

Town of

Reading Public Schools

COOLIDGE MIDDLE SCHOOL
FOSSIL FUEL COMPARISON





ENVIRONMENTAL CONTROLS ENE, INC.

BARBER-COLMAN/ROBERTSHAW

July 13, 1998

Mr. Jeffery Griffin
Town of Reading Public Schools
82 Oakland Road
Reading, MA 01867

Dear Jeff:

I have performed energy calculations for the Coolidge Middle School. Assume the following ASHRAE Standards:

#4 FUEL ASSUMPTIONS

Assume one gallon of #4 fuel oil contains 141,000 British Thermal Units (BTU's)

→ Coolidge Middle School consumed 56,929.32 gallons of #4 fuel or produced 8,027,034,120 BTU's annually. (pre renovation/ addition)

$$56,929.32 \text{ gallons \#4 oil} \times .53/\text{gallon} = \$30,172.53$$

#2 FUEL ASSUMPTIONS

Assume one gallon of #2 fuel oil contains 139,800 British Thermal Units (BTU's)

$$57,418 \text{ gallons \#2 oil} \times .69/\text{gallon} = \$39,618.$$

If Reading Public Schools utilizes #2 oil to heat the Coolidge Middle School as constructed today (57,000 square feet), it would cost an additional \$9,446.42.

GAS ASSUMPTIONS

Assume one therm of gas contains 100,000 BTU's

$$\text{Current: } 80,270.34 \text{ therms of gas} \times .78/\text{therm} = \$62,610.86$$

If Reading Public Schools participates in the gas consortium group, they will benefit by reducing the gas cost approximately 15%.

$$80,270.34 \text{ therms of gas} \times .66/\text{therm} = \$52,978.42$$

If Reading Public Schools utilizes gas to heat the Coolidge Middle School as constructed today (57,000 square feet) and participates in the consortium, they would realize a reduction in cost for gas of \$9,632.44. (1770)

Coolidge (after addition/renovation)
86,130 sq.ft

MAINTENANCE COST - OIL vs. GAS

Utilizing oil, the cost to maintain heating, ventilation and air conditioning equipment at the Coolidge Middle School is currently \$15,970.

ASHRAE estimates an approximate 15% reduction if a consumer switches fossil fuels from oil to gas. This reduction will present the Coolidge Middle School with average savings of \$2,396 annually, or \$23,960 over 10 years.

SUMMARIZATION OF COST

Annual Heating & Maintenance Cost Coolidge Middle School

	<u>Cost</u>	<u>Maintenance Cost</u>	<u>Total Cost</u>	
→ #4 Fuel Oil	\$30,172.52	\$16,289.00	\$46,461.52	Pre-Remov.
#2 Fuel Oil	\$39,618.42	\$15,970.00	\$55,588.42	options
Gas	\$52,978.42	\$13,574.00	\$66,552.42	Post-Remov.

Jeff, based on the table above, it would seem that #4 fuel usage is economically the best choice. However, mechanically there are costs associated to operating the system that we are not able to include in the above data.

Given the consortium price of gas and the additional cost of installing an above ground oil tank, my recommendation is that Reading Public Schools utilize gas as their fuel of choice.

If you have any questions, please contact me at my office.

Sincerely,
Siebe Environmental Controls ENE, Inc.


Michael F. Brickley
Account Executive

MFB/imm

Gas - minimal difference
in maintenance cost
- Far more costly as
fuel than #4 oil.
- approx. \$3,000 maintenance
contrast with
approx. \$20,000 savings
with #4 oil

