Appendix 2
Entech Comparative Emissions Study

– ATTACHMENT 2:

DEMONSTRATE B.A.T. BY BENCHMARKING DESIGN BASIS OF THE PROPOSED ENTECH-WtGAS-RES™

(72 MWt) FOR BOODARIE PROJECT EMISSION PERFORMANCE AGAINST PRESENT FOSSIL FUEL FIRED

POWER GENERATION

BASED UPON COMPARATIVE ANALYSIS TO "AP-42 COMPILATION OF AIR POLLUTION EMISSIONS FACTORS", FIFTH EDITION, US-EPA, 1998-2006 (AVAILABLE FOR DOWNLOAD AT WWW.EPA.GOV)

COMARATIVE ANALYSIS TO US-EPA REPORT VERIFIES THE PROPOSED ENTECH-WtGAS-RES™ (72 MWt) FOR BOODARIE PROJECT IS ENVIRONMENTALLY SUPERIOR (B.A.T.) TO FOSSIL FUELS

This document contains detailed comparative analysis of emission performance that verifies the proposed ENTECH-WtGas-RES™ for Boodarie project shall produce less HAP's (hazardous air pollutants), including dioxins than fossil fuels, per equivalent energy output. The comparative analysis is based upon latest US-EPA official reports on fossil fuel emissions, namely "AP-42 Compilation of Air Pollution Emissions Factors", fifth edition, US-EPA, 1998-2006 (available for download at www.epa.gov). Verification is detailed below.

FIGURE 1: FLOW DIAGRAM OF DESIGN BASIS OF THE PROPOSED ENTECH-WtGAS-RES™ FOR BOODARIE PROJECT

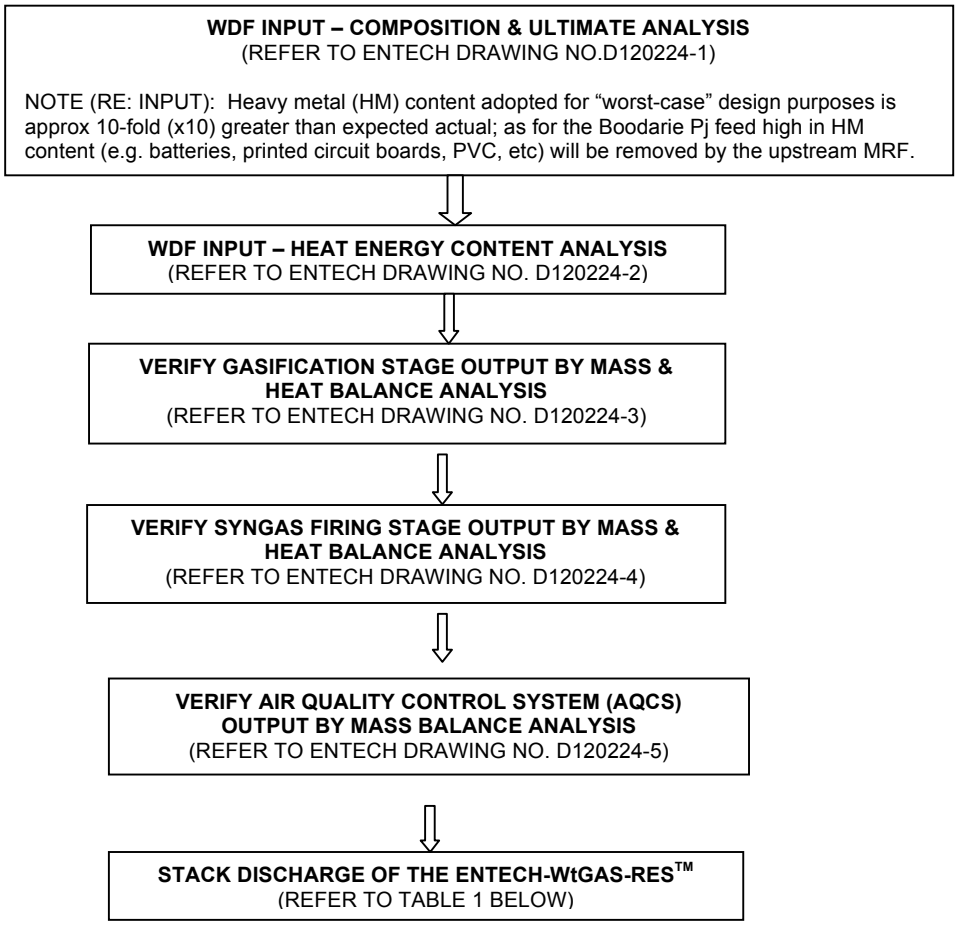

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TABLE 1: STACK DISCHARGE OF THE PROPOSED ENTECH-WtGAS-RES™ FOR BOODARIE PROJECT

ITEM	EXHAUST GAS MASS FLOW RATE KG PER 1-TONNE OF WDF FEED (1)		EXHAUST GAS EMISSION RATES MG/NM^3 @ 11% O^2 REF (1)
A	Dioxin (I-TEQ)	3.53×10^{-10} (2) (3)	0.0230 (ng/Nm^3) (2) (3)
B	TOC/VOC	0.0134631 (2) (3)	0.8800 (2) (3)
C	HM	0.0013542 (4)	0.0892 (4)
D	Hg	0.0000028 (4)	0.0002 (4)
E	Cd + Tl	0.0000334 (4)	0.0022 (4)
F	SOx	0.1156000	7.5548
G	NOx	0.7466000	48.8003
H	HCl	0.0332000	2.1710
I	HF	0.0038000	0.2467
J	CO	0.1831000	11.9700
K	<PM 2.5 <PM 1.0 PM Total	45% 20% 0.0143000	0.4216 0.1873 0.9367

NOTES:

(1) Exhaust gas emission rates of Table 1 are consistent with actual Entech plants in commercial operation. Refer to details of "Average Results of 10 Independent Emission Tests of Entech-WtGas Plants Firing Syngas" (Appendix 1).

