March 26, 2025

Transmitted via email to: rvic461@ecy.wa.gov

Washington State Department of Ecology
Central Region Office
1250 West Alder Street
Union Gap, WA 98903

Attn: Ryan Vicente, PE

Re: Notice of Construction Application—Generator Specification Sheet Change
Microsoft Malaga Data Center Campus (EAT12-13-14)
Chelan County, Washington
Landau Project No. 1409016.020

Dear Mr. Vicente:

Microsoft Corporation (Microsoft) is developing a data center campus at 5373 Malaga Alcoa Highway, southeast of Wenatchee, Washington (Malaga Data Center) under an Approval Order issued by the Washington State Department of Ecology (Ecology). This application and its attachments constitute a request for a modification to the existing Approval Order No. 24AQ-C70, prepared by Landau Associates, Inc. (Landau) on behalf of Microsoft.

The modification is being requested because of updated generator emissions data provided by the equipment vendor. The vendor has issued revised generator performance data sheets and an updated emission guarantee for the emission controls. While these changes indicate an increase in the particulate matter (PM) and nitrogen oxides (NO_X) emissions under specific operating loads, the changes to air dispersion modeling results are expected to be minimal. On February 27, 2025, Landau met with Ecology to discuss these changes. This letter provides a summary of the emission changes and provides a comparison of the modified emission values to source testing results for this same engine model.

Summary of Changes

Microsoft plans to install generators at three data center buildings (EAT12, EAT13, and EAT14) that will comprise the Malaga Data Center. There will be 60 3.0-megawatt electrical (MWe) generators and 5 0.5-MWe generators. The 60 3.0-MWe generators will be equipped with passive catalyzed diesel particulate filters (cDPFs) and selective catalytic reduction (SCR).

Generator Performance Data Sheet

The 3.0-MWe generators were permitted using the Caterpillar (CAT) Performance Data Sheet DM8455. Attachment 1 presents the list of currently permitted equipment at the facility, along with the corresponding engine performance data sheet numbers originally identified.

Recently, NC Power Systems provided updated performance data for the CAT generators to be installed, Performance Data Sheet DM9239, which will replace Performance Data Sheet DM8455. All variables used for air permitting remain identical between DM8455 and DM9239. These variables include engine power, fuel consumption, engine exhaust temperature, engine exhaust flow rate, and potential site variation emission estimates for NO_x, carbon monoxide (CO), hydrocarbons (HC), and PM. The revised performance data sheet is provided in Attachment 2.

Generator Post-Catalyst Emissions Data

Safety Power also provided revised post-catalyst emissions data for engines operating in accordance with the DM9239 performance specifications, as provided in Attachment 3. For most pollutants and generator operating loads, Safety Power's post-catalyst emissions are equal to or lower than the levels evaluated during the permitting of EAT12-13-14. However, higher maximum emissions were observed for:

- NO_x at 75 percent engine load
- PM at 25 percent engine load
- PM at 75 percent engine load.

A summary of these emission changes across the different engine loads is provided in Attachment 4.

Ambient Air Quality Impact Analysis

Despite the increase in NO_x and PM emissions at some engine loads, the revised emissions data are not expected to significantly change the air dispersion modeling results previously conducted, as described in detail below. In the previous air dispersion modeling effort, the worst-case loads for each pollutant identified in the load screening analysis were modeled to demonstrate compliance to the applicable standards. Because of this, Landau reviewed the emission changes on the load screening analysis for NOx, PM and diesel engine exhaust particulate (DEEP) and a summary of the resulting changes is provided in Attachment 5.

NO_2 Impacts

The updated emissions data indicated that the NO_x emission rate at 75 percent engine load has increased from the permitted value of 3.64 pounds per hour (lbs/hr) to 4.08 lbs/hr, reflecting a 12 percent increase in emissions. However, the engine load screening analysis previously conducted for permitting showed that the highest modeled NO_2 concentration occurs at 100 percent engine load. A 12 percent increase in the modeled concentrations at 75 percent load results in a value of 92 micrograms per cubic meter (µg/m³), which is less than the modeled concentration of 100 µg/m³ at 100 percent load. This demonstrates that the increased NO_x emission rate at 75 percent engine load is

unlikely to change the worst-case scenario, which remains at 100 percent engine load for both the 1-hour and annual averaging periods. Therefore, this change in emissions does not affect the conclusions of the air dispersion modeling previously conducted for this project.

Furthermore, during the EAT03 (Permit No. 21AQ-C255 Third Revision) source test, which was conducted on the same engine and emission controls, the measured NO_x emission rate at 75 percent engine load of 1.21 lbs/hr was significantly lower than the controlled potential site variation value used for permitting, further supporting the conclusion that the previously permitted maximum NO_x emission rates and modeled NO_2 concentrations sufficiently characterized a worst-case scenario.

PM and DEEP Impacts

The PM emission rates reported by Caterpillar and Safety Power are considered DEEP and are assumed to represent the filterable fraction of PM. When calculating emission rates for total PM with an aerodynamic diameter of 10 microns or less (PM_{10}) or 2.5 microns or less ($PM_{2.5}$), the manufacturer's estimate for hydrocarbons is added to the PM emission rate to provide a conservatively high estimate of the condensable fraction of PM.

The updated emissions data showed that the DEEP emission rate at 25 percent engine load has increased from the permitted 0.043 lbs/hr to 0.050 lbs/hr, and at 75 percent engine load from 0.054 lbs/hr to 0.06 lbs/hr, representing 15 percent and 11 percent increases, respectively.

However, the load screening analysis previously conducted for permitting showed that the highest modeled DEEP concentration occurs at 10 percent engine load. An 11 percent increase in the modeled DEEP concentration at 75 percent engine load results in a concentration of 0.056 µg/m³, which is less than the modeled concentration of 0.057 µg/m³ at 10 percent engine load. This demonstrates that the increased DEEP emission rate at 75 percent engine load is unlikely to become the worst-case engine load for modeled DEEP concentrations. A 15 percent increase in the modeled DEEP concentration at 25 percent engine load results in a concentration of 0.060 µg/m³, which is higher than the modeled DEEP concentration of 0.057 µg/m³ at 10 percent engine load, suggesting that the worst-case engine load for DEEP impacts could change to 25 percent engine load based on this new data. A 15 percent increase to the modeled DEEP concentration has the potential to increase the reported increased cancer risk associated with the project from 5.5 to 6.4 per million population. This increased cancer risk is still well below the limit of 10 per million population. Additionally, during the EAT03 source test, which was conducted on the same engine and emission controls, the measured DEEP emission rate of 0.035 lbs/hr at 25 percent engine load was significantly lower than the controlled potential site variation value used for permitting.