Boston, MA (Hanscom AFB)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	100 01-08														0
Coincident WB	74 09-16								2	1					3
Humidity Ratio	0.01267 17-24														0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	95 01-08														0
Coincident WB	74 09-16						1	6	10	7	2				26
Humidity Ratio	0.01383 17-24							1	2	1					4
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	90 01-08														0
Coincident WB	71 09-16					1	5	20	31	24	8				89
Humidity Ratio	0.01252 17-24						1	5	8	4	1				17
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	85 01-08							1	2						3
Coincident WB	69 09-16					1	10	40	57	57	22	3			190
Humidity Ratio	0.01212 17-24							14	21	17	5				57
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	80 01-08						1	4	11	9	2				27
Coincident WB	66 09-16					4	21	44	69	61	37	13			249
Humidity Ratio	0.01106 17-24					1	7	25	43	39	13	1			129
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	75 01-08							19	44	35	18				116
Coincident WB	64 09-16						32	52	48	52	48	17	2		251
Humidity Ratio	0.01081 17-24					2	15	40	65	56	30	5			213
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	70 01-08					1	12	48	71	62	28	3			221
Coincident WB	61 09-16				2	15	40	38	22	30	42	32	5		224
Humidity Ratio	0.00997 17-24					6	20	51	60	59	38	15	3		252
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	65 01-08					3	21	50	62	64	40	17	4	1	262
Coincident WB	57 09-16			1	3	29	50	19	8	12	43	43	11	3	222
Humidity Ratio	0.00865 17-24				2	13	37	42	35	44	48	27	6	1	253
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	60 01-08					10	37	59	37	41	47	29	9	2	271
Coincident WB	52 09-16		2	1	7	38	40	17	1	4	27	54	24	5	218
Humidity Ratio	0.00698 17-24			1	4	23	40	37	13	19	46	42	12	2	239
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	55 01-08		1	1	2	18	55	36	15	21	41	43	20	3	254
Coincident WB	48 09-16		2	3	15	42	20	4	0	0	10	45	43	8	192
Humidity Ratio	0.00606 17-24		1	2	7	31	51	20	2	8	35	45	25	4	231
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	50 01-08		2	2	4	32	57	18	4	13	33	40	30	7	242
Coincident WB	43 09-16		7	7	32	44	10	0	0	0	2	24	44	15	185
Humidity Ratio	0.00483 17-24		2	4	13	47	37	5	0	2	16	48	35	9	218
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	45 01-08		7	5	13	58	39	6	1	3	19	41	34	14	240
Coincident WB	38 09-16		20	23	57	39	6	0	0	0	0	13	48	31	237
Humidity Ratio	0.00379 17-24		10	9	39	57	18	0	0	0	8	33	42	22	238
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	40 01-08		17	18	51	55	17	1	0	0	11	38	42	24	274
Coincident WB	34 09-16		41	44	58	15	0	0	0	0	0	4	36	36	234

Boston, MA (Hanscom AFB)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	100	01-08													0
Coincident WB	74	09-16							2	1					3
Humidity Ratio	0.01267	17-24													0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	95	01-08													0
Coincident WB	74	09-16					1	8	10	7	2				26
Humidity Ratio	0.01383	17-24						1	2	1					4
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	90	01-08													0
Coincident WB	71	09-16				1	5	20	31	24	8				89
Humidity Ratio	0.01252	17-24					1	5	6	4	1				17
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	85	01-08						1	2						3
Coincident WB	69	09-16				1	10	40	57	57	22	3			190
Humidity Ratio	0.01212	17-24						14	21	17	5				57
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	80	01-08					1	4	11	9	2				27
Coincident WB	68	09-16				4	21	44	69	61	37	13			249
Humidity Ratio	0.01106	17-24				1	7	25	43	39	13	1			129
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	75	01-08						19	44	35	18				116
Coincident WB	64	09-16					32	52	48	52	48	17	2		251
Humidity Ratio	0.01081	17-24				2	15	40	65	56	30	5			213
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	70	01-08				1	12	46	71	62	28	3			221
Coincident WB	61	09-16			2	15	40	36	22	30	42	32	5		224
Humidity Ratio	0.00997	17-24				6	20	51	60	59	38	15	3		252
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	65	01-08				3	21	50	62	64	40	17	4	1	262
Coincident WB	57	09-16		1	3	29	50	19	8	12	43	43	11	3	222
Humidity Ratio	0.00865	17-24			2	13	37	42	35	44	46	27	6	1	253
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	60	01-08				10	37	59	37	41	47	29	9	2	271
Coincident WB	52	09-16		2	1	7	36	40	17	1	4	27	54	24	218
Humidity Ratio	0.00698	17-24			1	4	23	40	37	13	19	46	42	12	239
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	55	01-08		1	1	2	16	55	36	15	21	41	43	20	254
Coincident WB	48	09-16		2	3	15	42	20	4	0	0	10	45	43	192
Humidity Ratio	0.00606	17-24		1	2	7	31	51	20	2	8	35	45	25	231
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	50	01-08		2	2	4	32	57	18	4	13	33	40	30	242
Coincident WB	43	09-16		7	7	32	44	10	0	0	0	2	24	44	185
Humidity Ratio	0.00483	17-24		2	4	13	47	37	5	0	2	16	48	35	218
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	45	01-08		7	5	13	58	39	6	1	3	19	41	34	240
Coincident WB	38	09-16		20	23	57	39	6	0	0	0	13	48	31	237
Humidity Ratio	0.00379	17-24		10	9	39	57	18	0	0	0	8	33	42	238
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Top Temperature	40	01-08		17	18	51	55	17	1	0	0	11	38	42	274
Coincident WB	34	09-16		41	44	58	15	0	0	0	0	0	4	36	234