(2) PM, acid gas and HM emission rates have been verified by mass balance calculation, however dioxin (I-TEQ), TOC/VOC and CO emission rates can't. Subsequently these emission rates are based upon above-mentioned independent emission test results of actual Entech plants in commercial operation (Appendix 1).

(3) The independent emission test results of Appendix 1 are mostly high HCl applications where dioxin, TOC/VOC and CO emissions are considerably greater than from the typical WDF of the Boodarie project. Subsequently there is nominal +50% AQCS design contingency input for these constituent. Conversely expected dioxin, TOC/VOC and CO emissions shall be < ½ of that noted in Table 1 and the bar charts herein.

(4) HM output is approx 10-fold (x10) greater than expected actual; as for the Boodarie Pj feed high in HM content (e.g. batteries, printed circuit boards, PVC, etc) will be removed by an upstream mechanical recycling facility (MRF). Conversely expected HM output shall be 1/10th of that noted in Table 1 and the bar charts herein.

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TABLE 2: NO. OF TIMES FOSSIL FUEL EMISSION IS GREATER THAN THE PROPOSED ENTECH-WtGAS-RES™ FOR BOODARIE PROJECT

ITEM	EMISSION	USA-EPA "AP-42" REPORT ON DISTILLATE (1)	USA-EPA "AP-42" REPORT ON HEAVY F.O. (1)	USA-EPA "AP-42" REPORT ON COAL (1)	USA-EPA "AP-42" REPORT ON NATURAL GAS (1)
A	Average of all HAP's	X 4	X 20	X 138	X 5
B	Dioxin (I-TEQ)	X 1.2 (2)	X 5 (2)	X 97 (2)	No Data Available(5)
C	TOC/VOC	X 10 (2)	X 11 (2)	X 5 (2)	X 3 (2)
D	HM	X 1.6 (3)	X 11 (3)	X 30 (3)	X 0.3(3)
E	Hg	X 8 (3)	X 45 (3)	X 45 (3)	X 7 (3)
F	Cd + Tl	X 0.8 (3)	X 28 (3)	X 12 (3)	X 0.3 (3)
G	SOx	X 18	X 86	X 114	X 0.04
H	NOx	X 1.6	X 5	X 7	X 2
I	HCl	X 0.6	X 0.6	X 14	No Data Available
J	HF	X 0.6	X 0.6	X 15	No Data Available
K	CO	X 1.7	X 1.5	X 29	X 4
L	<PM 2.5 <PM 1.0 PM Total	X 9 X 8 X 9	X 36 X 40 X 36	X 1497 X 776 X 1728	Negligible X 22 X 4

NOTES:

(1) Refer to Appendix 2 titled "Comparative Analysis of Emissions for Boodarie Project – ENTECH-WtGas-RES™ Firing of Syngas Vs Fossil Fuel" for references and calculations used to derive the data in Table 2.

(2) Per Note 3 of Table 1 above, the expected dioxin, TOC/VOC and CO emissions shall be < ½ of that noted. Conversely the number of times fossil fuel emission is greater shall be ≈ double that shown in Table 2.

(3) Per Note 4 of Table 1 above, the Boodarie project expected HM emissions shall be 1/10th of that noted. Conversely the number of times fossil fuel emission is greater shall be ≈ 10-fold (x10) greater than that shown in Table 2.

(4) Data in Table 2 is represented in the bar charts that follow.

(5) Although AP-42 provides no data for dioxin performance from natural gas, this comparison assumes a dioxin result of 0 (TEQ/mg/Nm^3). This is to acknowledge the superior dioxin performance of natural gas.

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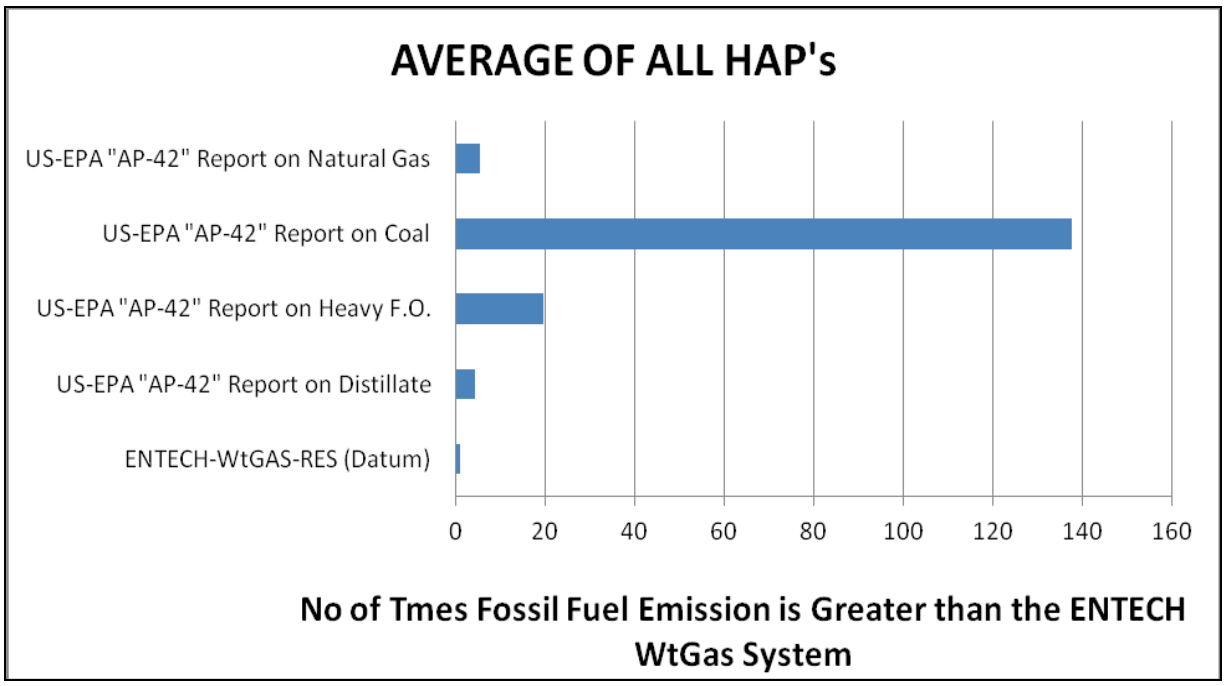

