), and multiple "hold" points to control physical and thermal stresses during startup. <u>The control room operator selects the appropriate startup process (normal startup, or cold startup) based on the actual initial steam turbine temperatures.</u>

iii. **Exceed the normal startup emissions limits** – A gas turbine progresses through a series of well-defined and controlled steps during startup. The emission profiles of each step are very consistent from startup to startup. When comparing normal steam turbine startups and cold steam turbine startups the differences in hourly emissions and emission rates are due solely to the different amount of time the gas turbine spends in each step due to longer cold steam turbine startup times.

iv. **Shutdown of the steam turbine for at least 72 hours** – This is a close approximation of the amount of shutdown time that would result in steam turbine temperatures dropping low enough to require a cold startup process. However, steam turbine cool down can be affected by many operational and environmental factors. As discussed above, the control room operator selects the appropriate

startup process (normal startup, or cold startup) based on the actual initial steam turbine temperatures just prior to startup.

c. **Conclusion**

i. While 72 hours is a close approximation of the time it takes for a steam turbine to cool down to internal temperatures which would require a cold steam turbine startup process it is not 100% accurate. Sometimes after a steam turbine has been shutdown for at least 72 hours temperatures have not dropped low enough to require a cold steam turbine startup process. Therefore, a normal startup process is conducted which results in a normal startup emission profile which does not cause issues with the hourly scenarios used in the CEC analysis for the approved order CEC 2004.

BACKGROUND

MLPPP 2017 requests the following modification:

- Clarify the definition of short-term excursion;

MLPPP 2017 proposes clarifications for the definition of the term "short-term excursion." Condition of Certification **AQ-18** allows relief from steady-state emission limitations for NOx during pre-mix mode switchovers. To qualify, short term excursions are limited to 15-minute periods and 30 ppmvd corrected to 15 percent oxygen. MLPPP 2017 is requesting to change the term "pre-mix mode switchover" to the more general term, "combustion mode switchover."

The Title V permit issued by the Monterey Bay Unified Air Pollution Control District, doing business as Monterey Bay Air Resources District (MBARD), includes a condition allowing short-term excursions for "diffusion mode switchover" and does not use the term "pre-mix mode." Pre-mix mode switchovers and diffusion switchovers are different events. There are additional categories of combustor mode changes that have varying names used by industry. MLPPP 2017 does not provide justification for extending the NOx short-term excursion to different operating modes. MLPPP 2017 does not provide discussion or an estimate of the impacts of this proposed change. Staff has concerns that generalizing the term to any combustor mode change could extend allowable short-term excursions to additional events and could result in an increase to short-term NOx emissions.

DATA REQUEST

2. Please provide additional information on the proposed change including a discussion on the potential for an increase to allowable short-term excursions.

3. Please provide information on how many modes of operation would qualify as combustor mode switchovers if the language is changed.

PROJECT OWNER RESPONSE:

I. <u>Clarification of the definition of gas turbine short-term excursion:</u>

a. Changing the permit language from "pre-mix mode switchover" to the more general term "combustion mode switchover" will not result in extending relief from steady state emission limitation for NOx to additional (unintended) events which could increase short term NOx emissions.

b. **Explanation**

i. AQ-18 allows relief from steady state emission limitations for NOx during pre-mix mode switchovers. Short term excursions are limited to 15-minute periods and 30 ppmvd corrected to 15% O2.

ii. MLPPP 2017 requested changing the term to the more general term "combustion mode switchover". However, the purpose was only to update permit language commensurate with current GE gas turbine combustion technology without having to include detailed combustion mode definitions and descriptions, and to prevent permit changes as a result of changes in GE combustion vocabulary or sequence of operation.

iii. Combustion Mode Technology/Vocabulary

1. Earlier versions of GE combustion technology describes four (4) different combustion modes:
    a. Primary
    b. Lean-Lean
    c. Secondary
    d. Premix (also called Premix Steady State)

2. Current versions of GE combustion technology describe seven (7) different combustion modes used in the following startup sequence:
    a. Mode 3 - firing and initial crossfire
    b. Mode 2 – crossfire to 95% speed
    c. Mode 1 – 95% speed to approx. 10% load

d. Mode 3 – 10% to 25% load
e. Mode 4 – 25% to ~40% load
f. Mode 5 – brief transfer
g. Mode 5Q – short time delay at ~45% load
h. Mode 6Q – Normal low emissions operating mode, ~50% to 100% load

3. Mode 6Q is the only mode (currently) that is the normal operating low emissions combustion mode. Switching into combustion Mode 6Q reduces emissions to levels compatible with compliance. Switching out of Mode 6Q increases emissions out of compliance with permit limits.

c. **Conclusion**

i. The only combustion mode switchover that results in a change from emissions compliance to emissions non-compliance is a change from Mode 6Q to any other combustion mode. The only combustion mode switchover that results in a change from emissions non-compliance to emissions compliance is a change from any combustion mode into Mode 6Q. Getting too specific could result in permit changes to keep up with GE terminology or mode sequencing.

