

Supplemental Information

Table S1. Supplementary engine operating conditions and outcomes.

AFF	Mode 1		Mode 2		Mode 3		Mode 4		Mode 5		Mode 6		Mode 7	
CDC	0.58	0	0.51	0	0.42	0	0.21	0	0.67	0	0.58	0	0.48	0
	4.38	0	7.57	0	5.61	0	7.01	0	8.78	0	8.65	0	7.50	0
	21.26	120287	21.50	108436	16.66	92593	12.09	65895	19.66	56434	18.09	50501	15.05	45000
	80.63	181.1%	39.52	164.1%	32.97	140.9%	30.11	101.8%	31.71	144.9%	31.48	131.0%	27.39	116.0%
5%	0.58	149	0.51	322	0.43	524	0.21	1753	0.66	21	0.59	242	0.48	300
	4.48	2882	7.20	2333	5.17	1645	6.67	654	8.99	1471	8.70	1190	7.04	860
	21.56	121612	21.38	110229	16.18	92656	11.93	66025	19.40	56918	17.90	49775	14.67	44468
	86.28	182.7%	39.75	166.4%	32.73	140.8%	28.72	101.8%	33.76	145.0%	32.01	128.3%	27.91	115.3%
10%	0.58	319	0.51	1658	0.43	1184	0.22	3863	0.67	114	0.60	517	0.48	734
	4.33	5734	7.33	4647	5.36	3421	6.86	1308	9.01	3055	8.45	2422	6.71	1720
	21.79	123208	21.30	109492	16.18	92900	12.15	66144	19.42	56201	17.79	49232	14.41	44042
	86.99	184.7%	39.90	165.0%	33.34	140.8%	27.89	101.8%	33.51	142.8%	31.98	126.5%	28.90	113.9%
15%	-	-	0.52	1444	0.44	1754	0.22	6321	0.67	136	0.60	790	0.49	1245
	-	-	7.70	6926	5.40	5032	6.68	1962	9.07	4563	8.46	3598	6.30	2579
	-	-	21.50	109518	16.20	92567	12.48	66169	19.26	56283	17.60	48909	14.07	43444
	-	-	41.36	164.5%	33.25	140.0%	28.01	101.7%	34.21	142.9%	32.59	125.2%	29.26	112.0%
20%	-	-	0.53	1823	0.45	2407	0.23	8446	0.68	229	0.61	1078	0.50	1696
	-	-	8.05	9278	5.44	6706	7.33	2616	9.12	6101	8.34	4738	5.86	3439
	-	-	21.41	109132	16.50	92532	12.57	66241	19.39	55657	17.63	48578	13.77	42623
	-	-	41.93	163.6%	35.05	139.5%	24.45	101.5%	35.23	141.0%	31.50	123.9%	29.70	109.7%
25%	-	-	0.54	2377	0.46	3155	0.24	10836	0.70	226	0.62	1392	0.52	2167
	-	-	7.99	11603	5.48	8376	7.37	3270	8.99	7639	8.01	5975	5.91	4299
	-	-	21.17	109132	16.59	92339	12.71	66447	19.38	55128	17.41	47969	13.68	41720
	-	-	41.69	163.0%	35.11	138.9%	24.00	101.3%	35.68	138.1%	31.50	121.9%	29.89	107.0%
30%	0.61	1303	0.54	3033	0.47	3870	-	-	0.72	264	0.63	1904	0.53	2627
	5.86	17040	6.88	13908	5.66	10048	-	-	8.82	9209	7.75	7109	5.67	5159
	22.05	124517	19.57	106104	17.40	92390	-	-	19.07	53015	17.30	47688	13.57	41042
	88.16	185.1%	43.62	158.0%	39.50	138.6%	-	-	36.03	132.9%	32.35	120.9%	30.53	104.8%
35%	0.61	2500	0.53	3440	0.48	4519	-	-	-	-	0.64	2230	0.54	3185
	5.91	19814	6.26	13531	5.55	11687	-	-	-	-	7.00	8316	5.56	6018
	21.83	123850	19.14	106075	17.12	92414	-	-	-	-	16.88	47036	13.47	40968
	87.54	183.2%	45.94	158.5%	36.97	138.3%	-	-	-	-	33.20	118.6%	30.67	103.3%
40%	0.63	2740	0.56	4335	0.48	5356	-	-	-	-	-	-	0.60	3746
	5.99	23945	6.33	18555	5.62	13380	-	-	-	-	-	-	5.51	6878
	21.86	124721	19.38	104963	17.25	92630	-	-	-	-	-	-	13.11	41532
	89.59	183.6%	45.91	155.2%	37.96	138.1%	-	-	-	-	-	-	30.61	105.1%
45%	-	-	0.57	4856	0.49	6245	-	-	-	-	0.66	2803	0.57	5483
	-	-	6.39	12448	5.88	14988	-	-	-	-	6.15	10716	5.50	7642
	-	-	19.79	105843	17.65	92627	-	-	-	-	16.55	45727	13.17	41199
	-	-	46.83	155.8%	39.61	137.8%	-	-	-	-	34.29	114.4%	30.60	103.5%
50%	-	-	0.58	5540	0.50	6974	-	-	-	-	0.67	3096	0.54	6068
	-	-	6.45	22289	5.95	16398	-	-	-	-	6.03	11953	5.23	8598
	-	-	20.11	103856	17.87	92412	-	-	-	-	16.26	45065	13.18	41134
	-	-	46.97	153.6%	40.30	137.3%	-	-	-	-	33.12	112.3%	30.68	103.3%

Table S1a. Legend for supplementary engine operating conditions and outcomes.

AFF	ISO 8178-C1 Mode # (1–7)	
	Equivalence Ratio [–]	Exhaust NH ₃ [ppm]
CDC or %	Combustion Onset (CA10), [CAD ATDC]	NH₃ Reactor GHSV [hr ^{–1}]
	Combustion Phasing (CA50), [CAD ATDC]	DOC GHSV [hr ^{–1}]
	Combustion Duration (CA10–90), [CAD]	Volumetric Efficiency [%]