Miller, Felicia@Energy

From:	Stephen O'Kane [stephen.okane@AES.com]
Sent:	Tuesday, October 23, 2012 6:07 PM
To:	Chris Perri
Cc:	Robert.Mason@CH2M.com; 'Jerry.Salamy@CH2M.com'; McKinsey, John A.; Foster, Melissa A.; Miller, Felicia@Energy
Subject:	RE: HBEP emission rates and modeling results
Attachments:	Attachement_1.pdf; SCAQMD response letter 10-23-2012.pdf; Attachement_2.pdf; Turbine Data

Chris,

I response to your request for additional information regarding emission rates and modeling results for the Huntington Beach Energy Project, as detailed below and in your subsequent email (attached) I have prepared the attached letter and accompanying documents.

Thanks

Per: Stephen O'Kane
Permitting and Regulatory Approvals, Southland Repower Team

AES Southland
690 N. Studebaker Rd. | Long Beach, CA | 90803
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stephen.okane@aes.com | www.aes.com

From: Chris Perri [mailto:CPerri@aqmd.gov]
Sent: Friday, October 05, 2012 8:12 AM
To: Stephen O'Kane
Cc: Keith.McGregor@CH2M.com; 'Robert.Mason@CH2M.com'
Subject: RE: HBEP emission rates and modeling results

Stephen,

Thanks for the info.

There are a few things concerning the modeling that I think should be addressed at this point.

1) To be consistent with the revised annual operating scenario, the annual NOx, PM10 and PM2.5 modeling should be re-done based on 5,900 hrs/yr wo duct firing and 470 hrs/yr with duct firing

2) To be consistent with AB2588 and our current practice for estimating toxic emissions from gas turbines, the HRA should be redone using AP42 Table 3.1-3 factors. There should be no adjustment to the formaldehyde factor, and if you want to use the PAH results from a source test, we have to have the test results to review, otherwise just use the AP42 factor.

3) The 1 hour NOx should be done using stack parameters that correspond to a cold start up, unless you can justify that case 15 simulates a cold start up.

Also, a couple of questions –
1) Is the MPSA start up emissions table in the document or can I get a copy of it? and,

2) Do the units have DLN combustors? If so, at what load are they operational and what is their outlet NOx concentration?

Thank you.

Chris Perri
Air Quality Engineer
South Coast Air Quality Management District
(909) 396-2696

From: Stephen O'Kane [mailto:stephen.okane@AES.com]
Sent: Wednesday, October 03, 2012 5:28 PM
To: Chris Perri
Cc: Keith.McGregor@CH2M.com; 'Robert.Mason@CH2M.com'
Subject: RE: HBEP emission rates and modeling results

Chris,

Admittedly, the stack parameters that correspond to each of the emission rates that produced the highest predicted AERMOD impacts are a little tough to follow. The stack parameters (temp and velocity) for each of the ambient and load conditions are detailed in the file 7-HBEP_Appendix 5.1C_Dispersion Modeling.pdf in tables 5.1C-4 and 5.1C-7 The operational performance data and emission rates and calcs are in the file 6-HBEP_Appendix 5.1B_Ops Emissions Calcs.pdf.

- The 1-hour NO2 and CO emissions were based on 60 minutes of a cold startup (maximum mass emission rate of these pollutants for an hour) matched with the stack parameters at an ambient temp of 110F and 70% load (Case 15). In this scenario the lower load results in lower velocities, and the higher ambient temp results in less plume buoyancy (smaller temp delta between stack gas and ambient) to get the maximum ground level 1-hour impact.
- The 1, 3 and 24 hour SO2 emission rate was based on max fuel flow (therefore maximum sulfur mass) so that corresponds to 100% load with duct burners and again an ambient temperature of 110F to get the maximum ground level impact (Case 11). (Note that in this scenario, the greater fuel consumption at 100% load means more sulfur, thus gives a higher impact than the 70% load case with the lower velocity)
- The 24-hour PM2.5 and PM10 were based on 100% load with duct burners to produce the maximum PM mass emissions, matched with the 110F ambient case (Case 11)
- The annual PM2.5 and PM10 emission rates were based on the total PM emitted from 5000 hours turbine fired, 1200 hours of duct firing hours and 624 startup/shutdowns. This is then averaged and matched with the stack parameters from the average ambient temperature case and 70% load. Since the PM from the turbines is guaranteed by the manufacturer at 4.0 lbs/hr (not including fuel sulfur) regardless of load the 70% load case produces the maximum ground level impact (Case 10)
- The annual NO2 emission rates were based on the total NOx emitted from 5000 hours turbine fired, 1200 hours of duct firing hours and 624 startup/shutdowns. This is then averaged and matched with the stack parameters from the average ambient temperature case and 100% load. (Case 7) Since NOx mass emissions are highest at the high load, the high load stack parameters at average ambient temp was used.