BACKGROUND

MLPPP 2017 requests the following modification:

- Remove the CO data substitution language;
- Incorporate a reporting protocol;

MLPPP 2017 proposes to remove the CO data substitution requirement from Condition of Certification **AQ-19**. Condition of Certification **AQ-19** requires a CEMS for CO and the CEMS operated in accordance with 40 CFR Part 60 Appendix F (Appendix F). Appendix F establishes procedures to assess and improve the quality of CEMS data. Appendix F requires CEMS calibration, calibration drift determination, preventive maintenance, data recording and reporting, accuracy audit procedures and corrective action program. Condition of Certification **AQ-19** outlines procedures for determining CO values when there is missing CO data from the CEMS. Missing data procedures are not included in Appendix F.

Condition of Certification **AQ-19** specifies the CO_2, O_2, and NOx CEMS are subject to 40 CFR Part 72 and 75 requirements. 40 CFR Part 72 through 78 establish the Acid Rain Program Regulations. 40 CFR Part 75 (Part 75) correlates with the New Source Performance Standards in 40 CFR Part 60 Subpart GG (Subpart GG). Subpart GG allows a certified Part 75 NOx CEMS for emissions monitoring. Part 75 establishes procedures for missing data from CEMS. Per the missing emission data procedures, the CEMS data acquisition handling system (DAHS) handles substitution data. These procedures are specific to the monitored pollutant and do not include guidelines for CO because CO monitoring is not established under the Acid Rain core regulations.

The Decision's air quality conditions of certification required a CO CEMS with CO substitution requirements to ensure the integrity of the CO CEMS data. MLPP 2017 proposes to incorporate by reference a reporting protocol to address monthly reporting requirements of the CEMS data and DAHS calculations. MLPPP 2017 states the project owner is working with the MBARD to develop a reporting protocol that identifies applicable federal and local monthly reporting requirements. The draft reporting protocol was not originally included in MLPPP 2017. Staff obtained a draft copy from the MBUAPCD and a subsequent final draft. Staff requests confirmation on the final MLPPP CO substitution procedures and corresponding reporting protocol to ensure the integrity of the CO CEMS data for consistency with the intent of Condition of Certification **AQ-19**.

DATA REQUEST

4. Please provide a summary of the finalized MLPPP CO substitution procedures.

5. Please verify if there are any changes to the CO substitution procedures in the final Dynegy Moss Landing Power Plant Monitoring and Reporting Protocol for Monthly Reporting dated December 2017.

6. Please provide the date any changes to the CEMS DAHS were completed.

PROJECT OWNER RESPONSE:

Please refer to the finalized Monitoring and Reporting Protocol for Monthly Reporting. The Monitoring and reporting Protocol for Monthly Reporting includes a description of the CO substitution procedures.

The CEMS DAHS was updated for CO substitution and will become effective on June 30, 2020.

Staff Update: The project owner confirmed the CEMS DAHS for CO substitution was updated in Mid-July 2020.

BACKGROUND

MLPPP 2017 requests the following modification:

- Remove Air Quality Conditions of Certification related to the two boilers that are no longer operational;
- Revise the facility quarterly emission limits;

The original license for MLPPP incorporated requirements for Units 6 and 7 that already existed at the MLPPP site at the time of the original MLPPP licensing process. Units 6 and 7 consisted of two boilers, each rated at 7,048 MMBtu/hour, two steam turbines rated at 1,515 MW each, and seawater cooling intake and outfall structures. The Decision included several air quality conditions of certification that included operating requirements for Units 6 and 7. Requirements included mass emission rates, pollutant concentration limits, continuous monitoring procedures, and a combined annual facility emissions cap including emissions from MLPPP combined cycle Units 1 and 2 and existing boiler Units 6 and 7.

Units 6 and 7 permanently retired on December 31, 2016. The facility owners submitted an application to the MBARD to bank emission reduction credits (ERCs) from Units 6 and 7 on May 10, 2017. The MBARD needed to modify permit conditions on the Title V and the individual operating permits prior to processing the ERC applications. The project owner submitted a request to the MBARD in August 2017 to inactivate the Permits to Operate for Units 6 and 7. In addition, the project owner submitted an application to the MBARD on June 14, 2017 to renew the title V operating permit that was due to expire on December 31, 2017, and in August 2017 to amend the combined cycle PTOs.

The Decision incorporated a facility emissions cap, including emissions from Units 6 and 7, as mitigation for the MLPPP. Per the MBUAPCD Final Determination of Compliance (FDOC), the applicant requested the emissions cap to limit the total emissions from all power generating equipment at the facility in order to reduce the quantity of offsets necessary for the installation of the combined cycle units. The power generating equipment emissions cap allowed flexibility to operate some units preferentially or fire all the units for a finite time during any one year.

