

FES- L1 T8 Replacing T12s and T12HOs

Assumptions									
Average kWh Cost		\$ 0.042							
Minimum Operating Hours		1,800							
Demonstration Operating Hours*		3,680							
* hours based on 16hrs/day, 5 days/week, 52 weeks/year									
Measure ID	Demonstration Operating Hours		Energy Efficient		Standard		Differential		Operating Hours
	Energy Efficient Installation T 8 w/Electronic Ballast	Energy Efficient System Wattage	Initial Lumens	Energy Efficient Mean** Lumens	Installation T12 w/Magnetic Ballast	Standard System Wattage	Initial Lumens	Standard Mean** Lumens	
1	T8 - 17W - 2' 1 Lamp - Electronic	20	1,325	1,260	T12 - 20W - 2' 1 Lamp - Magnetic	27.5	1,200	1,160	
2	T8 - 17W - 2' 2 Lamp - Electronic	33	2,650	2,520	T12 - 20W - 2' 2 Lamp - Magnetic	43	2,400	2,300	
3	T8 - 17W - 2' 3 Lamp - Electronic	48	3,975	3,780	T12 - 20W - 2' 3 Lamp - Magnetic	68	3,600	3,450	
4	T8 - 17W - 2' 4 Lamp - Electronic	63	5,300	5,040	T12 - 20W - 2' 4 Lamp - Magnetic	85	4,800	4,600	
5	T8 - 25W - 3' 1 Lamp - Electronic	26	2,080	1,970	T12 - 30W - 3' 1 Lamp - Magnetic	37	2,200	1,910	
6	T8 - 25W - 3' 2 Lamp - Electronic	43	4,160	3,940	T12 - 30W - 3' 2 Lamp - Magnetic	53	4,400	3,820	
7	T8 - 25W - 3' 3 Lamp - Electronic	78	6,240	5,910	T12 - 30W - 3' 3 Lamp - Magnetic	90	6,600	5,730	
8	T8 - 25W - 3' 4 Lamp - Electronic	86	8,320	7,880	T12 - 30W - 3' 4 Lamp - Magnetic	106	8,800	7,640	
9	T8 - 32W - 4' 1 Lamp - Electronic	30	2,800	2,660	T12 - 34W - 4' 1 Lamp - Magnetic	44	2,650	2,280	
10	T8 - 32W - 4' 2 Lamp - Electronic	60	5,600	5,320	T12 - 34W - 4' 2 Lamp - Magnetic	77	5,300	4,560	
11	T8 - 32W - 4' 3 Lamp - Electronic	88	8,400	7,980	T12 - 34W - 4' 3 Lamp - Magnetic	120	7,950	6,840	
12	T8 - 32W - 4' 4 Lamp - Electronic	112	11,200	10,640	T12 - 34W - 4' 4 Lamp - Magnetic	150	10,600	9,120	
13	T8 - 59W - 8' 1 Lamp - Electronic	58	5,800	5,500	T12 - 60W - 8' 1 Lamp - Magnetic	69	5,500	5,060	
14	T8 - 59W - 8' 2 Lamp - Electronic	112	11,600	11,000	T12 - 60W - 8' 2 Lamp - Magnetic	132	11,000	10,120	
15	T8 - 86W - 8' 1 Lamp - HO - Electronic	80	8,000	7,600	T12 - 95W - 8' 1 Lamp - Magnetic - HO	105	8,000	6,950	
16	T8 - 86W - 8' 2 Lamp - HO - Electronic	160	16,000	15,200	T12 - 95W - 8' 2 Lamp - Magnetic - HO	210	16,000	13,900	
17	Low Watt T8	28	2,750	2,585	32 W T8	32	2,800	2,660	
									(75)
									-3%
									4
									0.004
									3,680
									15

FES- L2 T5s and T5HOs Replacing T12s and T12HOs

Assumptions											
Demonstration Operating Hours						3,680					
Energy Efficient Installation T 5 w/Electronic Ballast			Energy Efficient System Wattage	Energy Efficient Initial Lumens	Energy Efficient Mean** Lumens	Standard System Installation		Standard System Wattage	Standard Initial Lumens	Standard Mean** Lumens	Differential Mean** Lumens
18	T5 - 4' 1 Lamp - 28 watt		32	2,900	2,726	T12- 34W - 4' 1 Lamp - Magnetic		44	2,650	2,280	446
19	T5 - 4' 2 Lamp - 28 watt		65	5,800	5,452	T12- 34W - 4' 2 Lamp - Magnetic		77	5,300	4,560	892
20	T5 - 4' 3 Lamp - 28 watt		93	8,700	5,452	T12- 34W - 4' 3 Lamp - Magnetic		120	7,950	6,840	(1,388)
21	T5 - 4' 4 Lamp - 28 watt		126	11,600	10,904	T12- 34W - 4' 4 Lamp - Magnetic		150	10,600	9,120	1,784
22	T5 - 4' 1 Lamp HO - 54 watt		62	5,000	4,700	T12- 34W - 4' 2 Lamp - Magnetic		77	5,300	4,560	140
	T5 - 4' 2 Lamp HO - 54 watt		122	10,000	9,400	T12- 60W - 8' 2 Lamp - Magnetic		132	11,000	10,120	(720)
	T5 - 4' 2 Lamp HO - 54 watt		122	10,000	9,400	T12- 34W - 4' 4 Lamp - Magnetic		150	16,000	13,900	(4,500)
23	T5 - 4' 2 Lamp HO - 54 watt		122	10,000	9,400	T12 - 8' and 4' Avg		141	13,500	12,010	(2,610)
	T5 - 4' 3 Lamp HO - 54 watt		185	15,000	14,100	T12 - 95W - 8' 2 Lamp - Magnetic - HO		210	16,000	13,900	200
24	T5 - 4' 3 Lamp HO - 54 watt		243	20,000	18,800	T12 - 60W - 8' 4 Lamp - Magnetic - HO		264	22,000	20,000	(1,200)
	T5 - 4' 4 Lamp HO - 54 watt		243	20,000	18,800	T12 - 95W - 8' 2 Lamp - Magnetic - HO		210	16,000	13,900	4,900
	T5 - 4' 4 Lamp HO - 54 watt		243	20,000	18,800	T12 - 95W - 8' 2 Lamp - Magnetic - VHO		380	30,000	26,000	(7,200)
25	T5 - 4' 4 Lamp HO - 54 watt		243	20,000	18,800	T12 - 95W - 8' 2 Lamp - Magnetic - HO - VHO Avg		295	22,667	19,967	(1,167)
**Mean Lumens is the light output at 40% of rated lamp life.											
Product Description			Material Totals								
T5 - 4' 1 Lamp - 28 watt			\$59.30								
T5 - 4' 2 Lamp - 28 watt			\$74.12								
T5 - 4' 3 Lamp - 28 watt			\$78.60								
T5 - 4' 4 Lamp - 28 watt			\$87.56								
T5 - 4' 1 Lamp HO - 54 watt			\$120.00								
T5 - 4' 2 Lamp HO - 54 watt			\$140.00								
T5 - 4' 3 Lamp HO - 54 watt			\$175.00								
T5 - 4' 4 Lamp HO - 54 watt			\$223.88								

Product Description	Lumens Initial per Lamp	Lumens Mean* per Lamp	Avg Rated Life
T5 28 W - 4 foot	2,900	2,726	20,000
T5 54 W HO - 4 foot	5,000	4,700	20,000
T12 34 W - 4 foot	2,650	2,280	20,000
T12 60 W - 8 foot	5,500	5,060	12,000
T12 95 W HO - 8 foot	8,000	6,950	12,000

**Mean Lumens is the light output at 40% of rated lamp life.

FES- L3 High Bay Fluorescents

Assumptions															
Operating Hours		4,160													
Energy Efficient Installation Hi Bay Fluorescents		Energy Efficient System Wattage	Energy Efficient Initial Lumens	Energy Efficient Mean** Lumens	Standard Installation	Standard System Wattage	Standard Initial Lumens	Standard Mean** Lumens	Differential Mean** Lumens	delta P Mean** Lumens	Watts Savings	kW Savings	Demonstration Operating Hours	Energy Savings kWh/yr	
	3L T5 HO	182	15,000	14,100	250 W HID	290	22,500	12,500	1,600	13%	108	0.108	4,160	449	
	4L T5 HO	243	20,000	18,800	400 W HID	455	41,000	22,500	(3,700)	-16%	212	0.212	4,160	882	
	6L T5 HO	365	30,000	28,200	400W HID	455	41,000	22,500	5,700	25%	90	0.09	4,160	374	
	2-6L T5 HO	730	90,000	84,600	1000W HID	1080	125,000	69,500	15,100	22%	350	0.35	4,160	1,456	
	4L F32 T8	142	13,924	10,839	250 W HID	290	22,500	12,500	(1,661)	-13%	148	0.148	4,160	616	
	6L F32 T8	224	20,866	16,258	400 W HID	455	41,000	22,500	(6,242)	-28%	231	0.231	4,160	961	
	8L F32 T8	299	27,848	21,677	400W HID	455	41,000	22,500	(823)	-4%	156	0.156	4,160	649	
	2-8L F32 T8	598	55,696	43,355	1000W HID	1080	125,000	69,500	(26,145)	-38%	482	0.482	4,160	2,005	
	8L 42W CFL	372	21,200	19,080	400 W HID	455	41,000	22,500	(3,420)	-15%	83	0.083	4,160	345	
	320 Watt Metal Halide - Pulse Start	342	32,000	22,500	400 W HID	455	41,000	22,500	0	0%	113	0.113	4,160	470	
	350 Watt Metal Halide - Pulse Start	375	36,000	25,200	400 W HID	455	41,000	22,500	2,700	12%	80	0.08	4,160	333	
	400 Watt Metal Halide - Pulse Start	455	41,000	28,700	400 W HID	455	41,000	22,500	6,200	28%	0	0	4,160	0	

**Mean Lumens is the light output at 40% of rated lamp life.

Fixture Installation		Material Cost	
320 Watt Metal Halide - Pulse Start		\$150.00	
350 Watt Metal Halide - Pulse Start		\$160.00	
400 Watt Metal Halide - Pulse Start		\$170.00	
3L T5 HO		\$180.00	
4L T5 HO		\$192.00	
6L T5 HO		\$350.00	
4L F32 T8		\$160.00	
6L F32 T8		\$160.00	
8L F32 T8		\$200.00	
8L 42W CFL		\$395.00	

Product Description		Lumens Initial per Lamp		Lumens Mean* per Lamp		Avg Rated Life	
400 W Metal Halide - Probe Start		41,000		22500		20,000	
4L T5 HO		20,000		18,800		20,000	
6L F32 T8		20,886		16,258		20,000	
8L 42W CFL		21,200		19,080		10,000	
320 Watt Metal Halide - Pulse Start		32,000		22,500		25,000	
350 Watt Metal Halide - Pulse Start		36,000		25,200		25,000	
400 Watt Metal Halide - Pulse Start		41,000		28,700		25,000	

**Mean Lumens is the light output at 40% of rated lamp life.

FES-L6 Compact Fluorescent Lamps and Fixtures

The conversion of incandescent lamps to compact fluorescent lamps (CFL) is evaluated.

Assumptions:

- A 15W CFL is assumed to be the replacement for a 60 W incandescent lamp
- A CFL fixture with two 13W lamps is assumed to be the replacement for a incandescent fixture with two 60W lamps.
- Annual hours of operation of 3,680 assumed, an average of typical commercial and industrial usage
- A coincidence factor of 0.9 was assumed

EXISTING

Lighting Type

Number of Fixtures

Lamps per Fixture

Fixture Wattage

LF - Load Factor

Annual Operating Hours

Conversion Factor

KW

kWh/Yr Use

Average kWh Rate

Annual Energy Cost

PROPOSED

Lighting Type

Number of Fixtures

Lamps per Fixture

Fixture Wattage

Conversion Factor

KW

kWh/Yr Use

Gas Increase (th/yr)

Average therm Rate

Annual Energy Cost

SAVINGS

KW

kWh/Yr Use

th/yr

Annual Energy Cost

Project cost Estimate

Simple Payback

Measure ID

Measure ID

Test

60W Inc

2-60W Inc

Fixture

1

2

120

0.9

3,680

1,000

0.070

199

397

\$0.070

\$14

\$28

15W CFL

2-13 W CFL

Fixture

1

2

15

27

1,000

0.014

50

89

NA

NA

\$10

\$22

\$3

0.3

2.1

\$45

0.0405

0.0837

149

308

NA

NA

\$10

\$22

\$3

0.3

2.1

FES- M1 Premium Efficiency Motors
Summary Sheet

This calculation estimates the energy savings associated with replacing a standard efficiency EFAPCT motor with a NEMA premium efficiency motor.

Assumptions:

- Run Time: 3680 Hrs

- Average Loading 85%

		1200 TEFC		1800 TEFC		3600 TEFC		1200 ODP		1800 ODP		3600 ODP		Overall				
Motor HP	Delta kW	Delta kWh/yr	Delta kW	Delta kWh/yr	Delta kW	Delta kWh/yr	Delta kW	Delta kWh/yr	Delta kW	Delta kWh/yr	Delta kW	Delta kWh/yr	Average 6 Categories Delta kW	Average 6 Categories Delta kWh/yr	Average per Size Category	Cross Reference Focus Values	% Diff	
1	0.02	67.59	0.02	75.89	0.01	46.04	0.02	67.59	0.02	92.09	0.02	92.09	0.02	67	0.03079	0.034	0.0945058	
1.5	0.02	71.56	0.03	92.09	0.02	57.94	0.03	92.09	0.03	95.41	0.03	95.41	0.02	77				
2	0.03	93.24	0.03	122.79	0.02	74.54	0.03	122.79	0.03	122.79	0.02	74.54	0.03	97				
3	0.04	136.72	0.04	136.72	0.02	136.72	0.04	136.72	0.04	139.86	0.06	207.45	0.04	134				
5	0.06	227.86	0.06	227.86	0.03	115.22	0.06	227.86	0.06	227.86	0.06	227.86	0.05	191				
7.5	0.07	246.48	0.10	358.75	0.05	168.66	0.08	285.01	0.11	415.45	0.05	172.83	0.07	275	0.11099	0.1275	0.123519	
10	0.09	328.64	0.13	478.93	0.04	154.73	0.09	323.61	0.13	478.93	0.06	225.29	0.09	331				
15	0.13	485.41	0.17	632.55	0.07	260.88	0.13	485.41	0.17	632.55	0.06	232.09	0.12	424				
20	0.18	647.21	0.23	843.40	0.09	347.83	0.16	594.22	0.23	843.40	0.09	347.83	0.16	604				
25	0.25	925.15	0.37	1181.98	0.10	374.22	0.18	843.40	0.27	1181.98	0.10	374.22	0.19	619	0.28697	0.3186	0.0992834	
30	0.30	1089.40	0.46	1685.70	0.12	449.06	0.20	742.77	0.46	1685.70	0.12	449.06	0.20	708				
40	0.50	1897.18	0.70	2584.08	0.16	589.68	0.24	897.18	0.70	2584.08	0.16	589.68	0.24	796				
50	0.60	2323.61	0.90	3582.97	0.17	622.97	0.30	1121.48	0.90	3582.97	0.17	622.97	0.30	1089				
60	0.75	3137.12	1.05	4705.68	0.20	737.98	0.30	1089.40	1.05	4705.68	0.20	737.98	0.32	1171				
75	0.90	3921.40	1.25	5787.64	0.25	922.47	0.37	1347.76	1.25	5787.64	0.25	922.47	0.36	1309				
100	1.00	4705.68	1.40	6968.11	0.28	1012.88	0.49	1796.51	1.40	6968.11	0.33	1229.86	0.46	1700				
125	1.10	5401.51	1.55	8125.25	0.34	1242.29	0.61	2245.64	1.55	8125.25	0.34	1242.29	0.52	1909	0.67817	0.69	0.017151	
150	1.20	6172.11	1.65	9324.84	0.41	1490.75	0.73	2672.11	1.65	9324.84	0.41	1490.75	0.58	2123				
200	1.50	7845.55	1.90	11575.14	0.53	1952.48	0.97	3562.81	1.90	11575.14	0.53	1952.48	0.82	3014				
250	1.80	9321.40	2.20	13952.48	0.64	2342.97	1.00	4705.68	2.20	13952.48	0.64	2342.97	0.73	2695				
300	2.10	10894.00	2.50	15897.64	0.64	2342.97	1.00	4705.68	2.50	15897.64	0.64	2342.97	0.74	2737				
																		8.51%

FES- 1 Premium Efficiency Motors
Totally Enclosed Fan Cooled 1200 RPM

This calculation estimates the energy savings associated with replacing a standard efficiency EPAct1 motor with a NEMA premium efficiency motor.

- Assumptions:
- Run Time: 3680 Hrs
 - Average Loading 65%

Motor Cost & Efficiency Data															
Motor HP	EPact High Eff			NEMA Premium Eff				EPact High Eff			NEMA Premium Eff			Delta kW	Delta kWh
	Eff %	List Price *** \$	Cost \$	Eff %	List Price \$	Cost \$	Delta Eff	Delta Cost	kW	kWh	kW	kWh	Cost Index		
1	80.0%	\$ 550	\$ 550	82.5%	\$ 612	\$ 612	2.5%	\$ 62	0.61	2,231	0.59	2,163	1.11	0.02	68
1.5	85.5%	\$ 603	\$ 603	87.5%	\$ 729	\$ 729	2.0%	\$ 126	0.85	3,131	0.83	3,059	1.21	0.02	72
2	86.5%	\$ 645	\$ 645	88.5%	\$ 740	\$ 740	2.0%	\$ 95	1.12	4,126	1.10	4,033	1.15	0.03	93
3	87.5%	\$ 846	\$ 846	89.5%	\$ 923	\$ 923	2.0%	\$ 77	1.66	6,118	1.63	5,981	1.09	0.04	137
5	87.5%	\$ 937	\$ 937	89.5%	\$ 1,072	\$ 1,072	2.0%	\$ 135	2.77	10,197	2.71	9,969	1.14	0.06	228
7.5	89.5%	\$ 1,143	\$ 1,143	91.0%	\$ 1,528	\$ 1,528	1.5%	\$ 385	4.06	14,953	4.00	14,707	1.34	0.07	246
10	89.5%	\$ 1,273	\$ 1,273	91.0%	\$ 1,745	\$ 1,745	1.5%	\$ 472	5.42	19,938	5.33	19,609	1.37	0.09	329
15	90.2%	\$ 2,031	\$ 2,031	91.7%	\$ 2,328	\$ 2,328	1.5%	\$ 297	8.06	29,675	7.93	29,189	1.15	0.13	485
20	90.2%	\$ 2,454	\$ 2,454	91.7%	\$ 3,100	\$ 3,100	1.5%	\$ 646	10.75	39,566	10.58	38,919	1.26	0.18	647
25	91.7%	\$ 2,961	\$ 2,961	93.0%	\$ 3,508	\$ 3,508	1.3%	\$ 547	13.22	48,649	13.03	47,969	1.18	0.18	680
30	91.7%	\$ 3,592	\$ 3,592	93.0%	\$ 4,053	\$ 4,053	1.3%	\$ 461	15.86	58,378	15.64	57,562	1.13	0.22	816
40	93.0%	\$ 3,980	\$ 3,980	94.1%	\$ 5,051	\$ 5,051	1.1%	\$ 1,071	20.86	76,750	20.61	75,853	1.27	0.24	897
50	93.0%	\$ 5,051	\$ 5,051	94.1%	\$ 6,104	\$ 6,104	1.1%	\$ 1,053	26.07	96,937	25.77	94,816	1.21	0.30	1,121
60	93.6%	\$ 6,249	\$ 6,249	94.5%	\$ 7,261	\$ 7,261	0.9%	\$ 1,012	31.08	114,387	30.79	113,297	1.16	0.30	1,089
75	93.6%	\$ 7,049	\$ 7,049	94.5%	\$ 8,456	\$ 8,456	0.9%	\$ 1,407	38.85	142,983	38.48	141,622	1.20	0.37	1,362
100	94.1%	\$ 8,811	\$ 8,811	95.0%	\$ 11,128	\$ 11,128	0.9%	\$ 2,317	51.53	189,631	51.04	187,835	1.26	0.49	1,797
125	94.1%	\$ 11,309	\$ 11,309	95.0%	\$ 12,572	\$ 12,572	0.9%	\$ 1,263	64.41	237,039	63.80	234,794	1.11	0.61	2,246
150	95.0%	\$ 13,359	\$ 13,359	95.8%	\$ 14,175	\$ 14,175	0.8%	\$ 816	76.56	281,752	75.92	279,400	1.06	0.64	2,353
200	95.0%	\$ 15,908	\$ 15,908	95.8%	\$ 18,567	\$ 18,567	0.8%	\$ 2,659	102.08	375,670	101.23	372,533	1.17	0.85	3,137
250	95.0%	\$ 19,924	\$ 19,924	95.8%	\$ 26,119	\$ 26,119	0.8%	\$ 6,195	127.61	469,587	126.54	465,666	1.31	1.07	3,921
300	95.0%	\$ 25,432	\$ 25,432	95.8%	\$ 33,332	\$ 33,332	0.8%	\$ 7,900	153.13	563,505	151.85	558,799	1.31	1.28	4,706
*** 250 & 300 HP prices are based on Baldor.															
1. Assume that all new applications will be EPAct efficiency unless incentivize to encourage NEMA Premium Efficiency.															
2. Delta Eff is the difference between NEMA Prem & EPAct.															
3. Delta Cost is the difference between NEMA Prem & EPAct.															
4. EPAct Eff Rating not avail for 250 & 300 HP Motors- Use Energy Efficient form NEMA Table 12-11															
List Price Discount <=200 HP 35% (Baldor)															
List Price Discount >200 HP 35% (Baldor)															

FES- 1 Premium Efficiency Motors
Totally Enclosed Fan Cooled 1800 RPM

This calculation estimates the energy savings associated with replacing a standard efficiency EPACT motor with a NEMA premium efficiency motor.
Assumptions:
- Run Time: 3680 Hrs
- Average Loading 65%