Landau also evaluated whether the increased DEEP emission rates at 25 percent and 75 percent engine load may have changed the worst-case engine load for modeled PM_{10} and $PM_{2.5}$ concentrations. While hydrocarbons represent a larger fraction of PM_{10} and $PM_{2.5}$, it was noted that hydrocarbon emission rates decreased across all engine loads. However, this evaluation conservatively assumed no change in the hydrocarbon emission rates and incorporated the increased

DEEP emission rates. The worst-case load for PM_{10} and $PM_{2.5}$ was determined to be unchanged, and no changes to the modeled concentrations of these pollutants are expected.

Conclusion

Based on the information presented in this letter, Landau has determined that the changes in emissions data provided by Safety Power would not have significantly changed the results of modeling completed as part of the original permitting process for this campus. It is Landau's conclusion that there would have been no changes to the conclusions of modeling completed to demonstrate compliance with the National Ambient Air Quality Standards for criteria pollutants. There may have been a negligible increase in the modeled DEEP concentrations compared to those reported during the original permitting process due to the change in the worst-case load from 10 percent to 25 percent engine load; however, recent source testing has demonstrated that DEEP emissions at 25 percent load are well below the emission rate used for permitting. Therefore, Landau recommends that no further evaluation is needed.

A Notice of Construction Application Form is provided in Attachment 6. Microsoft requests that Ecology revise the performance number for the 3.0 MWe generators listed in the equipment table of the Approval Order to DM9239.

Please contact us if you have any questions about this request. Thank you for your time and consideration.

LANDAU ASSOCIATES, INC.

Sarunporn B.

Yara Boonyarattaphan
Project Scientist

Mark Brunner
Principal

Y_B/MWB/tac
[P:\1409\016.020\R\EAT12 NOC MODIFICATION APPLICATION\LANDAU_EAT12 NOC MOD_2025-03-26.DOCX]

cc: John Frohning, Microsoft

Attachments

1: Permitted Emission Units
2: Caterpillar Engine Performance Data Sheet DM9239
3: Safety Power EcoCUBE Post-Catalyst Emissions for DM9239
4: Summary of Generator Emission Changes
5: Summary of Worst-Case Load Screening Analysis Results
6: Notice of Construction Application Form

ATTACHMENT 1

Permitted Emission Units

Attachment 1
Permitted Emission Units
Notice of Construction Application
Microsoft Malaga Data Center

Emission Units (Approval Order 24AQ-C270)

Emission Unit ID No.	Engine Group ID No.	Building	Engine Make and Model	Engine Rating (kWm)	Performance Number	No. of Units
EU-01 through EU-20	1	EAT12	CAT C175-16	3,263	DM8455	20
EU-21	2	EAT12	CAT C15	568	DM8155	1
EU-22 through EU-41	1	EAT13	CAT C175-16	3,263	DM8455	20
EU-42	2	EAT13	CAT C15	568	DM8155	1
EU-43 through EU-62	1	EAT14	CAT C175-16	3,263	DM8455	20
EU-63	2	EAT14	CAT C15	568	DM8155	1
EU-64 and EU-65	2	EAT12 (for water treatment)	CAT C15	568	DM8155	2

ATTACHMENT 2

Caterpillar Engine Performance Data Sheet DM9239

PERFORMANCE DATA[DM9239]

July 18, 2023

Performance Number: DM9239 **Change Level: 12**

SALES MODEL:	C175-16	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
MACHINE SALES MODEL:		**HERTZ:**	60
ENGINE POWER (BHP):	4,376	**ASPIRATION:**	TA
GEN POWER W/O FAN (EKW):	3,100.0	**AFTERCOOLER TYPE:**	SCAC
COMPRESSION RATIO:	15.3	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC+1AC, 2AC
RATING LEVEL:	MISSION CRITICAL STANDBY	**AFTERCOOLER TEMP (F):**	115
PUMP QUANTITY:	2	**JACKET WATER TEMP (F):**	210.2
FUEL TYPE:	DIESEL	**TURBO CONFIGURATION:**	PARALLEL
MANIFOLD TYPE:	DRY	**TURBO QUANTITY:**	4
GOVERNOR TYPE:	ADEM4	**TURBOCHARGER MODEL:**	GTB6251BN-48T-1.38
ELECTRONICS TYPE:	ADEM4	**CERTIFICATION YEAR:**	2010
CAMSHAFT TYPE:	STANDARD	**CRANKCASE BLOWBY RATE (FT3/HR):**	2,436.4
IGNITION TYPE:	CI	**FUEL RATE (RATED RPM) NO LOAD (GAL/HR):**	15.5
INJECTOR TYPE:	CR	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,598.4
FUEL INJECTOR:	4439455		
REF EXH STACK DIAMETER (IN):	14		

INDUSTRY	SUBINDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET

General Performance Data

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
EKW	%	BHP	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR	LB/EKW-HR	LB/EKW-HR
3,100.0	100	4,376	373	0.339	0.332	209.0	205.0	0.478	0.469
2,790.0	90	3,938	335	0.338	0.331	187.6	184.0	0.477	0.468
2,480.0	80	3,501	298	0.341	0.335	168.5	165.3	0.482	0.473
2,325.0	75	3,282	279	0.347	0.340	160.4	157.3	0.489	0.480
2,170.0	70	3,063	261	0.355	0.348	153.2	150.3	0.501	0.491
1,860.0	60	2,626	224	0.376	0.369	139.4	136.7	0.531	0.521
1,550.0	50	2,188	186	0.402	0.395	124.1	121.7	0.568	0.557
1,240.0	40	1,750	149	0.424	0.416	104.6	102.6	0.599	0.587
930.0	30	1,313	112	0.448	0.440	83.0	81.4	0.633	0.621
775.0	25	1,094	93	0.463	0.454	71.4	70.0	0.653	0.641
620.0	20	875	75	0.481	0.472	59.4	58.3	0.680	0.667
310.0	10	438	37	0.551	0.541	34.0	33.4	0.778	0.763

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
3,100.0	100	4,376	90.3	131.1	1,225.5	63.4	890.4	91	447.1
2,790.0	90	3,938	80.1	129.4	1,188.6	55.5	877.6	81	409.8
2,480.0	80	3,501	71.6	128.1	1,158.3	49.1	868.0	73	380.1
2,325.0	75	3,282	68.5	127.7	1,147.4	46.8	865.1	70	370.1
2,170.0	70	3,063	66.2	127.5	1,139.4	45.1	863.6	68	363.4
1,860.0	60	2,626	61.6	127.2	1,123.9	42.1	860.9	64	350.8
1,550.0	50	2,188	54.8	126.7	1,104.1	38.0	855.9	57	332.0
1,240.0	40	1,750	42.8	125.4	1,072.5	30.6	844.6	47	296.3
930.0	30	1,313	30.8	124.0	1,023.2	22.6	829.2	35	251.2
775.0	25	1,094	24.8	123.3	984.4	18.6	812.8	28	225.1
620.0	20	875	18.9	122.8	892.3	14.9	749.2	22	197.3
310.0	10	438	6.9	121.7	643.1	7.8	569.8	9	135.2

General Performance Data (Continued)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)

PERFORMANCE DATA[DM9239]