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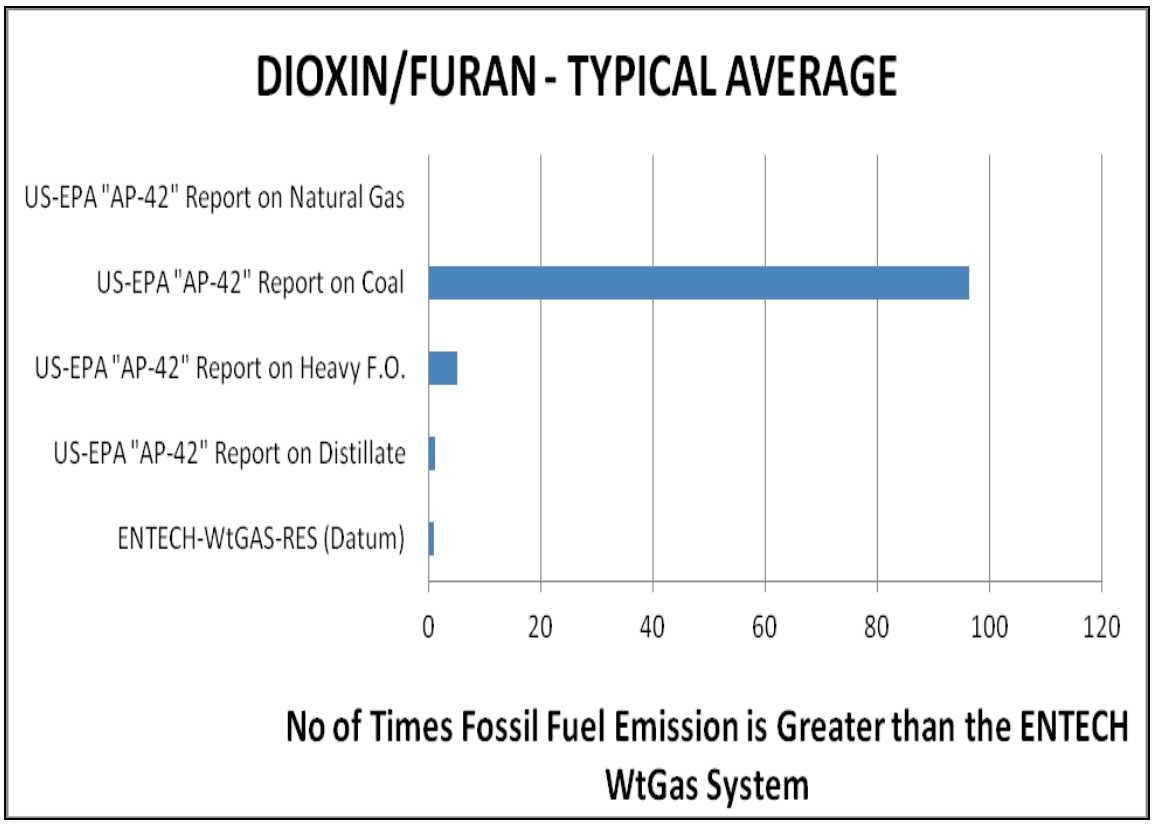