The Decision evaluated the MLPPP net emission increase by calculating emissions from the existing boiler Units 6 and 7, as well as from the new combined cycle units, Units 1 and 2. The expected maximum emissions was a combined total from Units 6 and 7 and new Units 1 and 2. The MBARD established actual or historical emissions from existing Units 6 and 7 as baseline operation for the MLPPP. The capped maximum emissions were compared with actual or baseline emissions from the existing Units 6 and 7. The

difference between the potential capped emissions and the actual emissions was the only portion that required mitigation with ERCs.

Due to the emissions cap, there is a gap between the potential emissions from the permitted operation of the combined cycle and the ERCs obtained to mitigate the addition of the combined cycles. DML filed applications with the MBUAPCD to obtain ERCs for the retirement of Units 6 and 7. Please provide information on quantity of ERCs MLPP obtained to ensure the boiler baseline operations used for original mitigation remain surplus.

DATA REQUEST

7. Please provide information on the ERCs banked from the shutdown of boiler Units 6 & 7.

PROJECT OWNER RESPONSE:

Please refer to the MBARD Emission Reduction Credit Evaluation Report attached at the end of this document.

BACKGROUND

The Title V permit covers all operations under MBARD permit at the MLPP facility. The Title V permit for MLPPP includes Unit 6 and 7 operation, the two combined-cycle turbine units, and other ancillary equipment. Ancillary equipment included in the current Title V permit includes aqueous ammonia storage tanks, a gasoline storage tank, a paint spray facility, emergency fire pumps, and laboratory fume hoods. Please provide information on the ancillary equipment to determine the extent of the MLPPP linear facilities.

DATA REQUEST

8. Please provide the following information on the ammonia tanks at the MLPPP facility. Please provide a brief description of how these tanks are used. Please include how many ammonia tanks are on site and include how many of these tanks serve or could potentially serve the combined cycle. Please provide the size of these tanks. Please include the how long the tanks have been onsite and dates of any permitting actions by the MBUPACD. Permitting actions include approximate initial permitting date and any applicable modification date. (Additional background: Decision says one 33,000 gallon tank, Title V says five 30,000 gallon tanks)

PROJECT OWNER RESPONSE:

There is no separate MBARD permit issued for the ammonia tanks. The ammonia tanks are included in the MBARD issued Title V permit. The ammonia tanks are regulated

under the EPA's Risk Management Plan (RMP) Rule, and the CA Accidental Release Prevention Program (Cal ARP).

The aqueous ammonia storage tank farm consists of five storage tanks each with a capacity of 30,000 gallons.

DATA REQUEST

9. Please provide the following information on the gasoline tank at the MLPPP facility. Please provide a brief description of how this tank is used. Please include how long this tank has been onsite and dates of any permitting actions by the MBUPACD. Permitting actions include approximate initial permitting date and any applicable modification date.

PROJECT OWNER RESPONSE:

The gasoline has an individual District permit. The aboveground gasoline storage tank was installed in March 2004 under ATC 11849. The tank was modified on September 10, 2013 to comply with the California Air Resources Board (CARB) Standing Loss Control (SLC) requirements.

DATA REQUEST

10. Please provide the following information on the paint spray facility at the MLPPP facility. Please provide a brief description of the function of this paint spray facility. Please include of any permitting actions by the MBUPACD. Permitting actions include approximate initial permitting date and any applicable modification date.

PROJECT OWNER RESPONSE:

The paint spray facility has an individual District permit. The permit is for an unconfined spray coating operations. The paint spray facility was permitted February 5, 2005.

DATA REQUEST

11. Please provide the following information on the emergency generator that was removed from the MLPPP Title V permit. Please provide a brief description of the function of generator and how the function of the emergency generator has been replaced if applicable.

PROJECT OWNER RESPONSE:

The emergency generator was used for "Black Start" capabilities on Boilers 6-1 and 7-1. The function of the generator was not replaced. The engine was last operated in August

2017, and a request to inactivate the Permit to Operate was sent to MBARD on November 28, 2017.

DATA REQUEST

12. Please provide the following information on the emergency fire pumps at the MLPPP facility. Please provide a brief description of the function of the fire pumps including the operations they serve. Please include of any permitting actions by the MBUPACD. Please include the how long the fire pumps have been onsite and dates of any permitting actions by the MBUPACD. Permitting actions include approximate initial permitting date and any applicable modification date.

PROJECT OWNER RESPONSE:

The emergency fire pumps have individual District permits. The District initially permitted the units in July 2005 (Fire Pump #1), and September 2005 (Fire Pumps #3 & #4). The permits have been modified due to facility ownership changes and to include new EPA NESHAP requirements.