July 18, 2023

EKW	%	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
3,100.0	100	4,376	9,674.6	25,320.3	42,304.4	43,785.9	9,221.5	8,576.0
2,790.0	90	3,938	8,834.8	22,758.0	38,384.4	39,715.1	8,367.4	7,787.1
2,480.0	80	3,501	8,133.6	20,653.4	35,133.9	36,329.8	7,648.7	7,127.4
2,325.0	75	3,282	7,873.5	19,883.5	33,933.2	35,071.5	7,379.4	6,882.8
2,170.0	70	3,063	7,674.4	19,303.2	33,017.6	34,104.9	7,172.3	6,697.1
1,860.0	60	2,626	7,287.7	18,220.5	31,272.8	32,261.2	6,783.7	6,349.9
1,550.0	50	2,188	6,739.4	16,826.5	28,846.8	29,726.1	6,288.4	5,901.2
1,240.0	40	1,750	5,792.8	14,535.8	24,673.2	25,413.7	5,479.6	5,153.6
930.0	30	1,313	4,845.5	11,851.1	20,542.1	21,129.9	4,521.1	4,261.0
775.0	25	1,094	4,371.7	10,369.7	18,492.5	18,998.8	4,006.8	3,781.7
620.0	20	875	3,897.7	8,845.4	16,453.5	16,874.9	3,597.6	3,409.5
310.0	10	438	2,949.2	5,561.0	12,407.4	12,648.6	2,655.9	2,544.6

Heat Rejection Data

PUMP POWER IS INCLUDED IN HEAT REJECTION BALANCE, BUT IS NOT SHOWN.

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM 2ND STAGE AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
3,100.0	100	4,376	77,079	8,233	176,058	100,091	24,081	27,356	185,573	452,113	481,614
2,790.0	90	3,938	68,674	7,617	157,585	88,535	21,506	22,077	167,015	403,771	430,117
2,480.0	80	3,501	61,730	7,130	142,543	79,399	19,247	18,045	148,458	361,362	384,941
2,325.0	75	3,282	58,955	6,949	136,754	76,169	18,272	16,609	139,179	343,060	365,445
2,170.0	70	3,063	56,877	6,821	132,798	73,794	17,456	15,731	129,901	327,733	349,118
1,860.0	60	2,626	53,228	6,605	125,732	69,340	15,919	14,476	111,343	298,886	318,389
1,550.0	50	2,188	49,412	6,441	117,165	63,168	14,300	13,183	92,786	268,478	285,997
1,240.0	40	1,750	44,006	6,297	102,298	52,689	12,215	10,300	74,229	229,338	244,303
930.0	30	1,313	37,226	6,186	83,787	42,347	9,854	7,429	55,672	184,999	197,070
775.0	25	1,094	33,267	6,118	73,173	36,703	8,568	6,178	46,393	160,871	171,368
620.0	20	875	28,325	5,745	61,741	27,923	7,209	5,244	37,114	135,351	144,182
310.0	10	438	16,748	4,702	36,241	11,322	4,278	3,828	18,557	80,318	85,559

Sound Data

SOUND DATA REPRESENTATIVE OF NOISE PRODUCED BY THE "ENGINE ONLY"

EXHAUST:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ	800 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
3,100.0	100	4,376	134.4	109.7	115.8	113.6	115.4	115.8	118.8	119.7	121.4	120.2	121.0
2,790.0	90	3,938	133.1	110.4	116.2	112.4	114.1	114.3	117.1	118.2	119.8	118.1	119.2
2,480.0	80	3,501	131.8	111.9	116.7	110.7	112.5	112.8	115.3	116.7	118.2	116.2	117.4
2,325.0	75	3,282	131.1	112.7	116.9	109.8	111.6	112.0	114.5	115.9	117.3	115.3	116.4
2,170.0	70	3,063	130.5	113.5	117.2	108.9	110.7	111.3	113.6	115.2	116.4	114.4	115.5
1,860.0	60	2,626	129.2	115.1	117.7	107.1	109.0	109.8	111.9	113.7	114.7	112.6	113.6
1,550.0	50	2,188	127.9	116.8	118.2	105.3	107.3	108.4	110.2	112.3	113.0	110.7	111.7
1,240.0	40	1,750	126.6	118.4	118.7	103.5	105.6	106.9	108.4	110.8	111.3	108.9	109.8
930.0	30	1,313	125.3	120.0	119.2	101.7	103.9	105.4	106.7	109.3	109.5	107.1	107.9
775.0	25	1,094	124.6	120.8	119.5	100.8	103.0	104.7	105.8	108.6	108.7	106.2	106.9
620.0	20	875	124.0	121.6	119.7	99.9	102.1	103.9	105.0	107.8	107.8	105.3	106.0
310.0	10	438	122.7	123.2	120.3	98.1	100.4	102.5	103.2	106.4	106.1	103.4	104.1

EXHAUST:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER	PERCENT LOAD	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ	10000 HZ

PERFORMANCE DATA[DM9239]

July 18, 2023

WITHOUT FAN													
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
3,100.0	100	4,376	122.0	122.4	123.4	124.7	124.5	122.9	122.2	121.4	119.9	118.8	123.5
2,790.0	90	3,938	120.5	120.8	122.0	123.4	123.0	121.3	120.6	119.8	118.6	117.7	123.8
2,480.0	80	3,501	119.2	119.5	120.6	122.3	121.7	120.2	119.7	118.9	117.5	117.0	123.5
2,325.0	75	3,282	118.5	118.9	119.8	121.8	121.0	119.7	119.2	118.4	117.0	116.7	123.2
2,170.0	70	3,063	117.9	118.3	119.1	121.2	120.4	119.1	118.8	118.0	116.4	116.4	123.0
1,860.0	60	2,626	116.5	117.1	117.6	120.2	119.0	118.1	117.9	117.1	115.4	115.8	122.5
1,550.0	50	2,188	115.2	115.8	116.2	119.1	117.7	117.0	117.0	116.2	114.3	115.1	122.0
1,240.0	40	1,750	113.9	114.6	114.7	118.1	116.4	116.0	116.1	115.3	113.3	114.5	121.5
930.0	30	1,313	112.6	113.4	113.2	117.0	115.1	114.9	115.2	114.4	112.2	113.9	121.0
775.0	25	1,094	112.0	112.8	112.5	116.5	114.5	114.4	114.8	114.0	111.7	113.6	120.7
620.0	20	875	111.3	112.2	111.8	116.0	113.8	113.9	114.4	113.6	111.2	113.3	120.5
310.0	10	438	110.0	110.9	110.3	115.0	112.5	112.8	113.5	112.7	110.2	112.6	120.0

