

From: [Mona Johnson](#)
To: [Zigich, Daren K, NMENV](#)
Cc: [Roger Schnabel](#); [Michael Barnett](#)
Subject: FW:Hobbs Output-Based Standards (GHG)
Date: Friday, June 20, 2014 1:14:18 PM
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[A-3449 Hobbs Station UA3 Section 12.B.1_20140620-Rev#5_GHG Perfm.xls](#)
[GADs Operating Summary Report.pdf](#)

Daren –

Responses to your questions regarding the Hobbs output-based GHG standard are provided in the email below.

-Mona

From: Zigich, Daren K, NMENV [<mailto:DarenK.Zigich@state.nm.us>]
Sent: Wednesday, June 18, 2014 2:54 PM
To: Mona Johnson
Cc: Roger Schnabel; Michael Barnett
Subject: RE: Hobbs Output-Based Standards (GHG)

Mona,

Thank you for the very detailed proposal. It's nice to have some actual performance data to base it from.

I have a couple of questions and one comment.

1. I assume the CO₂ emission factor in the table (from Part 75) is what the plant currently reports? I noticed it is a bit different from the Part 98 subpart C default value of 116 lbs/MMBtu. Not a huge difference but I will probably define the factor to be used in the permit since there seems to be some inconsistency.

Hobbs reports CO₂ emissions to EPA under Part 98 Subpart D. According to §98.43, CO₂ mass emissions should be monitored and reported as required in §75.13 or section 2.3 of appendix G to 40 CFR Part 75 and §75.64. Cumulative annual CO₂ mass emissions from the fourth quarter electronic data report required under §75.64 are converted from units of short tons to metric tons dividing by 1.1023 according to §98.43(a) (1). Therefore, the emission factor proposed, as listed in the table below, is consistent with reporting mechanism.

$$\begin{aligned} \text{CO}_2 \text{ (lb/MMBtu)} &= F_c \text{ (scf/MMBtu)} * U_f \text{ (lbmole/scf)} * MW_{\text{CO}_2} \text{ lb/lbmole} \\ \text{CO}_2 \text{ Emission Factor} &= 1,040 \text{ scf/MMBtu} * 1 \text{ lbmole/385 scf} * 44 \text{ lb/lbmole} = 118.9 \text{ lb/MMBtu} \end{aligned}$$

2. Do you have the fuel usage data that was used to calculate the Btu/Kwh? Is the 1040 btu/scf used as a default heating value or is it actually measured?

The provided net heat rate is calculated for the NERC GADS report using actual measured fuel heat input and actual net generation. The facility is equipped with a gas chromatographer that measures the heat input and stores it in the data historian. Actual data is incorporated in the attached workbook (A-3449 Hobbs Station UA3 Section 12.B.1_20140620-Rev#5_GHG Perfm.xls). GADS report is also attached for your reference only (GADs Operating Summary Report.pdf).

3. Comment on the Net Output-Based Heat Rate – Since the BACT limit will be based on a 12-month rolling average, I don't know if it is appropriate to use the maximum monthly value from the last 2+ years. Especially when the goal of the modification is to improve heat rate. If we use the 2+ year average and add a couple standard deviations, wouldn't that cover the facility over a 12-month averaging period? One or two months may come in high but the annual average should be easily met, especially if we add 7.5% safety factor and carve out separate limits for Simple Cycle and Startup/shutdown modes. Also the Simple Cycle Heat rate should probably not include the parasitic load from the steam-side of the plant.

We have revised our calculations to utilize the average 2+years instead of the maximum values. Since the proposed NSPS directs the inclusion of all hours of operation, regardless of the operational mode, we have removed the initially proposed standards that did not account for the simple cycle or startup and shutdown operational modes. We have also adjusted the proposed safety factor over the actual data to maintain our proposed performance standard below the regulatory requirement for new units of 1,000 lbCO₂/MWh.