Hope this helps.

Stephen O'Kane

From: Chris Perri [mailto:CPerri@aqmd.gov]
Sent: Wednesday, October 03, 2012 3:32 PM
To: Stephen O'Kane
Subject: RE: HBEP emission rates and modeling results

Stephen,

Thank you for the previous email in response to my questions. I'm still a little confused on the modeling, though. I see the stack parameters that were used in each of the 15 screening scenarios. How do those stack parameters correspond to the refined modeling runs for each pollutant/averaging time? For example, NOx 1 hour modeling was based on a start up emission rate of 25.5 lbs/hr. What were the stack parameters used? Was it from the highest screening model result (which looks like would be case 15 - 110°F and 70% load) or were there start up stack parameters that were used? Again, I apologize if this information is already in the document, but I wasn't able to locate it.

Chris Perri
Air Quality Engineer
South Coast Air Quality Management District
(909) 396-2696

From: Stephen O'Kane [mailto:stephen.okane@AES.com]
Sent: Thursday, September 27, 2012 11:43 AM
To: Chris Perri
Subject: FW: HBEP emission rates and modeling results

Chris,

It was easiest just to forward the email I got back from my consultant. Per your request I will also ask them to forward the additional modeling files.

Regards,

Stephen O'Kane

From: Keith.McGregor@CH2M.com [mailto:Keith.McGregor@CH2M.com]
Sent: Thursday, September 27, 2012 11:22 AM
To: Stephen O'Kane
Cc: Jerry.Salamy@CH2M.com; Robert.Mason@CH2M.com
Subject: RE: HBEP emission rates and modeling results

Hello Stephen,

Based on our interpretation of the modeling exemption in Rule 1303(b)(1) and Rule 1304(a), it was assumed that the SCAQMD would only be reviewing the modeling results associated with Rule 1401, Rule 2005, and Regulation XVII (PSD). As a result, only the modeling files and summaries associated with NOx and TACs were included as part of our SCAQMD submittal package. Please let us know if Chris is planning to review the modeling for all pollutants and we can provide the additional modeling files.

With that said, I think the attached summaries may provide some of the supporting documentation that Chris may be requesting:

AFC Excerpts:
Table 5.1-24 Emission Rates Corresponding to the Highest Predicted AERMOD Impacts – the footnotes include a description of the assumptions each emission rate is based on.
Table 5.1C.7 (AFC Appendix) Operational Modeling Results Summary – contains the predicted output for each modeling scenario and each year of meteorological data*
Table 5.1-29 Operation Impacts Analysis – Maximum Modeled Impacts Compared to the Ambient Air Quality Standards
Table 5.1-30 Rule 2005 Air Quality Thresholds and Standards Applicable to the Project (per emission unit) – a summary of the results for each stack are listed below.**
Table 5.1-31 HBEP Predicted Impacts Compared to the PSD Air Quality Impact Standards
Table 5.1-32 HBEP Predicted Impacts Compared to the Class I SIL and Increment Standards

*Please note that we identified during the compilation of this data that the annual PM10 and PM2.5 data are underreported in the attached Appendix Table 5.1C.7. However, the values in Table 5.1-24 (the main part of the AFC) are correct and match the final dispersion modeling files.

As indicated above, the following summary presents the maximum predicted impacts for each individual turbine for comparison to the Rule 2005 thresholds and applicable standards. The results are based on a maximum NOx emission rate of 25.5 lb/hr.