Boston, MA (Hanscom AFB)

Humidity Ratio	0.00331	17-24	29	31	69	41	3	0	0	0	2	20	50	30		275
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	35	01-08	39	38	72	43	5	0	0	0	4	25	42	42		310
Coincident WB	29	09-16	44	48	45	4	0	0	0	0	0	1	21	51		214
Humidity Ratio	0.00252	17-24	47	52	62	16	0	0	0	0	0	10	40	49		276
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	30	01-08	30	36	50	17	1	0	0	0	0	10	32	43		219
Coincident WB	25	09-16	45	38	19	0	0	0	0	0	0	0	4	42		148
Humidity Ratio	0.00217	17-24	40	43	32	2	0	0	0	0	0	2	20	46		185
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	25	01-08	34	36	32	3	0	0	0	0	0	2	19	35		161
Coincident WB	20	09-16	31	27	5	0	0	0	0	0	0	0	1	30		94
Humidity Ratio	0.0016	17-24	40	35	12	0	0	0	0	0	0	0	7	35		129
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	20	01-08	32	28	14	1	0	0	0	0	0	0	6	27		108
Coincident WB	15	09-16	28	17	3	0	0	0	0	0	0	0	0	15		63
Humidity Ratio	0.00115	17-24	34	20	4	0	0	0	0	0	0	0	1	27		86
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	15	01-08	23	20	7	0	0	0	0	0	0	0	1	22		73
Coincident WB	11	09-16	16	8	1	0	0	0	0	0	0	0	0	7		32
Humidity Ratio	0.00105	17-24	22	15	3	0	0	0	0	0	0	0	0	14		54
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	10	01-08	25	19	3	0	0	0	0	0	0	0	0	17		64
Coincident WB	6	09-18	8	5	0	0	0	0	0	0	0	0	0	3		16
Humidity Ratio	0.00075	17-24	15	9	1	0	0	0	0	0	0	0	0	6		31
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	5	01-08	14	14	1	0	0	0	0	0	0	0	0	7		36
Coincident WB	1	09-16	3	2	0	0	0	0	0	0	0	0	0	1		6
Humidity Ratio	0.00051	17-24	5	2	0	0	0	0	0	0	0	0	0	2		9
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	0	01-08	6	5	0	0	0	0	0	0	0	0	0	2		13
Coincident WB	-3	09-16	1	1	0	0	0	0	0	0	0	0	0	1		3
Humidity Ratio	0.00056	17-24	2	1	0	0	0	0	0	0	0	0	0	1		4
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-5	01-08	4	2	0	0	0	0	0	0	0	0	0	1		7
Coincident WB	-8	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.0004	17-24	1	0	0	0	0	0	0	0	0	0	0	0		1
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-10	01-08	2	1	0	0	0	0	0	0	0	0	0	0		3
Coincident WB	-13	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00028	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Top Temperature	-15	01-08	1	0	0	0	0	0	0	0	0	0	0	0		1
Coincident WB	-18	09-16	0	0	0	0	0	0	0	0	0	0	0	0		0
Humidity Ratio	0.00019	17-24	0	0	0	0	0	0	0	0	0	0	0	0		0
			Jan	Feb	Mar	Apr	May									