The higher safety factor proposed for operation during startup and shutdowns is deemed necessary as there is a significant amount of uncertainty on the startup and shutdown heat rate. As we previously mentioned, these are non-output generating scenarios and consequently heat

rate can increase significantly, particularly on a cold-cold startup. Finally, during simple cycle operation, the HRSGs remain in service, as the units are not equipped with simple cycle stacks. The generated steam in the HRSGs bypasses the steam turbine into the Air Cooled Condenser. Therefore, during Simple Cycle operation, the steam-related parasitic load is still required.

Therefore, following this review, Hobbs' proposal is:

I. **Proposed Performance Standard**

Hobbs proposes to continue to operate the facility as a combined cycle plant, with 2x1 configuration or 1x1 with either CT (HOBB1 and HOBB2) unit in combination with the ST. During outages of the ST, Hobbs may operate the CTs in simple cycle mode. For the purpose of establishing an annual lb-CO₂/MWh limit, we have assumed a scenario in which each unit would operate up to 1 month (720 hr/yr) in Simple Cycle Mode out of a rolling 12 month period. Should the ST remain out of service for longer than 1 month in any given calendar year, that time over 1 month should be excluded from the 12-month rolling average calculation. During Simple Cycle operation, the HRSGs remain in service, as the units are not equipped with simple cycle stacks. The generated steam in the HRSGs bypasses the steam turbine into the Air Cooled Condenser. Therefore, during Simple Cycle operation, the steam-related parasitic load is still required.

The proposed performance standard also accounts for the higher heat rate expected during startup and shutdown events. During the startup process, the goal of the unit is not to produce electricity but to quickly reach the necessary operational conditions to stabilize the unit and generate electricity. During the units' ramp up, fuel maybe consumed with no electricity production (e.g., full speed no load). Therefore, during startup and shutdown periods, the net output-based heat rate will necessarily be significantly higher than in normal operations. We have accounted for the higher heat rates that occur during simple cycle operations and startup and shutdown in the proposed 12-month rolling average performance standard (net basis).. Table 1 summarizes Hobbs proposed performance standard. The supporting calculations are included in the attached workbook.

		Table 1 – Hobbs Output-Based Proposed Standard (Includes All Operational Modes: Combined Cycle – Simple Cycle - SSM Operation)			
		Combined Cycle Operation	Simple Cycle Operation	Startup & Shutdowns	Proposed Performance Standard
Estimated Annual Hours of Operation	hr/yr	7,210	720	470	8,400
Net Output-Based Heat Rate	Btu/kWh (HHV)	7,569	11,737	16,401	8,420
CO ₂ Emission Factor	lb/MMBtu (HHV)	118.8	118.8	118.8	118.8
Output-Based CO ₂ Emission Standard, Net Basis	lb _{CO2} /MWh (HHV)	899	1,394	1,949	1,000

Proposed Net Output-Based Heat Rate

Hobbs proposes an output-based heat rate on a rolling 12-month average and net basis of **8,420 Btu/kWh** for combined cycle, simple cycle and SSM operations combined. The proposed net output-based heat rate was determined based on actual performance data recorded during calendar years 2012 through 2014 with a 1.15% – 2.5% safety factor and a scenario of a maximum of one month (720 hr/yr) in simple cycle mode, 470 hr/yr in startup and shutdown mode and 360 hr/yr of plant outage. Estimated annual hours of operation in these modes are based on engineering knowledge of the plant performance but are not intended to limit Hobbs operations in any manner, including contractually. Hobbs will meet the proposed output-based CO₂ emission standard on a 12-month rolling average and net basis. This limit is based on the actual plant performance, with a minimal allowance for degradation. The duct burner contribution is included in the proposed heat rate during the combined cycle operation.

Proposed Output Based CO₂ Emission Standard

Hobbs proposes an output based annual average CO₂ emission standard demonstrated on a rolling 12-month average and net basis of **1,000 lb_{CO2}/MWh** for combined cycle, simple cycle and SSM operations. This limit is based on the proposed net output based heat rates, as described above, and a CO₂ emission factor calculated according to 40 CFR Part 75, Appendix G, Equation G-4, as referenced in §98.43(a).