Huntington Beach Energy Project
SCAQMD Rule 2005 NO2 Modeling Results Summary

Stack 1

Year	1-hr Concentration (μg/m³)	Annual Concentration (μg/m³)
2005	5.34	0.148
2006	11.1	0.138
2007	12.6	0.106

Stack 2

Year	1-hr Concentration (μg/m³)	Annual Concentration (μg/m³)
2005	20.6	0.148
2006	23.6	0.138
2007	24.4	0.106

Stack 3

Year	1-hr Concentration (μg/m³)	Annual Concentration (μg/m³)
2005	10.5	0.148
2006	12.4	0.138
2007	22.1	0.106

Stack 4

Year	1-hr Concentration (μg/m³)	Annual Concentration (μg/m³)
2005	4.31	0.147
2006	3.87	0.138
2007	4.33	0.106

Stack 5

Year	1-hr Concentration (μg/m³)	Annual Concentration (μg/m³)
2005	4.27	0.147
2006	3.87	0.138
2007	4.23	0.106

Stack 6

Year	1-hr Concentration (μg/m³)	Annual Concentration (μg/m³)
2005	4.20	0.147
2006	6.51	0.138
2007	4.25	0.106

Give me a call if you have any questions or if you would like to provide additional data.

Thank you,

Keith McGregor
Project Manager
CH2MHILL
2485 Natomas Park Drive Suite 600
Sacramento, CA 95833
Direct: (916) 286-0221
Mobile: (916) 705-7624
Fax: (916) 614-3450

From: Stephen O'Kane [mailto:stephen.okane@AES.com]
Sent: Wednesday, September 26, 2012 8:33 AM
To: McGregor, Keith/SAC; Salamy, Jerry/SAC
Cc: Mason, Robert/SCO
Subject: HBEP emission rates and modeling results

Keith,

I just got a call from Chris Perri at the SCAQMD. He's having a little trouble correlating the emission rate used for each of the maximum modeled impacts. Could you put together a table that shows the emission scenario, emission rate and modeled impact for each pollutant and averaging period. I believe all the information is in the application but he's having a bit of a hard time matching the emission rate used for each modeling scenario.

Also, I confirmed that we presented the maximum impact for each scenario out of the entire 3 years of modeling data and we did not average the maximum impact from each individual year and then present that as the maximum.

Thanks

Per: Stephen O'Kane
Permitting and Regulatory Approvals, Southland Repower Team

AES
the power of being global

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AES Huntington Beach

October 23, 2012

AES Huntington Beach
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Huntington Beach, CA 92646
tel 562 493 7891
fax 562 493 7320

Mr. Chris Perri
Air Quality Engineer
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4178

RE: Huntington Beach Energy Project Permit Application (Facility ID# 115389)

Dear Mr. Perri:

AES Huntington Beach, LLC (AES-HB) is submitting this letter in response to the October 5, 2012 South Coast Air Quality Management District's (AQMD) electronic mail request for additional information needed to complete the Huntington Beach Energy Project (HBEP) engineering evaluation. Listed below are your specific requests followed by AES-HB's response.

SCAQMD-DR1: To be consistent with the revised annual operating scenario, the annual NOx, PM_{10} and $PM_{2.5}$ modeling should be re-done based on 5,900 hrs/yr without duct firing and 470 hrs/yr with duct firing.

Response: Table DR1-1 compares the original per turbine annual NOx, PM_{10}, and $PM_{2.5}$ emission rates from the permit application[1] to the revised operating profile. The revised operating profile was proposed to reduce $PM_{2.5}$ emissions below the Rule 1325 applicability threshold.[2] As presented below, both annual NOx and $PM_{10}/PM_{2.5}$ emissions are lower than those modeled in the HBEP permit application due to the operating profile revision. Because the only emission sources included in the air dispersion modeling assessment are the six identical turbines, the reduced annual impacts can be calculated by scaling the annual NO_2 and $PM_{10}/PM_{2.5}$ impacts presented in AFC Section 5.1, Table 5.1-29, by the ratio of the revised annual emissions to the emissions in the original permit application. Based on this approach, the modeled annual NO_2 and $PM_{10}/PM_{2.5}$ impacts for the revised operating profile in Table DR1-2 are reduced compared to the values in the AFC.

[1] AES Huntington Beach, LLC. *Application for District Permit to Construct and Modification to the Title V Permit to Operate.* June 22, 2012.
[2] AES Huntington Beach, LLC. *Response Letter to the SCAQMD's July 24, 2012, Request for Additional Information.* September 20, 2012

Table DR1-1
Comparison of HBEP Revised Annual Air Emissions per Turbine

Annual Emissions	Annual Emission per Turbine[a] (Tons)	Revised Annual Emissions per Turbine[b] (Tons)
NOx	40.9	40.4
PM10	18.0	16.6
PM2.5	18.0	16.6

[a] Average annual emissions based on 5,000 hours of base load operation without duct burner firing per turbine per year, 1,200 hours of base load operation with duct burner firing per turbine per year, and 624 startups and shutdowns per turbine per year. (SCAQMD Permit Application, June 22, 2012).
[b] Average annual emissions based on 5,900 hours of base load operation without duct burner firing per turbine per year, 470 hours of base load operation with duct burner firing per turbine per year, and 624 startups and shutdowns per turbine per year (SCAQMD Response Letter dated September 20, 2012).