Motor Cost & Efficiency Data														
Motor HP	EPACT High Eff			NEMA Premium Eff				Energy Consumption						Delta kW
	Eff %	List Price *** \$	Cost \$	Eff %	List Price \$	Cost \$	Delta Eff	Delta Cost	EPACT High Eff kW	kWh	NEMA Premium Eff kW	kWh	Cost Index	
1	82.5%	\$ 417	\$ 271	85.5%	\$ 547	\$ 356	3.0%	\$ 85	0.59	2.163	0.57	2.087	1.31	0.02
1.5	84.0%	\$ 425	\$ 276	86.5%	\$ 566	\$ 368	2.5%	\$ 92	0.87	3.186	0.84	3.094	1.33	0.03
2	84.0%	\$ 461	\$ 300	86.5%	\$ 594	\$ 386	2.5%	\$ 86	1.15	4.249	1.12	4.126	1.29	0.03
3	87.5%	\$ 607	\$ 395	89.5%	\$ 674	\$ 438	2.0%	\$ 44	1.66	6.118	1.63	5.981	1.11	0.04
5	87.5%	\$ 617	\$ 401	89.5%	\$ 675	\$ 439	2.0%	\$ 38	2.77	10.197	2.71	9.969	1.09	0.06
7.5	89.5%	\$ 823	\$ 535	91.7%	\$ 900	\$ 585	2.2%	\$ 50	4.06	14.953	3.97	14.595	1.09	0.10
10	89.5%	\$ 886	\$ 576	91.7%	\$ 1,011	\$ 657	2.2%	\$ 81	5.42	19.938	5.29	19.459	1.14	0.13
15	91.0%	\$ 1,190	\$ 774	92.4%	\$ 1,390	\$ 904	1.4%	\$ 130	7.99	29.414	7.87	28.968	1.17	0.12
20	91.0%	\$ 1,438	\$ 935	93.0%	\$ 1,685	\$ 1,095	2.0%	\$ 161	10.66	39.218	10.43	38.375	1.17	0.23
25	92.4%	\$ 1,779	\$ 1,156	93.6%	\$ 2,205	\$ 1,433	1.2%	\$ 277	13.12	48.280	12.95	47.661	1.24	0.17
30	92.4%	\$ 2,101	\$ 1,366	93.6%	\$ 2,617	\$ 1,701	1.2%	\$ 335	15.74	57.936	15.54	57.193	1.25	0.20
40	93.0%	\$ 2,788	\$ 1,812	94.1%	\$ 3,422	\$ 2,224	1.1%	\$ 412	20.86	76.750	20.61	75.853	1.23	0.24
50	93.0%	\$ 2,886	\$ 1,876	94.5%	\$ 3,740	\$ 2,431	1.5%	\$ 555	26.07	95.937	25.66	94.414	1.30	0.41
60	93.6%	\$ 4,422	\$ 2,874	95.0%	\$ 5,383	\$ 3,499	1.4%	\$ 625	31.08	114.387	30.63	112.701	1.22	0.46
75	94.1%	\$ 4,927	\$ 3,203	95.4%	\$ 6,295	\$ 4,092	1.3%	\$ 889	38.65	142.224	38.12	140.286	1.28	0.53
100	94.5%	\$ 6,770	\$ 4,401	95.4%	\$ 8,619	\$ 5,602	0.9%	\$ 1,202	51.31	188.829	50.83	187.047	1.27	0.48
125	95.0%	\$ 9,134	\$ 5,937	95.4%	\$ 10,188	\$ 6,622	0.9%	\$ 685	64.14	236.036	63.54	233.809	1.12	0.61
150	95.0%	\$ 10,700	\$ 6,955	95.8%	\$ 11,936	\$ 7,758	0.8%	\$ 803	76.56	281.752	75.92	279.400	1.12	0.64
200	95.0%	\$ 13,152	\$ 8,549	96.2%	\$ 14,359	\$ 9,333	1.2%	\$ 785	102.08	375.670	100.81	370.984	1.09	1.27
250	95.0%	\$ 15,759	\$ 10,243	96.2%	\$ 18,113	\$ 11,773	1.2%	\$ 1,530	127.61	469.587	126.01	463.730	1.15	1.59
300	95.4%	\$ 23,458	\$ 15,248	96.2%	\$ 24,966	\$ 16,228	0.8%	\$ 980	152.48	561.142	151.22	556.476	1.06	1.27
*** 250 & 300 HP prices are based on Baldor.														
1. Assume that all new applications will be EPACT efficiency unless incentivize to encourage NEMA Premium Efficiency.														
2. Delta Eff is the difference between NEMA Prem & EPACT.														
3. Delta Cost is the difference between NEMA Prem & EPACT.														
4. EPACT Eff Rating not avail for 250 & 300 HP Motors- Use Energy Efficient form NEMA Table 12-11														
List Price Discount <=200 HP 35% (Baldor)														
List Price Discount >200 HP 35% (Baldor)														

FES- 1 Premium Efficiency Motors
Totally Enclosed Fan Cooled 3600 RPM

This calculation estimates the energy savings associated with replacing a standard efficiency EPACT motor with a NEMA premium efficiency motor.
Assumptions:
- Run Time: 3680 Hrs
- Average Loading 65%

Motor Cost & Efficiency Data										Energy Consumption									
Motor HP	EPACT High Eff			NEMA Premium Eff			Delta Eff	Delta Cost	Delta kW	Delta kWh	EPACT High Eff			NEMA Premium Eff			Cost Index	Delta kW	Delta kWh
	Eff %	List Price *** \$	Cost \$	Eff %	List Price \$	Cost \$					kW	kWh	kW	kWh					
1	75.5%	\$ 292	\$ 190	77.0%	\$ 382	\$ 248	1.5%	\$ 59	0.64	2,363	0.63	2,317	1.31	0.01	46				
1.5	82.5%	\$ 448	\$ 291	84.0%	\$ 499	\$ 324	1.5%	\$ 33	0.88	3,244	0.87	3,186	1.11	0.02	58				
2	84.0%	\$ 505	\$ 328	85.5%	\$ 519	\$ 337	1.5%	\$ 9	1.15	4,249	1.13	4,174	1.03	0.02	75				
3	85.5%	\$ 604	\$ 393	86.5%	\$ 656	\$ 426	1.0%	\$ 34	1.70	6,261	1.68	6,189	1.09	0.02	72				
5	87.5%	\$ 747	\$ 486	88.5%	\$ 807	\$ 525	1.0%	\$ 39	2.77	10,197	2.74	10,082	1.08	0.03	115				
7.5	88.5%	\$ 861	\$ 553	89.5%	\$ 935	\$ 608	1.0%	\$ 55	4.11	15,122	4.06	14,953	1.10	0.05	169				
10	89.5%	\$ 1,022	\$ 664	90.2%	\$ 1,097	\$ 713	0.7%	\$ 49	5.42	19,938	5.38	19,783	1.07	0.04	155				
15	90.2%	\$ 1,335	\$ 868	91.0%	\$ 1,511	\$ 982	0.8%	\$ 114	8.06	29,675	7.99	29,414	1.13	0.07	261				
20	90.2%	\$ 1,466	\$ 953	91.0%	\$ 1,659	\$ 1,078	0.8%	\$ 125	10.75	39,566	10.66	39,218	1.13	0.09	348				
25	91.0%	\$ 1,865	\$ 1,212	91.7%	\$ 2,164	\$ 1,407	0.7%	\$ 194	13.32	49,023	13.22	48,649	1.16	0.10	374				
30	91.0%	\$ 2,024	\$ 1,316	91.7%	\$ 2,339	\$ 1,520	0.7%	\$ 205	15.99	58,827	15.86	58,378	1.16	0.12	449				
40	91.7%	\$ 2,894	\$ 1,881	92.4%	\$ 3,333	\$ 2,166	0.7%	\$ 285	21.15	77,838	20.99	77,248	1.15	0.16	590				
50	92.4%	\$ 2,941	\$ 1,912	93.0%	\$ 3,859	\$ 2,508	0.6%	\$ 597	26.24	96,560	26.07	95,937	1.31	0.17	623				
60	93.0%	\$ 4,489	\$ 2,918	93.6%	\$ 5,421	\$ 3,524	0.6%	\$ 606	31.28	115,125	31.08	114,387	1.21	0.20	738				
75	93.0%	\$ 5,462	\$ 3,544	93.6%	\$ 6,308	\$ 4,100	0.6%	\$ 556	39.10	143,906	38.85	142,983	1.16	0.25	922				
100	93.6%	\$ 6,823	\$ 4,435	94.1%	\$ 8,624	\$ 5,606	0.5%	\$ 1,171	51.81	190,644	51.53	189,631	1.26	0.28	1,013				
125	94.5%	\$ 9,286	\$ 6,036	95.0%	\$ 10,134	\$ 6,587	0.5%	\$ 551	64.14	236,036	63.80	234,794	1.09	0.34	1,242				
150	94.5%	\$ 11,027	\$ 7,168	95.0%	\$ 11,880	\$ 7,722	0.5%	\$ 554	76.97	283,243	76.56	281,752	1.08	0.41	1,491				
200	95.0%	\$ 11,968	\$ 7,779	95.4%	\$ 14,069	\$ 9,145	0.4%	\$ 1,366	102.08	375,670	101.66	374,095	1.18	0.43	1,575				
250	95.4%	\$ 17,327	\$ 11,263	96.8%	\$ 19,722	\$ 12,819	0.4%	\$ 1,557	127.07	467,618	126.54	465,666	1.14	0.53	1,952				
300	95.4%	\$ 29,112	\$ 18,923	96.8%	\$ 31,706	\$ 20,609	0.4%	\$ 1,686	152.48	561,142	151.85	558,799	1.09	0.64	2,343				
*** 250 & 300 HP prices are based on Baldor.																			
1. Assume that all new applications will be EPACT efficiency unless incentivize to encourage NEMA Premium Efficiency.																			
2. Delta Eff is the difference between NEMA Prem & EPACT.																			
3. Delta Cost is the difference between NEMA Prem & EPACT.																			
4. EPACT Eff Rating not avail for 250 & 300 HP Motors- Use Energy Efficient form NEMA Table 12-11																			
List Price Discount <=200 HP 35% (Baldor)																			
List Price Discount >200 HP 35% (Baldor)																			

FES- 1 Premium Efficiency Motors
Open, Drip Proof 1200 RPM

This calculation estimates the energy savings associated with replacing a standard efficiency EPACT motor with a NEMA premium efficiency motor.
Assumptions:
- Run Time: 3680 Hrs
- Average Loading 65%

Motor Cost & Efficiency Data															
Motor HP	EPACT High Eff			NEMA Premium Eff				Energy Consumption					Delta kW	Delta kWh	
	Eff %	List Price *** \$	Cost \$	Eff %	List Price \$	Cost \$	Delta Eff	Delta Cost	EPACT High Eff		NEMA Premium Eff				Cost Index
										kW	kWh	kW	kWh		
1	80.0%	\$ 377	\$ 245	82.5%	\$ 435	\$ 283	2.5%	\$ 38		0.61	2,231	0.59	2,163	1.15	
1.5	84.0%	\$ 442	\$ 287	86.5%	\$ 509	\$ 331	2.5%	\$ 44		0.87	3,186	0.84	3,094	1.15	
2	85.5%	\$ 434	\$ 282	87.5%	\$ 520	\$ 338	2.0%	\$ 56		1.13	4,174	1.11	4,079	1.20	
3	86.5%	\$ 509	\$ 331	88.5%	\$ 662	\$ 430	2.0%	\$ 99		1.68	6,189	1.64	6,049	1.30	
5	87.5%	\$ 607	\$ 395	89.5%	\$ 868	\$ 564	2.0%	\$ 170		2.77	10,197	2.71	9,969	1.43	
7.5	88.5%	\$ 825	\$ 536	90.2%	\$ 1,042	\$ 677	1.7%	\$ 141		4.11	15,122	4.03	14,837	1.26	
10	90.2%	\$ 1,067	\$ 694	91.7%	\$ 1,356	\$ 881	1.5%	\$ 188		5.38	19,783	5.29	19,459	1.27	
15	90.2%	\$ 1,397	\$ 908	91.7%	\$ 1,830	\$ 1,190	1.5%	\$ 281		8.06	29,675	7.93	29,189	1.31	
20	91.0%	\$ 1,714	\$ 1,114	92.4%	\$ 2,228	\$ 1,448	1.4%	\$ 334		10.66	39,218	10.50	38,624	1.30	
25	91.7%	\$ 2,408	\$ 1,565	93.0%	\$ 2,691	\$ 1,749	1.3%	\$ 184		13.22	48,649	13.03	47,969	1.12	
30	92.4%	\$ 2,538	\$ 1,650	93.6%	\$ 2,807	\$ 1,825	1.2%	\$ 175		15.74	57,936	15.54	57,193	1.11	
40	93.0%	\$ 3,725	\$ 2,421	94.1%	\$ 4,000	\$ 2,600	1.1%	\$ 179		20.86	76,750	20.61	75,853	1.07	
50	93.0%	\$ 4,484	\$ 2,915	94.1%	\$ 4,842	\$ 3,147	1.1%	\$ 233		26.07	95,937	25.77	94,816	1.08	
60	93.6%	\$ 5,230	\$ 3,400	94.5%	\$ 6,025	\$ 3,916	0.9%	\$ 517		31.08	114,387	30.79	113,297	1.15	
75	93.6%	\$ 6,176	\$ 4,014	94.5%	\$ 6,709	\$ 4,361	0.9%	\$ 346		38.85	142,983	38.48	141,622	1.09	
100	94.1%	\$ 6,677	\$ 4,340	95.0%	\$ 6,735	\$ 4,378	0.9%	\$ 38		51.53	189,631	51.04	187,835	1.01	
125	94.1%	\$ 7,144	\$ 4,644	95.0%	\$ 7,975	\$ 5,184	0.9%	\$ 540		64.41	237,039	63.80	234,794	1.12	
150	94.5%	\$ 7,722	\$ 5,019	95.4%	\$ 9,392	\$ 6,105	0.9%	\$ 1,086		76.97	283,243	76.24	280,571	1.22	
200	94.5%	\$ 9,831	\$ 6,390	95.4%	\$ 12,347	\$ 8,026	0.9%	\$ 1,635		102.62	377,658	101.66	374,095	1.26	
250	95.4%	\$ -	\$ -	95.4%	\$ -	\$ -	0.0%	\$ -		127.07	467,618	127.07	467,618	#DIV/0!	
300	95.4%	\$ -	\$ -	95.4%	\$ -	\$ -	0.0%	\$ -		152.48	561,142	152.48	561,142	#DIV/0!	
*** 250 & 300 HP prices are based on Baldor.															
1. Assume that all new applications will be EPACT efficiency unless incentivize to encourage NEMA Premium Efficiency.															
2. Delta Eff is the difference between NEMA Prem & EPACT.															
3. Delta Cost is the difference between NEMA Prem & EPACT.															
4. EPACT Eff Rating not avail for 250 & 300 HP Motors- Use Energy Efficient form NEMA Table 12-11															
List Price Discount <=200 HP 35% (Baldor)															
List Price Discount >200 HP 35% (Baldor)															

FES- 1 Premium Efficiency Motors
Open, Drip Proof 1800 RPM

This calculation estimates the energy savings associated with replacing a standard efficiency EPAct1 motor with a NEMA premium efficiency motor.
Assumptions:
- Run Time: 3680 Hrs
- Average Loading 65%

Motor Cost & Efficiency Data															
Motor HP	EPAct High Eff			NEMA Premium Eff				EPAct High Eff			NEMA Premium Eff			Delta kW	Delta kWh
	Eff %	List Price *** \$	Cost \$	Eff %	List Price \$	Cost \$	Delta Eff	Delta Cost	kW	kWh	kW	kWh	Cost Index		
1	82.5%	\$ 268	\$ 174	85.5%	\$ 370	\$ 241	3.0%	\$ 66	0.59	2,163	0.57	2,087	1.38	0.02	76
1.5	84.0%	\$ 285	\$ 185	86.5%	\$ 388	\$ 252	2.5%	\$ 67	0.87	3,186	0.84	3,094	1.36	0.03	92
2	84.0%	\$ 307	\$ 200	86.5%	\$ 415	\$ 270	2.5%	\$ 70	1.15	4,249	1.12	4,126	1.35	0.03	123
3	86.5%	\$ 335	\$ 218	89.5%	\$ 448	\$ 291	3.0%	\$ 73	1.68	6,189	1.63	5,981	1.34	0.06	207
5	87.5%	\$ 370	\$ 241	89.5%	\$ 491	\$ 319	2.0%	\$ 79	2.77	10,197	2.71	9,969	1.33	0.06	228
7.5	88.5%	\$ 526	\$ 342	91.0%	\$ 722	\$ 469	2.5%	\$ 127	4.11	15,122	4.00	14,707	1.37	0.11	415
10	89.5%	\$ 644	\$ 419	91.7%	\$ 875	\$ 569	2.2%	\$ 150	5.42	19,938	5.29	19,459	1.36	0.13	478
15	91.0%	\$ 881	\$ 573	93.0%	\$ 1,240	\$ 806	2.0%	\$ 233	7.99	29,414	7.82	28,781	1.41	0.17	633
20	91.0%	\$ 1,250	\$ 813	93.0%	\$ 1,558	\$ 1,013	2.0%	\$ 200	10.66	39,218	10.43	38,375	1.25	0.23	843
25	91.7%	\$ 1,515	\$ 985	93.6%	\$ 1,899	\$ 1,234	1.9%	\$ 250	13.22	48,649	12.95	47,661	1.25	0.27	988
30	92.4%	\$ 1,771	\$ 1,151	94.1%	\$ 2,077	\$ 1,350	1.7%	\$ 199	15.74	57,936	15.46	56,889	1.17	0.28	1,047
40	93.0%	\$ 2,259	\$ 1,468	94.1%	\$ 2,710	\$ 1,762	1.1%	\$ 293	20.86	76,750	20.61	75,853	1.20	0.24	897
50	93.0%	\$ 2,652	\$ 1,724	94.5%	\$ 2,991	\$ 1,944	1.5%	\$ 220	26.07	95,937	25.66	94,414	1.13	0.41	1,523
60	93.6%	\$ 3,272	\$ 2,127	95.0%	\$ 3,765	\$ 2,447	1.4%	\$ 320	31.08	114,387	30.63	112,701	1.15	0.46	1,686
75	94.1%	\$ 4,016	\$ 2,610	95.0%	\$ 4,622	\$ 3,004	0.9%	\$ 394	38.65	142,224	38.28	140,876	1.15	0.37	1,347
100	94.1%	\$ 4,384	\$ 2,850	95.4%	\$ 5,271	\$ 3,426	1.3%	\$ 577	51.53	189,631	50.83	187,047	1.20	0.70	2,584
125	94.5%	\$ 5,040	\$ 3,276	95.4%	\$ 6,466	\$ 4,203	0.9%	\$ 927	64.14	236,036	63.54	233,809	1.28	0.61	2,227
150	95.0%	\$ 6,524	\$ 4,241	95.8%	\$ 7,182	\$ 4,668	0.8%	\$ 428	76.56	281,752	75.92	279,400	1.10	0.64	2,353
200	95.0%	\$ 7,612	\$ 4,948	95.8%	\$ 8,976	\$ 5,834	0.8%	\$ 887	102.08	375,670	101.23	372,533	1.18	0.85	3,137
250	95.4%	\$ 10,179	\$ 7,634	95.8%	\$ 11,943	\$ 8,957	0.4%	\$ 1,323	127.07	467,618	126.54	465,666	1.17	0.53	1,952
300	95.4%	\$ 10,536	\$ 7,902	95.8%	\$ 12,362	\$ 9,272	0.4%	\$ 1,370	152.48	561,142	151.85	558,799	1.17	0.64	2,343
*** 250 & 300 HP prices are based on Baldor.															
1. Assume that all new applications will be EPAct efficiency unless incentivize to encourage NEMA Premium Efficiency.															
2. Delta Eff is the difference between NEMA Prem & EPAct.															
3. Delta Cost is the difference between NEMA Prem & EPAct.															
4. EPAct Eff Rating not avail for 250 & 300 HP Motors- Use Energy Efficient form NEMA Table 12-11															
List Price Discount <=200 HP 35% (Baldor)															
List Price Discount >200 HP 35% (Baldor)															

FES- 1 Premium Efficiency Motors
Open, Drip Proof 3600 RPM

This calculation estimates the energy savings associated with replacing a standard efficiency EPACT motor with a NEMA premium efficiency motor.
Assumptions:
- Run Time: 3680 Hrs
- Average Loading 65%

Motor Cost & Efficiency Data																	
Motor HP	EPAct High Eff			NEMA Premium Eff				EPAct High Eff				NEMA Premium Eff				Delta kW	Delta kWh
	Eff %	List Price *** \$	Cost \$	Eff %	List Price \$	Cost \$	Delta Eff	Delta Cost	kW	kWh	kW	kWh	Cost Index				
1	NA	\$ 262	\$ 170	77.0%	\$ 297	\$ 193	NA	\$ 23	NA	NA	0.63	2,317	1.13	NA	NA		
1.5	82.5%	\$ 315	\$ 205	84.0%	\$ 365	\$ 237	1.5%	\$ 33	0.88	3,244	0.87	3,186	1.16	0.02	58		
2	84.0%	\$ 349	\$ 227	85.5%	\$ 428	\$ 278	1.5%	\$ 51	1.15	4,249	1.13	4,174	1.23	0.02	75		
3	84.0%	\$ 371	\$ 241	85.5%	\$ 435	\$ 283	1.5%	\$ 42	1.73	6,373	1.70	6,261	1.17	0.03	112		
5	85.5%	\$ 383	\$ 249	86.5%	\$ 475	\$ 309	1.0%	\$ 60	2.84	10,435	2.80	10,315	1.24	0.03	121		
7.5	87.5%	\$ 527	\$ 343	88.5%	\$ 755	\$ 491	1.0%	\$ 148	4.16	15,295	4.11	15,122	1.43	0.05	173		
10	88.5%	\$ 662	\$ 430	89.5%	\$ 862	\$ 560	1.0%	\$ 130	5.48	20,163	5.42	19,938	1.30	0.06	225		
15	89.5%	\$ 968	\$ 629	90.2%	\$ 1,226	\$ 797	0.7%	\$ 168	8.13	29,907	8.06	29,675	1.27	0.06	232		
20	90.2%	\$ 1,239	\$ 805	91.0%	\$ 1,440	\$ 936	0.8%	\$ 131	10.75	39,566	10.66	39,218	1.16	0.09	348		
25	91.0%	\$ 1,499	\$ 974	91.7%	\$ 1,730	\$ 1,125	0.7%	\$ 150	13.32	49,023	13.22	48,649	1.15	0.10	374		
30	91.0%	\$ 1,587	\$ 1,032	91.7%	\$ 2,041	\$ 1,327	0.7%	\$ 295	15.99	58,827	15.86	58,378	1.29	0.12	449		
40	91.7%	\$ 2,235	\$ 1,453	92.4%	\$ 2,631	\$ 1,710	0.7%	\$ 257	21.15	77,838	20.99	77,240	1.18	0.16	598		
50	92.4%	\$ 2,316	\$ 1,505	93.0%	\$ 2,866	\$ 1,863	0.6%	\$ 358	26.24	96,560	26.07	95,937	1.24	0.17	623		
60	93.0%	\$ 3,236	\$ 2,103	93.6%	\$ 3,626	\$ 2,357	0.6%	\$ 254	31.28	115,125	31.08	114,387	1.12	0.20	738		
75	93.0%	\$ 3,861	\$ 2,510	93.6%	\$ 4,758	\$ 3,093	0.6%	\$ 583	39.10	143,906	38.85	142,983	1.23	0.25	922		
100	93.0%	\$ 4,366	\$ 2,838	93.6%	\$ 5,086	\$ 3,306	0.6%	\$ 468	52.14	191,874	51.81	190,644	1.16	0.33	1,230		
125	93.6%	\$ 4,982	\$ 3,238	94.1%	\$ 6,256	\$ 4,066	0.5%	\$ 828	64.76	238,306	64.41	237,039	1.26	0.34	1,266		
150	93.6%	\$ 6,725	\$ 4,371	94.1%	\$ 7,717	\$ 5,016	0.5%	\$ 645	77.71	285,967	77.30	284,447	1.15	0.41	1,519		
200	94.5%	\$ 7,419	\$ 4,822	95.0%	\$ 8,745	\$ 5,684	0.5%	\$ 862	102.62	377,668	102.08	376,670	1.18	0.54	1,988		
250	94.5%	\$ 10,205	\$ 7,654	95.0%	\$ 11,973	\$ 8,980	0.5%	\$ 1,326	128.28	472,072	127.61	469,587	1.17	0.68	2,485		
300	95.0%	\$ 11,905	\$ 8,929	95.4%	\$ 13,968	\$ 10,476	0.4%	\$ 1,547	153.13	563,505	152.48	561,142	1.17	0.64	2,363		
*** 250 & 300 HP prices are based on Baldor.																	
1. Assume that all new applications will be EPAct efficiency unless incentivize to encourage NEMA Premium Efficiency.																	
2. Delta Eff is the difference between NEMA Prem & EPAct.																	
3. Delta Cost is the difference between NEMA Prem & EPAct.																	
4. EPAct Eff Rating not avail for 250 & 300 HP Motors- Use Energy Efficient form NEMA Table 12-11																	
List Price Discount <=200 HP 35% (Baldor)																	
List Price Discount >200 HP 35% (Baldor)																	

Definition: TEFC

A TEFC enclosure on a motor means "Totally Enclosed, Fan Cooled".