II. **Continuous Compliance Demonstration with the Proposed CO₂ Emission Standard**

Hobbs proposes to continue to operate the facility in a combined cycle 2x1 configuration or in 1x1 with either CT (HOBB1 and HOBB2) unit in combination with the ST. During ST outages, Hobbs will operate the CTs in simple cycle mode. Hobbs proposes to demonstrate compliance with the proposed CO₂ Emission Standard using reported Part 98 CO₂ mass emission rates and the plant net electricity generation, as detailed below.

1x1 Combined Cycle Configuration Compliance Demonstration

During 1x1 configuration, compliance demonstration is simplified as only one of the two combustion turbines will be contributing to the net electricity generation. The following approach is therefore proposed to demonstrate compliance.



Where,

CO₂ Annual Emission Rate (ton_{CO2})

Hobbs is an electricity generating facility subject to 40 CFR 98 per §98.2(a)(1). As such, it is required to meet the general requirements of Part 98 Subpart A and the specific monitoring, calculation methodologies, and recordkeeping requirements of Subparts C and D. Hobbs will continue to report to EPA the HOBBS1 and HOBBS2 annual CO₂ emission rates following the 40 CFR 98 Tier 4 calculation methodology, which includes specific requirements related to quality assurance, fuel flow measurement, application of fuel heat content, and missing data procedures. We propose to use the reported CO₂ annual emission rate to demonstrate compliance with the proposed output based CO₂ emission standard.

Plant Net Electricity Generation (MWh)

Hobbs is equipped with a highly reliable meter used to measure the plant's net electricity generation for billing purposes. Readings from this meter are currently utilized to confirm Hobbs electricity sales. The net electricity measured accounts for the gross electricity generated by each of the CTGs (when operational) and the STG and subtracts the electricity consumed by site equipment, including but not limited to:

- 1) Unit 1 & Unit 2 Boiler Feed Water Pumps, 1 out of 2 per unit
- 2) 2 out of 3 Closed Cooling Water Pumps
- 3) CTG 1 & CTG 2 cranking motors
- 4) 2 out of 3 Condensate Pumps
- 5) 35 two speed ACC fan motors
- 6) Unit 1 & Unit 2 SCR Vaporizer Heaters
- 7) Boiler Water makeup plant
- 8) Chilled Water package, including
 - 8.1) Up to 6 Chilled Water Pumps
 - 8.2) Up to 6 Chiller Compressors
 - 8.3) Up to 6 Circulating Water Pumps
- 9) Chilled Water tank circulation pumps, up to 3

In a 1x1 configuration, since only one CT will be operational, both the electricity generated by the STG and the parasitic load will be attributable fully to that one CT, therefore, direct readings from the billing meter may be used for compliance demonstration. The net electricity generation billing meter is a third party meter. As such, Hobbs does not have physical control over the meter. Since this meter is subject to QA/QC controls by the third party controller, we request no QA/QC or operational requirements related to the generation meter to be imposed, as Hobbs will not be allowed to perform them.

2x1 Combined Cycle Configuration Compliance Demonstration

During operation in the 2x1 configuration, compliance demonstration for each unit will require some additional adjustments, as both CTs will be contributing to the net electricity generation. The following approach is therefore proposed to demonstrate compliance:



Where,

CO₂ Annual Emission Rate (ton_{CO2})

As for the 1x1 combined cycle configuration, we propose to use the reported CO₂ annual emission rate under 40 CFR 98 to demonstrate compliance with the proposed output based CO₂ emission standard.