TABLE DR1-2
HBEP Revised Operation Impacts Analysis—Maximum Modeled NO_2, PM_{10} and $PM_{2.5}$ Impacts Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	Modeled Concentration[a] (μg/m^3)	Revised Modeled Concentration (μg/m^3)[b]	Background Concentration (μg/m^3)[a]	Total Predicted Concentration (μg/m^3)	State/Federal Standard (μg/m^3)
NO_2[c]	Annual	0.86	0.85	24.8	25.7	57/100
PM_{10}	Annual	0.44	0.43	23.5	23.9	20/—
$PM_{2.5}$	Annual	0.44	0.43	10.4	10.8	12/15

[a] Modeled concentrations and background data from HBEP AFC Table 5.1-29.
[b] Revised modeled concentrations based on the values from HBEP AFC Table 5.1-29 multiplied by the ratio of the revised annual emissions to the emissions in the original permit application (see Table DR1-1).
[c] The annual NO_2 concentrations conservatively assume a complete conversion of NO_x to NO_2.

SCAQMD-DR2: To be consistent with AB2588 and our current practice for estimating toxic emissions from gas turbines, the HRA should be redone using AP42 Table 3.1-3 factors. There should be no adjustment to the formaldehyde factor, and if you want to use the PAH results from a source test, we have to have the test results to review, otherwise just use the AP42 factor.

Response: Table DR2-1 presents a comparison of the AP-42 HAP emission rates listed in Table 3.1-3 to the HAP/TAC emission rates used in the HBEP HRA analysis. As presented in Table DR2-1, the AP-42 emission rates are higher for some compounds but are lower for a majority of the compounds. The only compounds that differ by more than a factor of three higher or lower are the PAHs. Emission factors presented in AP-42 Table 3.1-3 are also uncontrolled and the AP-42 section discusses that the emission factors, including PAHs, could be up to 85 to 90 percent lower with the use of an oxidation catalyst system.[3] The HBEP design includes the use of an oxidation catalyst to reduce CO and VOC emissions to 2.0 ppm and 1.0 ppm, respectively. Therefore, it is expected the actual HAP emissions, and resulting predicted health risk impacts, would be significantly less than the potential HAP emissions estimated based on emission factors presented in the HBEP HRA analysis or AP-42, Table 3.1-3.

[3] AP-42, page 3.1-7 - The oxidation process takes place spontaneously, without the requirement for introducing reactants. The performance of these oxidation catalyst systems on combustion turbines results in 90-plus percent control of CO and about 85 to 90 percent control of formaldehyde. Similar emission reductions are expected on other HAP pollutants.

Table DR2-1
Comparison of the AP-42 HAP Emission Rates to the HAP/TAC Emission Rates Used in the HBEP HRA analysis

Compound	AP-42 (Lb/MMBTU)[a]	HBEP HRA (Lb/MMBTU)[b]
Acetaldehyde	4.00E-05	1.34E-04
Acrolein	6.40E-06	1.85E-05
Benzene	1.20E-05	1.30E-05
1,3-Butadiene	4.30E-07	1.25E-07
Ethylbenzene	3.20E-05	1.75E-05
Formaldehyde	7.10E-04	2.16E-04
Hexane	NA	2.54E-04
Naphthalene	1.30E-06	1.63E-06
PAHs	2.20E-06	1.37E-08
Propylene (propene)	NA	7.56E-04
Propylene Oxide	2.90E-05	4.69E-05
Toluene	1.30E-04	6.96E-05
Xylene	6.40E-05	2.56E-05

[a] Emission factors from Section 3.1 of the U.S. EPA AP-42, Table 3.1-3 Emission Factors for Hazardous Air Pollutants from Natural Gas-Fired Stationary Gas Turbines. April 2000.
[b] Emission factors from the California Air Toxics Emission Factors (CATEF) database, with the exception of formaldehyde and PAH. Formaldehyde emission factor was based on an exhaust concentration of 90 ppb to remain below the NSPS Subpart YYYY applicability threshold. Carcinogenic PAHs only; naphthalene considered separately. PAH emission factor based on two separate source tests (2002 and 2004) from the Delta Energy Center located in Pittsburg, CA.