This motor is probably the most commonly used motor in ordinary industrial environments. It costs only a few dollars more than the open motor, yet offers good protection against common hazards.

The motor is constructed with a small fan on the rear shaft of the motor, usually covered by a housing.

This fan draws air over the motor fins, removing excess heat and cooling the motor.

The enclosure is "Totally Enclosed". This ordinarily means that the motor is dust tight, and has a moderate water seal as well. Notice that TEFC motors are not secure against high pressure water. For these applications, consider the "wash down" motor, which is usually designed to withstand regular washing, such as found in a food processing facility.

In addition, the TEFC motor is not "Explosion-proof", nor is it capable of operation in "Hazardous Environments".

Definition: ODP

An ODP enclosure on a motor means "Open, Drip Proof".

ODP motors are relatively inexpensive motors used in normal applications.

The construction of an ODP motor consists of a sheet metal enclosure with vent stamped to allow good air flow. The vents are designed in such a way that water dripping on the motor will not normally flow into the motor. A fan is mounted on the motor's rear shaft to pull air through the motor to keep the motor cool.

The ODP motor is relatively inexpensive, but care should be taken not to use the motor in applications where the TEFC motor is required.

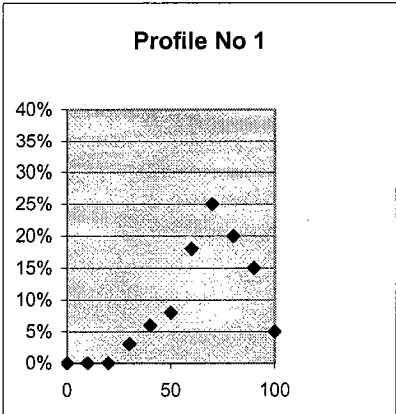
FES-M2 VFD's for Pumps

The savings of installing a variable frequency drive on pumps with variable flow applications. Three typical load profiles were used to estimate savings. The base system analyzed is a throttling valve controlled system that reduces flow rates by increasing the head. VFD performance data was taken from simple models and used to create equivalent flows for the purpose of spreadsheet analysis.

- Assumptions:
- 80 feet design head
 - 500 GPM design flow
 - 59% Pump Efficiency at Full Load
 - Design Load is 86% Pump Capacity

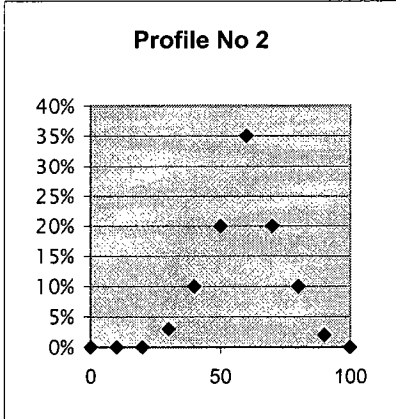
EXISTING

	Profile 1	Profile 2	Profile 3
Design Head	80	80	80
Design GPM	500	500	500
Min Head	16	16	16
Conversion	3960	3960	3960
Nominal Pump Eff	0.59	0.59	0.59
Nominal BHP	17.120	17.120	17.120
Motor HP	20.00	20.00	20.00
Average Flow	70%	60%	80%
Hours	3680	3680	3680
kWh/year	44727	41970	47405
Avg kW	12.154	11.405	12.882



PROPOSED

kWh/year	25581	18217	31935
Avg kW	6.951	4.950	8.678

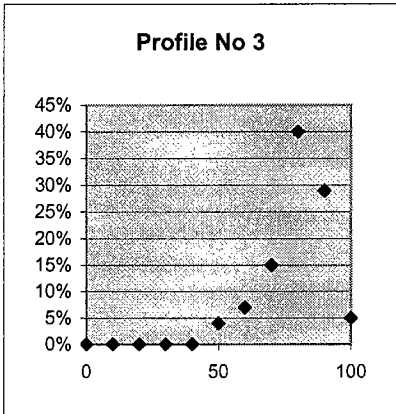


SAVINGS

kWh/year	19146	23753	15469
Avg kW	5.203	6.455	4.204
Avg kW/HP	0.260	0.323	0.210
Avg kWh/HP	957	1188	773

Project cost Estimate	\$8,061	\$8,061	\$8,061
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HP	kWh	kW
1.5	1,436	0.4
2	1,915	0.5
3	2,872	0.8
5	4,786	1.3
7.5	7,180	2.0
10	9,573	2.6
15	14,359	3.9
20	19,146	5.2
25	23,932	6.5
30	28,719	7.8
40	38,292	10.4
50	47,865	13.0



FES-M2 VFD's for Pumps
Savings Estimate

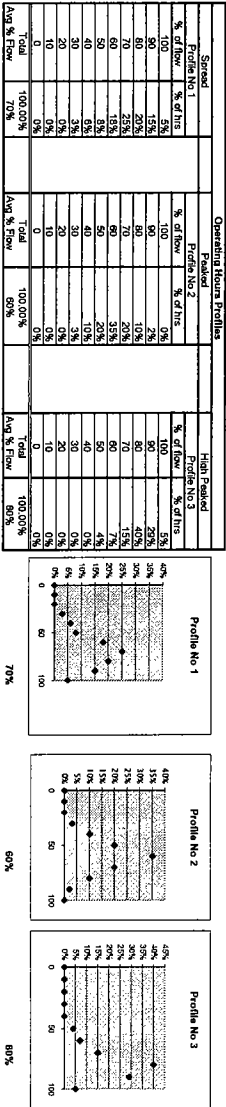
Assumptions:
Mfr: 3600
Motor HP: 2500
Avg % Flow: 70%

Calculations:

Design Data & Flow Profile				Constant Speed Pump (Rides the pump curve)				Variable Speed Pump (Curve Fit: 1.135600)			
Design Head		80		Generic curve fit				Calculation	-1.212121	-0.464268	
Design GPM		500		0.464268	Motor Eff.			of Sine	2.487976	1.023957	
Min. Static Head		16		0.40271	Is almost			Pressure	0.013333	0.220000	
Estimated BHP		17.1		1.359631	Constant			on the			
Estimated Motor HP								Modulation			
% Motor Load at Design				65%							
				Correction Factors							
						Motor Eff.					
3 Hours				65.2%	75.0%	BHP	60%	Head	0	Eq. Flow	
	Heavy	GPM	% flow			Pump Eff.	Cut. kW			Pump Eff.	
15%	582	450	90%	84	58%	16.4	14.2	2.662	60%	58%	1.1
20%	450	360	72%	84	58%	16.4	14.2	2.662	60%	58%	1.1
25%	360	270	54%	87	56%	15.6	12.9	6.515	57.0	56%	9.7
30%	270	180	36%	90	54%	14.8	12.3	11.272	47.4	56%	7.1
35%	180	135	27%	92	54%	13.9	11.5	17.690	39.0	56%	5.1
40%	135	90	18%	92	54%	13.9	11.5	27.690	30.0	56%	4.6
45%	90	67.5	13.5%	92	54%	13.9	11.5	37.690	23.0	56%	3.5
50%	67.5	50	10%	97	47%	11.7	8.7	47.690	20.2	46%	2.6
55%	50	37.5	7.5%	99	37%	10.3	8.5	57.690	17.7	46%	1.7
60%	37.5	27	5.4%	101	30%	8.3	6.9	67.690	15.1	40%	1.1
65%	27	18	3.6%	102	24%	5.4	4.5	77.690	12.6	32%	0.7
70%	18	13.5	2.7%					87.690	10.1	23%	0.2
75%	13.5	9	1.8%					97.690	7.6	14%	0.1
80%	9	6.75	1.35%					107.690	5.1	5%	0
Avg Flow								44.727	16.6		23.581

Design Data & Flow Profile				Constant Speed Pump (Rides the pump curve)				Variable Speed Pump (Curve Fit: 1.135600)			
Design Head		80		Generic curve fit				Calculation	-1.212121	-0.464268	
Design GPM		500		0.464268	Motor Eff.			of Sine	2.487976	1.023957	
Min. Static Head		16		0.40271	Is almost			Pressure	0.013333	0.220000	
Estimated BHP		17.1		1.359631	Constant			on the			
Estimated Motor HP		20						Modulation			
% Motor Load at Design				65%							
				Correction Factors							
						Motor Eff.					
3 Hours				65.2%	75.0%	BHP	60%	Head	0	Eq. Flow	
	Heavy	GPM	% flow			Pump Eff.	Cut. kW			Pump Eff.	
0%	-	500	100%	84	58%	17.1	14.2	9.980	60.0	59%	13.0
2%	74	450	90%	84	58%	16.4	13.6	14.972	59.0	59%	11.1
4%	148	400	80%	84	58%	15.6	12.9	20.964	58.0	59%	9.2
6%	222	350	70%	87	56%	14.8	12.3	26.956	57.0	58%	7.3
8%	296	300	60%	92	50%	13.9	11.5	32.948	56.0	56%	5.4
10%	370	250	50%	95	47%	12.9	10.7	38.940	54.0	54%	3.5
12%	444	200	40%	97	44%	11.7	9.7	44.932	52.0	52%	2.6
14%	518	150	30%	97	44%	11.7	9.7	50.924	50.0	50%	1.7
16%	592	100	20%	101	31%	8.3	6.9	56.916	48.0	48%	1.1
18%	666	75	15%	102	24%	5.4	4.5	62.908	46.0	46%	0.7
20%	740	50	10%					68.900	44.0	35%	0.2
Avg Flow								41.970	16.6		18.217

Design Data & Flow Profile				Constant Speed Pump (Rides the pump curve)				Variable Speed Pump (Curve Fit: 1.135600)			
Design Head		80		Generic curve fit				Calculation	-1.212121	-0.464268	
Design GPM		500		0.464268	Motor Eff.			of Sine	2.487976	1.023957	
Min. Static Head		16		0.40271	Is almost			Pressure	0.013333	0.220000	
Estimated BHP		17.1		1.359631	Constant			on the			
Estimated Motor HP		20						Modulation			
% Motor Load at Design				65%							
				Correction Factors							
						Motor Eff.					
3 Hours				65.2%	75.0%	BHP	60%	Head	0	Eq. Flow	
	Heavy	GPM	% flow			Pump Eff.	Cut. kW			Pump Eff.	
5%	104	500	100%	80	58%	17.1	14.2	2.605	80.0	59%	17.1
20%	1,047	480	96%	84	58%	16.4	13.6	14.470	67.8	100%	13.0
40%	1,472	400	80%	87	58%	15.6	12.9	19.020	57.0	98%	9.7
60%	1,897	300	60%	92	54%	13.9	11.5	23.570	50.0	96%	6.8
75%	258	250	50%	95	47%	12.9	10.7	28.120	48.0	94%	5.1
4%	147	250	50%	95	47%	12.9	10.7	1.672	32.0	80%	3.6
0%	-	200	40%	97	44%	11.7	9.7	9.7	26.2	54%	2.5
0%	-	150	30%	97	44%	11.7	9.7	21.8	56%	48%	1.7
0%	-	100	20%	101	31%	8.3	6.9	33.4	46%	46%	1.1
0%	-	50	10%	102	24%	5.4	4.5	45.0	44%	35%	0.7
0%	-	50	10%					16.6	25%	23%	0.2
Avg Flow								47.405	16.6		31.935



FES-M2 VFD's for Pumps
Cost Analysis

VFD Installation Cost Estimate						
Drive HP	VFD Installed Installed	Feeder unit \$	30 Feeder Total \$	P/I Transducer	Press Sensor	Control Cable
Totals						
1	\$ 3,170	\$ 6.35	\$ 191	\$ 200	\$ 200	\$ 100
2	\$ 3,280	\$ 6.35	\$ 191	\$ 200	\$ 200	\$ 100
3	\$ 3,400	\$ 6.51	\$ 195	\$ 200	\$ 200	\$ 100
5	\$ 3,650	\$ 6.77	\$ 203	\$ 200	\$ 200	\$ 100
7.5	\$ 4,800	\$ 6.77	\$ 203	\$ 200	\$ 200	\$ 100
10	\$ 5,025	\$ 6.77	\$ 203	\$ 200	\$ 200	\$ 100
15	\$ 6,450	\$ 7.04	\$ 211	\$ 200	\$ 200	\$ 100
20	\$ 7,350	\$ 7.04	\$ 211	\$ 200	\$ 200	\$ 100
25	\$ 8,700	\$ 7.04	\$ 211	\$ 200	\$ 200	\$ 100
30	\$ 10,100	\$ 7.59	\$ 228	\$ 200	\$ 200	\$ 100
40	\$ 10,600	\$ 8.99	\$ 270	\$ 200	\$ 200	\$ 100
50	\$ 13,400	\$ 11.85	\$ 356	\$ 200	\$ 200	\$ 100

FES- M3 High Efficiency Pumps
Summary Sheet

This calculation estimates the energy savings associated with replacing standard pumps with properly selected high efficiency pumps. For twenty-five flow and variations, 17 comparisons were analyzed for performance. Pumps capable of meeting the design criteria were utilized. Some of the categories did not have sufficient options to make a comparison and were not used. High efficiency pumps were considered to be the pumps that could meet the load and have a 75% pump efficiency.

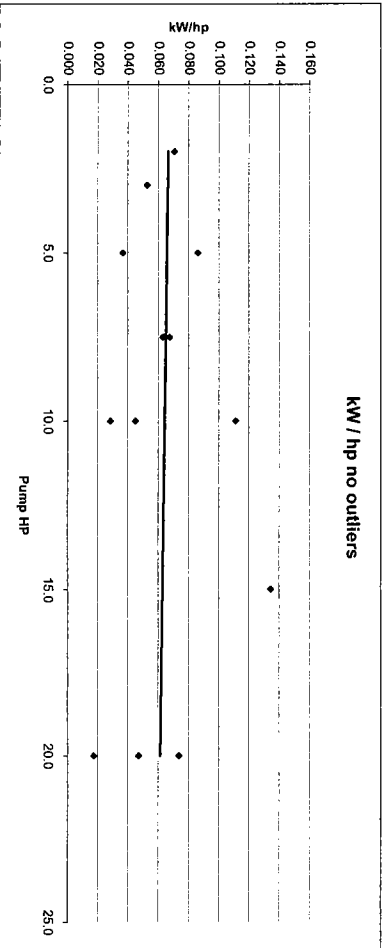
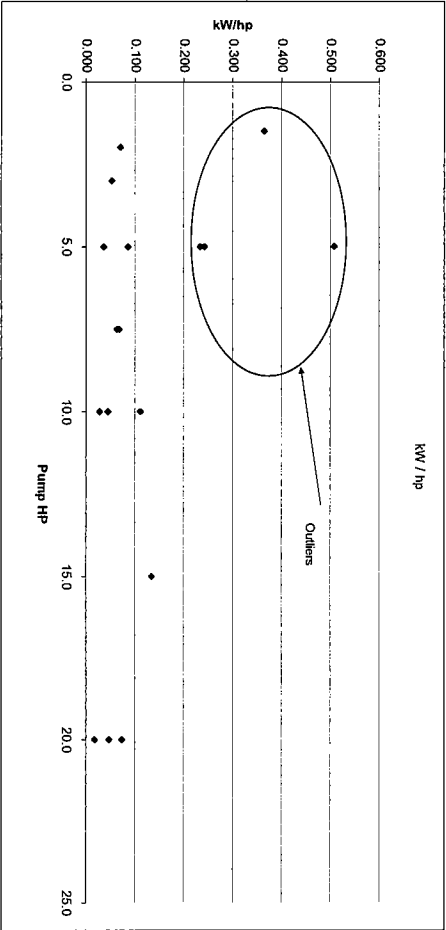
- Assumptions:
-Standard pump HP
-Motor efficiency 85%

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Calculations

Pump No	Pump HP	ET/ Increase	KW	kWh/ Savings	Cost Under	Increased Cost \$	kW / hp
1	1.5	5.66	0.547097	1.961	1.47	\$ 319	0.365
3	2.0	7.48	0.140911	513	1.51	\$ 467	0.070
6	3.0	7.18	0.197489	573	1.29	\$ 461	0.052
8	4.0	13.48	1.1543	4649	1.09	\$ 394	0.049
4	5.0	21.3	2.5364	9,232	1.28	\$ 504	0.567
5	5.0	12.6	1.21078	4,405	1.72	\$ 754	0.242
11	5.0	13.75	0.431022	1,569	1.16	\$ 341	0.086
14	5.0	24.54	1.189733	4,254	1.34	\$ 610	0.234
8	7.5	7.48	0.505822	1,840	1.38	\$ 657	0.067
9	7.5	6.09	0.47467	1,720	1.28	\$ 486	0.063
7	10.0	13.58	1.54542	5,359	1.08	\$ 332	0.065
10	10.0	4.6	0.4476	1,629	1.14	\$ 332	0.045
12	10.0	12.29	1.10711	4,043	1.06	\$ 150	0.111
15	15.0	16.09	2.0142	7,332	1.21	\$ 565	0.134
13	20.0	2.45	0.348133	1,267	1.32	\$ 1,029	0.017
16	20.0	9.24	1.467133	5,340	1.17	\$ 498	0.073
17	20.0	4	0.938544	3,409	1.29	\$ 850	0.047

average kW/hp	0.064
average kWh/hp	235,500



FES-M3 High Efficiency Pumps

Summary Sheet

Summary Sheet

This calculation estimates the energy savings associated with replacing standard pumps with properly selected high efficiency pumps. For twenty-five flow and voltages, 17 comparisons were analyzed for performance. Pumps capable of meeting the design criteria were utilized. Some of the categories did not have sufficient options to make a comparison and were not used. High efficiency pumps were considered to be the pumps that could meet the load and have a 75% pump efficiency.

efficiency.

Assumptions:

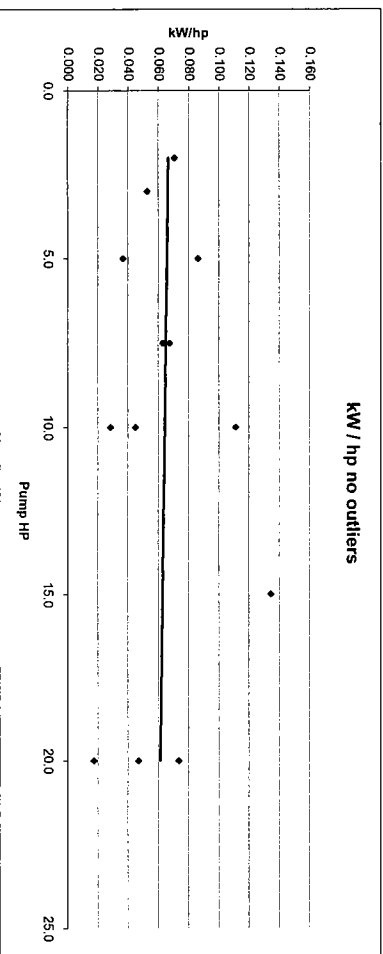
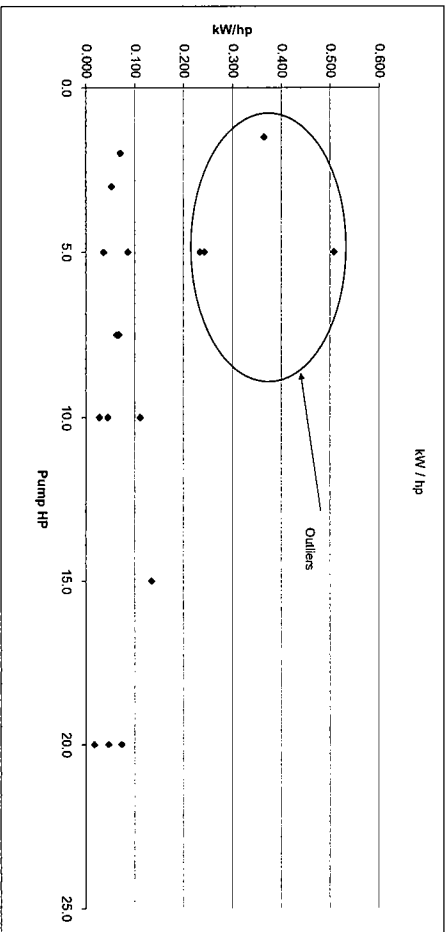
- Run Time: 3680 Hrs
- Motor efficiency 90%