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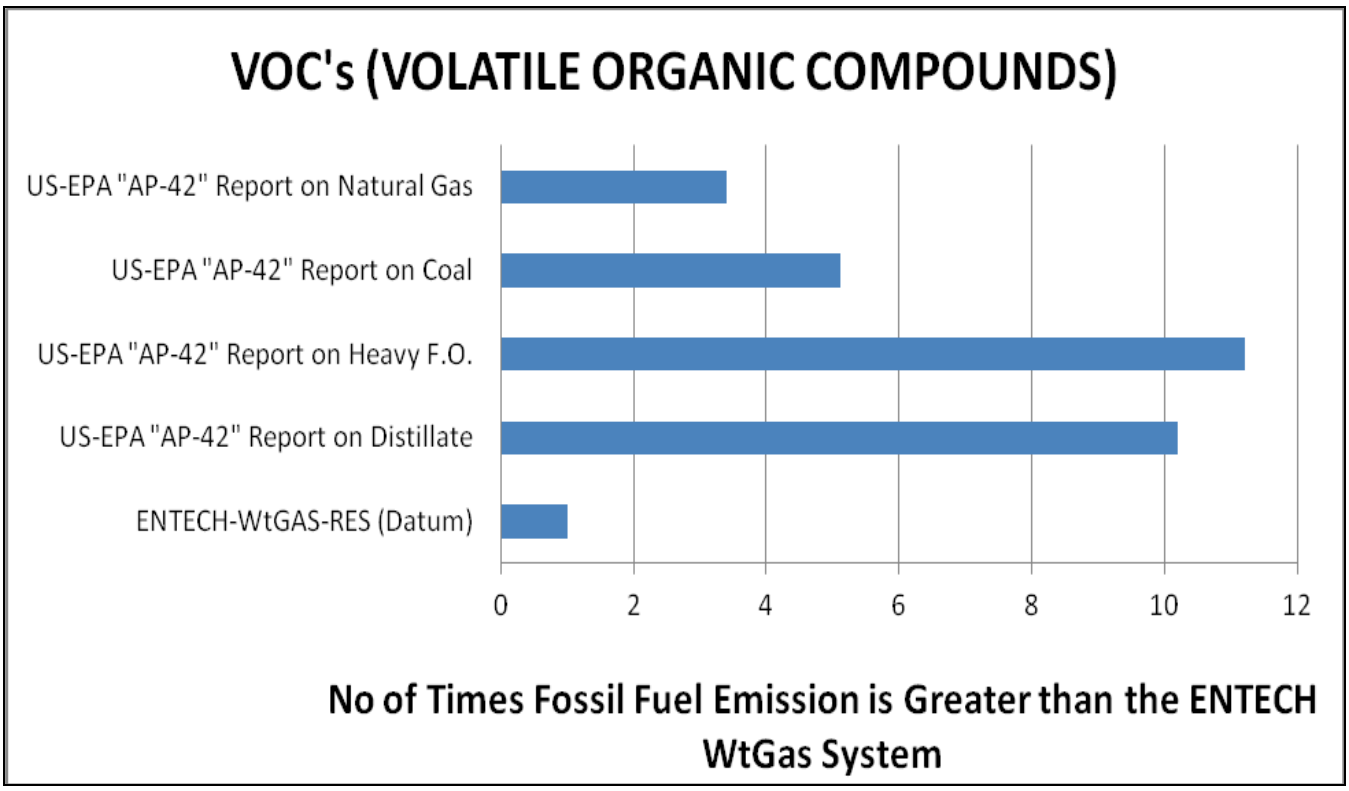

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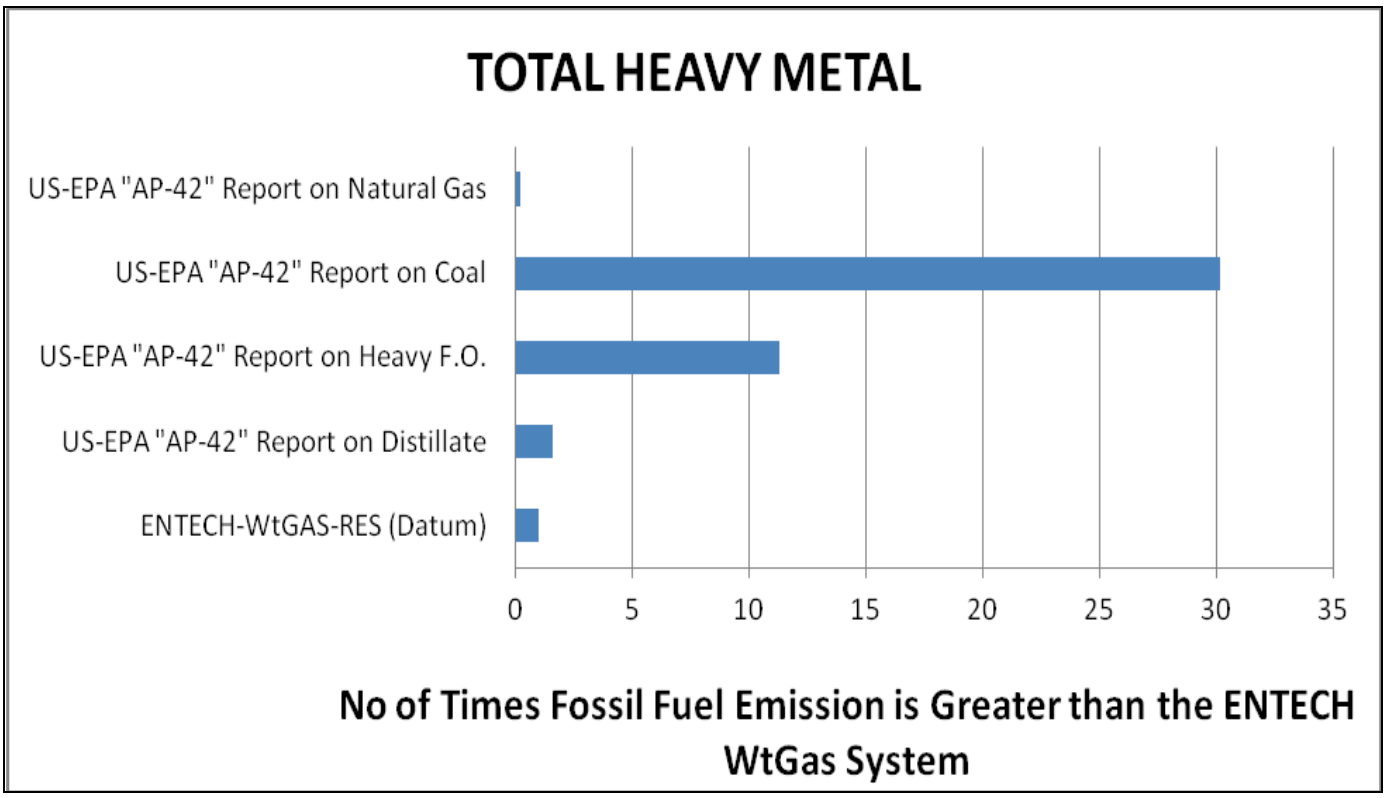