As requested, an additional HRA analysis was conducted based on the uncontrolled AP-42 emission factors, with the exception of formaldehyde. The hourly and annual turbine emission rates are presented in Table DR2-2. The use of the AP-42 emission factor for formaldehyde would result in a formaldehyde potential to emit (PTE) greater than 10 tons per year for the facility. Therefore, in order to reduce the PTE to less than 10 ton per year for a single pollutant, the formaldehyde emission rate presented in Table DR2-2 was based on a 120 ppb[4] formaldehyde concentration.

The emissions, and subsequent HRA, were conducted assuming the combustion turbines would be operated:

- 5,900 hours per turbine per year at base load without duct burner firing,
- 470 hours at base load per turbine per year with duct burner firing, and
- 624 startups and shutdowns (estimated 465 hours) per turbine per year.

As noted above, the AP-42 emission factor for PAHs is more than a factor of three higher than the emission factor used in the HBEP HRA analysis. However, the AP-42 represents an uncontrolled emission factor compared to a measured PAH emission rate from a similar turbine with a 4 ppm CO and 2 ppm VOC emission limit. It should also be noted that although

[4] The formaldehyde emission rate proposed in the original permit application was 90 ppb. The proposed revision to 120 ppb is based on the revised operating scenario presented in the AES Huntington Beach, LLC. *Response Letter to the SCAQMD's July 24, 2012, Request for Additional Information.* September 20, 2012

the AP-42 includes an emission factor for both PAH and naphthalene, naphthalene is listed as a subset of PAHs in the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values*. Therefore, naphthalene emissions have been subtracted from the total PAH emissions (hourly and annual) presented in Table DR2-2 and the PAH emission rates used in the HRA.

Table DR2-2
Air Toxic Emission Rates Modeled for HBEP (Basis: AP-42 Emission Factors)

Pollutant[a]	Chemical Abstracts Service Registry Number	CTG/HRSG (per turbine)	
		lb/hr[b]	lb/yr[b]
Ammonia[c]	7664417	1.32E+01	8.61E+04
Acetaldehyde	75070	8.02E-02	3.93E+02
Acrolein	107028	1.28E-02	6.29E+01
Benzene	71432	2.41E-02	1.18E+02
1,3-Butadiene	106990	8.62E-04	4.23E+00
Ethyl Benzene	100414	6.42E-02	3.14E+02
Formaldehyde[d]	50000	5.77E-01	2.83E+03
Naphthalene	91203	2.61E-03	1.28E+01
PAHs[e]	1151	1.80E-03	8.85E+00
Propylene oxide	75569	5.81E-02	2.85E+02
Toluene	108883	2.61E-01	1.28E+03
Xylenes	1330207	1.28E-01	6.29E+02

[a] Emission rates based on the Section 3.1 of the U.S. EPA AP-42, Table 3.1-3 Emission Factors for Hazardous Air Pollutants from Natural Gas-Fired Stationary Gas Turbines. April 2000, unless otherwise noted.
[b] Hourly emission rates are based on a maximum turbine heat input with duct burner firing of 2,005 MMBtu/hr (high heat value). The annual emission rates are based on 6,365 hours of turbine operation with an average annual heat input of 1,403 MMBtu/hr and 470 hours of turbine operation with duct burner firing and an average annual heat input of 1,910 MMBtu/hr.
[c] Based on the operating exhaust ammonia limit of 5 ppmv @ 15% oxygen and an F-factor of 8710.
[d] Emission factor is based on an emission limit of 120 ppbv for formaldehyde.
[e] Naphthalene was subtracted from the total PAH emissions (i.e., 4.4E-03 lb/hr and 21.6 lb/yr based on the AP-42 emission factor) and considered separately in the HRA.