2020-2021 Academic Year

Calculations

Pump No	Pump HP	Eff	KW	SWH	Cost Index	Cost \$	KW/ HP
1	1.5	5.68	0.540767	1.91	1.47	317	0.956
3	2.0	7.48	0.1400711	513	1.31	467	0.070
4	3.0	7.01	0.1517469	573	1.28	451	0.052
2	5.0	2.88	0.183258	864	1.07	75	0.038
4	5.0	2.13	0.23554	932	1.29	304	0.537
3	5.0	2.0	0.121075	4465	1.26	346	0.068
4	5.0	2.35	0.16176	4465	1.16	324	0.068
14	5.0	3.54	0.188233	1460	1.34	810	0.234
7	7.5	7.48	0.595652	1460	1.38	657	0.087
8	7.5	6.05	0.472487	1420	1.28	488	0.085
7	10.0	2.86	0.281827	1120	1.06	135	0.028
10	10.0	4.8	0.4476	1.629	1.14	332	0.045
12	10.0	12.25	0.1170711	4.043	1.06	150	0.111
15	15.0	16.08	2.0142	7.332	1.21	585	0.134
13	20.0	24.05	0.348133	1.567	1.32	1028	0.017
76	20.0	8.24	0.467133	3.400	1.17	450	0.073
17	20.0	4	0.036444	3.406	1.28	850	0.047

average kW/hp	0.064
average kWh/hp	235.500



High Efficiency Pumping Savings Estimate
Pump Curve Data

Assumptions

Motor Eff 0.9
Hrs/Yr 3680

Flow gpm	Pump Parameter Model No	Pump Head 20				Pump Head 40				Pump Head 60				Pump Head 80				Pump Head 100		
		Pump1	Pump2	Pump3		Pump1	Pump2	Pump3		Pump1	Pump2	Pump3		Pump1	Pump2	Pump3		Pump1	Pump2	Pump3
100	Not Used																			
	BHP	1531-21/2AB	1531-3BC	1531-21/2BB		1535-35B	1531-11/2AC			1531-11/2AA	1531-21/2AB	1531-21/2BB		1531-11/2AA	1531-21/2AB	1531-21/2BB		1535-35B	1531-11/2AC	
	Eff	62.02	68.0	65.54		63.55	69.21			59.07	60.90	63.55		58.39	61.25	61.74		64.53	62.9	
	Imp dia	5.25	4.375	6.625		3.6875	6.625			4.75	4.20	4.75		5.25	4.625	4.75		5.125	5.125	
	RPM	1750	1750	1750		3500	1750			3450	3450	1750		3450	3450	1750		3500	3500	
	HP	9.59	9.32	9.09		2	1.5			5	0	5		5	5	5		6	7.5	
	KW	7.03	6.92	6.67		1.77	1.23			2.93	2.74	2.74		2.93	2.74	2.74		3.40	3.32	
200	Comparison 3					Comparison 4				Comparison 5				Comparison 6				Comparison 7		
	BHP	1531-21/2AB	1531-3BC	1531-21/2BB		1535-35B	1531-21/2AB	1531-3AC		1535-35B	1531-21/2AB	1531-21/2BB		1531-21/2AB	1531-2BC	1531-21/2BB		1531-11/2AC	1531-2AC	
	Eff	1.59	1.42	1.55		5.74	2.68	2.82		5.61	4.02	4.15		6.32	5.71	5.43		7.56	7.22	
	Imp dia	64.48	71.36	65.54		53.89	75.19	70.8		61.15	63.45	74.05		64.04	71.52	73.46		67.68	70.64	
	RPM	5.75	7.375	6.125		5.125	6.875	4.625		5.125	4.875	8.125		5.375	9.375	9		5.75	5.625	
	HP	1750	1150	1160		3500	1750	1750		3500	3500	1750		3500	1750	1750		3500	3500	
	KW	1.32	1.18	1.28		5	5	3		5	7.5	7.5		7.5	4.73	4.68		6.27	5.98	
300	Comparison 8					Not Used				Comparison 9				Comparison 10				Not Used		
	BHP	1531-3AC	1531-3BC			1531-3AC				1531-21/2AB	1531-3BC	1531-21/2BB		1531-21/2AB	1531-21/2BB			1531-21/2AB	1510-3E	
	Eff	2.18	1.99			7.03				6.72	6.12	6.15		73.03	8.39	7.85		10.51		
	Imp dia	69.63	76.82			74.08				68.03	74.82	74.08		5.25	77.63			75.9		
	RPM	5.75	8			6.875				4.875	4.120	8.625		3500	1750			5.625		
	HP	1750	1150			1750				3500	1750	1750		3500	1750			3500		
	KW	3	3			5				7.5	10	7.5		10	10			10		
400	Comparison 11					Not Used				Comparison 12				Not Used				Comparison 13		
	BHP	1531-3AC	1531-4BC	1531-3AC		1531-4AC				1531-21/2BC	1531-3BC			1510-3AC				1531-21/2AB	1510-3E	
	Eff	3.08	2.56	2.72		9.096				9.06	7.72			11.74				13.6	13.18	
	Imp dia	65.68	79.43	70.69		80.96				67.01	79.26			66.04				74.39	76.84	
	RPM	7.875	7.875	8		8.125				9.5	8.5			5.25				6	10.625	
	HP	1750	1150	1450		1750				1750	1750			3500				3500	1750	
	KW	5	3	3		8				10	10			15				20	20	
500	Comparison 14					Not Used				Comparison 15				Comparison 16				Comparison 17		
	BHP	1531-3AC	1531-4BC	1531-3AC		1531-3AC				1531-3AC	1531-4BC	1531-3AC		1510-3AC	1510-4E	1510-4BC		1510-3AC	1510-4E	1510-3E
	Eff	4.62	3.21	3.16		6.93				11.8	9.37	9.57		14.44	12.67	12.62		17.17	16.04	16.45
	Imp dia	54.94	79.48	60.48		64.28				64.28	80.37	73.63		70.69	79.93	70.70		74.81	78.81	78.17
	RPM	7	7	7		8.375				5.125	8.375	8.875		5.5	9.75	9.375		5.875	10.625	11
	HP	1750	1150	1450		1750				3500	1750	1750		3500	1750	1750		3500	1750	1750
	KW	5	5	5		4.3				15	15	10		20	15	10		20	20	20
		Cost Index	14.092	9.791	9.457	16.367	0.902	0.902		35.994	28.581	30.402		44.046	38.647	37.440		52.374	48.927	53.178
		\$ Cost	\$ 1.794	\$ 2.404	\$ 2.044	\$ 3	\$ 3	\$ 3		\$ 2.787	\$ 3.372	\$ 3.572		\$ 2.931	\$ 3.429	\$ 3.597		\$ 2.931	\$ 3.781	\$ 3.917

High Efficiency Pumping Savings Estimate
Pump Comparison

Assumptions
Motor Eff 0.9
Pipe 3600

Calculations

	Comparison 1			Comparison 2			Comparison 3			Comparison 4			Comparison 5			Comparison 6		
	Base	7H-Eff	DH	2	2H-Eff	DH	3	3H-Eff	DH	4	4H-Eff	DH	5	5H-Eff	DH	6	6H-Eff	DH
Flow	100	100		100	100		200	200		200	200		200	200		200	200	
Head	40	40		80	80		40	40		40	40		60	60		80	80	
BHP	2.14	1.48		3.33	3.31	0.22	1.59	1.42	0.17	5.74	2.68	3.06	5.61	4.15	1.46	6.32	5.71	0.61
Eff	63.56	69.21	5.66	58.39	61.25	2.86	64.48	71.96	7.48	53.69	76.19	21.3	61.16	74.05	12.9	64.04	71.52	7.48
Imp dia	3.6975	6.625	2.9375	4.625	4.625	0.625	5.75	7.375	1.925	6.725	6.875	1.75	5.125	6.125	3.375	5.375	5.975	1.750
RPM	3500	1750	3450	3450	3450	0	1750	1150	600	3500	1750	1750	3500	1750	1750	3500	1750	1750
HP	2	1.5	0.5	5	5	0	5	3.25	0.25	5	5	5	5	5	0	5	5	0
KW	1.77	1.23	0.55	2.93	2.94	0.18	1.32	1.24	0.14	4.850	4.931	1.18	4.14	4.176782222	2.54	5.238573	4.73	0.51
KWH	6528	4514	2013	10788	10097	671	4850	4931	519	17508.7868	8174.93378	8934	17112.2463	12658.2911	17112.2463	18277.97	17417	1861
Cost Index	1.00	1.47	1.00	1.07	1.07	1.00	1.00	1.31	1.29	1.00	1.29	1.00	1.00	1.00	1.00	1.00	1.38	1.00
Cost	\$ 678	\$ 997	\$ 319	\$ 1077	\$ 1142	\$ 75	\$ 1506	\$ 1973	\$ 467	\$ 1047	\$ 1351	\$ 304	\$ 1047	\$ 1800.64	\$ 754	\$ 1738.00	\$ 2894.64	\$ 657
Comparison 7																		
Flow	200	200		300	300		300	300		300	300		400	400		400	400	
Head	100	100		20	20		60	60		80	80		20	20		60	60	
BHP	7.56	7.22	0.34	2.18	1.99	0.19	6.72	6.16	0.57	8.39	7.85	0.54	3.09	2.56	0.52	9.06	7.72	1.34
Eff	67.68	70.64	2.96	69.63	76.82	7.19	68.03	74.08	6.05	73.03	77.63	4.6	65.98	79.13	13.75	67.01	79.26	12.25
Imp dia	5.75	5.625	0.125	5.75	8	2.25	4.875	8.925	3.75	5.25	5.25	9.5	4.25	6.375	7.875	9.5	9.5	1
RPM	3500	3500	0	1750	1150	600	3500	1750	1750	3500	1750	1750	3500	1750	1750	3500	1750	1750
HP	10	9.7	0	5	3	0.5	5	1.75	0.25	10	10	5	5	5	0	10	10	0
KW	6.26847719	6.029	0.237	1.06927	0.67	0.16	5.670433	5.02666667	6.51	6.51	6.51	0.45	2.55297778	2.2	0.43	5.238573	6.40	0.87
KWH	23680.352	22023.2262	1038	6690.6732	6070.11811	580	20989.029	18759.4133	1.739	25592.1102	23.945	1.647	8934.9828	7.809	1.568	27536.82	23.548	4.017
Cost Index	1.00	1.06	1.00	1.28	1.28	1.00	1.00	1.28	1.00	1.00	1.28	1.00	1.00	1.19	1.00	1.00	1.06	1.00
Cost	\$ 2181.00	\$ 2311.98	\$ 131	\$ 1647	\$ 2108.16	\$ 461	\$ 1914.00	\$ 2411.64	\$ 498	\$ 2370.00	\$ 2702	\$ 332	\$ 1794.00	\$ 2135	\$ 341	\$ 2489.00	\$ 2649	\$ 150
Comparison 13																		
Flow	400	400		500	500		500	500		500	500		500	500		500	500	
Head	100	100		20	20		60	60		80	80		100	100		100	100	
BHP	13.6	13.18	0.42	4.62	3.21	1.41	11.8	9.37	2.43	10.49	12.67	1.77	17.17	16.04	1.13	17.17	16.04	1.13
Eff	74.39	76.84	2.45	64.94	79.48	24.54	64.28	64.28	16.09	70.69	79.93	9.24	78.81	78.81	4.76	78.81	78.81	4.76
Imp dia	6	10.625	4.625	7	8.5	1.5	5.125	8.375	3.25	5.8	5.8	9.75	4.25	5.975	10.625	4.25	5.975	10.625
RPM	3500	1750	1750	1750	1150	600	3500	1750	1750	3500	1750	1750	3500	1750	1750	3500	1750	1750
HP	20	20	5	5	5	0	15	15	5	20	20	20	20	20	0	20	20	0
KW	11.2728989	10.92	0.35	3.8294687	2.66	1.17	9.7809899	7.77	2.01	11.9691556	10.50	1.47	14.200222	13.30	0.94	14.200222	13.30	0.94
KWH	41484.231	40.203	1.281	14092.437	6.791	4.301	35993.671	28.581	7.412	44008.4824	38.647	5.399	52373.8418	48.927	3.447	52373.8418	48.927	3.447
Cost Index	1.00	1.32	1.00	1.34	1.34	1.00	1.00	1.21	1.00	1.00	1.17	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cost	\$ 3216.00	\$ 4745	\$ 1029	\$ 1794.00	\$ 2704	\$ 610	\$ 2787.00	\$ 3972.7	\$ 595	\$ 2931.00	\$ 3429	\$ 498	\$ 2931.00	\$ 3781	\$ 550	\$ 2931.00	\$ 3781	\$ 550

FES-I1 Engineered Nozzles

The savings of replacing blow off tubes with engineered nozzles. Leakage rates from the compressed air challenge were used to provide an estimate for the energy savings related with engineered nozzles. The hp/scfm and system pressure assumptions are conservative. For the prescriptive measure the minimum energy savings rating was used.

- Assumptions:
- .16 kW/scfm
 - 80# System pressure
 -

EXISTING

SCFM
kW/SCFM
kW

1/4	1/3	3/8
33	58	87
0.16	0.16	0.16
5.28	9.28	13.92

Blow Off Tubes

PROPOSED

SCFM
kW/SCFM
kW

1/4	1/3	3/8
10	17	13
0.16	0.16	0.16
1.60	2.72	2.08

Engineered Nozzles

SAVINGS

kW
kWh/Yr Use

1/4	1/3	3/8
3.680	6.560	11.840
7,360	13,120	23,680
14,720	26,240	47,360
22,080	39,360	71,040
29,440	52,480	94,720
32,237	57,466	103,718

Annual Hours of Use

2000
4000
6000
8000
8760

Project cost Estimate

\$80	\$80	\$80
------	------	------

CAC Typical Efficiencies	kW/100SCFM
Reciprocating Compressors	15-24
Rotary Screw Compressors	16-22
Centrifugal Compressors	16-20

FES-I2

Barrel Wraps Savings Analysis

On a Per Ton Basis

Data from manufacturers studies available at:
<http://www.unitherm.com/information/kwhstudies/index.htm>

Metered Study Number	Machine Size tons	Project Cost	Annual Savings kWh	Cost per ton	Energy Savings kWh/ton
1	55	\$ 699	14,542	\$ 12.71	264.4
2	165	\$ 438	7,183	\$ 2.65	43.5
3	200	\$ 420	17,958	\$ 2.10	89.8
4	200	\$ 435	14,042	\$ 2.18	70.2
5	220	\$ 515	11,388	\$ 2.34	51.8
6	220	\$ 383	7,008	\$ 1.74	31.9
7	500	\$ 600	18,746	\$ 1.20	37.5
8	500	\$ 1,010	36,500	\$ 2.02	73.0
9	1000	\$ 2,987	58,166	\$ 2.99	58.2
10	1000	\$ 1,258	30,916	\$ 1.26	30.9
Total	4060	\$ 8,745	216,449	\$ 2.15	53.3
Average			21,645	\$ 3.12	75.1

Cost data from Uni-Vest, www.imscompany.com

Cost	Width (in)					
	2		4		6	
ID (in)	Cost \$	Unit Cost \$/in2	Cost \$	Unit Cost \$/in2	Cost \$	Unit Cost \$/in2
4	\$ 16.90	\$ 1.34	\$ 27.40	\$ 1.09	\$ 36.65	\$ 0.97
5	\$ 19.55	\$ 1.24	\$ 31.75	\$ 1.01	\$ 42.75	\$ 0.91
6	\$ 22.15	\$ 1.18	\$ 34.90	\$ 0.93	\$ 48.85	\$ 0.86
7	\$ 24.75	\$ 1.13	\$ 39.25	\$ 0.89	\$ 54.95	\$ 0.83
8	\$ 27.40	\$ 1.09	\$ 43.65	\$ 0.87	\$ 61.10	\$ 0.81
9	\$ 30.00	\$ 1.06	\$ 48.00	\$ 0.85	\$ 67.15	\$ 0.79

Average Unit Cost \$ 0.99

Avg Elec Cost	\$	0.065	\$/kWh
Insul Thickness		1.5	in
Secondary Heating & Cooling Impacts Ignored			
Insulated Duct Cost	\$	40	\$/sq ft

Table FES-13
Pellet Dyer Duct Insulation Analysis
On a Per Foot Basis

Estimated Costs				
Duct Dia	Mat Duct sq ft per ft	Mat Duct \$/ft	Est. Incentive \$/ft	
3	\$ 1.50	\$ 31.42	\$ 15.71	
4	\$ 1.05	\$ 41.89	\$ 20.94	
5	\$ 1.31	\$ 52.36	\$ 26.18	
6	\$ 1.57	\$ 62.83	\$ 31.42	
8	\$ 2.09	\$ 83.78	\$ 41.89	

160													
Duct Temp													
Duct Dia	Heat Loss				2000 Hrs/yr				4000 Hrs/yr				8760 Hrs/yr
	Uninsul Btu/hr/ft	Insul Btu/hr/ft	Reduction Btu/hr/ft	Reduction kWh/ft	Savings \$/yr	Payback years	kWh/yr	Payback years	Savings \$/yr	Payback years	kWh/yr	Payback years	
				kWh/ft									
3	102	18	84	0.02	49 \$	3.20	4.9	98 \$	6.40	2.5	148 \$	9.60	1.6
4	136	22	114	0.03	67 \$	4.34	4.8	134 \$	8.69	2.4	200 \$	13.03	1.6
5	175	26	149	0.04	87 \$	5.68	4.6	175 \$	11.35	2.3	262 \$	17.03	1.5
6	215	31	184	0.05	108 \$	7.01	4.5	216 \$	14.02	2.2	324 \$	21.03	1.5
8	296	37	259	0.08	152 \$	9.87	4.2	304 \$	19.74	2.1	455 \$	29.60	1.4
Duct Temp													
170													
Duct Dia	Heat Loss				2000 Hrs/yr				4000 Hrs/yr				8760 Hrs/yr
	Uninsul Btu/hr/ft	Insul Btu/hr/ft	Reduction Btu/hr/ft	Reduction kWh/ft	Savings \$/yr	Payback years	kWh/yr	Payback years	Savings \$/yr	Payback years	kWh/yr	Payback years	
				kWh/ft									
3	117	21	96	0.03	56 \$	3.66	4.3	113 \$	7.32	2.1	169 \$	10.97	1.4
4	156	25	131	0.04	77 \$	4.99	4.2	154 \$	9.98	2.1	230 \$	14.97	1.4
5	200	30	170	0.05	100 \$	6.48	4.0	199 \$	12.95	2.0	299 \$	19.43	1.3
6	247	35	212	0.06	124 \$	8.08	3.9	249 \$	16.15	1.9	373 \$	24.23	1.3
8	340	42	298	0.09	175 \$	11.35	3.7	349 \$	22.71	1.8	524 \$	34.06	1.2
Duct Temp													
180													
Duct Dia	Heat Loss				2000 Hrs/yr				4000 Hrs/yr				8760 Hrs/yr
	Uninsul Btu/hr/ft	Insul Btu/hr/ft	Reduction Btu/hr/ft	Reduction kWh/ft	Savings \$/yr	Payback years	kWh/yr	Payback years	Savings \$/yr	Payback years	kWh/yr	Payback years	
				kWh/ft									
3	133	23	110	0.03	64 \$	4.19	3.7	129 \$	8.38	1.9	193 \$	12.57	1.2
4	177	28	149	0.04	87 \$	5.68	3.7	175 \$	11.35	1.8	262 \$	17.03	0.8
5	227	34	193	0.06	113 \$	7.35	3.6	226 \$	14.71	1.8	339 \$	22.06	1.2
6	280	39	241	0.07	141 \$	9.18	3.4	283 \$	18.36	1.7	424 \$	27.55	1.1
8	386	48	338	0.10	198 \$	12.88	3.3	386 \$	25.76	1.6	594 \$	38.63	1.1
Duct Temp													
190													
Duct Dia	Heat Loss				2000 Hrs/yr				4000 Hrs/yr				8760 Hrs/yr
	Uninsul Btu/hr/ft	Insul Btu/hr/ft	Reduction Btu/hr/ft	Reduction kWh/ft	Savings \$/yr	Payback years	kWh/yr	Payback years	Savings \$/yr	Payback years	kWh/yr	Payback years	
				kWh/ft									
3	149	26	123	0.04	72 \$	4.69	3.4	144 \$	9.37	1.7	216 \$	14.06	1.1
4	199	31	168	0.05	98 \$	6.40	3.3	197 \$	12.80	1.6	295 \$	19.20	1.1
5	255	37	218	0.06	128 \$	8.31	3.2	256 \$	16.61	1.6	383 \$	24.92	1.1
6	314	44	270	0.08	158 \$	10.29	3.1	317 \$	20.57	1.5	475 \$	30.86	1.0
8	433	53	380	0.11	223 \$	14.48	2.9	445 \$	28.96	1.4	668 \$	43.43	1.0
Duct Temp													
200													
Duct Dia	Heat Loss				2000 Hrs/yr				4000 Hrs/yr				8760 Hrs/yr
	Uninsul Btu/hr/ft	Insul Btu/hr/ft	Reduction Btu/hr/ft	Reduction kWh/ft	Savings \$/yr	Payback years	kWh/yr	Payback years	Savings \$/yr	Payback years	kWh/yr	Payback years	
				kWh/ft									
3	166	28	138	0.04	81 \$	5.26	3.0	162 \$	10.52	1.5	243 \$	15.77	1.0
4	222	34	188	0.06	110 \$	7.16	2.9	220 \$	14.33	1.5	331 \$	21.49	1.0
5	284	41	243	0.07	142 \$	9.26	2.8	285 \$	18.52	1.4	427 \$	27.78	0.9
6	350	48	302	0.09	177 \$	11.51	2.7	354 \$	23.01	1.4	531 \$	34.52	0.9
8	482	58	424	0.12	249 \$	16.15	2.6	497 \$	32.31	1.3	746 \$	48.46	0.9
Duct Temp													
210													
Duct Dia	Heat Loss				2000 Hrs/yr				4000 Hrs/yr				8760 Hrs/yr
	Uninsul Btu/hr/ft	Insul Btu/hr/ft	Reduction Btu/hr/ft	Reduction kWh/ft	Savings \$/yr	Payback years	kWh/yr	Payback years	Savings \$/yr	Payback years	kWh/yr	Payback years	
				kWh/ft									
3	182	30	152	0.04	89 \$	5.80	2.9	178 \$	11.20	1.4	267 \$	17.52	0.9
4	242	36	206	0.06	119 \$	7.96	2.8	238 \$	15.16	1.3	357 \$	23.76	0.8
5	306	43	263	0.07	152 \$	9.93	2.7	306 \$	19.26	1.2	456 \$	30.36	0.7
6	376	51	325	0.09	189 \$	12.51	2.6	378 \$	23.85	1.1	561 \$	37.50	0.6
8	512	62	450	0.12	267 \$	17.10	2.5	534 \$	32.82	1.0	798 \$	50.88	0.5

Duct Dia in	Heat Loss				2000 Hrs/yr				4000 Hrs/yr				6000 Hrs/yr				8760 Hrs/yr			
	Uninsul Btu/hr/ft	Insul Btu/hr/ft	Reduction Btu/hr/ft	Reduction kWh/ft	Savings \$/yr	Payback years	kWh/yr	Savings \$/yr	Payback years	kWh/yr	Savings \$/yr	Payback years	kWh/yr	Savings \$/yr	Payback years					
3	133	23	110	0.03	64	4.19	3.7	129	8.38	1.9	193	12.57	1.2	282	18.36	0.9				
4	177	28	149	0.04	87	5.68	3.7	175	11.35	1.8	262	17.03	1.2	383	24.87	0.8				
5	227	34	193	0.06	113	7.35	3.6	226	14.71	1.8	339	22.06	1.2	496	32.21	0.8				
6	280	39	241	0.07	141	9.18	3.4	283	18.36	1.7	424	27.55	1.1	619	40.22	0.8				
8	386	48	338	0.10	198	12.88	3.3	396	25.76	1.6	594	38.63	1.1	868	56.47	0.7				

FES-H1 Room Air Conditioners <14,000 Btu/h

Assumptions:

- 9.3 EER, Estimated energy efficiency of existing unit (BTU/hr per Watt) - average minimum NAECA stand
- 10.2 EER, Energy efficiency of NEW unit (BTU/hr per Watt) Energy Star
- 8,950 Btu/h, Nominal cooling capacity of unit (average for all Energy Star rated units under 14,000 Btu/h
- 0.8 Diversity Factor
- 1,032 EFLH; effective full load cooling hours for Kansas City, MO as specified on EPA's Energy Star website
- 1,000 Watts/kW, Electrical power conversion factor
- 1 , Number of units installed
- \$0.100 per kWh, Average cost of electricity
- \$30 estimated incremental cost to purchase Energy Star labeled room air conditioner

CALCULATIONS:

Power Requirement of Existing System (per unit):

8,950 BTU/hr

X

9.3 EER

X

0.8

1,000 Watts/kW

=

0.77

kW

Estimated Annual Energy Use of Existing System:

0.77 kW

X

1,032 hours

X

1 unit(s)

=

795

kWh

Power Requirement of NEW System (per unit):

8,950 BTU/hr

X

10.2 EER

X

0.8

1,000 Watts/kW

=

0.70

kW

Estimated Annual Energy Use of NEW system:

0.70 kW

X

1,032 hours

X

1 unit(s)

=

724

kWh

ESTIMATED ENERGY AND COST SAVINGS:

795 kWh

-

724 kWh

=

70 kWh

0.77 kW

-

0.70 kW

=

0.07 kW

70 kWh

X

\$0.100 /kWh

=

\$7

Annual Cost Savings

FES-H1 Room AC.xls<14000Btuh

FES-H1 Room Air Conditioners >14,000 Btu/h

Assumptions:

- 9.2 EER, Estimated energy efficiency of existing unit (BTU/hr per Watt) - average minimum NAECA standard per E-Star website
- 10.2 EER, Energy efficiency of NEW unit (BTU/hr per Watt) Energy Star website
- 19,350 Btu/h, Nominal cooling capacity of unit; average capacity for all Energy Star rated units over 14,000 Btu/h
- 0.8 Diversity Factor
- 1,032 EFLH; effective full load cooling hours for Kansas City, MO as specified on EPA's Energy Star website
- 1,000 Watts/kW, Electrical power conversion factor
- 1, Number of units installed
- \$30 estimated incremental cost to purchase Energy Star labeled room air conditioner