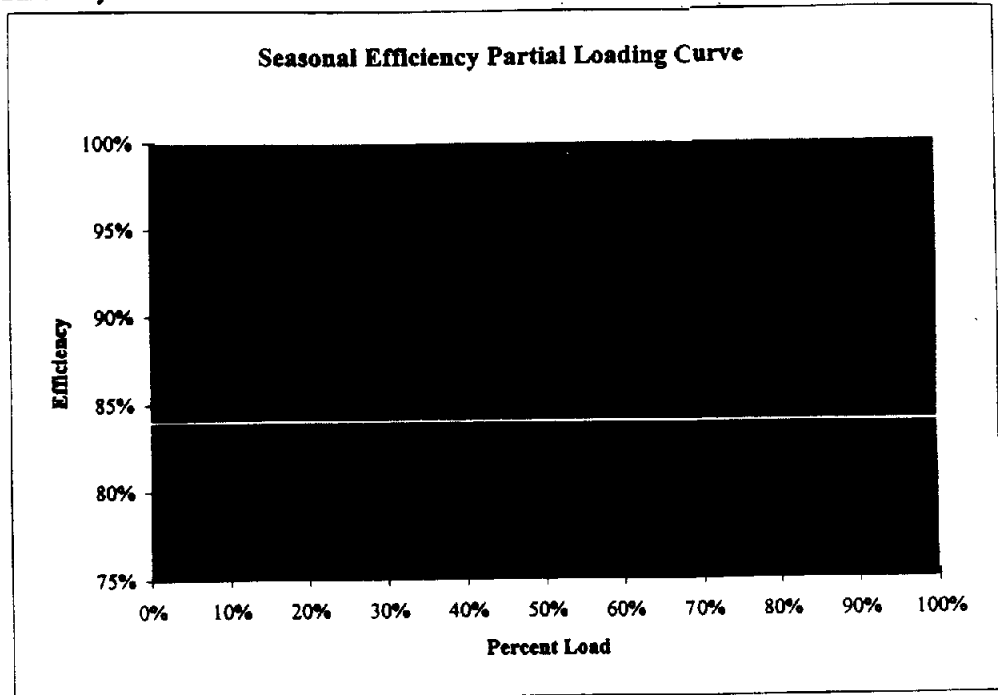
		Jan	Feb	Mar	Apr	May	Sep	Oct	Nov	Dec	Seasonal Hours
Top Temperature	80 01-08				10	37	47	28	9	2	134
Coincident WB	52 08-18	2		1	7	38	40	27	54	5	198
Humidity Ratio	0.00898 17-24			1	4	23	40	46	42	2	170
											500
Top Temperature	55 01-08	1	1		2	18	55	41	43	20	182
Coincident WB	48 08-18	2	3		15	42	20	10	45	43	188
Humidity Ratio	0.00808 17-24	1	2		7	31	51	35	45	28	201
											571
Top Temperature	50 01-08	2	2	4	32	57	33	40	30	7	207
Coincident WB	43 08-18	7	7	32	44	10	2	24	44	15	185
Humidity Ratio	0.00483 17-24	2	4	13	47	37	18	48	35	9	211
											803
Top Temperature	45 01-08	7	5	13	58	39	18	41	34	14	230
Coincident WB	38 08-18	20	23	57	38	8	0	13	48	31	237
Humidity Ratio	0.00379 17-24	10	9	39	57	18	8	33	42	22	238
											706
Top Temperature	40 01-08	17	18	51	55	17	11	38	42	24	273
Coincident WB	34 08-18	41	44	68	15	0	0	4	38	38	234
Humidity Ratio	0.00331 17-24	29	31	69	41	3	2	20	50	30	278
											782
Top Temperature	35 01-08	39	38	72	43	5	4	25	42	42	310
Coincident WB	29 08-18	44	48	48	4	0	0	1	21	51	214
Humidity Ratio	0.00282 17-24	47	52	82	18	0	0	10	48	48	278
											600
Top Temperature	30 01-08	30	38	50	17	1	0	10	32	43	218
Coincident WB	25 08-18	45	38	19	0	0	0	0	4	42	148
Humidity Ratio	0.00217 17-24	40	43	32	2	0	0	2	20	48	186
											552
Top Temperature	25 01-08	34	38	32	3	0	0	2	18	35	181
Coincident WB	20 08-18	31	27	5	0	0	0	0	1	30	84
Humidity Ratio	0.0016 17-24	40	35	12	0	0	0	0	7	38	129
											384
Top Temperature	20 01-08	32	28	14	1	0	0	0	8	27	108
Coincident WB	15 08-18	28	17	3	0	0	0	0	0	15	83
Humidity Ratio	0.00115 17-24	34	20	4	0	0	0	0	1	27	86
											257
Top Temperature	15 01-08	23	20	7	0	0	0	0	1	22	73
Coincident WB	11 08-18	18	8	1	0	0	0	0	0	7	32
Humidity Ratio	0.00106 17-24	22	15	3	0	0	0	0	0	14	54
											158
Top Temperature	10 01-08	28	19	3	0	0	0	0	0	17	64
Coincident WB	6 08-18	8	5	0	0	0	0	0	0	3	16
Humidity Ratio	0.00075 17-24	15	9	1	0	0	0	0	0	9	31
											111
Top Temperature	5 01-08	14	14	1	0	0	0	0	0	7	38
Coincident WB	1 08-18	3	2	0	0	0	0	0	0	1	8
Humidity Ratio	0.00051 17-24	8	2	0	0	0	0	0	0	2	9
											51
Top Temperature	0 01-08	6	5	0	0	0	0	0	0	2	13
Coincident WB	-3 08-18	1	1	0	0	0	0	0	0	1	3
Humidity Ratio	0.00038 17-24	2	1	0	0	0	0	0	0	1	4
											20
Top Temperature	-6 01-08	4	2	0	0	0	0	0	0	1	7
Coincident WB	-8 08-18	0	0	0	0	0	0	0	0	0	0
Humidity Ratio	0.0004 17-24	1	0	0	0	0	0	0	0	0	1
											8
Top Temperature	-10 01-08	2	1	0	0	0	0	0	0	0	3
Coincident WB	-13 08-18	0	0	0	0	0	0	0	0	0	0
Humidity Ratio	0.00028 17-24	0	0	0	0	0	0	0	0	0	0
											3
Top Temperature	-15 01-08	1	0	0	0	0	0	0	0	0	1
Coincident WB	-18 08-18	0	0	0	0	0	0	0	0	0	0
Humidity Ratio	0.00019 17-24	0	0	0	0	0	0	0	0	0	0
											1
		Jan	Feb	Mar	Apr	May	Sep	Oct	Nov	Dec	
	01-08	233	235	249	235	211	155	228	235	243	
	08-18	248	234	242	180	76	19	141	221	245	
	17-24	247	224	246	217	149	107	200	232	247	