A summary of the MICR, chronic health index, and acute health index at the point of maximum impact (PMI) locations, as well as the maximum predicted public health impacts for worker, residential, and sensitive receptors, have been included in Table DR2-3. In accordance with SCAQMD Rule 1401, the results in Table DR2-3 represent the predicted risk for each individual emission unit. Overall, the predicted MICR for the MEIR, MEIW, and the sensitive receptors using emissions presented in Table DR2-2 are below the individual source significance threshold of one in 1 million. The predicted chronic and acute indices are also below the SCAQMD individual source significance threshold of 1.0. Therefore, the predicted impacts from each individual unit, assuming no emissions control, will be less than significant and T-BACT would not be required. However, while not required for Rule 1401, T-BACT equivalent emission control technologies have been included in this project. As a result, the predicted impacts presented in Table DR2-3 represent a conservative approach and would likely be reduced by 80 to 90 percent if the emissions were adjusted to account for the oxidation catalyst included as part of the project.

The HARP report files will be submitted on compact disc under separate cover.

TABLE DR2-3
Health Risk Assessment Summary: Individual Units (Basis: AP-42 Emission Factors)[a]

Risk[b]	Turbine 1	Turbine 2	Turbine 3	Turbine 4	Turbine 5	Turbine 6
Derived Cancer Risk at the PMI[c] (per million)	0.609	0.609	0.611	0.605	0.605	0.605
Derived Adjusted Cancer Risk at the PMI[d] (per million)	0.595	0.596	0.597	0.592	0.592	0.592
Derived Adjusted Cancer Risk at the MEIR[d] (per million)	0.565	0.571	0.578	0.592	0.592	0.592
Derived Adjusted Highest Cancer Risk at a Sensitive Receptor[d] (per million)	0.468	0.466	0.463	0.450	0.457	0.464
Derived Cancer Risk at the MEIW (per million)	0.107	0.107	0.108	0.107	0.107	0.107
Chronic Hazard Index at the PMI	0.00174	0.00174	0.00175	0.00173	0.00173	0.00173
Resident Chronic Hazard Index	0.00165	0.00167	0.00169	0.00173	0.00173	0.00173
Worker Chronic Hazard Index	0.00174	0.00174	0.00175	0.00173	0.00173	0.00173
Chronic Hazard Index at Sensitive Receptor	0.00137	0.00136	0.00136	0.00132	0.00134	0.00136
Acute Hazard Index at the PMI	0.00988	0.0191	0.0173	0.00339	0.00334	0.00509
Resident Acute Hazard Index	0.00596	0.0116	0.00469	0.00255	0.00255	0.00412
Worker Acute Hazard Index	0.00988	0.0191	0.0173	0.00339	0.00334	0.00509
Acute Hazard Index at Sensitive Receptor	0.00255	0.00316	0.00344	0.00247	0.00237	0.00234

[a] The results in Table DR2-3 represent the predicted risk for each individual emission unit in accordance with SCAQMD Rule 1401.
[b] A source with a MICR less than one in 1 million individuals is considered to be less than significant. A chronic or acute hazard index less than 1.0 for each source is considered to be a less-than-significant health risk.
[c] Cancer risk values are based on the OEHHA Derived Methodology.
[d] Risk values are based on the Derived Adjusted Methodology.

SCAQMD-DR3: The 1 hour NOx should be done using stack parameters that correspond to a cold start up, unless you can justify that case 15 simulates a cold start up.

Response: The overall duration of a cold, warm, or hot start (i.e., time required to achieve BACT levels) is dependent on the SCR and oxidation catalyst systems reaching minimum operating temperatures as well as the conditions of the steam cycle. However, because of the HBEP turbine's rapid start technology, the duration required from initiation of fuel to the turbine reaching 100 percent load is only 10 minutes for all three startup scenarios (hot, warm, and cold). Attachment 1 presents a startup curve for the turbine.

Therefore, the Applicant expects that the turbines will be able to operate at a minimum of 70 percent operating load rate from 10 minutes through the time when the emission control systems are fully functional during all starts (i.e., the remaining 50 minutes of the hour). Because the 1-hour NO_2 modeling presented in the permit application assumed the maximum hourly cold start up emission rate for NOx of 25.5 lb/hr for turbine exhaust conditions at 70, 80, 90, and 100 percent load with and without duct burners at 32°F, 65.8°F, and 110°F ambient temperature (which includes Case 15), the results presented in the AFC Table 5.1-29 would represent the highest 1-hour NO_2 impacts modeled for all load and temperature conditions, including a cold start.

SCAQMD-DR4: Is the MPSA start up emissions table in the document or can I get a copy of it?

Response: The turbine start up emission table is presented as Attachment 2.

SCAQMD-DR5: Do the units have DLN combustors? If so, at what load are they operational and what is their outlet NOx concentration?