CALCULATIONS:

Power Requirement of Existing System (per unit):

19,350 BTU/hr

X

0.8

=

1.68 kW

9.2 EER

X

1,000 Watts/kW

Estimated Annual Energy Use of Existing System:

1.68 kW

X

1,032 hours

X

1 unit(s)

=

1,736 kWh

Power Requirement of NEW System (per unit):

19,350 BTU/hr

X

0.8

=

1.52 kW

10.2 EER

X

1,000 Watts/kW

Estimated Annual Energy Use of NEW system:

1.52 kW

X

1,032 hours

X

1 unit(s)

=

1,566 kWh

ESTIMATED ENERGY AND COST SAVINGS:

1,736 kWh

-

1,566 kWh

=

170 kWh

1.68 kW

-

1.52 kW

=

0.16 kW

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Haier	ESA305	No	Yes	None	5000	10.7	9.7	10%	Yes	11/14/2002
Sharp	AF-S50CX	No	Yes	None	5000	11.0	9.7	13%	Yes	1/17/2002
Sharp	AF-S50DX	No	Yes	None	5000	11.0	9.7	13%	Yes	4/7/2003
Sharp	AF-S55CX	No	Yes	None	5000	11.0	9.7	13%	Yes	1/17/2002
Arctic Air	AAC5044D	No	Yes		5050	10.7	9.7	10%	Yes	5/2/2005
	E									
Comfort Aire	RADS-51B	No	Yes	None	5100	10.7	9.7	10%	Yes	7/24/2007
Friedrich	CP05A10	No	Yes		5100	10.8	9.7	11%	Yes	6/20/2005
Friedrich	CP05A10*	No	Yes	None	5100	10.8	9.7	11%	Yes	4/18/2005
Friedrich	CP05C10	No	Yes	None	5100	10.7	9.7	10%	Yes	5/2/2006
Haier	ESAM3056-	No	Yes	None	5150	10.7	9.7	10%	Yes	1/3/2006
	C									
Admiral	AAW-	No	Yes	None	5200	10.7	9.7	10%	Yes	11/30/2004
	05CR1FHU									
Amana	E	No	Yes	None	5200	10.7	9.7	10%	Yes	5/3/2004
	AC053E									
Amana	ACB055E	No	Yes	None	5200	10.7	9.7	10%	Yes	10/21/2004
Amana	ACB057E	No	Yes	None	5200	10.7	9.7	10%	Yes	1/3/2007
Carrier	ACA051B	No	Yes	None	5200	11.0	9.7	13%	Yes	11/4/2002
Comfort Aire	RADS-51A	No	Yes	None	5200	10.7	9.7	10%	Yes	1/3/2007
Fedders	A7X05F2A	No	Yes	None	5200	10.7	9.7	10%	Yes	1/8/2002
Fedders	A7X05F2D	No	Yes		5200	10.7	9.7	10%	Yes	6/16/2005
Frigidaire	FAA053P7A	No	Yes	None	5200	11.0	9.7	13%	Yes	12/28/2004
Frigidaire	FAA055N7A	No	Yes	None	5200	11.0	9.7	13%	Yes	3/24/2004
Frigidaire	FAA055P7A	No	Yes	None	5200	11.0	9.7	13%	Yes	12/28/2004
Frigidaire	FAA056P7A	No	Yes	None	5200	11.0	9.7	13%	Yes	12/28/2004
Goldstar	BG5200ER	No	Yes	None	5200	10.8	9.7	11%	Yes	3/25/2004
HEC	CE05BC5	No	Yes	None	5200	10.7	9.7	10%	Yes	10/21/2004
Haier	ESA3055	No	Yes	None	5200	10.7	9.7	10%	Yes	10/21/2004
Haier	ESA3056	No	Yes	None	5200	10.7	9.7	10%	Yes	1/3/2006
Haier	ESA3057	No	Yes	None	5200	10.7	9.7	10%	Yes	1/3/2007
Haier	ESAM055-C	No	Yes	None	5200	10.7	9.7	10%	Yes	10/21/2004
Hampton	HAW-	No	Yes	None	5200	10.7	9.7	10%	Yes	11/6/2003
Bay	05CR1FDE									
Hampton	HBLG5200	No	Yes	None	5200	10.8	9.7	11%	Yes	5/3/2002
Bay	E									
LG		No	Yes	None	5200	10.8	9.7	11%	Yes	2/19/2003
Electronics	LW5200E									
Maytag	M7X05F2A	No	Yes	None	5200	10.7	9.7	10%	Yes	1/8/2002
Maytag	M7X05F2D	No	Yes		5200	10.7	9.7	10%	Yes	6/16/2005
Midea	KC15	No	Yes	None	5200	11.0	9.7	13%	Yes	3/21/2006
Midea	KC15/Y	No	Yes	None	5200	11.0	9.7	13%	Yes	3/21/2006
Midea	MWF-055C*	No	Yes	None	5200	11.0	9.7	13%	Yes	3/21/2006
Midea	MWF-05C*	No	Yes	None	5200	11.0	9.7	13%	Yes	3/21/2006
Panasonic	CW-C53HU	No	Yes	None	5200	10.8	9.7	11%	Yes	3/5/2003
Panasonic	CW-	No	Yes	None	5200	10.8	9.7	11%	Yes	3/25/2004
	XC54HU									
Panasonic	CW-	No	Yes	None	5200	10.8	9.7	11%	Yes	3/11/2005
	XC55HU									
Sharp	AF-S50EX	No	Yes	None	5200	10.7	9.7	10%	Yes	3/25/2004
White- Westinghou se	WAA053M7	No	Yes	None	5200	11.0	9.7	13%	Yes	3/12/2003
	A									
Wintair	AW-	No	Yes	None	5200	10.7	9.7	10%	Yes	11/6/2003
	05CR1FDE									
General Electric	AGF05LHG	No	Yes		5250	10.7	9.7	10%	Yes	6/1/2005
	1									

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
General Electric	AGM05LHG1	No	Yes		5250	10.7	9.7	10%	Yes	6/1/2005
General Electric	AGM05LJ	No	Yes		5250	10.7	9.7	10%	Yes	6/1/2006
General Electric	AGM05LJG1	No	Yes	None	5250	10.7	9.7	10%	Yes	6/16/2006
General Electric	ASM05LKS1	No	Yes	None	5250	10.7	9.7	10%	Yes	1/11/2007
Simplicity	SAC5250	No	Yes		5250	10.7	9.7	10%	Yes	5/2/2005
	SAC5254D									
Simplicity	E	No	Yes		5250	10.7	9.7	10%	Yes	5/2/2005
Kenmore	75051	No	Yes		5300	10.8	9.7	11%	Yes	6/7/2005
	DWC-									
Daewoo	055RL	No	Yes		5350	10.7	9.7	10%	Yes	4/29/2005
Turbo Air	TAW-5EL	No	Yes		5350	10.7	9.7	10%	Yes	4/29/2005
Carrier	ACA051T	No	Yes	None	5400	11.2	9.7	15%	Yes	3/12/2003
Comfort Aire	RADS-51	No	Yes	None	5400	10.7	9.7	10%	Yes	11/5/2002
Fedders	A7X05F2B	No	Yes	None	5400	10.7	9.7	10%	Yes	3/27/2003
Friedrich	CP06C10	No	Yes		5400	10.7	9.7	10%	Yes	5/19/2006
General Electric	ASF05LA	No	Yes		5400	10.8	9.7	11%	Yes	3/4/2004
General Electric	ASM05LB	No	Yes		5400	10.8	9.7	11%	Yes	3/4/2004
Samsung	AW0593L	No	Yes	None	5400	10.8	9.7	11%	Yes	3/25/2004
Friedrich	XQ05L10*	No	Yes	None	5500	11.0	9.7	13%	Yes	4/18/2005
Whirlpool	ACQ058PR	No	Yes		5500	10.7	9.7	10%	Yes	4/28/2005
Whirlpool	ACQ058PS	No	Yes	None	5500	10.7	9.7	10%	Yes	7/17/2006
Airtemp	B7X05F2A	No	Yes	None	5600	11.0	9.7	13%	Yes	3/27/2003
Friedrich	CP06A10	No	Yes		5600	10.7	9.7	10%	Yes	6/20/2005
Friedrich	CP06A10*	No	Yes	None	5600	10.7	9.7	10%	Yes	4/18/2005
Kenmore	75052	No	Yes		5700	11.2	9.7	15%	Yes	5/26/2005
LG Electronics	LW060CS	No	Yes	None	5700	10.8	9.7	11%	Yes	3/25/2004
General Electric	AGF06LB	No	Yes		5950	10.8	9.7	11%	Yes	2/6/2004
Airtemp	B7X06F2A	No	Yes	None	6000	10.7	9.7	10%	Yes	3/27/2003
Amana	AC063E	No	Yes	None	6000	10.7	9.7	10%	Yes	5/3/2004
Amana	ACB067E	No	Yes	None	6000	10.7	9.7	10%	Yes	1/3/2007
Amana	ACC065E	No	Yes	None	6000	10.7	9.7	10%	Yes	10/21/2004
Carrier	ACA061T	No	Yes	None	6000	10.7	9.7	10%	Yes	11/4/2002
Carrier	ACA081T	No	Yes	None	6000	10.8	9.7	11%	Yes	11/4/2002
	DAC6006D									
Danby	E	No	Yes	None	6000	10.7	9.7	10%	Yes	4/26/2006
Fedders	A7X06F2A	No	Yes	None	6000	10.7	9.7	10%	Yes	3/27/2003
Fedders	A7X06F2C	No	Yes		6000	10.7	9.7	10%	Yes	6/16/2005
Frigidaire	FAA063P7A	No	Yes	None	6000	10.7	9.7	10%	Yes	12/28/2004
Frigidaire	FAA065N7A	No	Yes	None	6000	10.7	9.7	10%	Yes	3/24/2004
Frigidaire	FAA065P7A	No	Yes	None	6000	10.7	9.7	10%	Yes	12/28/2004
Frigidaire	FAA067P7A	No	Yes	None	6000	10.7	9.7	10%	Yes	12/28/2004
General Electric	AGM06LHG1	No	Yes		6000	10.7	9.7	10%	Yes	6/1/2005
General Electric	AGM06LJ	No	Yes		6000	10.7	9.7	10%	Yes	6/1/2006
General Electric	AGM06LJG1	No	Yes	None	6000	10.7	9.7	10%	Yes	6/16/2006
General Electric	AJCQ06LCB	No	No	None	6000	10.0	9	11%	Yes	2/23/2004
General Electric	AJCQ06LCBM1	No	No	None	6000	10.0	9	11%	Yes	11/1/2006
General Electric	AJCQ06LCM1	No	No	None	6000	10.0	9	11%	Yes	12/13/2006

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
General Electric	AJCS06LCB	No	No	None	6000	10.0	9	11%	Yes	2/23/2004
General Electric	M1	No	No	None	6000	10.0	9	11%	Yes	11/1/2006
General Electric	M2	No	No	None	6000	10.0	9	11%	Yes	10/2/2006
General Electric	CM2	No	No	None	6000	10.0	9	11%	Yes	11/1/2006
General Electric	ASM06LKS 1	No	Yes	None	6000	10.7	9.7	10%	Yes	1/11/2007
GoldStar	GL6000ER	No	Yes	None	6000	10.7	9.7	10%	Yes	6/11/2007
Haier	ESA306	No	Yes	None	6000	10.7	9.7	10%	Yes	11/14/2002
Haier	ESA3065	No	Yes	None	6000	10.7	9.7	10%	Yes	10/21/2004
Haier	ESA3067	No	Yes	None	6000	10.7	9.7	10%	Yes	1/3/2007
Kenmore	75062	No	Yes		6000	10.8	9.7	11%	Yes	6/7/2005
LG Electronics	BP6000ER	No	Yes	None	6000	10.7	9.7	10%	Yes	3/25/2004
LG Electronics	GL6000ER	No	Yes	None	6000	10.7	9.7	10%	Yes	3/25/2004
LG Electronics	LL060CS	No	Yes	None	6000	10.7	9.7	10%	Yes	3/25/2004
LG Electronics	LP6000ER	No	Yes	None	6000	10.7	9.7	10%	Yes	3/31/2004
LG Electronics	LP6000ERY 4	No	Yes	None	6000	10.7	9.7	10%	Yes	3/25/2004
Maytag	M7X06F2A	No	Yes	None	6000	10.7	9.7	10%	Yes	3/27/2003
Maytag	M7X06F2C	No	Yes		6000	10.7	9.7	10%	Yes	6/16/2005
Midea	KC18	No	Yes	None	6000	10.7	9.7	10%	Yes	3/21/2006
Midea	KC18/Y	No	Yes	None	6000	10.7	9.7	10%	Yes	3/21/2006
Midea	MWF-06C*	No	Yes	None	6000	10.7	9.7	10%	Yes	3/21/2006
Panasonic	CW-XC63HU	No	Yes	None	6000	10.7	9.7	10%	Yes	3/5/2003
Panasonic	CW-XC64HU	No	Yes	None	6000	10.7	9.7	10%	Yes	3/25/2004
Panasonic	CW-XC65HU	No	Yes	None	6000	10.7	9.7	10%	Yes	3/11/2005
Samsung	AW06ECB7	No	Yes	None	6000	10.7	9.7	10%	Yes	3/29/2007
Sharp	AF-06CSL	No	Yes	None	6000	11.0	9.7	13%	Yes	1/17/2002
Sharp	AF-S60CX	No	Yes	None	6000	11.0	9.7	13%	Yes	1/17/2002
Sharp	AF-S60DX	No	Yes	None	6000	11.0	9.7	13%	Yes	4/7/2003
Sharp	AF-S60FX	No	Yes	None	6000	10.7	9.7	10%	Yes	2/1/2005
Sharp	AF-S60MX	No	Yes	None	6000	10.7	9.7	10%	Yes	1/3/2007
Sunbeam	SCA063RE C1	No	Yes	None	6000	10.7	9.7	10%	Yes	12/21/2006
Whirlpool	ACQ068PR AW-	No	Yes		6000	11.0	9.7	13%	Yes	4/28/2005
Wintair	06CR1FDE	No	Yes	None	6150	10.7	9.7	10%	Yes	11/6/2003
Sharp	AF-S60EX	No	Yes	None	6200	10.7	9.7	10%	Yes	3/25/2004
Whirlpool	ACQ068PS	No	Yes	None	6200	10.7	9.7	10%	Yes	7/25/2006
Friedrich	XQ06L10*	No	Yes	None	6300	11.5	9.7	19%	Yes	4/18/2005
Samsung	AW069CB	Yes	Yes		6300	10.7	9	19%	Yes	12/28/2005
Danby	DAC6304D E	No	Yes		6400	10.7	9.7	10%	Yes	5/2/2005
General Electric	ASD06LKS 1	No	Yes	None	6400	10.7	9.7	10%	Yes	2/13/2007
Samsung	AW0693L	No	Yes	None	6400	10.7	9.7	10%	Yes	3/25/2004
Danby	DAC7006D E	No	Yes	None	7000	10.8	9.7	11%	Yes	4/26/2006
Silhouette	DAC7024D E	No	Yes		7000	10.7	9.7	10%	Yes	5/2/2005
Comfort Aire	RADS-81A	No	Yes	None	7800	10.8	9.7	11%	Yes	1/3/2007
Friedrich	CP08A10*	No	Yes	None	7800	10.8	9.7	11%	Yes	4/18/2005
Friedrich	CP08C10	No	Yes	None	7800	10.8	9.7	11%	Yes	6/16/2006
Goldstar	WG8000E	No	Yes	None	7800	11.0	9.7	13%	Yes	12/3/2001
Haier	ESA3087	No	Yes	None	7800	10.8	9.7	11%	Yes	1/3/2007

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Panasonic	CW- XC78HU	No	Yes	None	7800	10.7	9.7	10%	Yes	3/5/2003
Panasonic	CW- XC80HU	No	Yes	None	7800	10.7	9.7	10%	Yes	3/25/2004
Panasonic	CW- XC80YU	No	Yes	None	7800	11.0	9.7	13%	Yes	3/13/2001
Panasonic	CW- XC83HU	No	Yes	None	7800	10.8	9.7	11%	Yes	3/5/2003
Panasonic	CW- XC84HU	No	Yes	None	7800	10.8	9.7	11%	Yes	3/25/2004
Panasonic	CW- XC85HU	No	Yes	None	7800	10.8	9.7	11%	Yes	3/11/2005
Airtemp	B7Q08F2A	No	Yes	None	8000	10.8	9.8	10%	Yes	7/1/2004
Amana	AC083E	No	Yes	None	8000	10.8	9.8	10%	Yes	5/3/2004
Amana	ACC085E	No	Yes	None	8000	10.8	9.8	10%	Yes	10/21/2004
Amana	ACW086R	No	No	None	8000	10.0	8.5	18%	Yes	1/3/2006
Carrier	52FC010-1- E	No	No	None	8000	9.4	8.5	11%	Yes	1/15/2004
Climette	CA0816TC R	No	No	None	8000	9.4	8.5	11%	Yes	7/1/2004
Comfort Aire	BD-81	No	No		8000	10.0	8.5	18%	Yes	6/7/2005
Comfort Aire	BD-81-A	No	No		8000	9.6	8.5	13%	Yes	6/1/2005
Comfort Aire	BG-81A	No	No	None	8000	9.6	8.5	13%	Yes	6/11/2007
Comfort Aire	RADS-81	No	Yes	None	8000	10.8	9.8	10%	Yes	11/5/2002
Comfort Aire	RADS-81B	No	Yes	None	8000	10.8	9.8	10%	Yes	7/24/2007
Daewoo	DWC- 084RL	No	Yes		8000	10.8	9.8	10%	Yes	4/29/2005
Danby	DAC8006D E	No	Yes	None	8000	10.8	9.8	10%	Yes	4/26/2006
Danby	DAC8404D E	No	Yes		8000	10.8	9.8	10%	Yes	5/2/2005
Danby	DAC10033T									
Designer	W	No	No	None	8000	9.4	8.5	11%	Yes	1/15/2004
Danby	DVAC8034 E	No	N/A	Casement Slider	8000	10.5	9.5	11%	Yes	1/15/2004
Fedders	A7Q08F2A	No	Yes	None	8000	10.8	9.8	10%	Yes	1/8/2002
Fedders	A7Q08F2B	No	Yes		8000	10.8	9.8	10%	Yes	6/16/2005
Fedders	A7U08W2A	No	No	None	8000	9.4	8.5	11%	Yes	6/30/2004
Fedders	A7U08W2B	No	No		8000	9.4	8.5	11%	Yes	6/16/2005
Friedrich	UE08A13B	No	No		8000	9.6	8.5	13%	Yes	6/22/2005
Friedrich	US08A10A	No	No	None	8000	10.0	8.5	18%	Yes	4/28/2004
Friedrich	US08B10	No	No		8000	10.0	8.5	18%	Yes	12/23/2003
Friedrich	US08B10A	No	No		8000	9.6	8.5	13%	Yes	6/22/2005
Friedrich	US08B10A*	No	No	None	8000	9.6	8.5	13%	Yes	4/18/2005
Friedrich	WS08B10	No	No		8000	10.5	8.5	24%	Yes	12/23/2003
Friedrich	WS08B10A*	No	No	None	8000	10.5	8.5	24%	Yes	4/18/2005
Friedrich	XQ08L10*	No	Yes	None	8000	10.8	9.8	10%	Yes	4/18/2005
Frigidaire	FAA083P7A	No	Yes	None	8000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAA085M7 A	No	Yes	None	8000	10.8	9.8	10%	Yes	8/25/2004
Frigidaire	FAA085P7A	No	Yes	None	8000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAA086P7A	No	Yes	None	8000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAA087P7A	No	Yes	None	8000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAA087S7A	No	Yes	None	8000	10.8	9.8	10%	Yes	9/19/2007

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Frigidaire	FAC085N7A	No	Yes	None	8000	10.8	9.8	10%	Yes	3/24/2004
Frigidaire	FAC086N7A	No	Yes	None	8000	10.8	9.8	10%	Yes	3/24/2004
Frigidaire	FAH085N1T	No	No	None	8000	9.4	8.5	11%	Yes	1/15/2004
Frigidaire	FAH085P1T	No	No	None	8000	9.4	8.5	11%	Yes	12/28/2004
Frigidaire	FAH086N1T	No	No	None	8000	9.4	8.5	11%	Yes	12/8/2005
Frigidaire	FAH086R1T	No	No	None	8000	9.4	8.5	11%	Yes	9/25/2006
Frigidaire	FAH086S1T	No	No	None	8000	9.4	8.5	11%	Yes	9/19/2007
Frigidaire	FAK083J7V	No	Yes	Casement Slider	8000	10.5	9.5	11%	Yes	12/18/2000
Frigidaire	FAK083N7V	No	N/A	Casement Slider	8000	10.5	9.5	11%	Yes	1/15/2004
Frigidaire	FAK085P7V	No	Yes	Casement Slider	8000	10.5	9.5	11%	Yes	12/28/2004
Frigidaire	FAK085Q7V	No	Yes	Casement Slider	8000	10.5	9.5	11%	Yes	12/8/2005
Frigidaire	FAK085R7V	No	Yes	Casement Slider	8000	10.5	9.5	11%	Yes	9/25/2006
General Electric	AGF08FB	No	Yes		8000	10.8	9.8	10%	Yes	2/6/2004
General Electric	AGM08LHG1	No	Yes		8000	10.8	9.8	10%	Yes	6/1/2005
General Electric	AGM08LJ	No	Yes		8000	10.8	9.8	10%	Yes	6/1/2006
General Electric	AGM08LJG1	No	Yes	None	8000	10.8	9.8	10%	Yes	6/16/2006
General Electric	AJCH08ACB	No	No	None	8000	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCH08ACBM1	No	No	None	8000	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCH08ACBM2	No	No	None	8000	9.5	8.5	12%	Yes	10/2/2006
General Electric	AJCH08ACCM2	No	No	None	8000	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCQ08ACB	No	No	None	8000	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCQ08ACBM1	No	No	None	8000	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCQ08ACCM1	No	No	None	8000	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCS08ACB	No	No	None	8000	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCS08ACBM1	No	No	None	8000	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCS08ACBM2	No	No	None	8000	9.5	8.5	12%	Yes	10/2/2006
General Electric	AJCS08ACCM2	No	No	None	8000	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJHS08ASBM1	Yes	No	None	8000	9.5	8.5	12%	Yes	1/12/2006
General Electric	AJHS08ASBM1	Yes	No	None	8000	9.5	8.5	12%	Yes	10/4/2006
General Electric	AJHS08DCBM1	Yes	No	None	8000	9.5	8.5	12%	Yes	1/12/2006
General Electric	AJHS08DCBM1	Yes	No	None	8000	9.5	8.5	12%	Yes	10/4/2006
General Electric	ASM08FC	No	Yes	None	8000	10.8	9.8	10%	Yes	2/21/2003
General Electric	ASM08LKS1	No	Yes	None	8000	10.8	9.8	10%	Yes	1/11/2007
Goldstar	BG8000ER	No	Yes	None	8000	10.8	9.8	10%	Yes	3/25/2004