Plant Net Electricity Generation(MWh)

As for the 1x1 combined cycle configuration, we propose to use the net electricity generation measured by the plant's billing meter used to confirm Hobbs electricity sales. As detailed above, the plant net electricity generation measurement accounts for the gross electricity generated by each of the CTGs, the STG and subtracts the electricity consumed by site equipment. Since the readings from this meter account for both CTGs in operation and the contribution of both CT to the ST and parasitic loads, we propose to ratio the plant net electricity generation according to the ratio of the CTGs gross electricity generation.

CTG Gross Electricity Generation (MWh)

HOB1 and HOB2 gross electricity generation will be continually recorded, and the appropriate data sent to the Data Acquisition and Handling System (DAHS) for use in emission rate calculations. We propose to use this measured gross electricity generation to ratio the measured plant net electricity generation.

Simple Cycle Mode

During Simple Cycle operation there will be no contribution to the net electricity generation by the ST, however both CTs will be contributing to the net electricity generation, therefore, the same approach followed for the 2x1 combined cycle configuration mode will be used to demonstrate compliance.

Startup and Shutdown Mode

During the startup process, the goal of the unit is not to produce electricity but to quickly reach the necessary operational conditions to stabilize the unit and then generate electricity. During the units' ramp up, fuel may be consumed with no electricity production (e.g., full speed no load). As the two units will be operational and contributing to the net electricity generation, the same approach followed for the 2x1 combined cycle configuration mode will be used to demonstrate compliance.

The appropriateness of this plan to demonstrate the apportionment of the net electricity generation will be confirmed within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days of the date of initial startup of the combustion turbine generator after the upgrade of the units has been finalized. Any changes necessary to this methodology will be submitted to NMED in writing before the conclusion of this timeframe. Additionally, Hobbs requests the option to switch to a gross generation basis rather than net generation basis for the purpose of complying with the CO2 BACT limit, should the use of net generation prove to be too conservative for the compliance demonstration.

Of course there will be some differences in actual performance depending on the operational configuration of the plant and whether or not the duct burners are fired. However, on a rolling 12-month basis, we believe that the plant will be able to meet the proposed limit, and demonstrate compliance using the methodology outlined. We appreciate your consideration of this proposal and look forward to receiving your feedback.

Let me know your thoughts.

Sincerely,
Daren K. Zigich
505-476-4366

From: Mona Johnson [<mailto:mjohnson@camesparc.com>]
Sent: Tuesday, June 17, 2014 6:56 PM
To: Zigich, Daren K, NMENV
Cc: Roger Schnabel; Michael Barnett
Subject: Hobbs Output-Based Standards (GHG)
Importance: High

Daren,

Following our discussions we have reviewed the proposed output based standards for Hobbs to account for parasitic load in the net electricity generation calculation (as discussed in the proposed NSPS Da rule you provided us) and to account for the potential operation of the plant in Simple Cycle Mode and during startup and shutdowns. This email outlines our proposed performance standards and compliance demonstration methodology. Attached to the email are the detailed calculations for the proposed standard. Please let me know if you believe this would be an acceptable approach and if there is any other information that you need from us at this time.

III. Proposed Performance Standard

Hobbs proposes to continue to operate the facility as a combined cycle plant, with 2x1 configuration or 1x1 with either CT (HOB1 and HOB2) unit in combination with the ST. During outages of the ST, Hobbs may operate the CTs in simple cycle mode. For the purpose of establishing an annual lb-CO₂/MWh limit, we have assumed a scenario in which each unit would operate up to 1 month (720 hr/yr) in Simple Cycle Mode out of a rolling 12 month period. Should the ST remain out of service for longer than 1 month in any given calendar year, that time over 1 month should be excluded from the 12-month rolling average calculation. The proposed performance standard also accounts for the higher heat rate expected during startup and shutdown events. During the startup process, the goal of the unit is not to produce electricity but to quickly reach the necessary operational conditions to stabilize the unit and generate electricity. During the units ramp up, fuel may be consumed with no electricity production (e.g., full speed no load). Therefore, during startup and shutdown periods, the net output-based heat rate will necessarily be significantly higher than in normal operations. We have accounted for the higher heat rates that occur during simple cycle operations and startup and shutdown in the proposed 12-month rolling average performance standard (net basis). Table 1 summarizes Hobbs proposed performance standard. The supporting calculations are included in the attached workbook. Alternatively, simple cycle operation and/or startup and shutdown could be excluded from the performance standard. In this case a more stringent limit could be met. Refer to Tables 2 and 3 below.