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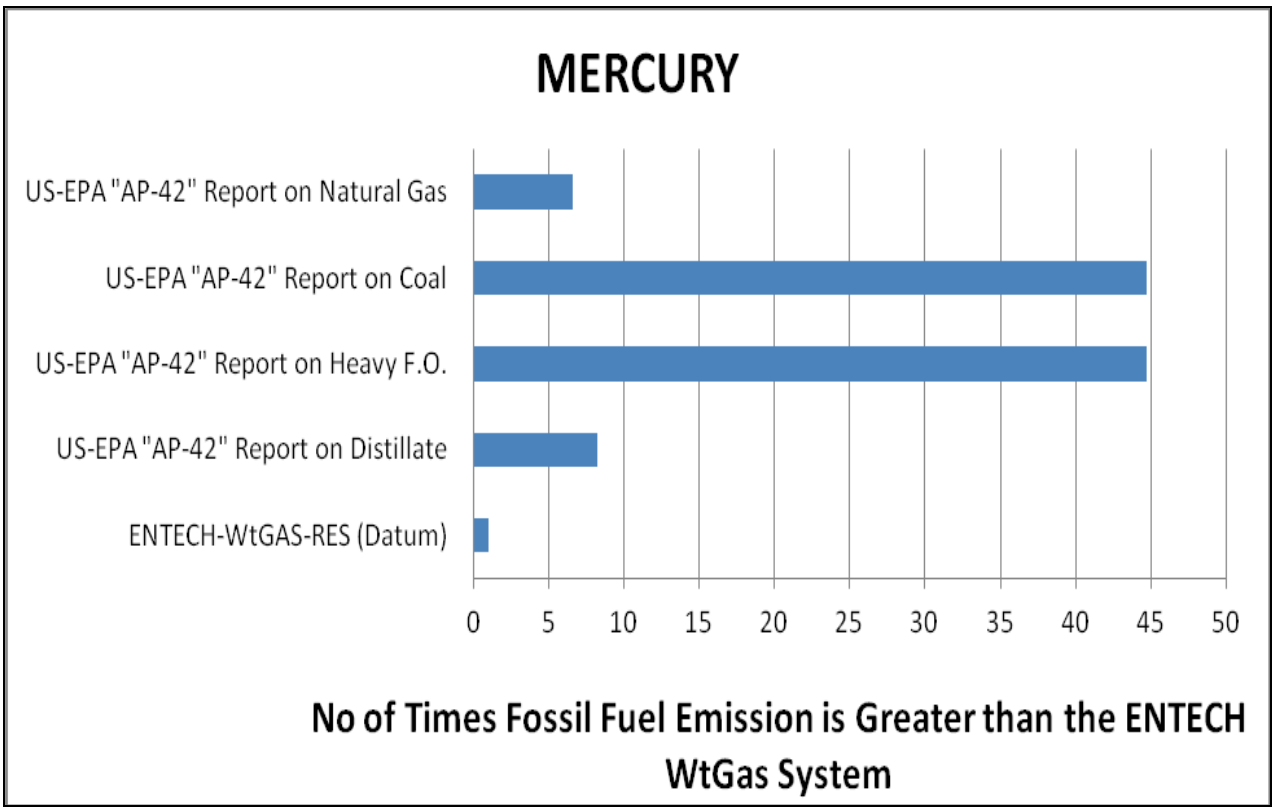

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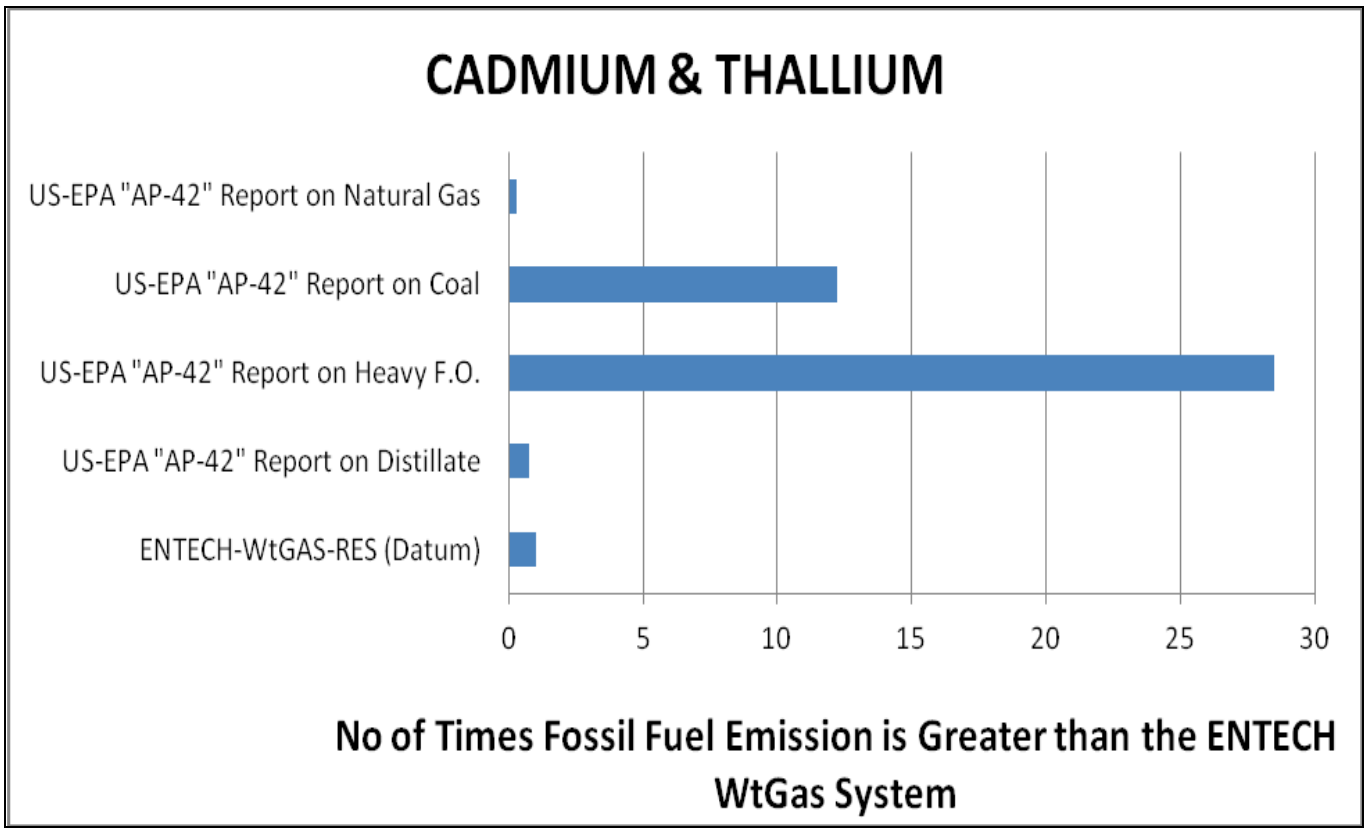