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
HEC	CE08CC5	No	Yes	None	8000	10.8	9.8	10%	Yes	10/21/2004
Haier	ESA308	No	Yes	None	8000	10.8	9.8	10%	Yes	11/14/2002
Haier	ESA3085	No	Yes	None	8000	10.8	9.8	10%	Yes	10/21/2004
Haier	HTWR08XC6	No	No	None	8000	10.0	8.5	18%	Yes	1/3/2006
Kenmore	74083	No	Yes	None	8000	10.8	9.8	10%	Yes	4/29/2004
Kenmore	74085	No	No	None	8000	10.0	8.5	18%	Yes	4/29/2004
Kenmore	74093	No	No	None	8000	10.0	8.5	18%	Yes	11/18/2004
Kenmore	75081	No	Yes		8000	10.8	9.8	10%	Yes	6/1/2005
Kenmore	75085	No	No		8000	9.6	8.5	13%	Yes	6/8/2005
Kenmore	75088	No	Yes	None	8000	10.8	9.8	10%	Yes	3/12/2003
Kenmore	76081	No	Yes	None	8000	10.8	9.8	10%	Yes	6/16/2006
LG Electronics	CL8000ER	No	Yes	None	8000	10.8	9.8	10%	Yes	3/25/2004
LG Electronics	LT0810C	No	No	None	8000	10.0	8.5	18%	Yes	3/25/2004
LG Electronics	LT0810CR	No	No		8000	9.6	8.5	13%	Yes	5/25/2005
LG Electronics	LT0810CRY7	No	No	None	8000	9.6	8.5	13%	Yes	6/11/2007
Maytag	M7Q08F2B	No	Yes		8000	10.8	9.8	10%	Yes	6/16/2005
Maytag	M7U08W2A	No	No	None	8000	9.4	8.5	11%	Yes	7/1/2004
Maytag	M7U08W2B	No	No		8000	9.4	8.5	11%	Yes	6/16/2005
Midea	KC23	No	Yes	None	8000	10.8	9.8	10%	Yes	3/21/2006
Midea	KC23/Y	No	Yes	None	8000	10.8	9.8	10%	Yes	3/21/2006
Midea	KC23C	No	No		8000	9.4	8.5	11%	Yes	3/23/2006
Midea	KC23L/Y	No	Yes	Casement Slider	8000	10.5	9.5	11%	Yes	3/21/2006
Midea	KCD23C	Yes	No		8000	9.4	8.5	11%	Yes	3/23/2006
Midea	MWF-08C*	No	Yes	None	8000	10.8	9.8	10%	Yes	3/21/2006
Midea	MWL-08C*	No	Yes	Casement Slider	8000	10.5	9.5	11%	Yes	3/21/2006
Midea	MWW-08CR	No	No		8000	9.4	8.5	11%	Yes	3/23/2006
Midea	MWW-08ER	Yes	No		8000	9.4	8.5	11%	Yes	3/23/2006
Polar Wind	MWF-08CR	No	Yes	None	8000	10.8	9.8	10%	Yes	12/13/2006
Samsung	AW0893L	No	Yes	None	8000	10.8	9.8	10%	Yes	3/25/2004
Samsung	AW0893M	No	Yes	None	8000	10.8	9.8	10%	Yes	3/25/2004
Samsung	AW089CB	Yes	Yes		8000	10.8	9	20%	Yes	12/28/2005
Samsung	AW08ECB7	No	Yes	None	8000	10.8	9.8	10%	Yes	3/29/2007
Sharp	AF-P80CX	No	Yes	None	8000	11.0	9.8	12%	Yes	1/17/2002
Sharp	AF-S80CX	No	Yes	None	8000	11.0	9.8	12%	Yes	1/17/2002
Sharp	AF-S80DX	No	Yes	None	8000	11.0	9.8	12%	Yes	4/7/2003
Sharp	AF-S80FX	No	Yes	None	8000	10.8	9.8	10%	Yes	2/1/2005
Sharp	AF-S80MX	No	Yes	None	8000	10.8	9.8	10%	Yes	1/3/2007
Sharp	AF-S85FX	No	Yes	None	8000	10.8	9.8	10%	Yes	2/1/2005
Sharp	AF-S85MX	No	Yes	None	8000	10.8	9.8	10%	Yes	1/3/2007
Silhouette	DAC8444DE	No	Yes		8000	10.8	9.8	10%	Yes	5/2/2005
Sunbeam	SCA083RAC1	No	No	None	8000	9.4	8.5	11%	Yes	12/21/2006
Sunbeam	SCA083REC1	No	Yes	None	8000	10.8	9.8	10%	Yes	12/21/2006
Sunbeam	SCA083RKC1	No	Yes	Casement Slider	8000	10.5	9.5	11%	Yes	12/21/2006
Turbo Air	TAW-8EL	No	Yes		8000	10.8	9.8	10%	Yes	4/29/2005
Whirlpool	ACQ088MS	No	Yes	None	8000	10.8	9.8	10%	Yes	7/25/2006
Whirlpool	ACQ088XP	No	Yes	None	8000	10.8	9.8	10%	Yes	3/2/2004
Whirlpool	ACS088PR	No	No	Casement Slider	8000	10.5	9.5	11%	Yes	4/28/2005

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Whirlpool	ACU088PP	No	No	None	8000	9.4	8.5	11%	Yes	5/20/2004
Whirlpool	ACU088PR	No	No		8000	9.4	8.5	11%	Yes	4/28/2005
Admiral	AAW-08CR1FHU E	No	Yes	None	8050	10.8	9.8	10%	Yes	11/30/2004
Hampton Bay	HAW-08CR1FDE	No	Yes	None	8050	10.8	9.8	10%	Yes	11/6/2003
Wintair	AW-08CR1FDE	No	Yes	None	8050	10.8	9.8	10%	Yes	11/6/2003
LG Electronics	LB8000ER	No	Yes	None	8200	10.9	9.8	11%	Yes	3/25/2004
LG Electronics	LW080CS	No	Yes	None	8200	10.9	9.8	11%	Yes	3/17/2004
LG Electronics	LW8000ER Y4	No	Yes	None	8200	10.9	9.8	11%	Yes	3/25/2004
Sharp	AF-S80EX	No	Yes	None	8200	10.8	9.8	10%	Yes	3/25/2004
Whirlpool	ACQ088PS	No	Yes	None	8200	10.8	9.8	10%	Yes	7/25/2006
Friedrich	SS08L10*	No	Yes	None	8400	11.4	9.8	16%	Yes	4/18/2005
General Electric	AJHS08AS CM1	Yes	No	None	8400	9.5	8.5	12%	Yes	12/13/2006
Simplicity	SAC8404D E	No	Yes		8400	10.8	9.8	10%	Yes	5/2/2005
General Electric	AJHS08DC CM1	Yes	No	None	8550	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCS09DC A	No	No	None	8900	9.5	8.5	12%	Yes	5/8/2002
General Electric	AJCS09DC B	No	No	None	8900	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCS09DC BM1	No	No	None	8900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCS09DC BM2	No	No	None	8900	9.5	8.5	12%	Yes	10/2/2006
General Electric	AJCS09DC CM2	No	No	None	8900	9.5	8.5	12%	Yes	11/1/2006
Amana	PBH092A12 MA	Yes	No	None	9000	9.4	8.5	11%	Yes	5/11/2006
Amana	PBH093A35 MA	Yes	No	None	9000	9.5	8.5	12%	Yes	5/11/2006
Danby	DAC9006D E	No	Yes	None	9000	10.8	9.8	10%	Yes	4/26/2006
Frigidaire	FAH096M2 T	No	No	None	9000	9.4	8.5	11%	Yes	3/12/2003
Friedrich	SS09L10*	No	Yes	None	9100	11.5	9.8	17%	Yes	4/18/2005
Friedrich	YS09L10	Yes	Yes	None	9200	12.0	9	33%	Yes	5/2/2006
Amana	AH093A35 MA	Yes	Yes	None	9300	10.0	9	11%	Yes	5/11/2006
Amana	PBC092A00 MA	No	No	None	9300	9.5	8.5	12%	Yes	5/11/2006
Amana	PBC093A00 MA	No	No	None	9300	9.5	8.5	12%	Yes	5/11/2006
Crosley	CAR10XSR	No	Yes		9800	10.8	9.8	10%	Yes	4/28/2005
General Electric	AJHS10DC BM1	Yes	No	None	9800	9.5	8.5	12%	Yes	1/12/2006
General Electric	AJHS10DC BM1	Yes	No	None	9800	9.5	8.5	12%	Yes	10/4/2006
Panasonic	CW- XC100HU	No	Yes	None	9800	10.8	9.8	10%	Yes	3/25/2004
Panasonic	CW- XC103HU	No	Yes	None	9800	10.8	9.8	10%	Yes	3/5/2003
Panasonic	CW- XC104HU	No	Yes	None	9800	10.8	9.8	10%	Yes	3/25/2004
Panasonic	CW- XC105HU	No	Yes	None	9800	10.8	9.8	10%	Yes	3/11/2005
Whirlpool	ACQ108MR	No	Yes		9800	10.8	9.8	10%	Yes	4/28/2005
General Electric	AJCH10AC B	No	No	None	9900	9.5	8.5	12%	Yes	2/23/2004

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
General Electric	AJCH10AC BM1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCH10AC BW1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCH10DC B	No	No	None	9900	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCH10DC BM1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCH10DC BW1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCQ10AC B	No	No	None	9900	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCQ10AC BM1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCQ10AC CM1	No	No	None	9900	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCQ10DC B	No	No	None	9900	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCQ10DC BM1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCQ10DC CM1	No	No	None	9900	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCS10AC B	No	No	None	9900	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCS10AC BM1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCS10AC BW1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCS10DC B	No	No	None	9900	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCS10DC BM1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCS10DC BW1	No	No	None	9900	9.5	8.5	12%	Yes	11/1/2006
Airtemp	B7Y10F2A	No	Yes	None	10000	10.8	9.8	10%	Yes	3/27/2003
Amana	AC103E	No	Yes	None	10000	10.8	9.8	10%	Yes	5/3/2004
Amana	ACD105E	No	Yes	None	10000	10.8	9.8	10%	Yes	10/21/2004
Carrier	52FC010-1	No	No		10000	9.4	8.5	11%	Yes	3/12/2003
Climette	CA1016TC R	No	No	None	10000	9.4	8.5	11%	Yes	7/1/2004
Climette	CH1026TC R	No	No	None	10000	9.4	8.5	11%	Yes	7/1/2004
Comfort Aire	BD-101-A	No	No		10000	9.4	8.5	11%	Yes	6/1/2005
Comfort Aire	BDE-103-A	No	No		10000	9.4	8.5	11%	Yes	6/1/2005
Comfort Aire	BGE-103A	No	No	None	10000	9.4	8.5	11%	Yes	6/11/2007
Comfort Aire	RADS-101	No	Yes	None	10000	10.8	9.8	10%	Yes	11/5/2002
Comfort Aire	RADS-101A	No	Yes	None	10000	10.8	9.8	10%	Yes	6/11/2007
Danby	DAC10034T TW	No	No		10000	9.4	8.5	11%	Yes	5/2/2005
Danby	DAC10035T W	No	No		10000	9.4	8.5	11%	Yes	5/2/2005
Danby	DAC10066D E	No	Yes	None	10000	10.8	9.8	10%	Yes	4/26/2006
Fedders	A7U10W2A	No	No	None	10000	9.4	8.5	11%	Yes	6/30/2004
Fedders	A7U10W7A	No	No	None	10000	9.4	8.5	11%	Yes	6/30/2004
Fedders	A7Y10F2A	No	Yes	None	10000	10.8	9.8	10%	Yes	3/27/2003
Fedders	A7Y10F2B	No	Yes		10000	10.8	9.8	10%	Yes	6/16/2005
Fedders	AE7U10W7 E	No	No	None	10000	9.4	8.5	11%	Yes	6/30/2004
Friedrich	CP10A10	No	Yes		10000	10.8	9.8	10%	Yes	6/20/2005
Friedrich	CP10A10*	No	Yes	None	10000	10.8	9.8	10%	Yes	4/18/2005
Friedrich	CP10C10	No	Yes	None	10000	10.8	9.8	10%	Yes	5/2/2006

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Friedrich	KS10L10*	No	Yes	None	10000	11.5	9.8	17%	Yes	4/18/2005
Friedrich	UE10A33B	No	No		10000	9.4	8.5	11%	Yes	6/22/2005
Friedrich	US10A10A	No	No	None	10000	9.5	8.5	12%	Yes	4/28/2004
Friedrich	US10A30A	No	No	None	10000	9.5	8.5	12%	Yes	4/28/2004
Friedrich	US10B10	No	No		10000	9.5	8.5	12%	Yes	12/23/2003
Friedrich	US10B10A	No	No		10000	9.4	8.5	11%	Yes	6/22/2005
Friedrich	US10B10A*	No	No	None	10000	9.4	8.5	11%	Yes	4/18/2005
Friedrich	US10B30	No	No		10000	9.5	8.5	12%	Yes	12/23/2003
Friedrich	US10B30A	No	No		10000	9.4	8.5	11%	Yes	6/22/2005
Friedrich	WS10B10	No	No		10000	10.5	8.5	24%	Yes	12/23/2003
Friedrich	WS10B10A*	No	No	None	10000	10.5	8.5	24%	Yes	4/18/2005
Friedrich	WS10B30	No	No		10000	10.0	8.5	18%	Yes	12/23/2003
Friedrich	WS10B30A*	No	No	None	10000	10.0	8.5	18%	Yes	4/18/2005
Frigidaire	FAC105P1A	No	Yes	None	10000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAC106N1A	No	Yes	None	10000	10.8	9.8	10%	Yes	3/24/2004
Frigidaire	FAC106P1A	No	Yes	None	10000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAC107P1A	No	Yes	None	10000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAC107S1A	No	Yes	None	10000	10.8	9.8	10%	Yes	9/19/2007
Frigidaire	FAH105N1T	No	No	None	10000	9.4	8.5	11%	Yes	1/15/2004
Frigidaire	FAH105N2T	No	No	None	10000	9.4	8.5	11%	Yes	1/15/2004
Frigidaire	FAH105P1T	No	No	None	10000	9.4	8.5	11%	Yes	12/28/2004
Frigidaire	FAH105P2T	No	No	None	10000	9.4	8.5	11%	Yes	12/28/2004
Frigidaire	FAH106N1T	No	No	None	10000	9.4	8.5	11%	Yes	12/8/2005
Frigidaire	FAH106N2T	No	No	None	10000	9.4	8.5	11%	Yes	12/8/2005
Frigidaire	FAH106R1T	No	No	None	10000	9.4	8.5	11%	Yes	9/25/2006
Frigidaire	FAH106R2T	No	No	None	10000	9.4	8.5	11%	Yes	9/25/2006
Frigidaire	FAH106S1T	No	No	None	10000	9.4	8.5	11%	Yes	9/19/2007
Frigidaire	FAH106S2T	No	No	None	10000	9.4	8.5	11%	Yes	9/19/2007
General Electric	AGF10AB	No	Yes		10000	10.9	9.8	11%	Yes	2/6/2004
General Electric	AGM10AHG 1	No	Yes		10000	10.8	9.8	10%	Yes	6/1/2005
General Electric	AGM10AJ	No	Yes		10000	10.8	9.8	10%	Yes	5/31/2006
General Electric	AGM10AJG 1	No	Yes	None	10000	10.8	9.8	10%	Yes	6/16/2006
General Electric	AJHS10DC CM1	Yes	No	None	10000	9.5	8.5	12%	Yes	12/13/2006
Haier	ESA310	No	Yes	None	10000	10.8	9.8	10%	Yes	11/14/2002
Haier	ESA3105	No	Yes	None	10000	10.8	9.8	10%	Yes	10/21/2004
Kenmore	74106	No	Yes	None	10000	10.8	9.8	10%	Yes	3/12/2003
Kenmore	74107	No	Yes	None	10000	10.8	9.8	10%	Yes	4/28/2004
Kenmore	75101	No	Yes		10000	10.8	9.8	10%	Yes	6/1/2005
LG Electronics	LA1000PR	No	Yes	None	10000	10.8	9.8	10%	Yes	6/21/2004
LG Electronics	LB1000ER	No	Yes	None	10000	11.0	9.8	12%	Yes	3/25/2004
LG Electronics	LT1030CR*	No	No		10000	9.4	8.5	11%	Yes	5/25/2005

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
LG Electronics	LT1030CRY7	No	No	None	10000	9.4	8.5	11%	Yes	6/11/2007
LG Electronics	LT1030HRY7	No	No	None	10000	9.4	8.5	11%	Yes	6/11/2007
LG Electronics	LT1030HY5	No	No		10000	9.4	8.5	11%	Yes	5/25/2005
LG Electronics	LW1004ER	No	Yes	None	10000	11.0	9.8	12%	Yes	3/25/2004
LG Electronics	LW100CS	No	Yes	None	10000	11.0	9.8	12%	Yes	3/25/2004
Maytag	M7U10W2A	No	No	None	10000	9.4	8.5	11%	Yes	7/1/2004
Maytag	M7U10W7A	No	No	None	10000	9.4	8.5	11%	Yes	7/1/2004
Maytag	M7Y10F2A	No	Yes	None	10000	10.8	9.8	10%	Yes	3/27/2003
Maytag	M7Y10F2B	No	Yes		10000	10.8	9.8	10%	Yes	6/16/2005
Maytag	ME7U10W7E	No	No	None	10000	9.4	8.5	11%	Yes	7/1/2004
Midea	KC30	No	Yes	None	10000	10.8	9.8	10%	Yes	3/21/2006
Midea	KC30/Y	No	Yes	None	10000	10.8	9.8	10%	Yes	3/21/2006
Midea	KC30C	No	No		10000	9.4	8.5	11%	Yes	3/23/2006
Midea	KCD30C	Yes	No		10000	9.4	8.5	11%	Yes	3/23/2006
Midea	MWF-10C*	No	Yes	None	10000	10.8	9.8	10%	Yes	3/21/2006
Midea	MWW-10CR	No	No		10000	9.4	8.5	11%	Yes	3/23/2006
Midea	MWW-10ER	Yes	No		10000	9.4	8.5	11%	Yes	3/23/2006
Polar Wind	MWF-10CR	No	Yes	None	10000	10.8	9.8	10%	Yes	12/13/2006
Sharp	AF-S100DX	No	Yes	None	10000	11.0	9.8	12%	Yes	4/7/2003
Sharp	AF-S100FX	No	Yes	None	10000	10.8	9.8	10%	Yes	2/1/2005
Sharp	AF-S100MX	No	Yes	None	10000	10.8	9.8	10%	Yes	1/3/2007
Sunbeam	SCA103RAC1	No	No	None	10000	9.4	8.5	11%	Yes	12/21/2006
Sunbeam	SCA103RAC2	No	No	None	10000	9.4	8.5	11%	Yes	12/21/2006
Sunbeam	SCA103REC1	No	Yes	None	10000	10.8	9.8	10%	Yes	12/21/2006
Whirlpool	ACC108PS	No	Yes	None	10000	10.8	9.8	10%	Yes	6/20/2006
Whirlpool	ACC108PT	No	Yes	None	10000	10.8	9.8	10%	Yes	5/9/2007
Whirlpool	ACC108XR	No	Yes		10000	10.8	9.8	10%	Yes	4/28/2005
Whirlpool	ACS102PR	No	No		10000	9.5	8.5	12%	Yes	4/28/2005
Whirlpool	ACU108PP	No	No	None	10000	9.4	8.5	11%	Yes	5/20/2004
Whirlpool	ACU108PR	No	No		10000	9.4	8.5	11%	Yes	4/28/2005
Whirlpool	ACU109PP	No	No	None	10000	9.4	8.5	11%	Yes	5/20/2004
Whirlpool	ACU109PR	No	No		10000	9.4	8.5	11%	Yes	4/28/2005
Friedrich	WY10B33A	Yes	No	None	10100	10.0	8.5	18%	Yes	5/2/2006
General Electric	AJCH10ACCM2	No	No	None	10150	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCH10DCBW2	No	No	None	10150	9.5	8.5	12%	Yes	10/2/2006
General Electric	AJCH10DCCM2	No	No	None	10150	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCH10DCCW2	No	No	None	10150	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCS10ACCM2	No	No	None	10150	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCS10DCBW2	No	No	None	10150	9.5	8.5	12%	Yes	10/2/2006
General Electric	AJCS10DCCM2	No	No	None	10150	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCS10DCCW2	No	No	None	10150	9.5	8.5	12%	Yes	11/1/2006

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Arctic Air	AAC10044D E	No	Yes		10200	10.8	9.8	10%	Yes	5/2/2005
Friedrich	RS10L10	No	Yes	None	10200	11.7	9.8	19%	Yes	4/18/2005
Samsung	AW1093L	No	Yes	None	10200	10.8	9.8	10%	Yes	3/25/2004
Samsung	AW1093M	No	Yes	None	10200	10.8	9.8	10%	Yes	3/25/2004
Samsung	AW109CB	Yes	Yes		10200	10.8	9	20%	Yes	12/28/2005
Sharp	AF-S100EX	No	Yes	None	10200	10.8	9.8	10%	Yes	3/25/2004
Silhouette	DAC10544D E	No	Yes		10200	10.8	9.8	10%	Yes	5/2/2005
Friedrich	SS10L10*	No	Yes	None	10400	12.0	9.8	22%	Yes	4/18/2005
Comfort Aire	BD-101	No	No		10500	9.5	8.5	12%	Yes	6/7/2005
Danby	DAC10560D E	No	Yes	None	10500	10.8	9.8	10%	Yes	4/26/2006
General Electric	ASM10AKS 1	No	Yes	None	10500	10.8	9.8	10%	Yes	1/5/2007
LG Electronics	LT1030C	No	No	None	10500	9.5	8.5	12%	Yes	3/25/2004
Samsung	AW10ECB7	No	Yes	None	10500	10.8	9.8	10%	Yes	3/29/2007
Simplicity	SAC10544D E	No	Yes		10500	10.8	9.8	10%	Yes	5/2/2005
General Electric	ASM10AC	No	Yes	None	10800	10.8	9.8	10%	Yes	2/21/2003
Carrier	ACA121T	No	Yes	None	11500	10.8	9.8	10%	Yes	11/4/2002
Fedders	A7U12W2A	No	No	None	11500	9.4	8.5	11%	Yes	6/30/2004
Fedders	A7U12W7A	No	No	None	11500	9.4	8.5	11%	Yes	6/30/2004
Frigidaire	FAL125M1A	No	Yes	None	11500	10.8	9.8	10%	Yes	3/12/2003
Maytag	M7U12W2A	No	No	None	11500	9.4	8.5	11%	Yes	7/1/2004
Maytag	M7U12W7A	No	No	None	11500	9.4	8.5	11%	Yes	7/1/2004
Sharp	AF-S120DX	No	Yes	None	11500	10.8	9.8	10%	Yes	4/7/2003
Amana	PBC122A00 MA	No	No	None	11600	9.4	8.5	11%	Yes	5/11/2006
Amana	PBC123A00 MA	No	No	None	11600	9.4	8.5	11%	Yes	5/11/2006
Friedrich	KS12L10*	No	Yes	None	11600	11.0	9.8	12%	Yes	4/18/2005
General Electric	AJCH12DC B	No	No	None	11600	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCH12DC BM1	No	No	None	11600	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCH12DC BM2	No	No	None	11600	9.5	8.5	12%	Yes	10/2/2006
General Electric	AJCH12DC CM2	No	No	None	11600	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCQ12DC B	No	No	None	11600	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCQ12DC BM1	No	No	None	11600	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCQ12DC CM1	No	No	None	11600	9.5	8.5	12%	Yes	12/13/2006
General Electric	AJCS12DC B	No	No	None	11600	9.5	8.5	12%	Yes	2/23/2004
General Electric	AJCS12DC BM1	No	No	None	11600	9.5	8.5	12%	Yes	11/1/2006
General Electric	AJCS12DC BM2	No	No	None	11600	9.5	8.5	12%	Yes	10/2/2006
General Electric	AJCS12DC CM2	No	No	None	11600	9.5	8.5	12%	Yes	11/1/2006
Whirlpool	ACE119PR	No	No		11600	9.4	8.5	11%	Yes	4/28/2005
Whirlpool	ACQ128XS	No	Yes	None	11600	10.8	9.8	10%	Yes	5/10/2006
Whirlpool	ACQL128X S	No	Yes	None	11600	10.8	9.8	10%	Yes	5/10/2006

