

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

15.9 Integrated Drives

Algorithms

$$Customer\ kWh = HP \times LF_{Motors} \times Conversion \times Hours \times Refrigeration_Factor \times \left(\frac{1 + \% Savings\ Drives}{Baseline_{Eff}} - \frac{1}{Proposed_{Eff}} \right)$$

$$Customer\ Coincident\ kW = HP \times LF_{Motors} \times Conversion \times CF \times Refrigeration_Factor \times \left(\frac{1 + \% Savings\ Drives}{Baseline_{Eff}} - \frac{1}{Proposed_{Eff}} \right)$$

Variables

Hours	Table 15.1 and Table 15.3	Annual operational hours per year of the motor. Deemed values are used for hours based on the type and use of the motor. The customer provides the following information on the rebate form: HP, industrial/non-industrial, building type, and compressor/pump/fan/other. ¹
LF_Motors	Table 15.2	Motor load factor as a percentage. ²
Refrigeration Factor	Table 15.3	Coefficient of Performance = Refrigeration/Cooling Capacity (BTU/hr) / Energy Input (BTU/hr)
CF	Table 15.5	Coincidence factor
Incremental Cost	Table 15.7	Incremental cost for integrated drives based on type ³
Baseline_Eff	Table 15.8	Efficiency of NEMA premium efficient motor as a percentage. Value is a weighted average by HP based on customer past selections.
Proposed_Eff	Table 15.8	Peak Efficiency of the Motor and Drive combo. This is deemed for Switched Reluctance Motors, and provided by the customers for EC motors
% Savings Drives	33%	Average savings achieved by installing a VFD on a fan or pumping motor. ²
Measure life	15	Years ¹
Conversion	0.746	Conversion from horsepower to kW.

Customer Inputs

M&V Verified

HP	Yes	Rated motor horsepower.
Proposed Eff	Yes	Peak efficiency of Motor and Drive Combo
Facility Type	Yes	
Application	Yes	
Motor Type	No	Switched reluctance motor with controller or EC motor with integrated drive

Assumptions:

- Each integrated motors and drives is replaced with the same size on a 1 for 1 basis.
- Prescriptive rebates are only given for integrated motors and drives put into service, rebates are not given for backup integrated motors and drives.
- Prescriptive rebates are only given to integrated motors and drive's installed on centrifugal pump and fan applications.

References:

1. Efficiency Vermont's Technical Reference User Manual, 2004 - Source for operating hours for non-industrial motors (p.15) and source for measure life, source for load factor
2. Office of Industrial Electric Motor Systems Market Opportunities Assessment : Department of Energy (assessment of 265 Industrial facilities in 1997) - Source for VSD opportunity in the US market along with load factors for fans and pumps along with average savings
3. Costs are derived from customer invoices received through Xcel Energy's prescriptive program.

Changes from Recent Filing:

New Measure

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Table 15.1: Operating Hours by Motor Size, Industrial Applications³

HP	Fans	Pumps	Data Center	Case Fans	Air Compressor	Other
1	4550	3380	8760	8629	1257	2435
1.5	4550	3380	8760	8629	1257	2435
2	4550	3380	8760	8629	1257	2435
3	4550	3380	8760	8629	1257	2435
5	4550	3380	8760	8629	1257	2435
7.5	4316	4121	8760	8629	2131	2939
10	4316	4121	8760	8629	2131	2939
15	4316	4121	8760	8629	2131	2939
20	4316	4121	8760	8629	2131	2939
25	5101	4889	8760	8629	3528	3488
30	5101	4889	8760	8629	3528	3488
40	5101	4889	8760	8629	3528	3488
50	5101	4889	8760	8629	3528	3488
60	6151	5667	8760	8629	4520	5079
75	6151	5667	8760	8629	4520	5079
100	6151	5667	8760	8629	4520	5079
125	5964	5126	8760	8629	4685	5137
150	5964	5126	8760	8629	4685	5137
200	5964	5126	8760	8629	4685	5137
250	7044	5968	8760	8629	6148	6102
300	7044	5968	8760	8629	6148	6102
350	7044	5968	8760	8629	6148	6102
400	7044	5968	8760	8629	6148	6102
450	7044	5968	8760	8629	6148	6102
500	7044	5968	8760	8629	6148	6102

#/NA

Table 15.2 Load Factors^{3,4,5}

Application	Load Factor
Other	75%
Pump	75%
ECM Fan	90%
Fan	65%

Table 15.3: Operating Hours by Application for all products other than motor controllers, Non-Industrial⁴

Building Type	Pumps	Fans	Data Center	Case Fans	Air Compressor	Other
Office	2000	6192	8760	8629	4500	4500
Retail	2000	3261	8760	8629	4500	4500
Hospitals	2754	8374	8760	8629	4500	4500
Elementary/Secondary Schools	2190	3699	8760	8629	4500	4500
Restaurant	2000	4155	8760	8629	4500	4500
Warehouse	2241	6389	8760	8629	4500	4500
Hotels/Motels	4231	3719	8760	8629	4500	4500
Grocery	2080	6389	8760	8629	4500	4500
Health	2559	2000	8760	8629	4500	4500
College/University	3641	3631	8760	8629	4500	4500
Data Center	2241	6389	8760	8629	4500	4500