Response: The turbines are equipped with Dry Low NOx (DLN) combustors which become functional when turbine loads reach approximately 68 percent, reducing the NOx concentrations to 9 ppm.

SCAQMD-DR6: Please complete the following table.

	ISO 59 F- 60% RH (Evaporative Cooling Off)	110 F-8% RH (Evaporative Cooling On, Case 12)	32 F – 87% RH (Evaporative Cooling Off, Case 2)	66 F – 58% RH (Evaporative Cooling On, Case 7)
Gas Turbine Heat Input, mmbtu/h HHV[1]	1,388	1,350	1,498	1,403
Total Heat Input, mmbtu/h HHV (w/duct fire)[2]	1,895	1,857	2,005	1,910
Gas Turbine Gross Output, kW[3]	121,435	115,264	132,256	121,840
Steam Turbine Gross Output, kW[3]	51,865	43,632	49,579	50,192
Total Gross Power Output, kW[3]	173,300	158,896	181,835	172,032
Total Net Power Output, Kw[3]	167,583	153,352	175,925	166,328
Net Plant Heat Rate, btu/kWh, LHV	7,354	7,814	7,558	7,487
Net Plant Heat Rate, btu/kWh, HHV	8,285	8,803	8,516	8,435

Notes:

1. Cases 110F, 32F and 66F heat input taken directly from M501DA Gas Turbine Expected Performance and Emissions Provided by MPSA and included in Table 5.1B.2 of *HBEP_Appendix 5.1B_Ops Emissions Calcs.pdf.* ISO 59F Case Heat input taken from GT PRO model.
2. Total Heat Input per gas turbine with duct firing can only be achieved while operating in a 1-on-1 or 2-on-1 mode. The steam cycle is sized such that the maximum heat input into the steam cycle is reached in a 3-on-1 mode without duct firing.
3. All output is provided on a per turbine basis assuming a 3-on-1 operating mode. To calculate total output for the entire power block these values must be multiplied by 3

If you require further information, please don't hesitate contacting me at 562-493-7840.

Sincerely,

Stephen O'Kane
Manager

AES Huntington Beach, LLC

Attachments

cc: Robert Mason/CH2M HILL
Jennifer Didlo/AES
John McKinsey/Stoel Rives
Missy Foster/Stoel Rives
Jerry Salamy/CH2M HILL
Felicia Miller/CEC

Miller, Felicia@Energy

From: Chris Perri [CPerri@aqmd.gov]
Sent: Wednesday, October 17, 2012 2:59 PM
To: Stephen O'Kane
Subject: Turbine Data