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Whirlpool	ACU129PR	No	No		11600	9.4	8.5	11%	Yes	4/28/2005
Comfort Aire	BD-123-A	No	No		11700	9.4	8.5	11%	Yes	6/1/2005
Comfort Aire	BDE-123-A	No	No		11700	9.4	8.5	11%	Yes	6/1/2005
Friedrich	UE12A33B	No	No		11700	9.4	8.5	11%	Yes	6/22/2005
Friedrich	US12A10A	No	No	None	11700	9.5	8.5	12%	Yes	4/28/2004
Friedrich	US12A30A	No	No	None	11700	9.5	8.5	12%	Yes	4/28/2004
Friedrich	US12B10	No	No		11700	9.5	8.5	12%	Yes	12/23/2003
Friedrich	US12B10A	No	No		11700	9.4	8.5	11%	Yes	6/22/2005
Friedrich	US12B10A*	No	No	None	11700	9.4	8.5	11%	Yes	4/18/2005
Friedrich	US12B30	No	No		11700	9.5	8.5	12%	Yes	12/23/2003
Friedrich	US12B30A	No	No		11700	9.4	8.5	11%	Yes	6/22/2005
Friedrich	US12B30A*	No	No	None	11700	9.4	8.5	11%	Yes	4/18/2005
Kenmore	72127	No	No		11700	9.5	8.5	12%	Yes	6/20/2005
Kenmore	74124	No	No	None	11700	9.4	8.5	11%	Yes	4/12/2004
Kenmore	74130*	No	No	None	11700	9.5	8.5	12%	Yes	4/6/2005
Kenmore	75119	No	No		11700	9.4	8.5	11%	Yes	7/14/2005
Kenmore	75130	No	No		11700	9.4	8.5	11%	Yes	7/14/2005
LG Electronics	LT1210CR	No	No		11700	9.4	8.5	11%	Yes	5/25/2005
LG Electronics	LT1230CR	No	No		11700	9.4	8.5	11%	Yes	5/25/2005
LG Electronics	LT1230H	No	No		11700	9.4	8.5	11%	Yes	5/25/2005
LG Electronics	LT1230HY5	No	No		11700	9.4	8.5	11%	Yes	5/25/2005
Friedrich	CP12C10	No	Yes	None	11800	10.8	9.8	10%	Yes	5/2/2006
Friedrich	RS12L10	No	Yes	None	11800	11.8	9.8	20%	Yes	4/18/2005
Friedrich	SS12L10*	No	Yes	None	11800	11.8	9.8	20%	Yes	4/18/2005
Panasonic	CW-XC118HU	No	Yes	None	11800	10.8	9.8	10%	Yes	3/5/2003
Airtemp	B7Y12F2A	No	Yes	None	12000	10.8	9.8	10%	Yes	3/27/2003
Amana	AC123E	No	Yes	None	12000	10.8	9.8	10%	Yes	4/28/2004
Amana	ACD125E	No	Yes	None	12000	10.8	9.8	10%	Yes	10/21/2004
Comfort Aire	RADS-121	No	Yes	None	12000	10.8	9.8	10%	Yes	11/5/2002
Danby	DAC12060D E	No	Yes	None	12000	10.8	9.8	10%	Yes	4/26/2006
Danby	DAC12666D E	No	Yes	None	12000	10.8	9.8	10%	Yes	4/26/2006
Fedders	A7Y12F2A	No	Yes	None	12000	10.8	9.8	10%	Yes	3/27/2003
Fedders	A7Y12F2B	No	Yes		12000	10.8	9.8	10%	Yes	6/16/2005
Fedders	A7Y12F7A	No	Yes	None	12000	10.8	9.8	10%	Yes	6/30/2004
Fedders	AE7U12W7 E	No	No	None	12000	9.4	8.5	11%	Yes	7/15/2004
Friedrich	CP12A10*	No	Yes	None	12000	10.8	9.8	10%	Yes	4/18/2005
Frigidaire	FAC125P1A	No	Yes	None	12000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAC126N1A	No	Yes	None	12000	10.8	9.8	10%	Yes	3/24/2004
Frigidaire	FAC126P1A	No	Yes	None	12000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAC127P1A	No	Yes	None	12000	10.8	9.8	10%	Yes	12/28/2004
Frigidaire	FAC127S1A	No	Yes	None	12000	10.8	9.8	10%	Yes	9/19/2007
Frigidaire	FAH125P2T	No	No	None	12000	9.4	8.5	11%	Yes	12/28/2004
General Electric	AGF12AB	No	Yes		12000	10.8	9.8	10%	Yes	2/6/2004
General Electric	AGM12AHG 1	No	Yes		12000	10.8	9.8	10%	Yes	6/1/2005
General Electric	AGM12AJ	No	Yes		12000	10.8	9.8	10%	Yes	6/1/2006

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
General Electric	AGM12AJG 1	No	Yes	None	12000	10.8	9.8	10%	Yes	6/16/2006
Gibson	GAC125P1 A	No	Yes	None	12000	10.8	9.8	10%	Yes	12/28/2004
Haier	ESA312	No	Yes	None	12000	10.8	9.8	10%	Yes	11/14/2002
Haier	ESA3125	No	Yes	None	12000	10.8	9.8	10%	Yes	10/21/2004
Impco	IAC1220R	No	Yes	None	12000	10.8	9.8	10%	Yes	7/1/2004
Maytag	M7Y12F2A	No	Yes	None	12000	10.8	9.8	10%	Yes	3/27/2003
Maytag	M7Y12F2B	No	Yes		12000	10.8	9.8	10%	Yes	6/16/2005
Maytag	ME7U12W7 E	No	No	None	12000	9.4	8.5	11%	Yes	7/15/2004
Midea	KC35Y	No	Yes	None	12000	10.8	9.8	10%	Yes	3/21/2006
Midea	KC35C	No	No		12000	9.4	8.5	11%	Yes	3/23/2006
Midea	KCD35C	Yes	No		12000	9.4	8.5	11%	Yes	3/23/2006
Midea	MWF-12C*	No	Yes	None	12000	10.8	9.8	10%	Yes	3/21/2006
Midea	MWW-12CR	No	No		12000	9.4	8.5	11%	Yes	3/23/2006
Midea	MWW-12ER	Yes	No		12000	9.4	8.5	11%	Yes	3/23/2006
Panasonic	CW- XC120HU	No	Yes	None	12000	10.8	9.8	10%	Yes	3/25/2004
Panasonic	CW- XC123HU	No	Yes	None	12000	10.8	9.8	10%	Yes	3/5/2003
Panasonic	CW- XC124HU	No	Yes	None	12000	10.8	9.8	10%	Yes	3/25/2004
Panasonic	CW- XC125HU	No	Yes	None	12000	10.8	9.8	10%	Yes	3/11/2005
Polar Wind	MWF-12CR	No	Yes	None	12000	10.8	9.8	10%	Yes	12/13/2006
Sharp	AF-S120FX	No	Yes	None	12000	10.8	9.8	10%	Yes	2/1/2005
Sharp	AF-S120MX	No	Yes	None	12000	10.8	9.8	10%	Yes	1/3/2007
Sharp	AF-S125FX	No	Yes	None	12000	10.8	9.8	10%	Yes	2/1/2005
Sharp	AF-S125MX	No	Yes	None	12000	10.8	9.8	10%	Yes	1/3/2007
Sunbeam	SCA123RE C1	No	Yes	None	12000	10.8	9.8	10%	Yes	12/21/2006
Westpointe	MWF-12CR	No	Yes	None	12000	10.8	9.8	10%	Yes	12/13/2006
Whirlpool	ACQ128PT	No	Yes	None	12000	10.8	9.8	10%	Yes	5/9/2007
Whirlpool	ACS124PR	No	No		12000	9.5	8.5	12%	Yes	4/28/2005
Friedrich	SS12L30*	No	Yes	None	12100	11.5	9.8	17%	Yes	4/18/2005
Sharp	AF-S120EX	No	Yes	None	12200	10.8	9.8	10%	Yes	3/25/2004
Sharp	AF-S125EX	No	Yes	None	12200	10.8	9.8	10%	Yes	4/29/2004
General Electric	ASM12AKS 1	No	Yes	None	12300	10.8	9.8	10%	Yes	1/11/2007
General Electric	ASM24DKS 1	No	Yes	None	12300	10.8	9.8	10%	Yes	1/11/2007
Kenmore	75121	No	Yes		12300	10.8	9.8	10%	Yes	6/7/2005
Kenmore	76129	No	Yes	None	12300	10.8	9.8	10%	Yes	1/17/2002
LG Electronics	LB1200ER	No	Yes	None	12300	10.8	9.8	10%	Yes	3/25/2004
LG Electronics	LT1230C	No	No	None	12300	9.5	8.5	12%	Yes	3/25/2004
LG Electronics	LW1204ER	No	Yes	None	12300	10.8	9.8	10%	Yes	3/25/2004
Samsung	AW129CB	Yes	Yes		12300	10.8	9	20%	Yes	12/28/2005
Samsung	AW12ECB7	No	Yes	None	12300	10.8	9.8	10%	Yes	3/29/2007
Kenmore	73125	No	Yes	None	12500	10.8	9.8	10%	Yes	3/12/2003
Arctic Air	AAC12344D E	No	Yes		12600	10.8	9.8	10%	Yes	5/2/2005

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Danby	DAC12344D E	No	Yes		12600	10.8	9.8	10%	Yes	5/2/2005
General Electric	ASM12AC	No	Yes	None	12600	10.8	9.8	10%	Yes	2/21/2003
Samsung	AW1293L	No	Yes	None	12600	10.8	9.8	10%	Yes	3/25/2004
Samsung	AW1293M	No	Yes	None	12600	10.8	9.8	10%	Yes	3/25/2004
Silhouette	DAC12544D E	No	Yes		12600	10.8	9.8	10%	Yes	5/2/2005
Friedrich	WS13B30	No	No		13200	9.5	8.5	12%	Yes	12/23/2003
Friedrich	WS13B30A*	No	No	None	13200	9.5	8.5	12%	Yes	4/18/2005
Friedrich	WS14B10	No	No		13500	9.5	8.5	12%	Yes	12/23/2003
Friedrich	WS14B10A*	No	No	None	13500	9.5	8.5	12%	Yes	4/18/2005
General Electric	AGF14AB	No	Yes		13800	10.8	9.8	10%	Yes	2/6/2004
General Electric	AGM14AHG 1	No	Yes		13800	10.8	9.8	10%	Yes	6/1/2005
General Electric	AGM14AJ	No	Yes		13800	10.8	9.8	10%	Yes	6/1/2006
General Electric	AGM14AJG 1	No	Yes	None	13800	10.8	9.8	10%	Yes	6/16/2006
Goldstar	M1404ER	No	Yes	None	13800	10.8	9.8	10%	Yes	3/25/2004
Panasonic	CW- XC143HU	No	Yes	None	13800	10.8	9.8	10%	Yes	3/5/2003
Panasonic	CW- XC144HU	No	Yes	None	13800	10.8	9.8	10%	Yes	3/25/2004
Panasonic	CW- XC145HK	No	Yes		13800	10.8	9.8	10%	Yes	6/20/2005
Panasonic	CW- XC145HU	No	Yes	None	13800	10.8	9.8	10%	Yes	3/11/2005
Friedrich	SS14L10*	No	Yes	None	14000	10.7	9.7	10%	Yes	4/18/2005
General Electric	ASM14AKS 1	No	Yes	None	14300	10.7	9.7	10%	Yes	1/5/2007
Samsung	AW149CB	Yes	Yes		14300	10.8	9	20%	Yes	12/28/2005
Admiral	AAW- 15CR1FHU E	No	Yes	None	14500	10.7	9.7	10%	Yes	11/30/2004
Airtemp	B7Y15F2A	No	Yes	None	14500	10.7	9.7	10%	Yes	3/27/2003
Amana	ACD155E	No	Yes	None	14500	10.7	9.7	10%	Yes	10/21/2004
Comfort Aire	RADS-151	No	Yes	None	14500	10.7	9.7	10%	Yes	11/5/2002
Fedders	A7Y15F2B	No	Yes		14500	10.7	9.7	10%	Yes	6/16/2005
Friedrich	KS15L10*	No	Yes	None	14500	10.8	9.7	11%	Yes	4/18/2005
Friedrich	RS15L10	No	Yes	None	14500	10.8	9.7	11%	Yes	4/18/2005
HEC	CE15DC5	No	Yes	None	14500	10.7	9.7	10%	Yes	10/21/2004
Haier	ESA3155	No	Yes	None	14500	10.7	9.7	10%	Yes	10/21/2004
Hampton Bay	HAW- 15CR1FDE	No	Yes	None	14500	10.8	9.7	11%	Yes	11/6/2003
Hampton Bay	HBLG1453 E	No	Yes	None	14500	10.8	9.7	11%	Yes	2/19/2003
LG Electronics	LW1400ER	No	Yes	None	14500	10.8	9.7	11%	Yes	3/25/2004
LG Electronics	LWHD1450 ER	No	Yes		14500	10.7	9.7	10%	Yes	6/7/2005
Maytag	M7Y15F2A	No	Yes	None	14500	10.7	9.7	10%	Yes	3/27/2003
Maytag	M7Y15F2B	No	Yes		14500	10.7	9.7	10%	Yes	6/16/2005
Wintair	AW- 15CR1FDE	No	Yes	None	14500	10.7	9.7	10%	Yes	11/6/2003
Samsung	AW15ECB7	No	Yes	None	14700	10.7	9.7	10%	Yes	3/29/2007
Whirlpool	ACQ158PT	No	Yes	None	14700	10.7	9.7	10%	Yes	5/9/2007
Whirlpool	ACQ158XS	No	Yes	None	14700	10.7	9.7	10%	Yes	5/10/2006
Whirlpool	ACQL158X S	No	Yes	None	14700	10.7	9.7	10%	Yes	5/10/2006
Amana	ACE156E	No	Yes	None	15000	10.7	9.7	10%	Yes	1/3/2006
Haier	ESA3156	No	Yes	None	15000	10.7	9.7	10%	Yes	1/3/2006

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Kenmore	75151	No	Yes		15000	10.8	9.7	11%	Yes	6/20/2005
LG Electronics	LWHD1500ER	No	Yes		15000	10.8	9.7	11%	Yes	5/25/2005
Midea	KC45/Y	No	Yes	None	15000	10.7	9.7	10%	Yes	3/21/2006
Midea	MWF-15C*	No	Yes	None	15000	10.7	9.7	10%	Yes	3/21/2006
Westpointe	MWF-15CR	No	Yes	None	15000	10.7	9.7	10%	Yes	12/13/2006
Whirlpool	ACQ158XL	No	Yes	None	15000	10.7	9.7	10%	Yes	1/25/2002
Frigidaire	FAM155R1A	No	Yes	None	15100	10.7	9.7	10%	Yes	9/19/2007
Frigidaire	FAM156R1A	No	Yes	None	15100	10.7	9.7	10%	Yes	9/25/2006
Frigidaire	FAM157Q1A	No	Yes	None	15100	10.7	9.7	10%	Yes	12/8/2005
Frigidaire	FAM157R1A	No	Yes	None	15100	10.7	9.7	10%	Yes	9/25/2006
Frigidaire	FAM157S1A	No	Yes	None	15100	10.7	9.7	10%	Yes	9/19/2007
Frigidaire	FAS155P1A	No	Yes	None	15100	10.7	9.7	10%	Yes	12/28/2004
Frigidaire	FAS156N1A	No	Yes	None	15100	10.7	9.7	10%	Yes	3/24/2004
Frigidaire	FAS156P1A	No	Yes	None	15100	10.7	9.7	10%	Yes	12/28/2004
Frigidaire	FAS157P1A	No	Yes	None	15100	10.7	9.7	10%	Yes	12/28/2004
Gibson	GAM155Q1A	No	Yes	None	15100	10.7	9.7	10%	Yes	1/9/2007
Kenmore	72156	No	Yes	None	15100	10.7	9.7	10%	Yes	1/17/2002
Kenmore	73156	No	Yes	None	15100	10.7	9.7	10%	Yes	3/12/2003
Kenmore	74156	No	Yes	None	15100	11.0	9.7	13%	Yes	4/29/2004
Sharp	AF-S155MX	No	Yes	None	15100	10.7	9.7	10%	Yes	1/3/2007
Sunbeam	SCA153REC1	No	Yes	None	15100	10.7	9.7	10%	Yes	12/21/2006
White-Westinghouse	WAS155M1A	No	Yes	None	15100	10.7	9.7	10%	Yes	3/12/2003
Amana	ACEX186E	No	Yes	None	17000	10.7	9.7	10%	Yes	1/3/2006
Comfort Aire	RADS-181A	No	Yes	None	17000	10.7	9.7	10%	Yes	1/3/2007
Haier	ESAX3186	No	Yes	None	17000	10.7	9.7	10%	Yes	1/3/2006
Climette	CA1816AR	No	Yes	None	17300	11.0	9.7	13%	Yes	7/1/2004
Comfort Aire	RADS-181	No	Yes	None	17300	11.0	9.7	13%	Yes	11/5/2002
Fedders	A7D18E2B	No	Yes		17300	10.7	9.7	10%	Yes	6/16/2005
General Electric	AGM18DHG1	No	Yes		17300	10.7	9.7	10%	Yes	6/1/2005
Maytag	M7D18E2A	No	Yes	None	17300	11.0	9.7	13%	Yes	7/1/2004
Maytag	M7D18E2B	No	Yes		17300	10.7	9.7	10%	Yes	6/16/2005
Airtemp	B7D18E7A	No	Yes	None	17500	10.7	9.7	10%	Yes	3/27/2003
Fedders	A7D18E7B	No	Yes	None	17500	10.7	9.7	10%	Yes	6/30/2004
Fedders	A7D18E7C	No	Yes		17500	10.7	9.7	10%	Yes	6/16/2005
Friedrich	SM18L30A	No	Yes	None	17500	10.8	9.7	11%	Yes	5/2/2006
Kenmore	73189	No	Yes	None	17500	10.8	9.7	11%	Yes	3/19/2003
LG Electronics	LW1800ERZ3	No	Yes	None	17500	10.8	9.7	11%	Yes	3/17/2004
LG Electronics	LW1800PRZ3	No	Yes	None	17500	10.8	9.7	11%	Yes	3/17/2004
LG Electronics	LW1804ER	No	Yes	None	17500	10.8	9.7	11%	Yes	3/25/2004
Maytag	M7D18E7C	No	Yes		17500	10.7	9.7	10%	Yes	6/16/2005
General Electric	ASM18DKS1	No	Yes	None	17600	10.7	9.7	10%	Yes	1/5/2007
Samsung	AW189CB	Yes	Yes	None	17600	10.7	9	19%	Yes	12/28/2005
Friedrich	SM18L30*	No	Yes	None	17800	11.0	9.7	13%	Yes	4/18/2005

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
General Electric	AGF18DB	No	Yes		17800	10.7	9.7	10%	Yes	2/6/2004
General Electric	AGM18DJ	No	Yes		17800	10.7	9.7	10%	Yes	6/1/2006
General Electric	AGM18DJG1	No	Yes	None	17800	10.7	9.7	10%	Yes	6/16/2006
Haier	ESA318	No	Yes	None	17800	10.7	9.7	10%	Yes	11/14/2002
Panasonic	CW-XC183HU	No	Yes	None	17800	10.7	9.7	10%	Yes	3/5/2003
Panasonic	CW-XC184HU	No	Yes	None	17800	10.7	9.7	10%	Yes	3/25/2004
Panasonic	CW-XC185HK	No	Yes	None	17800	10.7	9.7	10%	Yes	6/1/2005
Panasonic	CW-XC185HU	No	Yes	None	17800	10.7	9.7	10%	Yes	3/11/2005
Whirlpool	ACQ189XS	No	Yes	None	17800	10.7	9.7	10%	Yes	5/10/2006
Whirlpool	ACQL189XS	No	Yes	None	17800	10.7	9.7	10%	Yes	5/10/2006
Amana	AC183E	No	Yes	None	18000	10.7	9.7	10%	Yes	5/3/2004
Amana	ACE185E	No	Yes	None	18000	10.7	9.7	10%	Yes	10/21/2004
Frigidaire	FAS185N2A	No	Yes	None	18000	10.7	9.7	10%	Yes	3/24/2004
General Electric	AEM18DKG1	No	Yes	None	18000	10.7	9.7	10%	Yes	3/12/2007
Haier	ESA3185	No	Yes	None	18000	10.7	9.7	10%	Yes	10/21/2004
Samsung	AW18ECB7	No	Yes	None	18000	10.7	9.7	10%	Yes	3/29/2007
Westpointe	MWF-18CR	No	Yes	None	18000	10.7	9.7	10%	Yes	12/13/2006
Samsung	AW1893L	No	Yes	None	18100	10.7	9.7	10%	Yes	3/25/2004
Whirlpool	ACQ189PT	No	Yes	None	18400	10.7	9.7	10%	Yes	5/9/2007
Frigidaire	FAM186R2A	No	Yes	None	18500	10.7	9.7	10%	Yes	9/25/2006
Frigidaire	FAM187Q2A	No	Yes	None	18500	10.7	9.7	10%	Yes	12/8/2005
Frigidaire	FAM187R2A	No	Yes	None	18500	10.7	9.7	10%	Yes	9/25/2006
Frigidaire	FAM187S2A	No	Yes	None	18500	10.7	9.7	10%	Yes	9/19/2007
Frigidaire	FAS185P2A	No	Yes	None	18500	10.7	9.7	10%	Yes	12/28/2004
Frigidaire	FAS186N2A	No	Yes	None	18500	10.7	9.7	10%	Yes	3/24/2004
Frigidaire	FAS186P2A	No	Yes	None	18500	10.7	9.7	10%	Yes	12/28/2004
Frigidaire	FAS187P2A	No	Yes	None	18500	10.7	9.7	10%	Yes	12/28/2004
Gibson	GAM185Q2A	No	Yes	None	18500	10.7	9.7	10%	Yes	1/9/2007
Kenmore	73185	No	Yes	None	18500	10.7	9.7	10%	Yes	3/12/2003
Sunbeam	SCA183REC2	No	Yes	None	18500	10.7	9.7	10%	Yes	12/21/2006
Crosley	CAR21CSR	No	Yes		20500	9.4	8.5	11%	Yes	4/28/2005
Whirlpool	ACQ219XR	No	Yes		20500	9.4	8.5	11%	Yes	4/28/2005
Friedrich	KM21L30*	No	Yes	None	20600	9.9	8.5	16%	Yes	4/18/2005
Friedrich	SM21L30*	No	Yes	None	20600	9.9	8.5	16%	Yes	4/18/2005
Carrier	KCA223P	No	Yes	None	21800	9.4	8.5	11%	Yes	7/26/2007
Frigidaire	FAS225P2A	No	Yes	None	22000	9.4	8.5	11%	Yes	12/28/2004
Frigidaire	FAS226N2A	No	Yes	None	22000	9.4	8.5	11%	Yes	3/24/2004
Frigidaire	FAS226P2A	No	Yes	None	22000	9.4	8.5	11%	Yes	2/1/2005
Frigidaire	FAS226R2A	No	Yes	None	22000	9.4	8.5	11%	Yes	9/25/2006
Kenmore	73229	No	Yes	None	22000	9.4	8.5	11%	Yes	3/12/2003