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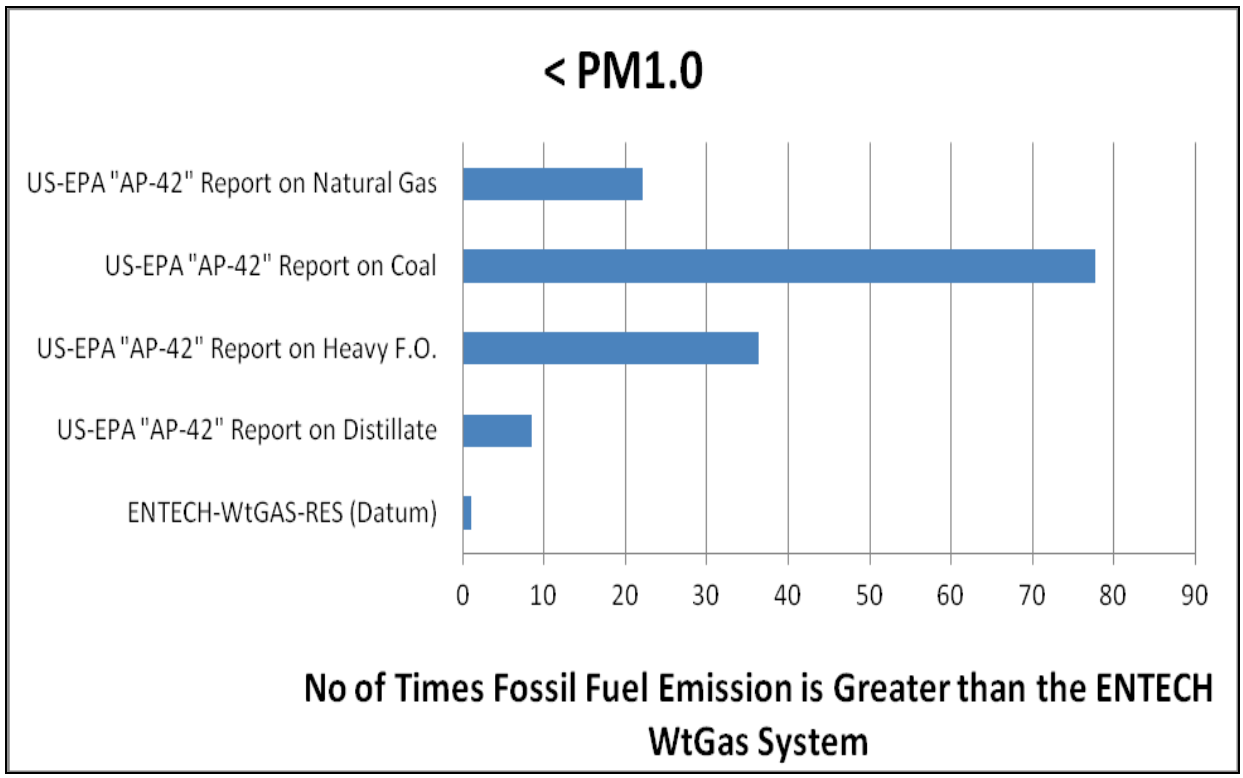