MECHANICAL:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ	800 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
3,100.0	100	4,376	125.9	89.8	105.6	98.3	100.7	104.3	108.4	111.5	113.2	112.5	114.1
2,790.0	90	3,938	125.8	89.3	105.5	97.9	100.9	103.2	108.7	111.1	112.6	112.2	113.7
2,480.0	80	3,501	126.0	88.9	104.9	97.8	99.6	102.3	107.8	111.0	111.6	111.8	112.9
2,325.0	75	3,282	126.1	88.7	104.5	97.8	98.8	101.9	107.3	111.0	111.1	111.7	112.5
2,170.0	70	3,063	126.3	88.5	104.2	97.8	98.0	101.5	106.8	111.0	110.6	111.5	112.0
1,860.0	60	2,626	126.5	88.0	103.5	97.8	96.5	100.7	105.8	111.0	109.5	111.1	111.2
1,550.0	50	2,188	126.8	87.6	102.8	97.8	95.0	99.9	104.8	111.0	108.5	110.8	110.3
1,240.0	40	1,750	127.0	87.2	102.2	97.7	93.5	99.2	103.8	110.9	107.5	110.5	109.5
930.0	30	1,313	127.3	86.7	101.5	97.7	92.0	98.4	102.8	110.9	106.5	110.1	108.6
775.0	25	1,094	127.4	86.5	101.1	97.7	91.2	98.0	102.3	110.9	105.9	109.9	108.2
620.0	20	875	127.5	86.3	100.8	97.7	90.5	97.6	101.8	110.9	105.4	109.8	107.8
310.0	10	438	127.8	85.9	100.1	97.7	89.0	96.8	100.8	110.9	104.4	109.4	106.9

MECHANICAL:SOUND POWER(1/3 Octave Frequencies)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ	10000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
3,100.0	100	4,376	112.7	113.9	114.6	115.3	114.9	112.7	110.8	111.8	114.2	113.3	117.9
2,790.0	90	3,938	112.5	113.7	114.4	114.9	114.4	112.2	110.3	111.0	113.6	112.8	119.5
2,480.0	80	3,501	112.1	113.1	113.7	114.3	114.2	111.8	109.9	110.6	113.1	112.6	121.8
2,325.0	75	3,282	111.9	112.8	113.3	113.9	114.1	111.6	109.8	110.4	112.9	112.5	123.1
2,170.0	70	3,063	111.7	112.5	112.8	113.6	114.0	111.4	109.6	110.3	112.6	112.4	124.3
1,860.0	60	2,626	111.2	111.9	112.0	112.9	113.8	110.9	109.2	109.9	112.2	112.2	126.8
1,550.0	50	2,188	110.8	111.3	111.1	112.2	113.7	110.5	108.9	109.6	111.8	112.1	129.3
1,240.0	40	1,750	110.4	110.7	110.3	111.5	113.5	110.1	108.5	109.2	111.3	111.9	131.8
930.0	30	1,313	110.0	110.1	109.4	110.8	113.3	109.6	108.2	108.8	110.9	111.7	134.2
775.0	25	1,094	109.7	109.8	109.0	110.5	113.2	109.4	108.0	108.7	110.7	111.6	135.5
620.0	20	875	109.5	109.5	108.6	110.2	113.1	109.2	107.8	108.5	110.5	111.5	136.7
310.0	10	438	109.1	108.9	107.8	109.5	112.9	108.8	107.5	108.1	110.0	111.3	139.2

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITHOUT FAN	EKW	3,100.0	2,790.0	2,325.0	1,550.0	775.0	310.0
PERCENT LOAD	%	100	90	75	50	25	10
ENGINE POWER	BHP	4,376	3,938	3,282	2,188	1,094	438
TOTAL NOX (AS	G/HR	26,403	22,877	17,130	7,010	2,936	2,988

PERFORMANCE DATA[DM9239]

July 18, 2023

NO2)								
TOTAL CO		G/HR	1,524	1,842	1,866	947	1,012	1,015
TOTAL HC		G/HR	179	143	147	279	284	248
TOTAL CO2		KG/HR	2,206	1,942	1,619	1,240	696	327
PART MATTER		G/HR	116.1	122.8	119.3	86.1	96.8	89.5
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	3,107.8	3,068.3	2,704.7	1,443.3	1,095.5	2,281.7
TOTAL CO	(CORR 5% O2)	MG/NM3	157.9	222.1	252.1	164.2	321.9	666.1
TOTAL HC	(CORR 5% O2)	MG/NM3	15.2	13.1	17.6	43.3	78.1	141.4
PART MATTER	(CORR 5% O2)	MG/NM3	10.3	12.5	14.0	13.4	27.5	54.3
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	1,153.2	1,138.5	1,003.6	535.6	406.5	846.7
TOTAL CO	(CORR 15% O2)	MG/NM3	58.6	82.4	93.6	60.9	119.5	247.2
TOTAL HC	(CORR 15% O2)	MG/NM3	5.7	4.8	6.5	16.1	29.0	52.5
PART MATTER	(CORR 15% O2)	MG/NM3	3.8	4.6	5.2	5.0	10.2	20.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,514	1,494	1,317	703	534	1,111
TOTAL CO	(CORR 5% O2)	PPM	126	178	202	131	258	533
TOTAL HC	(CORR 5% O2)	PPM	28	24	33	81	146	264
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	562	555	489	261	198	412
TOTAL CO	(CORR 15% O2)	PPM	47	66	75	49	96	198
TOTAL HC	(CORR 15% O2)	PPM	11	9	12	30	54	98
TOTAL NOX (AS NO2)		G/HP-HR	6.05	5.82	5.23	3.21	2.68	6.82
TOTAL CO		G/HP-HR	0.35	0.47	0.57	0.43	0.92	2.32
TOTAL HC		G/HP-HR	0.04	0.04	0.04	0.13	0.26	0.57
PART MATTER		G/HP-HR	0.03	0.03	0.04	0.04	0.09	0.20
TOTAL NOX (AS NO2)		G/KW-HR	8.23	7.92	7.11	4.36	3.65	9.27
TOTAL CO		G/KW-HR	0.48	0.64	0.77	0.59	1.26	3.15
TOTAL HC		G/KW-HR	0.06	0.05	0.06	0.17	0.35	0.77
PART MATTER		G/KW-HR	0.04	0.04	0.05	0.05	0.12	0.28
TOTAL NOX (AS NO2)		LB/HR	58.21	50.43	37.76	15.45	6.47	6.59
TOTAL CO		LB/HR	3.36	4.06	4.11	2.09	2.23	2.24
TOTAL HC		LB/HR	0.39	0.31	0.32	0.62	0.63	0.55
TOTAL CO2		LB/HR	4,863	4,281	3,570	2,735	1,535	720
PART MATTER		LB/HR	0.26	0.27	0.26	0.19	0.21	0.20
OXYGEN IN EXH		%	9.6	9.8	10.3	11.7	12.9	15.2
DRY SMOKE OPACITY		%	0.3	0.7	0.7	0.0	0.7	2.4
BOSCH SMOKE NUMBER			0.70	0.73	0.74	0.64	0.74	0.90