Seasonal Efficiency

Seasonal Efficiency Partial Loading Curve

Percent Load Efficiency Steady State Efficiency

0%	0%	84%
1%	5%	84%
2%	10%	84%
3%	15%	84%
4%	20%	84%
5%	25%	84%
6%	28%	84%
7%	30%	84%
8%	32%	84%
9%	34%	84%
10%	38%	84%
11%	40%	84%
12%	45%	84%
13%	50%	84%
14%	55%	84%
15%	60%	84%
16%	60%	84%
17%	60%	84%
18%	60%	84%
19%	65%	84%
20%	65%	84%
21%	65%	84%
22%	65%	84%
23%	75%	84%
24%	75%	84%
25%	75%	84%
26%	75%	84%
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33%	75%	84%
34%	75%	84%
35%	75%	84%
36%	75%	84%
37%	75%	84%
38%	75%	84%
39%	75%	84%
40%	75%	84%
41%	75%	84%
42%	75%	84%
43%	75%	84%



Seasonal Efficiency

44%	75%	84%
45%	75%	84%
46%	75%	84%
47%	75%	84%
48%	75%	84%
49%	75%	84%
50%	75%	84%
51%	75%	84%
52%	75%	84%
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86%	75%	84%
87%	75%	84%
88%	75%	84%
89%	75%	84%
90%	75%	84%
91%	75%	84%
92%	75%	84%
93%	75%	84%

Seasonal Efficiency

94%	75%	84%
95%	75%	84%
96%	75%	84%
97%	75%	84%
98%	75%	84%
99%	75%	84%
100%	78%	84%