Table 15.4 COPs for different systems

Application	COP
Low Temperature	1.43
Medium Temperature	2.28
HVAC	3.00
Data Center	4.00

Table 15.5 Coincidence Factors^{1,2,4}

Application	CF
Motors	78%
Well Pumps	38%
Pumps	78%
Fans	78%
Display Case Refrigeration Fans	99%
Walk-in Refrigeration Fans	98%

Table 15.6 Efficiencies by Motor Types

Motor Tag	HP	Speed	Type	EPACT Motor Efficiency	NEMA Premium Motor Efficiency	NEMA Premium +1% Motor Efficiency	NEMA Premium Cost	NEMA +1% Cost
1 HP 900 RPM ODP	1	900	ODP	74.0%	75.5%	76.5%	\$ 683.54	\$ 817.66
1.5 HP 900 RPM ODP	1.5	900	ODP	75.5%	77.0%	78.0%	\$ 718.34	\$ 866.89
2 HP 900 RPM ODP	2	900	ODP	85.5%	86.5%	87.5%	\$ 726.88	\$ 878.97
3 HP 900 RPM ODP	3	900	ODP	86.5%	87.5%	88.5%	\$ 759.91	\$ 925.69
5 HP 900 RPM ODP	5	900	ODP	87.5%	88.5%	89.5%	\$ 802.06	\$ 985.31
7.5 HP 900 RPM ODP	7.5	900	ODP	88.5%	89.5%	90.5%	\$ 996.00	\$ 1,259.65