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITHOUT FAN		**EKW**	**3,100.0**	**2,790.0**	**2,325.0**	**1,550.0**	**775.0**	**310.0**
PERCENT LOAD		**%**	**100**	**90**	**75**	**50**	**25**	**10**
ENGINE POWER		BHP	4,376	3,938	3,282	2,188	1,094	438
TOTAL NOX (AS NO2)		G/HR	31,683	27,452	20,556	8,412	3,523	3,586
TOTAL CO		G/HR	2,743	3,316	3,359	1,704	1,822	1,827
TOTAL HC		G/HR	238	190	195	372	378	330
PART MATTER		G/HR	162.5	171.9	167.1	120.5	135.6	125.3
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	3,729.4	3,681.9	3,245.7	1,732.0	1,314.5	2,738.0
TOTAL CO	(CORR 5% O2)	MG/NM3	284.3	399.8	453.8	295.6	579.5	1,199.1
TOTAL HC	(CORR 5% O2)	MG/NM3	20.3	17.4	23.4	57.6	103.9	188.1
PART MATTER	(CORR 5% O2)	MG/NM3	14.4	17.5	19.7	18.8	38.6	76.0
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	1,383.9	1,366.3	1,204.4	642.7	487.8	1,016.0
TOTAL CO	(CORR 15% O2)	MG/NM3	105.5	148.3	168.4	109.7	215.0	444.9
TOTAL HC	(CORR 15% O2)	MG/NM3	7.5	6.4	8.7	21.4	38.5	69.8
PART MATTER	(CORR 15% O2)	MG/NM3	5.3	6.5	7.3	7.0	14.3	28.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,817	1,793	1,581	844	640	1,334
TOTAL CO	(CORR 5% O2)	PPM	227	320	363	236	464	959
TOTAL HC	(CORR 5% O2)	PPM	38	32	44	108	194	351
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	674	665	587	313	238	495
TOTAL CO	(CORR 15% O2)	PPM	84	119	135	88	172	356
TOTAL HC	(CORR 15% O2)	PPM	14	12	16	40	72	130
TOTAL NOX (AS NO2)		G/HP-HR	7.26	6.99	6.28	3.85	3.22	8.18
TOTAL CO		G/HP-HR	0.63	0.84	1.03	0.78	1.66	4.17

TOTAL HC	G/HP-HR	0.05	0.05	0.06	0.17	0.35	0.75
PART MATTER	G/HP-HR	0.04	0.04	0.05	0.06	0.12	0.29
TOTAL NOX (AS NO2)	G/KW-HR	9.87	9.50	8.53	5.23	4.38	11.13
TOTAL CO	G/KW-HR	0.86	1.15	1.39	1.06	2.26	5.67
TOTAL HC	G/KW-HR	0.07	0.07	0.08	0.23	0.47	1.03
PART MATTER	G/KW-HR	0.05	0.06	0.07	0.07	0.17	0.39
TOTAL NOX (AS NO2)	LB/HR	69.85	60.52	45.32	18.54	7.77	7.91
TOTAL CO	LB/HR	6.05	7.31	7.41	3.76	4.02	4.03
TOTAL HC	LB/HR	0.52	0.42	0.43	0.82	0.83	0.73
PART MATTER	LB/HR	0.36	0.38	0.37	0.27	0.30	0.28

Regulatory Information

EPA TIER 2		**2006 - 2010**		
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 89 SUBPART D AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	NON-ROAD	TIER 2	CO: 3.5 NOx + HC: 6.4 PM: 0.20

EPA EMERGENCY STATIONARY		**2011 - ----**		
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data

ALTITUDE DERATE DATA IS BASED ON THE ASSUMPTION OF A 20 DEGREES CELSIUS(36 DEGREES FAHRENHEIT) DIFFERENCE BETWEEN AMBIENT OPERATING TEMPERATURE AND ENGINE INLET SCAC TEMPERATURE. AMBIENT OPERATING TEMPERATURE IS DEFINED AS THE AIR TEMPERATURE MEASURED AT THE TURBOCHARGER COMPRESSOR INLET.

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**NORMAL**
ALTITUDE (FT)													
0	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376
1,000	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376
2,000	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,355	4,376
3,000	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,376	4,309	4,216	4,376
4,000	4,345	4,345	4,345	4,345	4,345	4,345	4,344	4,344	4,343	4,280	4,190	4,100	4,345
5,000	4,174	4,174	4,174	4,174	4,174	4,174	4,173	4,172	4,170	4,130	4,073	4,017	4,174
6,000	4,015	4,015	4,015	4,015	4,015	4,015	4,013	4,011	4,008	3,988	3,960	3,933	4,015
7,000	3,868	3,868	3,868	3,868	3,868	3,868	3,866	3,863	3,859	3,853	3,847	3,840	3,868
8,000	3,751	3,751	3,751	3,751	3,751	3,751	3,749	3,745	3,742	3,736	3,729	3,723	3,751
9,000	3,634	3,634	3,634	3,634	3,634	3,634	3,633	3,628	3,624	3,618	3,612	3,606	3,634
10,000	3,523	3,523	3,523	3,523	3,523	3,523	3,521	3,517	3,512	3,506	3,500	3,495	3,523
11,000	3,417	3,417	3,417	3,417	3,417	3,417	3,415	3,411	3,406	3,400	3,394	3,388	3,417
12,000	3,312	3,312	3,312	3,312	3,312	3,312	3,310	3,304	3,299	3,294	3,288	3,282	3,312
13,000	3,206	3,206	3,206	3,206	3,206	3,206	3,204	3,198	3,193	3,188	3,182	3,176	3,206
14,000	3,100	3,100	3,100	3,100	3,100	3,100	3,098	3,093	3,088	3,083	3,079	3,074	3,100
15,000	2,993	2,993	2,993	2,993	2,993	2,993	2,991	2,988	2,984	2,981	2,977	2,974	2,993

Cross Reference

Test Spec	**Setting**	**Engine Arrangement**	**Engineering Model**	**Engineering Model Version**	**Start Effective Serial Number**	**End Effective Serial Number**
3704738	LL6318	3079788	GS265	-	WYB00620	
3704738	LL6318	5683569	PG323	-	TB800100	
3704738	LL6318	5717349	PG323	-	TB800100	

Performance Parameter Reference

Parameters Reference:DM9600-14

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.
PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.
C280/3600 HEAT REJECTION TOLERANCE FACTORS:
Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%
TEST CELL TRANSDUCER TOLERANCE FACTORS:
Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.
REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES
Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.
MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE
Location for air temperature measurement air cleaner inlet at stabilized operating conditions.
REFERENCE EXHAUST STACK DIAMETER
The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.
REFERENCE FUEL

PERFORMANCE DATA[DM9239]