Table 1 – Hobbs Output-Based Proposed Standard (Includes All Operational Modes: Combined Cycle – Simple Cycle)

		- SSM Operation)			
		Combined Cycle Operation	Simple Cycle Operation	Startup & Shutdowns	Proposed Performance Standard
Estimated Annual Hours of Operation	hr/yr	7,210	720	470	8,400
Net Output-Based Heat Rate	Btu/kWh (HHV)	8,310	12,810	17,201	9,193
CO ₂ Emission Factor	lb/MMBtu (HHV)	118.8	118.8	118.8	118.8
Output-Based CO ₂ Emission Standard, Net Basis	lb _{CO2} /MWh (HHV)	987	1,522	2,044	1,092

		Table 2 – Hobbs Output-Based Proposed Standard (Includes Operational Modes: Combined Cycle – Simple Cycle)		
		Combined Cycle Operation	Simple Cycle Operation	Proposed Performance Standard
Estimated Annual Hours of Operation	hr/yr	7,210	720	7,930
Net Output-Based Heat Rate	Btu/kWh (HHV)	8,310	12,810	8,718
CO ₂ Emission Factor	lb/MMBtu (HHV)	118.8	118.8	118.8
Output-Based CO ₂ Emission Standard, Net Basis	lb _{CO2} /MWh (HHV)	987	1,522	1,036

		Table 3 – Hobbs Output-Based Proposed Standard (Includes Only Combined Cycle Operation)
Estimated Annual Hours of Operation	hr/yr	7,210
Net Output-Based Heat Rate	Btu/kWh (HHV)	8,310
CO ₂ Emission Factor	lb/MMBtu (HHV)	118.8
Output-Based CO ₂ Emission Standard, Net Basis	lb _{CO2} /MWh (HHV)	987

Proposed Net Output-Based Heat Rate

Hobbs proposes an output-based heat rate on a rolling 12-month average and net basis of **8,310 Btu/kWh** (HHV) for combined cycle operations only, of **8,718 Btu/kWh** (HHV) for combined and simple cycle operations and of **9,193 Btu/kWh** for combined cycle, simple cycle and SSM operations. The proposed net output-based heat rates have been determined based on actual performance data recorded during calendar years 2012 through 2014 with a 7.5% safety factor and a scenario of a maximum of one month (720 hr/yr) in simple cycle mode, 470 hr/yr in startup and shutdown mode and 360 hr/yr of plant outage. Estimated annual hours of operation in these modes are based on engineering knowledge of the plant performance but are not intended to limit Hobbs operations in any manner, including contractually. Hobbs will meet the proposed output-based CO₂ emission standard on a 12-month rolling average and net basis. This limit is based on the actual plant performance, with a minimal allowance for degradation. The duct burner contribution is included in the proposed heat rate during the combined cycle operation.

Proposed Output Based CO₂ Emission Standard

Hobbs proposes an output based annual average CO₂ emission standard demonstrated on a rolling 12-month average and net basis of **987 lb_{CO2}/MWh** (HHV) for combined cycle operations only, of **1,036 lb_{CO2}/MWh** (HHV) for combined and simple cycle operations and of **1,092 lb_{CO2}/MWh** for combined cycle, simple cycle and SSM operations. These limits are based on the proposed net output based heat rates, as described above, and a CO₂ emission factor calculated according to 40 CFR Part 75, Appendix G, Equation G-4, as referenced in §98.43(a).