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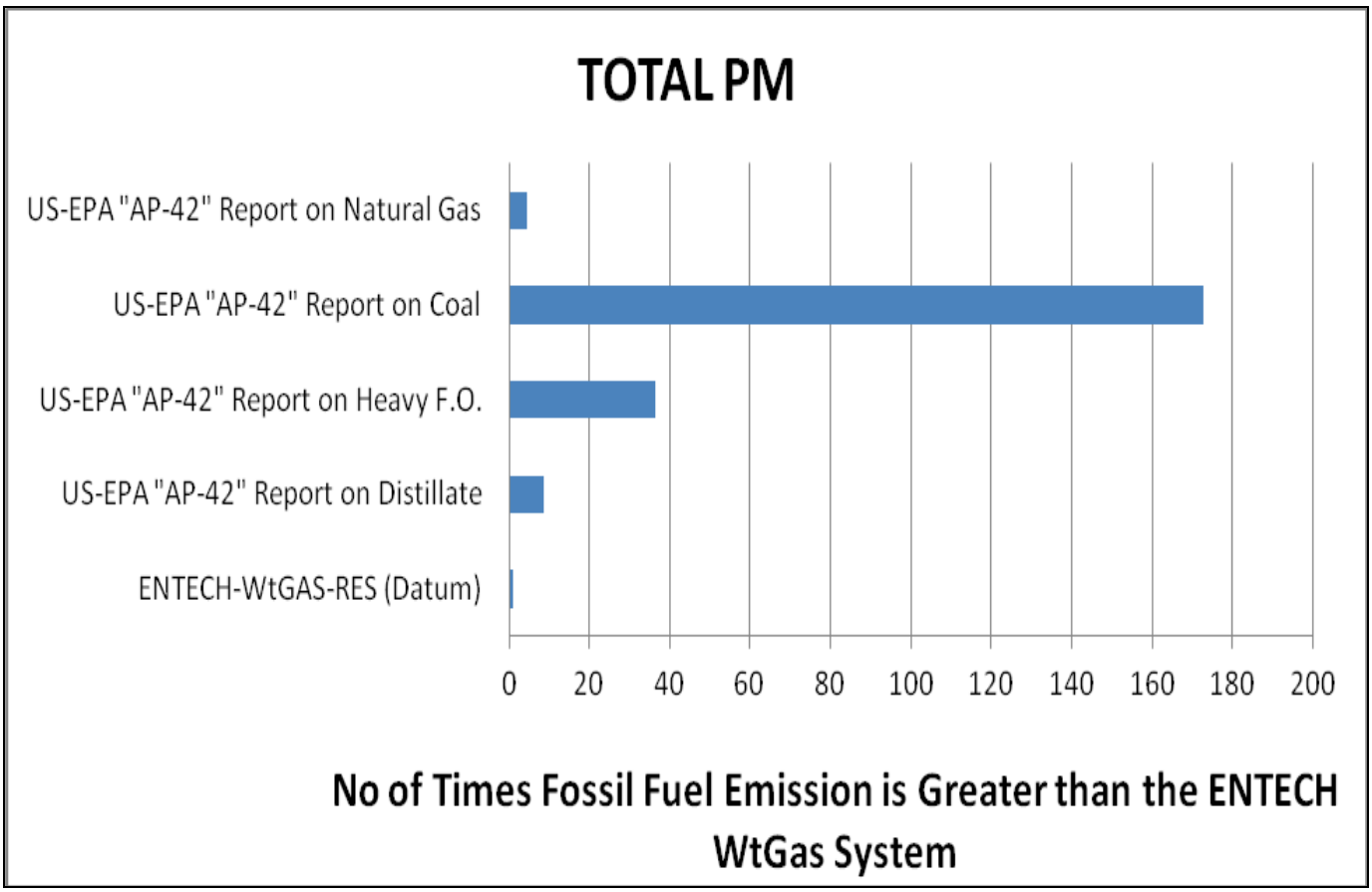

AVERAGE RESULTS OF 10 INDEPENDENT EMISSION TESTS OF ENTECH WtGAS PLANTS FIRING SYNGAS (INCLUDING HIGH HCl PROJECTS)

ITEM	PROJECT	DIOXIN (TEQ ng/Nm^3)	TOC/VOC (mg/Nm^3)	CO (mg/Nm^3)
A	PJ-1150 (RCO) – YR.2 (2004)	0.005	0.69	5
B	PJ-1150 (RCO) – YR.3 (2005)	0.034	0.57	34
C	PJ-1150 (RCO) – YR.4 (2006)	0.096	1.06	-
D	PJ-1150 (RCO) – YR.5 (2007)	0.006	-	-
E	PJ-1150 (RCO) – YR.6 (2008)	0.033	-	-
F	PJ-1150 (RCO) – YR.7 (2009)	0.064	2.60	-
G	PJ-1150 (RCO) – YR.8 (2010)	0.008	-	-
H	PJ-1151 (CGMH) – YR-5 (2009)	0.017	-	5
I	Pj-1152 (Kuznica) – Comm. (2004)	0.020	0.45	23
J	PJ-1157 (NVRI) – Comm. (2006)	0.004	1.20	8
	Average *	**0.023**	**0.880**	**11.97**

(*) In determining averages, the highest and lowest (spike) results have been deleted.

COMPARATIVE ANALYSIS OF EMISSIONS FOR BOODARIE PROJECT - ENTECH-WtGAS-RES™ FIRING OF SYNGAS VS FOSSIL FUELS

TABLE 1: RESULTS OF THE AQCS MASS BALANCE FOR BOODARIE PROJECT

		DIOXIN	VOC	PAH	TTl Heavy Metals	Mercury	Cd & Tl	SOx
Total (mg/Nm3)		0.000000023	0.880	N.A.	0.0892	0.0002	0.0022	7.5548
		NOx	**Chlorine (HCl)**	**Fluorine (HF)**	**CO**	**TTl Particulate**	**< PM2.5**	**< PM 1.0**
Total (mg/Nm3)		48.8003	2.1710	0.2467	11.9700	0.9367	0.4215	0.1873

TABLE 2: RESULTS OF THE AQCS MASS BALANCE FOR BOODARIE PROJECT REFERENCED TO 10 MWt OUTPUT

	UNITS	DIOXIN	VOC	TTl Heavy Metals	Mercury	Cd & Tl	SO x
	ng/Nm3	0.0230000000					
Results of the AQCS Mass Balance (Per Table 1 Above)	mg/Nm3	0.0000000230	0.8800	0.0892	0.0002	0.0022	7.5548
M&HB - Syngas Firing Off-Gas Flow Rate (Per Tonne of Feed)	Nm3/hr (Dry)	14247	14247	14247	14247	14247	14247
System Emission Discharge	mg/hr	0.0003276810	12537	1271	3	31	107633
M&HB - Syngas Firing MWt (Per Tonne of Feed)	MWt	5.109	5.109	5.109	5.109	5.109	5.109
Discharge per MWt	mg/MWt	0.0000641380	2454	249	1	6	21067
Discharge per 10 MWt	mg/10MWt	0.0006413799	24540	2487	6	61	210674
Discharge per 10 MWt @ 24 hr/dy	mg/day	0.0153931180	588954	59699	134	1472	5056171
Discharge per 10 MWt @ 334 dy/year	mg/Year	5.1413014210	196710663	19939308	44707	491777	1688761042
Discharge per 10 MWt @ 334 dy/year	MT/Year	0.0000000051	0.196711	0.019939	0.000045	0.000492	1.688761
	MT/Year	5.14E-09	1.97E-01	1.99E-02	4.47E-05	4.92E-04	1.689