DIESEL
Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at
15 deg C (59 deg F), where the density is
850 G/Liter (7.0936 Lbs/Gal).
GAS
Reference natural gas fuel has a lower heating value of 33.74 KJ/L
(905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500
BTU/CU FT) lower heating value gas. Propane ratings are based on
87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.
ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS
EXTERNAL AUXILIARY LOAD
Engine corrected gross output includes the power required to drive
standard equipment; lube oil, scavenge lube oil, fuel transfer,
common rail fuel, separate circuit aftercooler and jacket water
pumps. Engine net power available for the external (flywheel)
load is calculated by subtracting the sum of auxiliary load from
the corrected gross flywheel out put power. Typical auxiliary
loads are radiator cooling fans, hydraulic pumps, air compressors
and battery charging alternators. For Tier 4 ratings additional
Parasitic losses would also include Intake, and Exhaust
Restrictions.
ALTITUDE CAPABILITY
Altitude capability is the maximum altitude above sea level at
standard temperature and standard pressure at which the engine
could develop full rated output power on the current performance
data set.
Standard temperature values versus altitude could be seen on
TM2001.
When viewing the altitude capability chart the ambient temperature
is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at
conditions above the defined altitude capability derate for
atmospheric pressure and temperature conditions outside the values
defined, see TM2001.
Mechanical governor controlled unit injector engines require a
setting change for operation at conditions above the altitude
defined on the engine performance sheet. See your Caterpillar
technical representative for non standard ratings.
REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential
Site Variation' values for standard ratings. No tolerances are
applied to the emissions data. These values are subject to change
at any time. The controlling federal and local emission
requirements need to be verified by your Caterpillar technical
representative.
Customer's may have special emission site requirements that need
to be verified by the Caterpillar Product Group engineer.
EMISSION CYCLE LIMITS:
Cycle emissions Max Limits apply to cycle-weighted averages only.
Emissions at individual load points may exceed the cycle-weighted
limit.
WET & DRY EXHAUST/EMISSIONS DESCRIPTION:
Wet - Total exhaust flow or concentration of total exhaust flow
Dry - Total exhaust flow minus water vapor or concentration of exhaust
flow with water vapor excluded
EMISSIONS DEFINITIONS:
Emissions : DM1176
EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion,
including,diesel-electric drive, test cycle E2 shall be applied,
for controllable-pitch propeller sets
test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated
auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be
applied.
4. For variable-speed, variable-load auxiliary engines, not
included above, test cycle C1 shall be applied.
HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039

PERFORMANCE DATA[DM9239]

July 18, 2023

On-Highway Truck : TM6038
SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 10/27/21

ATTACHMENT 3

Safety Power EcoCUBE Post-Catalyst Emissions for DM9239

clean essential energy

Date:
February 20, 2025

Attention:
Randy Lukkasson,
Senior Project Engineer
NC Power Systems

Prepared by:
John Grousopoulos
Sr Applications Engineer
Safety Power Inc.

Randy,

Safety Power is pleased to submit the following performance data for the ecoCUBE® Emissions Control System with Selective Catalytic Reduction (SCR) + DPF for the CAT Diesel generator sets operating in accordance with engine performance as per published data sheets at "Stand-by" operating point. The design of the Safety Power emissions reduction system is based on the following conditions. Note: NOx is calculated as NO_2.

Emissions Data

Generator Power (w/ fan) [DM9239]	ekW	3100	2325	1550	775	310
Engine Power	bhp	4376	3282	2188	1094	438
% Load	%	100	75	50	25	10
Exhaust Temperature	deg F	890.4	865.1	855.9	812.8	569.8
Total PSV NOx (as NO2)	lb/hr	69.85	45.32	18.54	7.77	7.91
% Reduction	%	91.00%	91.00%	92.00%	92.00%	60.00%
Post Catalyst NOx (as NO2)	lb/hr	6.29	4.08	1.48	0.62	3.16
	-	-	-	-	-	-
Total PSV CO **	lb/hr	6.05	7.41	3.76	4.02	4.03
% Reduction	%	80	80	80	80	60
Post Catalyst CO	lb/hr	1.21	1.48	0.75	0.80	1.61
	-	-	-	-	-	-
Total PSV HC **	lb/hr	0.52	0.43	0.82	0.83	0.73
% Reduction	%	60	60	60	60	50
Post Catalyst HC	lb/hr	0.21	0.17	0.33	0.33	0.36
	-	-	-	-	-	-
Total PSV PM	lb/hr	0.36	0.37	0.27	0.3	0.28
% Reduction	%	0.85	0.85	0.85	0.85	0.85
Post Catalyst PM	lb/hr	0.05	0.06	0.04	0.05	0.04

clean essential energy

	-	-	-	-	-	-
Maximum Ammonia Slip	ppmvd at 15% O2	8	10	10	10	10

** Reductions assume an exhaust temp of 662 °F (350 °C) or more.

Notes: (1) The EPA does not treat methane and ethane as VOC's. Safety Power can achieve a stated reduction of VOC's based on the EPA definition assuming that the VOC's manifest themselves as propene. (2) all emissions reductions are based on an average at steady state using SCAQMD method 100.1 for NOx and SCAQMD/EPA methods 25.1/25.3 for CO and VOC's or mutually agreed test method approved in writing. (3) if NMHC/VOC data isn't provided 0.6 g/hp-hr is to be assumed (unless otherwise stated).

It's important to note that urea decomposition requires temperatures of 260°C to occur (physical chemical limitation) as a result it's unlikely that our system will be able to provide NOx reduction at the 10% load point based off of the engine data sheet. If insufficient temperature exists, the corresponding load point shall be dropped from the 5-load average emission limits (i.e. emissions will be compliant across average of remaining load points.)

Particulate Matter (PM) shall be measured using ISO 8178 as the engine data is measured using the ISO 8178 standard as well. If EPA Method 5/202 must be used, Safety Power will limit the guarantee to an 85% reduction in PM. As part of Safety Power's standard scope of supply, we would provide NOx measurements using a Testo analyzer at 25%, 50%, 75% & 100% load; samples would be taken from the NOx sensor port located on the ecoCUBE outlet. All other emission testing would be by others (typically in owner's scope as testing is generally tied to site air permit). It's been assumed that testing will take <15 mins at each load point on the D2 cycle (loads would be tested in order of decreasing load to ensure system is at temperature).

I hope this information is helpful. Please advise if any more details are needed and I'll be glad to follow up with additional data.