Hi Stephen,

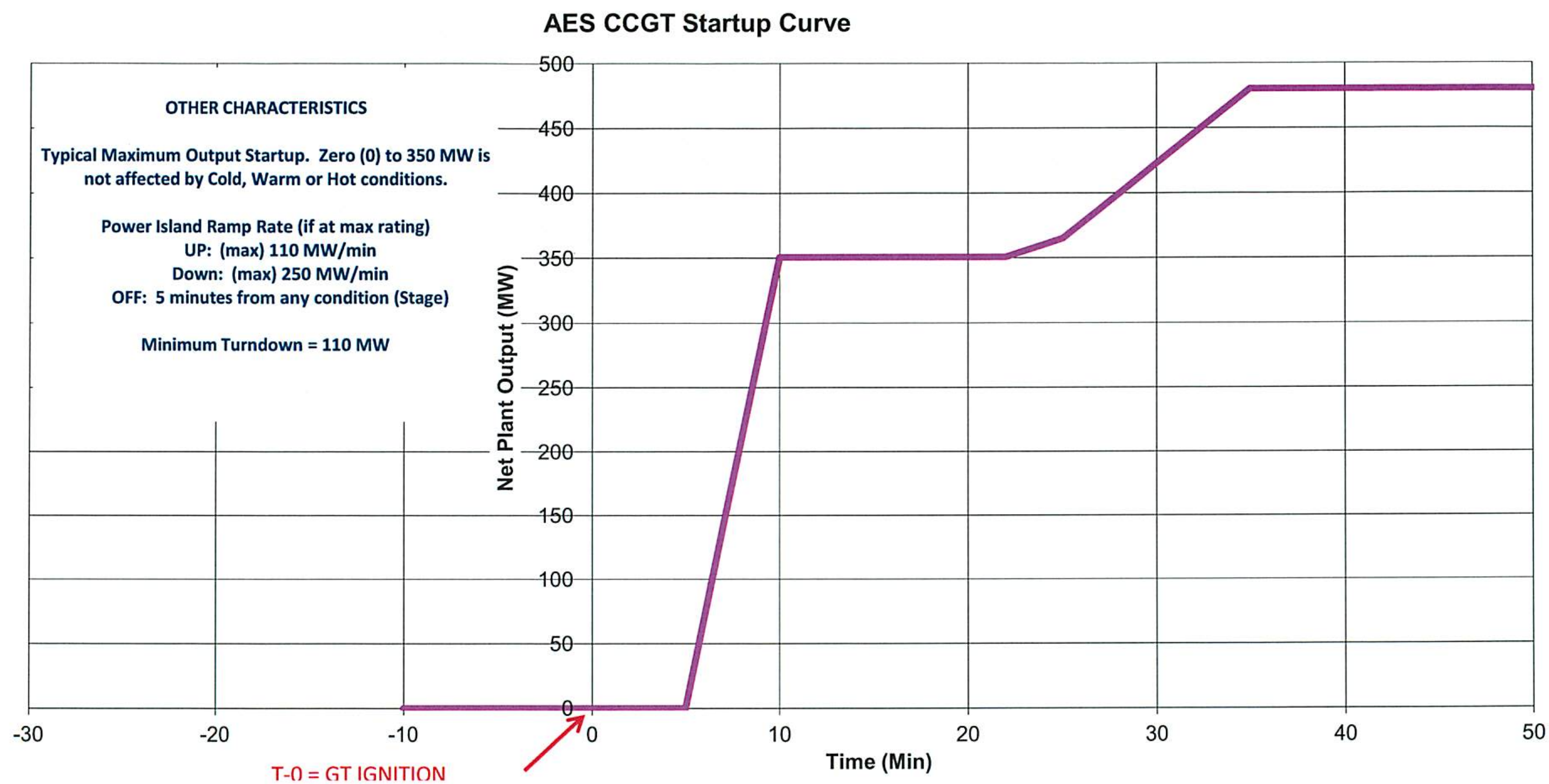
Can you please provide the following information:

	ISO 59 F- 60% RH	110 F-8% RH	32 F – 87% RH	63 F – 65% RH
Gas Turbine Heat Input, mmbtu/h HHV		1,350	1,498	
Total Heat Input, mmbtu/h HHV (w/duct fire)		1,857	2,005	
Gas Turbine Gross Output, kW		114,505	131,469	
Steam Turbine Gross Output, kW				
Total Gross Power Output, kW				
Net Power Output, Kw				
Net Plant Heat Rate, btu/kWh, LHV				
Net Plant Heat Rate, btu/kWh, HHV				

Also, still waiting for updated modeling so that I can forward to our planning group for review.

Thanks.

Chris Perri
Air Quality Engineer
South Coast Air Quality Management District
(909) 396-2696



ATTACHMENT 1
AES HBEP Start Up Curve
AES Huntington Beach Energy Project
Huntington Beach, California

CH2MHILL.

Customer AES
Project: M501D5

Combined Cycle Startup Emissions

Notes
Using : MPS preliminary M501DA Fast Start curve

Total Emissions Per Event (Combined Cycle) at site conditions

CTG/Stack 1

	Duration(1)	NOx	CO	VOC	PM10	GT Net MW	Fuel Gas
	minutes	lb	lb	lb	lb	MWh	klb
Hot Start	9	8.5	142.0	25.6	0.8	2.6	2.3
Shutdown	9.5	11.7	206.0	40.2	1.1	0.5	0.4

Notes
(1) Duration is the total time for the gas turbine between GT ignition and 70% load during Start-Up and Shut-Down.
(2) Calculations are performed for a New and Clean Gas turbine.
(3) Calculations were performed at 71°F dry bulb and 60% RH.
(4) Values are given at the GT Exhaust flange, without duct firing and without Catalyst effects.
(5) Since calculations may be based on some assumed values, Purchaser shall confirm with MPSA prior to using these values for permitting purposes.
(6) Shut down FSNL hold time based on 5 minutes.

198-AESinCA-DA-Gas-71F_STARTUP-20120320(Reduction)DMr1.xls, Customer

ATTACHMENT 2
HBEP Start Up Emmissions
AES Huntington Beach Energy Project
Huntington Beach, California

CH2MHILL.