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Goldstar	M2404ER	No	Yes	None	23000	9.4	8.5	11%	Yes	3/25/2004
General Electric	AGM24DH M1	No	Yes		23150	9.4	8.5	11%	Yes	6/1/2005
Friedrich	KM24L30*	No	Yes	None	23500	9.5	8.5	12%	Yes	4/18/2005
Friedrich	RM24L30	No	Yes	None	23500	9.5	8.5	12%	Yes	4/18/2005
Friedrich	SM24L30	No	Yes	None	23500	9.5	8.5	12%	Yes	5/2/2006
Panasonic	CW- XC243HU	No	Yes	None	23500	9.4	8.5	11%	Yes	3/5/2003
Panasonic	CW- XC244HU	No	Yes	None	23500	9.4	8.5	11%	Yes	3/25/2004
General Electric	AGM24DJ	No	Yes		23600	9.4	8.5	11%	Yes	6/1/2006
General Electric	AGM24DJM 1	No	Yes		23600	9.4	8.5	11%	Yes	5/19/2006
Admiral	AAW- 24CR3FHU E	No	Yes	None	24000	9.4	8.5	11%	Yes	11/30/2004
Airtemp	B7D24E7B	No	Yes	None	24000	9.4	8.5	11%	Yes	7/1/2004
Amana	AC243E	No	Yes	None	24000	9.4	8.5	11%	Yes	5/3/2004
Fedders	A7D24E7A	No	Yes	None	24000	9.4	8.5	11%	Yes	3/27/2003
Fedders	A7D24E7B	No	Yes	None	24000	9.4	8.5	11%	Yes	6/30/2004
Fedders	A7D24E7C	No	Yes		24000	9.4	8.5	11%	Yes	6/16/2005
Friedrich	YL24L35	Yes	Yes	None	24000	10.0	8.5	18%	Yes	5/2/2006
General Electric	ASF24DB	No	Yes		24000	9.4	8.5	11%	Yes	3/4/2004
General Electric	ASM24DE	No	Yes		24000	9.4	8.5	11%	Yes	3/4/2004
HEC	CE224EC5	No	Yes	None	24000	9.4	8.5	11%	Yes	10/21/2004
Haier	ACE245E	No	Yes	None	24000	9.4	8.5	11%	Yes	10/21/2004
Haier	ESA3245	No	Yes	None	24000	9.4	8.5	11%	Yes	10/21/2004
Haier	ESA3247	No	Yes	None	24000	9.4	8.5	11%	Yes	1/3/2007
Hampton Bay	HAW- 24CR3FDE	No	Yes	None	24000	9.4	8.5	11%	Yes	11/6/2003
Impco	IAC2420R	No	Yes	None	24000	9.4	8.5	11%	Yes	7/1/2004
Maytag	M7D24E7B	No	Yes	None	24000	9.4	8.5	11%	Yes	7/1/2004
Maytag	M7D24E7C	No	Yes		24000	9.4	8.5	11%	Yes	6/16/2005
Samsung	AW2492L	No	Yes	None	24000	9.4	8.5	11%	Yes	3/25/2004
Samsung	AW25ECB7	No	Yes	None	24000	9.4	8.5	11%	Yes	3/29/2007
Trane	WAEC2401 NAR	No	Yes	None	24000	9.4	8.5	11%	Yes	7/1/2004
Whirlpool	ACQ249PS	No	Yes	None	24000	9.4	8.5	11%	Yes	7/25/2006
Wintair	AW- 24CR3FDE	No	Yes	None	24000	9.4	8.5	11%	Yes	11/30/2004
Haier	ESA324	No	Yes	None	24400	9.5	8.5	12%	Yes	11/14/2002
Hampton Bay	HBLG2504 E	No	Yes	None	24500	9.4	8.5	11%	Yes	1/8/2004
LG Electronics	LWHD2500 ERY7	No	Yes	None	24500	9.4	8.5	11%	Yes	6/11/2007
Friedrich	SL25L30	No	Yes	None	24600	9.7	8.5	14%	Yes	4/18/2005
General Electric	AEM25DKH 1	No	Yes	None	24900	9.4	8.5	11%	Yes	3/12/2007
Arctic King	MWF-25CR	No	Yes	None	25000	9.4	8.5	11%	Yes	12/13/2006
Frigidaire	FAS255P2A	No	Yes	None	25000	9.4	8.5	11%	Yes	12/28/2004
Frigidaire	FAS256N2A	No	Yes	None	25000	9.4	8.5	11%	Yes	3/24/2004
Frigidaire	FAS256P2A	No	Yes	None	25000	9.4	8.5	11%	Yes	2/1/2005
Frigidaire	FAS256R2A	No	Yes	None	25000	9.4	8.5	11%	Yes	9/25/2006
Frigidaire	FAS257Q2 A	No	Yes	None	25000	9.4	8.5	11%	Yes	12/8/2005
Frigidaire	FAS257R2A	No	Yes	None	25000	9.4	8.5	11%	Yes	9/25/2006

Brand	Model	Reverse Cycle?	Louvered Sides	Casement	Capacity (BTU/hr)	Energy Efficiency Ratio (EER)	Federal Standard (EER)	Percent Better	Active	Active Date
Frigidaire	FAS257S2A	No	Yes	None	25000	9.4	8.5	11%	Yes	9/19/2007
Gibson	GAS256Q2 A	No	Yes	None	25000	9.4	8.5	11%	Yes	1/9/2007
LG Electronics	LWHD2500 ER	No	Yes		25000	9.4	8.5	11%	Yes	5/25/2005
Midea	KC73/Y	No	Yes	None	25000	9.4	8.5	11%	Yes	3/21/2006
Midea	KCD73/Y	Yes	Yes	None	25000	9.4	8.5	11%	Yes	3/21/2006
Midea	MWF-25C*	No	Yes	None	25000	9.4	8.5	11%	Yes	3/21/2006
Midea	MWF-25E*	Yes	Yes	None	25000	9.4	8.5	11%	Yes	3/21/2006
Sunbeam	SCA253RE C2	No	Yes	None	25000	9.4	8.5	11%	Yes	12/21/2006
Westpointe	MWF-25CR	No	Yes	None	25000	9.4	8.5	11%	Yes	12/13/2006
Haier	ESA325	No	Yes	None	25500	9.5	8.5	12%	Yes	7/21/2003
Friedrich	SL28L30*	No	Yes	None	28000	9.5	8.5	12%	Yes	4/18/2005

FES-H2B CI Heat Pump Water Heaters

Assumptions:
HPWH COP: 3.5
Electric Water Heater: COP: 0.98
Water heating capacity 20% oversized

EXISTING

	Example	500 gal/day	1000 gal/day	1500 gal/day	Totals
Hot Water Used (Gallons per Day):	1,440	500	1,000	1,500	3,000
Days of Operation Per Year:	200	360	360	360	
Temperature of Hot Water (F):	120	125	125	125	
Temperature of Cold Water Supply (F):	50	55	55	55	
Efficiency or EF of existing or standard unit:	90%	98%	98%	98%	
	31267				
Average Existing kWh/yr Use	54,474	31,267	62,534	93,801	187,602
Average kWh Rate	\$0.065	\$0.100	\$0.100	\$0.100	
Annual Energy Cost	\$3,541	\$3,127	\$6,253	\$9,380	\$18,760

*Elec WH have typical COP's between 0.85-0.95
*HPWH have COP's between 3.0 and 4.0
10.236
13.648
11.942 3.0708
1.674761347 6.51296079

PROPOSED

Total Btu per year	106714271	213428542	320142813	
COP of Proposed ASHPWH	80%	3.5	3.5	3.5
Average Proposed kWh/yr	2,092	8,968	17,935	26,903
Average kWh Rate	\$0.710	\$0.100	\$0.100	\$0.100
Annual Energy Cost	\$1,485	\$897	\$1,794	\$2,690
	\$5,381			

SAVINGS

kWh/yr	54,474	22,299	44,599	66,898	133,796
kW/yr		6.0	12.1	18.1	
Annual Cost Savings	\$2,055	\$1,115	\$2,230	\$3,345	\$6,690

Sizing of Storage Tank

Required Heat Pump Capacity (Btu/h)		20,825	41,650	62,475	\$124,950
Required Recovery Rate (GPH)		35.7	71.4	107.1	\$214
Storage Tank Volume needed		60.0	120.0	180.0	18.6
		71	143	214	
		62.5	125	187.5	
AVERAGE TANK SIZE Requirement (GAL)		65	129	194	
Requirements:	<80 Gal	80<x<150	150<x<250	just a suggestion....	

in many applications ASHP's will be placed outside; & require entering air temp of 50°F or higher

FES-G1 Multiplex Compressors

Assumptions:

- System Capacity: 40 Tons with full load (peak) kW per ton at 105°F saturated condensing temp of 2.3 kW/ton.
- Existing system is single compressors. Average kW/ton of 1.98 assumed.
- Proposed system has floating head, subcooling with multiple compressors to better match load. Assumed average kW/ton is 1.83. Improved peak kW/ton is 2.0.
- Average annual loads based on output data from computer modeling of similar compressors.
- The hours of 8760 are used due to use of average kW/tons to determine kWh. Peak kW/ton is used to determined impact on demand.

EXISTING

Tons Capacity	Test
Average Annual Load	40
Average kW/Ton	82%
Peak kW/ton	1.98
Hours	2.30
	8,760
kW	92.000
kWh/Yr Use	568,909

PROPOSED

Tons Capacity	40
Average Annual Load	78%
Ave kW/ton	1.83
Peak kW/ton	2.00
Hours	8760
kW	80.000
kWh/Yr Use	500,161

SAVINGS

kW	12.0000
kWh/Yr Use	68,748
kWh/Yr/Ton	1,719
kW/yr/ton	0.30
Project cost Estimate per Ton	\$80

FES-G3 Efficient Condensers

Assumptions:

- System capacity: 40 tons with full load kW/ton of 2.3 at 105°F saturated condensing temp.
- From a computer model completed by an outside engineering firm, a system without efficient (oversized) condensers (10°F condenser approach) operating based on 82F ambient had an ave. load of 82% and ave. kW/ton of 1.92 and a similar system operating based on 70F ambient had an ave. load of 79% and ave. kW/ton of 1.85.
- From the same computer model, a system with efficient (oversized) condensers (7°F condenser approach) operating based on 82F ambient had an ave. load of 83% and ave. kW/ton of 1.86 and a similar system operating based on 70F ambient had an ave. load of 80% and ave. kW/ton of 1.78. Peak kW/ton of the proposed in the model was 2.18 kW/ton.
- Due to savings for this measure occurring only in the warmer months,4380 hours was used (1/2 a year).

EXISTING

Tons Capacity	82 Cond	70 Cond
Average Annual Load	40	40
Average kW/Ton	82%	79%
peak kW/ton	1.92	1.85
Hours	2.30	2.30
	4,380	4,380
kW	92.000	92.000
kWh/Yr Use	274,489	255,731

PROPOSED

Lighting Type	40	40
Average Annual Load	83%	80%
Ave kW/ton	1.86	1.78
peak kW/ton	2.18	2.18
Equiv Full Load Hours	4380	4380
kW	87.200	87.200
kWh/Yr Use	271,126	249,485

SAVINGS

kW	4.8000	4.8000
kWh/Yr Use	3,364	6,246
kWh/Yr/Ton	84	156
kW/yr/ton	0.12	0.12
Project cost Estimate per Ton	\$35	\$35

FES-G5 Head Pressure Control

The installation of Head Pressure Control on a refrigeration system.

Assumptions:

- System Capacity: 40 Tons with full load kW per ton at 105°F Saturated Condensing temp of 2.3 kW/ton
- From a computer model completed by an outside engineering firm, a system without head pressure control down to 82F ambient had an average load of 82% in a year with an average kW/ton performance of 1.92.
- From a computer model completed by an outside engineering firm, a system with head pressure control down to 60F ambient had an average load of 78% with an average kW/ton performance of 1.83.

EXISTING

Tons Capacity	Test
Average Annual Load	40
kW/Ton	82%
Hours	1.92
	8,760
kW	0.000
kWh/Yr Use	551,670

PROPOSED

Tons Capacity	40
Average Annual Load	78%
Ave kW/ton	1.83
Equiv Full Load Hours	8760
kW	0.000
kWh/Yr Use	500,161

SAVINGS

kW	0.0000
kWh/Yr Use	51,509
kWh/Yr/Ton	1,288
kW/yr/ton	0.00
Project cost Estimate per Ton	\$80

FES-G6 Refrigerators Freezers

The savings of a ENERGY STAR Commercial Refrigerator and Freezer unit is evaluated.

Assumptions:

- Sizes Used for each range of unit is the average size of all units qualifying for ENERGY STAR in the size range.
- The energy per day for the existing unit is based on the equation 0.125*Volume+2.76 for refrigerators and 0.398*Volume+2.28 for freezers. (per Food Service Technology Center - pre-1996 standard)
- The energy per day for ENERGY STAR units is based on the qualifying specification 0.1*Volume+2.04 for refrigerators and 0.4*Volume+1.38 for freezers.
- The demand is assumed to be the average demand. (per Food Service Technology Center)

EXISTING

Internal Volume
Number of Fixtures
Energy Per Day
Days per Year

Refrigerator <20 ft³	Refrigerator 20-48 ft³	Refrigerator >48 ft³	Freezer <20 ft³	Freezer 20-48 ft³	Freezer >48 ft³
12	30	62	12	30	63
1	1	1	1	1	1
4.26	6.51	10.51	7.06	14.22	27.35
365	365	365	365	365	365

kW
kWh/Yr Use

0.178	0.271	0.438	0.294	0.593	1.140
1,555	2,376	3,836	2,575	5,190	9,984

PROPOSED

Internal Volume
Number of Fixtures
Energy per Day
Days per Year

12	30	62	12	30	63
1	1	1	1	1	1
3.24	5.04	8.24	6.18	13.38	26.58
365	365	365	365	365	365

kW
kWh/Yr Use

0.135	0.210	0.343	0.258	0.558	1.108
1,183	1,840	3,008	2,256	4,884	9,702

SAVINGS

kW
kWh/Yr Use
kW using FSTC Life Cycle Calculator
kWh/Yr using FSTC Life Cycle Calculator

0.043	0.061	0.095	0.036	0.035	0.032
372	537	829	320	307	283
0.042	0.062	0.095	0.037	0.035	0.032
371	544	832	320	307	282

Project cost Estimate

\$250	\$500	\$900	\$150	\$400	\$700
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FES-C1 Energy Star Commercial Clothes Washers

Assumptions:

DOE Standard 2007	1.26 MEF (requirement)
Energy Star 2007	1.72 MEF (requirement)
	950 cycles/year; Multihousing Laundry Assn (cited by Energy Star)
	3.0 cycles/day for Multifamily applications; cited by CEE
	6.0 cycles/day for Laundry Applications; cited by CEE
	4.5 cycles/day; weighted average
	0.114 kWh; machine energy per cycle, Energy Star 2007 (DOE 2006)
	0.133 kWh; machine energy per cycle, DOE Standard 2007 (DOE 2006)
	0.409 kWh; electric water heating energy per cycle, Energy Star 2007 (DOE 2006)
	0.790 kWh; electric water heating energy per cycle, DOE Standard 2007 (DOE 2006)
	0.400 kWh; energy savings per cycle
	\$750.00 average retail price for DOE Standard clothes washer, DOE 2006
	\$1,077.31 average retail price for Energy Star qualified clothes washer, DOE 2006
	\$327.31 incremental cost difference to purchase Energy Star qualified clothes washer

Average Number of Washer Cycles per year:

950 cycles X

0.400 kWh savings/cycle =

380 kWh saved per year

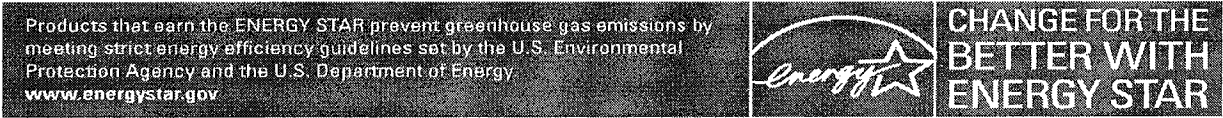
0.019 kW; peak summer demand savings

Annual Cost Savings:

380 kWh/yr X

\$/kWh =

\$0.00 per year savings



Life Cycle Cost Estimate for
1 ENERGY STAR Qualified Commercial Clothes Washer(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Choose the type of washing machine

Commercial

Number of units

1

Electric Rate (\$/kWh)

\$0.091

Water Rate (\$/1000 gallons)

\$4.158

Gas Rate (\$/therms)

\$1.068

Average Number of Loads per Week

18.3

Type of Water Heating

Electric Water Heating

ENERGY STAR Qualified Unit

Conventional Unit

Initial Cost per Unit (estimated retail price)

\$500

\$350

Annual and Life Cycle Costs and Savings for 1 Commercial Clothes Washer(s)

	1 ENERGY STAR Qualified Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Operating Costs*			
Electricity costs	43.54	51.50	7.96
Electricity consumption (kWh)	477.42	564.67	87.24
Water costs	57.92	128.39	70.47
Gas costs	0.00	0.00	0.00
Maintenance costs	0.00	0.00	0.00
Total	\$101	\$180	\$78
Life Cycle Costs*			
Operating costs (electricity, water, and maintenance)	888.86	1575.89	687.03
Electricity costs	381.44	451.14	69.70
Water costs	507.42	1124.74	617.32
Gas costs	0.00	0.00	0.00
Maintenance costs	0.00	0.00	0.00
Purchase price for 1 unit(s)	500.00	350.00	-150.00
Total	1388.86	1925.89	537.03
Simple payback of initial additional cost (years)†			1.9

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

Summary of Benefits for 1 Commercial Clothes Washer(s)

Initial cost difference	-\$150.00
Life cycle savings	\$687.03
Net life cycle savings (life cycle savings - additional cost)	\$537.03
Simple payback of additional cost (years)	1.91
Life cycle electricity saved (kWh)	959.69
Life cycle air pollution reduction (lbs of CO ₂)	1473.13
Air pollution reduction equivalence (number of cars removed from the road for a year)	0.13
Air pollution reduction equivalence (acres of forest)	0.18
Savings as a percent of retail price	107%

Assumptions for Clothes Washers		
Category	Value	Data Source
Power & Water		
ENERGY STAR Qualified Unit		
Initial Cost Per Unit	\$500	Industry Data 2007
Lifetime	11 years	Industry Data (D&R)
Annual Water Consumption	13930.102 gal/yr	DOE 2007
<i>Water Consumption (gal/Load) per unit</i>	14.66 (gal/Load)/unit	Calculated
<i>Electricity Consumption (kWh/Load) per unit</i>	0.503 (kWh/Load)/unit	Calculated
<i>Gas Consumption (therms/Load) per unit</i>	0.02 (therms/Load)/unit	Calculated
Electric Water Heating		
Reference Case Annual Electricity use	477.42347 kWh/yr	EPA 2006 / Calculated
Electricity use per load	0.50 kWh/load	Calculated
Gas Water Heating		
Reference Annual Electricity use	104.20918 kWh/yr	DOE 2007 / Calculated
Electricity use per load	0.11 kWh/load	Calculated
Reference Annual Gas Use	16.964286 Therm/yr	EPA 2006
Gas consumption per load	0.02 Therms/load	Calculated
Conventional Unit (New Unit)		
Initial Cost Per Unit	\$350	Industry Data 2007
Lifetime	11 years	Industry Data (D&R)
Annual Water Consumption	30877.423 gal/yr	DOE 2007
<i>Water Consumption per unit</i>	32.50 gal/Load	Calculated
<i>Electricity Consumption per unit</i>	0.594 kWh/Load	Calculated
<i>Gas Consumption per unit</i>	0.02 Therms/Load	Calculated
Electric Water Heating		
Reference Annual Electricity use	564.66837 kWh/yr	EPA 2006 / Calculated
Electricity use per load	0.59 kWh/load	Calculated
Gas Water Heating		
Reference Annual Electricity use	126.02041 kWh/yr	DOE 2007 / Calculated
Electricity use per load	0.13 kWh/load	Calculated
Reference Annual gas use	19.872449 Therm/yr	EPA 2006
Gas consumption per load	0.02 Therms/load	Calculated
Maintenance		
Labor cost (per hour)	\$20	EPA 2004
Labor time (hours)	0	EPA 2004
Usage (Reference Case)		
Residential and Commercial Clothes Washers		
Average number of loads per year (Res)	392 loads/year	DOE 2007
Average number of loads per year (Commercial)	950 loads/year	DOE 2007
Number of loads per week (Residential)	7.5 loads/week	Calculated
Number of loads per week (Commercial)	18.3 loads/week	Calculated
Discount Rate		
Commercial and Residential Discount Rate (real)	4%	A real discount rate of 4 percent is assumed, which is roughly equivalent to the nominal discount rate of 7 percent (4 percent real discount rate + 3 percent inflation rate).
Energy and Water Prices		
Commercial Electricity Price	\$0.091 \$/kWh	EIA 2006
Residential Electricity Price	\$0.101 \$/kWh	EIA 2006
Water Rate per 1000 Gallons	\$4.16 \$/1000 gal	DOE 2004
Commercial Gas Price	\$1.07 \$/Therm	EIA 2006
Residential Gas Price	\$1.25 \$/Therm	EIA 2006
Carbon Dioxide Emissions Factors		
Electricity Carbon Emission Factor	1.535 lbs CO ₂ /kWh	EPA 2006
Gas Emission Factor	116.3 lbs CO ₂ /MMBtu	EPA 2006
CO₂ Equivalents		
Annual CO ₂ sequestration per forested acre	8,066 lbs CO ₂ /year	EPA 2004
Annual CO ₂ emissions for "average" passenger car	11,470 lbs CO ₂ /year	EPA 2004

Calculator last updated: 07/07
Constants updated 05/07

FES-C2 Plug Load Occupancy Sensors For Document Stations

Assumptions:

Laser Printers	Continuous Use	130 to 550 watts	
	Idle Use	10 to 125 watts	Avg. Est. = 50 watts
Copiers	Continuous Use	400 to 1100 watts	
	Idle Use	20 to 300 watts	Avg. Est. = 120 watts
Fax, stamp machine, scanner etc.	Idle Use or Energy Saver Mode		Avg. Est. = 50 watts

Savings per document station

$$\frac{(50 + 120 + 50) \times 10 \text{ hours/day} \times 365 \text{ days/year} \times .25}{1000 \text{ watts/kWh}} = 803 \text{ kWh}$$

Summer Peak Demand Savings: Studied for a 15 minute increment

0.22 kW	X	0.25 hr	=	0.055 kWh
0.22 kW	X	0.1875 hr	=	0.04125 kWh
				<u>0.01375 kWh savings</u>

$$0.01375 \text{ kWh} / 0.25 \text{ hr} = 0.055 \text{ kW saved during 15 min increment}$$

nts