Best Regards,
John Grousopoulos,

Senior Applications Engineer

ATTACHMENT 4

Summary of Generator Emission Changes

Attachment 4
Summary of Generator Emission Changes
Notice of Construction Application
Microsoft Malaga Data Center

Performance Data Sheet DM9239

Engine Specifications						
Engine Power	bhp	4,376	3,282	2,188	1,094	438
Fuel Consumption	gal/hr	209	160.4	124.1	71.4	34
Exhaust Temperature	°F	892	865	858	826	648
Exhaust Flow Rate	cfm	25,320	19,884	16,827	10,370	5,561
Potential Site Variation Emissions with No Controls						
Load	%	100	75	50	25	10
NO_X Emissions	lb/hr	69.85	45.32	18.54	7.77	7.91
CO Emissions	lb/hr	6.05	7.41	3.76	4.02	4.03
HC Emissions	lb/hr	0.52	0.43	0.82	0.83	0.73
PM Emissions	lb/hr	0.36	0.37	0.27	0.3	0.28
Potential Site Variation Emissions with ecoCUBE Emissions Control System						
Load	%	100	75	50	25	10
NO_X Emissions	lb/hr	6.29	4.08	1.48	0.62	3.16
CO Emissions	lb/hr	1.21	1.48	0.75	0.80	1.61
HC Emissions	lb/hr	0.21	0.17	0.33	0.33	0.36
PM Emissions	lb/hr	0.05	0.06	0.04	0.05	0.04

Attachment 4
Summary of Generator Emission Changes
Notice of Construction Application
Microsoft Malaga Data Center

Comparison of Change Between DM8455 and DM9239

Engine Specifications						
Engine Power	change	0%	0%	0%	0%	0%
Fuel Consumption	change	0%	0%	0%	0%	0%
Exhaust Temperature	change	0%	0%	0%	0%	0%
Exhaust Flow Rate	change	0%	0%	0%	0%	0%
Potential Site Variation Emissions with No Controls						
Load	%	100	75	50	25	10
NO_X Emissions (lb/hr)	change	0%	0%	0%	0%	0%
CO Emissions (lb/hr)	change	0%	0%	0%	0%	0%
HC Emissions (lb/hr)	change	0%	0%	0%	0%	0%
PM Emissions (lb/hr)	change	0%	0%	0%	0%	0%
Potential Site Variation Emissions with ecoCUBE Emissions Control System						
Load	%	100	75	50	25	10
NO_X Emissions (lb/hr)	change	0%	12%	-11%	-11%	--[a]
CO Emissions (lb/hr)	change	-1%	-1%	0%	0%	0%
HC Emissions (lb/hr)	change	-13%	-23%	-20%	-21%	-16%
PM Emissions (lb/hr)	change	-17%	11%	0%	15%	0%

Note:

[a] Assumes no controls for NO_X emissions at 10% load for modeling purposes.

ATTACHMENT 5

Summary of Worst-Case Load Screening Analysis Results

Attachment 5
Summary of Worst-Case Load Screening Analysis Results
Notice of Construction Application
Microsoft Malaga Data Center

Permitted Screening Analysis Results

Load	Dispersion Factor			Model Results[a]					
	1-hour	24-hour	Annual	NO_X 1-hour	CO 1-hour	$PM_{10}/PM_{2.5}$ 24-hour	$PM_{2.5}$ Annual	NO_X Annual	DEEP Annual
	($\mu g/m^3$ per lb/hr)			($\mu g/m^3$)					
3.0-MWe Genset									
10%	40	8.7	1.4	92	64	4.1	0.64	11	0.057
25%	32	7.6	1.2	50	25	3.5	0.56	3.7	0.052
50%	30	5.8	0.98	63	22	2.6	0.44	7.1	0.035
75%	28	5.5	0.93	82	42	1.5	0.25	16	0.050
100%	27	5.1	0.85	100	33	1.5	0.26	23	0.049
			Worst-case Load:	100%	10%	10%	10%	100%	10%

Scaled Screening Analysis Results

Load	Dispersion Factor			Model Results[a,b]					
	1-hour	24-hour	Annual	NO_X 1-hour	CO 1-hour	$PM_{10}/PM_{2.5}$ 24-hour	$PM_{2.5}$ Annual	NO_X Annual	DEEP Annual
	($\mu g/m^3$ per lb/hr)			($\mu g/m^3$)					
3.0-MWe Genset									
10%	40	8.7	1.4	92	64	4.1	0.64	11	0.057
25%	32	7.6	1.2	50	25	**2.9**	**0.46**	3.7	**0.060**
50%	30	5.8	0.98	63	22	2.6	0.44	7.1	0.035
75%	28	5.5	0.93	**92**	42	**1.3**	**0.21**	**17**	**0.056**
100%	27	5.1	0.85	100	33	1.5	0.26	23	0.049
			Worst-case Load:	100%	10%	10%	10%	100%	25%

Notes:

[a] Green highlighted cells indicate the highest modeled impact for each pollutant and averaging period.

[b] Bolded cells indicate scaled modeling results changed based on DM9239 performance data. Only pollutant and engine load values where controlled potential site variation emissions increased were adjusted.

ATTACHMENT 6

Notice of Construction Application Form

Notice of Construction Application

A notice of construction permit is required before installing a new source of air pollution or modifying an existing source of air pollution. This application applies to facilities in Ecology's jurisdiction. Submit this application for review of your project. For general information about completing the application, refer to Ecology Forms ECY 070-410a-g, "Instructions for Ecology's Notice of Construction Application."

Ecology offers up to two hours of free pre-application assistance. We encourage you to schedule a pre-application meeting with the contact person specified for the location of your proposal, below. If you use up your two hours of free pre-application assistance, we will continue to assist you after you submit Part 1 of the application and the application fee. You may schedule a meeting with us at any point in the process.

Upon completion of the application, please enclose a check for the initial fee and mail to:

Department of Ecology
Cashiering Unit
PO Box 47611
Olympia, WA 98504-7611

For Fiscal Office Use Only: 0299-3030404-B00-216--001--000404

Check the box for the location of your proposal. For assistance, call the appropriate office listed below:

Check box	Ecology Permitting Office	Contact
☑	**Chelan, Douglas, Kittitas, Klickitat, or Okanogan County** Ecology Central Regional Office (509) 575-2490	Lynnette Haller (509) 457-7126 lynnette.haller@ecy.wa.gov
☐	**Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Stevens, Walla Walla, or Whitman County** Ecology Eastern Regional Office (509) 329-3400	Karin Baldwin (509) 329-3452 karin.baldwin@ecy.wa.gov
☐	**San Juan County** Ecology Northwest Regional Office (206) 594-0000	David Adler (425) 649-7267 david.adler@ecy.wa.gov
☐	**For actions taken at Kraft and Sulfite Paper Mills and Aluminum Smelters Only** Ecology Industrial Section (360) 407-6900	James DeMay (360) 407-6868 james.demay@ecy.wa.gov
☐	**For actions taken on the US Department of Energy Hanford Reservation Only** Ecology Nuclear Waste Program (509) 372-7950	Lilyann Murphy (509) 372-7951 lilyann.murphy@ecy.wa.gov

Check the box below for the fee that applies to your application.

New project or equipment:

- ☐ **$1,904: Basic project** initial fee covers up to 16 hours of review.
- ☐ **$12,614: Complex project** initial fee covers up to 106 hours of review.

Change to an existing permit or equipment:

- ☐ **$357: Administrative or simple change** initial fee covers up to 3 hours of review. Ecology may determine your change is complex during the completeness review of your application. If you project is complex, you must pay the additional xxx before we will continue working on your application
- ☑ **$1,190: Complex** change initial fee covers up to 10 hours of review
- ☐ **$350flat fee**: Replace or alter control technology equipment under WAC 173-400-114. Ecology will contact you if we determine your change belongs in another fee category. You must pay the fee associated with that category before we will continue working on your application.

Read each statement below, then check the box next to it to acknowledge that you agree.