IV. Continuous Compliance Demonstration with the Proposed CO₂ Emission Standard

Hobbs proposes to continue to operate the facility in a combined cycle 2x1 configuration or in 1x1 with either CT (HOBB1 and HOBB2) unit in combination with the ST. During ST outages, Hobbs will operate the CTs in simple cycle mode. Hobbs proposes to demonstrate compliance with the proposed CO₂ Emission Standard using reported Part 98 CO₂ mass emission rates and the plant net electricity generation, as detailed below.

1x1 Combined Cycle Configuration Compliance Demonstration

During 1x1 configuration, compliance demonstration is simplified as only one of the two combustion turbines will be contributing to the net electricity generation. The following approach is therefore proposed to demonstrate compliance.



Where,

CO₂ Annual Emission Rate (ton_{CO2})

Hobbs is an electricity generating facility subject to 40 CFR 98 per §98.2(a)(1). As such, it is required to meet the general requirements of Part 98 Subpart A and the specific monitoring, calculation methodologies, and recordkeeping requirements of Subparts C and D. Hobbs will continue to report to EPA the HOBB1 and HOBB2 annual CO₂ emission rates following the 40 CFR 98 Tier 4 calculation methodology, which includes specific requirements related to quality assurance, fuel flow measurement, application of fuel heat content, and missing data procedures. We propose to use the reported CO₂ annual emission rate to demonstrate compliance with the proposed output based CO₂ emission standard.

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- 10) Unit 1 & Unit 2 Boiler Feed Water Pumps, 1 out of 2 per unit
- 11) 2 out of 3 Closed Cooling Water Pumps
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 - 8.1) Up to 6 Chilled Water Pumps
 - 8.2) Up to 6 Chiller Compressors
 - 8.3) Up to 6 Circulating Water Pumps
- 18) Chilled Water tank circulation pumps, up to 3

In a 1x1 configuration, since only one CT will be operational, both the electricity generated by the STG and the parasitic load will be attributable fully to that one CT, therefore, direct readings from the billing meter may be used for compliance demonstration. The net electricity generation billing meter is a third party meter. As such, Hobbs does not have physical control over the meter. Since this meter is subject to QA/QC controls by the third party controller, we request no QAQC or operational requirements related to the generation meter to be imposed, as Hobbs will not be allowed to perform them.

2x1 Combined Cycle Configuration Compliance Demonstration

During operation in the 2x1 configuration, compliance demonstration for each unit will require some additional adjustments, as both CTs will be contributing to the net electricity generation. The following approach is therefore proposed to demonstrate compliance:



Where,

CO₂ Annual Emission Rate (ton_{CO2})

As for the 1x1 combined cycle configuration, we propose to use the reported CO₂ annual emission rate under 40 CFR 98 to demonstrate compliance with the proposed output based CO₂ emission standard.

Plant Net Electricity Generation(MWh)

As for the 1x1 combined cycle configuration, we propose to use the net electricity generation measured by the plant’s billing meter used confirm Hobbs electricity sales. As detailed above, the plant net electricity generation measurement accounts for the gross electricity generated by each of the CTGs, the STG and subtracts the electricity consumed by site equipment. Since the readings from this meter account for both CTG in operation and the contribution of both CT to the ST and parasitic loads, we propose to ratio the plant net electricity generation according to the ratio of the CTGs gross electricity generation.

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Simple Cycle Mode

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Startup and Shutdown Mode

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The appropriateness of this plan to demonstrate the apportionment of the net electricity generation will be confirmed within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days of the date of initial startup of the combustion turbine generator after the upgrade of the units has been finalized. Any changes necessary to this methodology will be submitted to NMED in writing before the conclusion of this timeframe.

Of course there will be some differences in actual performance depending on whether the operational configuration of the plant and whether or not the duct burners are fired. However, on a rolling 12-month basis, we believe that the plant will be able to meet the proposed limit, and demonstrate compliance using the methodology outlined. We appreciate your consideration of this proposal and look forward to receiving your feedback.

Mona Caesar Johnson, P.E.

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