(TABLE 2 CONTINUED)

	UNITS	NO x	Chlorine (HCl)	Fluorine (HF)	CO	TTl Particulate	< PM2.5	< PM 1.0
Results of the AQCS Mass Balance (Per Table 1Above)	mg/Nm3	48.8003	2.1710	0.2467	11.9700	0.9367	0.4215	0.1873
M&HB - Syngas Firing Off-Gas Flow Rate (Per Tonne of Feed)	Nm3/hr	14247	14247	14247	14247	14247	14247	14247
System Emission Discharge	mg/hr	695258	30930	3515	170537	13345	6005	2669
M&HB - Syngas Firing MWt (Per Tonne of Feed)	MWt	5.109	5.109	5.109	5.109	5.109	5.109	5.109
Discharge per MWt	mg/MWt	136085	6054	688	33380	2612	1175	522
Discharge per 10 MWt	mg/10MWt	1360849	60541	6879	333796	26121	11754	5224
Discharge per 10 MWt @ 24 hr/dy	mg/day	32660382	1452976	165108	8011114	626901	282106	125380
Discharge per 10 MWt @ 334 dy/year	mg/Year	10908567467	485294147	55146046	2675712087	209385089	94223290	41877018
Discharge per 10 MWt @ 334 dy/year	MT/Year	10.908567	0.485294	0.055146	2.675712	0.209385	0.094223	0.041877
	MT/Year	10.909	0.485	0.055	2.676	0.209	0.094	0.042

TABLE 3: THE AQCS MASS BALANCE FOR BOODARIE PROJECT COMPARATIVE TO US-EPA "AP-42" REPORT (REFERENCED TO 10 MWt OUTPUT)

	UNITS	DIOXIN	VOC	TTl Heavy Metals	Mercury	Cd & Tl	SO x
Results of the AQCS (Per Table 2 Above)	MTA	0.0000000051	0.196711	0.0199393	0.0000447	0.0004918	1.6887610
US-EPA "AP-42" Report - Distillate	MTA	0.0000000063	2.004000	0.032000	0.000370	0.000372	30.397000
		1.2	10.2	1.6	8.3	0.8	18.0
US-EPA "AP-42" Report - Heavy F.O.	MTA	0.0000000268	2.204000	0.226000	0.002000	0.014000	145.803000
		5.2	11.2	11.3	44.7	28.5	86.3
US-EPA "AP-42" Report - Coal	MTA	0.0000004960	1.007000	0.601000	0.002000	0.006000	191.874000
		96.5	5.1	30.1	44.7	12.2	113.6
US-EPA "AP-42" Report - Natural Gas	MTA	No Data	0.669000	0.005000	0.000297	0.000136	0.073000
		No Data	3.4	0.3	6.6	0.3	0.04

(TABLE 3 CONTINUED)

		NO x	Chlorine (HCl)	Fluorine (HF)	CO	TTl Particulate	< PM2.5	< PM 1.0
Results of the AQCS(Per Table 2 Above)	MTA	10.908567	0.485294	0.055146	2.675712	0.209385	0.094223	0.041877
US-EPA "AP-42" Report - Distillate	MTA	17.723000	0.305000	0.033000	4.425000	1.772000	0.886000	0.354000
		1.6	0.6	0.6	1.7	8.5	9.4	8.5
US-EPA "AP-42" Report - Heavy F.O.	MTA	48.737000	0.281000	0.031000	4.128000	7.599000	3.800000	1.520000
		4.5	0.6	0.6	1.5	36.3	40.3	36.3
US-EPA "AP-42" Report - Coal	MTA	80.859000	6.551000	0.808000	77.338000	361.817000	141.109000	32.504000
		7.4	13.5	14.7	28.9	1728.0	1497.6	776.2
US-EPA "AP-42" Report - Natural Gas	MTA	21.591000	No Data	No Data	10.218000	0.925000	Negligible	0.925000
		2.0	No Data	No Data	3.8	4.4	Negligible	22.1

TABLE 4: COMPARATIVE ANALYSIS FOR BOODARIE PROJECT – AVERAGE OF ALL HAP's

		DIOXIN	VOC	TTl Heavy Metals	Mercury	Cd & Tl	< PM 1.0
Results of the AQCS (Per Table 2 Above)	MTA	0.0000000051	0.1967106631	0.0199393081	0.0000447070	0.000491777	0.041877018
US-EPA "AP-42" Report - Distillate	MTA	0.0000000063	2.0040000000	0.0320000000	0.0003700000	0.000372000	0.35400000
		1.2	10.2	1.6	8.3	0.8	8.5
US-EPA "AP-42" Report - Heavy F.O.	MTA	0.0000000268	2.2040000000	0.2260000000	0.0020000000	0.014000000	1.520000000
		5.2	11.2	11.3	44.7	28.5	36.3
US-EPA "AP-42" Report - Coal	MTA	0.000000496	1.007000000	0.601000000	0.002000000	0.006000000	32.50400000
		96.5	5.1	30.1	44.7	12.2	776.2
US-EPA "AP-42" Report - Natural Gas	MTA	0	0.669000	0.005000	0.000297	0.000136	0.925000
		0	3.4	0.3	6.6	0.3	22.1