- ☑ The initial fee you submitted may not cover the cost of processing your application. Ecology will track the number of hours spent on your project. If the number of hours Ecology spends exceeds the hours included in your initial fee, Ecology will bill you $119 per hour for the extra time.
- ☑ You must include all information requested by this application. Ecology may not process your application if it does not include all the information requested.
- ☑ Submittal of this application allows Ecology staff to visit and inspect your facility.

Part 1: General Information

I. Project, Facility, and Company Information

1. Project Name: EAT12, EAT13, and EAT14 Data Centers Approval Order Amendment Request
2. Facility Name: Malaga Data Center Campus
3. Facility Street Address: 5375 Malaga Alcoa Highway, Malaga, Washington 98828
4. Facility Legal Description: Chelan County Parcel No. 222135100060; T 22N R 21EWM S 35 E1500' OF NE1/4 S OF RD 72.5000 ACRES, Chelan County Parcel No. 222135100072 T 22N R 21EWM S 35 LOTS 3 & 4 SP 650 20.0000 ACRES, Chelan County Parcel No. 222135100071 T 22N R 21EWM S 35 LOT 2 SP 650 10.0000 ACRES
5. Company Legal Name (if different from Facility Name): Microsoft Corporation
6. Company Mailing Address (street, city, state, zip)

   1 Microsoft Way, Redmond, Washington 98052

II. Contact Information and Certification

1. Facility Contact Name (who will be onsite): Mamoudou Diallo
2. Facility Contact Mailing Address (if different than Company Mailing Address: 1515 Port Industrial Way, Quincy, Washington 98848

3. Facility Contact Phone Number: 614-439-3617
4. Facility Contact E-mail: mamdiallo@microsoft.com
5. Billing Contact Name (who should receive billing information):
   Yara Boonyarattaphan, Landau Associates, Inc.
6. Billing Contact Mailing Address (if different Company Mailing Address):

   155 NE 100th Street, Suite 302, Seattle, Washington 98125

7. Billing contact Phone Number: 206-795-5352
8. Billing Contact E-mail: yboonyarattaphan@landauinc.com
9. Consultant Name (optional – if 3rd party hired to complete application elements):
   Mark Brunner
10. Consultant Organization/Company: Landau Associates, Inc.
11. Consultant Mailing Address (street, city, state, zip): 206-631-8695
12. Consultant Phone Number: 206-631-8695
13. Consultant E-mail: mbrunner@landauinc.com
14. Responsible Official Name and Title (who is responsible for project policy or decision making):
    Mamoudou Diallo
15. Responsible Official Phone: 614-439-3617
16. Responsible Official E-mail: mamdiallo@microsoft.com
17. Responsible Official Certification and Signature:

    I certify that the information on this application is accurate and complete.

    Signature: Mamoudou diallo Date: 04/14/2025

Part 2: Technical Information

The Technical Information may be sent with this application form to the Cashiering Unit, or may be sent directly to the Ecology regional office with jurisdiction along with a copy of this application form.

For all sections, check the box next to each item as you complete it.

III. Project Description

- ☑ Written narrative describing your proposed project.
- ☐ Projected construction start and completion dates.
- ☐ Operating schedule and production rates.
- ☑ List of all major process equipment and manufacturer and maximum rated capacity.
- ☐ Process flow diagram with all emission points identified.
- ☐ Plan view site map.
- ☑ Manufacturer specification sheets for major process equipment components
- ☑ Manufacturer specification sheets for pollution control equipment.
- ☐ Fuel specifications, including type, consumption (per hour and per year) and percent sulfur.

IV. State Environmental Policy Act (SEPA) Compliance

Check the appropriate box below.

- ☐ SEPA review is complete. Include a copy of the final SEPA checklist and SEPA determination (e.g., DNS, MDNS, and EIS) with your application.
- ☐ SEPA review has not been conducted:
  - ☐ If review will be conducted by another agency, list the agency. You must provide a copy of the final SEPA checklist and SEPA determination before Ecology will issue your permit. Agency reviewing SEPA: _____
  - ☐ If the review will be conducted by Ecology, fill out a SEPA checklist and submit it with your application. You can find a SEPA checklist online at https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-document-templates

V. Emissions Estimations of Criteria Pollutants

Does your project generate criteria air pollutant emissions? ☑ **Yes** ☐ **No**

If yes, please proved the following information regarding your criteria emissions in the application.

- ☑ The names of the criteria air pollutants emitted (i.e., NO_X, SO_2, CO, $PM_{2.5}$, PM_{10}, TSP, VOC, and Pb)
- ☑ Potential emissions of criteria air pollutants in tons per hour, tons per day, and tons per year (include calculations)
- ☐ If there will be any fugitive criteria pollutant emissions, clearly identify the pollutant and quantity

VI. Emissions Estimations of Toxic Air Pollutants

Does your project generate toxic air pollutant emissions? ☑ **Yes** ☐ **No**

If yes, please provide the following information regarding your toxic air pollutant emissions in your application.

☑ The names of the toxic air pollutants emitted (specified in WAC 173-460-150[1])

☑ Potential emissions of toxic air pollutants in pounds per hour, pounds per day, and pounds per year (include calculations)

☐ If there will be any fugitive toxic air pollutant emissions, clearly identify the pollutant and quantity

VII. Emission Standard Compliance

☐ Provide a list of all applicable new source performance standards, national emission standards for hazardous air pollutants, national emission standards for hazardous air pollutants for source categories, and emission standards adopted under Chapter 70A.15 RCW.

Does your project comply with all applicable standards identified? ☑ **Yes** ☐ **No**

VIII. Best Available Control Technology

☐ Provide a complete evaluation of Best Available Control Technology (BACT) for your proposal.

IX. Ambient Air Impacts Analyses

Please provide the following:

☐ Ambient air impacts analyses for Criteria Air Pollutants (including fugitive emissions)

☐ Ambient air impacts analyses for Toxic Air Pollutants (including fugitive emissions)

☐ Discharge point data for each point included in air impacts analyses (include only if modeling is required)

- ☐ Exhaust height
- ☐ Exhaust inside dimensions (ex. diameter or length and width)
- ☐ Exhaust gas velocity or volumetric flow rate
- ☐ Exhaust gas exit temperature
- ☐ The volumetric flow rate
- ☐ Description of the discharges (i.e., vertically or horizontally) and whether there are any obstructions (ex., raincap)
- ☐ Identification of the emission unit(s) discharging from the point
- ☐ The distance from the stack to the nearest property line
- ☐ Emission unit building height, width, and length
- ☐ Height of tallest building on-site or in the vicinity and the nearest distance of that building to the exhaust
- ☐ Whether the facility is in an urban or rural location

Does your project cause or contribute to a violation of any ambient air quality standard or acceptable source impact level? ☐ **Yes** ☑ **No**

To request ADA accommodation, call Ecology at (360) 407-6800, 711 (relay service), or (877) 833-6341 (TTY)

[1] http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460-150