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10 HP 900 RPM ODP	10	900	ODP	89.5%	90.2%	91.2%	\$ 1,117.02	\$ 1,430.85
15 HP 900 RPM ODP	15	900	ODP	89.5%	90.2%	91.2%	\$ 2,144.34	\$ 2,585.56
20 HP 900 RPM ODP	20	900	ODP	90.2%	91.0%	92.0%	\$ 2,369.70	\$ 2,904.34
25 HP 900 RPM ODP	25	900	ODP	90.2%	91.0%	92.0%	\$ 2,675.38	\$ 3,336.74
30 HP 900 RPM ODP	30	900	ODP	91.0%	91.7%	92.7%	\$ 2,921.91	\$ 3,685.47
40 HP 900 RPM ODP	40	900	ODP	91.0%	91.7%	92.7%	\$ 3,403.22	\$ 4,366.31
50 HP 900 RPM ODP	50	900	ODP	91.7%	92.4%	93.4%	\$ 3,728.24	\$ 4,826.07
60 HP 900 RPM ODP	60	900	ODP	92.4%	93.0%	94.0%	\$ 4,731.77	\$ 6,245.61
75 HP 900 RPM ODP	75	900	ODP	93.6%	94.1%	95.1%	\$ 5,507.32	\$ 7,342.66
100 HP 900 RPM ODP	100	900	ODP	93.6%	94.1%	95.1%	\$ 7,154.13	\$ 9,373.68
125 HP 900 RPM ODP	125	900	ODP	93.6%	94.1%	95.1%	\$ 8,514.50	\$ 11,297.99
150 HP 900 RPM ODP	150	900	ODP	93.6%	94.1%	95.1%	\$ 9,729.63	\$ 13,016.85
200 HP 900 RPM ODP	200	900	ODP	93.6%	94.1%	95.1%	\$ 11,653.55	\$ 15,738.32
250 HP 900 RPM ODP	250	900	ODP	94.5%	95.0%	96.0%	\$ 13,935.15	\$ 18,965.76
300 HP 900 RPM ODP	300	900	ODP	94.5%	95.0%	96.0%	\$ 16,722.72	\$ 22,908.92
350 HP 900 RPM ODP	350	900	ODP	94.5%	95.0%	96.0%	\$ 26,199.40	\$ 36,314.14
400 HP 900 RPM ODP	400	900	ODP	94.9%	95.1%	96.1%	\$ 29,656.70	\$ 41,204.66
450 HP 900 RPM ODP	450	900	ODP	95.3%	95.5%	96.5%	\$ 33,407.70	\$ 46,510.64
500 HP 900 RPM ODP	500	900	ODP	95.3%	95.5%	96.5%	\$ 34,526.40	\$ 48,093.09
1 HP 1200 RPM ODP	1	1200	ODP	80.0%	82.5%	83.5%	\$ 683.54	\$ 817.66
1.5 HP 1200 RPM ODP	1.5	1200	ODP	84.0%	86.5%	87.5%	\$ 718.34	\$ 866.89
2 HP 1200 RPM ODP	2	1200	ODP	85.5%	87.5%	88.5%	\$ 726.88	\$ 878.97
3 HP 1200 RPM ODP	3	1200	ODP	86.5%	88.5%	89.5%	\$ 759.91	\$ 925.69
5 HP 1200 RPM ODP	5	1200	ODP	87.5%	89.5%	90.5%	\$ 802.06	\$ 985.31
7.5 HP 1200 RPM ODP	7.5	1200	ODP	88.5%	90.2%	91.2%	\$ 996.00	\$ 1,259.65
10 HP 1200 RPM ODP	10	1200	ODP	90.2%	91.7%	92.7%	\$ 1,117.02	\$ 1,430.85
15 HP 1200 RPM ODP	15	1200	ODP	90.2%	91.7%	92.7%	\$ 2,144.34	\$ 2,585.56
20 HP 1200 RPM ODP	20	1200	ODP	91.0%	92.4%	93.4%	\$ 2,369.70	\$ 2,904.34
25 HP 1200 RPM ODP	25	1200	ODP	91.7%	93.0%	94.0%	\$ 2,675.38	\$ 3,336.74
30 HP 1200 RPM ODP	30	1200	ODP	92.4%	93.6%	94.6%	\$ 2,921.91	\$ 3,685.47
40 HP 1200 RPM ODP	40	1200	ODP	93.0%	94.1%	95.1%	\$ 3,403.22	\$ 4,366.31
50 HP 1200 RPM ODP	50	1200	ODP	93.0%	94.1%	95.1%	\$ 3,728.24	\$ 4,826.07
60 HP 1200 RPM ODP	60	1200	ODP	93.6%	94.5%	95.5%	\$ 4,731.77	\$ 6,245.61
75 HP 1200 RPM ODP	75	1200	ODP	93.6%	94.5%	95.5%	\$ 5,507.32	\$ 7,342.66
100 HP 1200 RPM ODP	100	1200	ODP	94.1%	95.0%	96.0%	\$ 7,154.13	\$ 9,373.68
125 HP 1200 RPM ODP	125	1200	ODP	94.1%	95.0%	96.0%	\$ 8,514.50	\$ 11,297.99
150 HP 1200 RPM ODP	150	1200	ODP	94.5%	95.4%	96.4%	\$ 9,729.63	\$ 13,016.85
200 HP 1200 RPM ODP	200	1200	ODP	94.5%	95.4%	96.4%	\$ 11,653.55	\$ 15,738.32
250 HP 1200 RPM ODP	250	1200	ODP	95.4%	95.8%	96.8%	\$ 13,935.15	\$ 18,965.76
300 HP 1200 RPM ODP	300	1200	ODP	95.4%	95.8%	96.8%	\$ 16,722.72	\$ 22,908.92
350 HP 1200 RPM ODP	350	1200	ODP	95.4%	95.8%	96.8%	\$ 26,199.40	\$ 36,314.14
400 HP 1200 RPM ODP	400	1200	ODP	95.8%	95.9%	96.9%	\$ 29,656.70	\$ 41,204.66
450 HP 1200 RPM ODP	450	1200	ODP	96.2%	96.3%	97.3%	\$ 33,407.70	\$ 46,510.64
500 HP 1200 RPM ODP	500	1200	ODP	96.2%	96.3%	97.3%	\$ 34,526.40	\$ 48,093.09
1 HP 1800 RPM ODP	1	1800	ODP	82.5%	85.5%	86.5%	\$ 683.54	\$ 817.66
1.5 HP 1800 RPM ODP	1.5	1800	ODP	84.0%	86.5%	87.5%	\$ 718.34	\$ 866.89
2 HP 1800 RPM ODP	2	1800	ODP	84.0%	86.5%	87.5%	\$ 726.88	\$ 878.97
3 HP 1800 RPM ODP	3	1800	ODP	86.5%	89.5%	90.5%	\$ 759.91	\$ 925.69
5 HP 1800 RPM ODP	5	1800	ODP	87.5%	89.5%	90.5%	\$ 802.06	\$ 985.31
7.5 HP 1800 RPM ODP	7.5	1800	ODP	88.5%	91.0%	92.0%	\$ 996.00	\$ 1,259.65
10 HP 1800 RPM ODP	10	1800	ODP	89.5%	91.7%	92.7%	\$ 1,117.02	\$ 1,430.85
15 HP 1800 RPM ODP	15	1800	ODP	91.0%	93.0%	94.0%	\$ 2,144.34	\$ 2,585.56
20 HP 1800 RPM ODP	20	1800	ODP	91.0%	93.0%	94.0%	\$ 2,369.70	\$ 2,904.34
25 HP 1800 RPM ODP	25	1800	ODP	91.7%	93.6%	94.6%	\$ 2,675.38	\$ 3,336.74
30 HP 1800 RPM ODP	30	1800	ODP	92.4%	94.1%	95.1%	\$ 2,921.91	\$ 3,685.47
40 HP 1800 RPM ODP	40	1800	ODP	93.0%	94.1%	95.1%	\$ 3,403.22	\$ 4,366.31
50 HP 1800 RPM ODP	50	1800	ODP	93.0%	94.5%	95.5%	\$ 3,728.24	\$ 4,826.07
60 HP 1800 RPM ODP	60	1800	ODP	93.6%	95.0%	96.0%	\$ 4,731.77	\$ 6,245.61
75 HP 1800 RPM ODP	75	1800	ODP	94.1%	95.0%	96.0%	\$ 5,507.32	\$ 7,342.66
100 HP 1800 RPM ODP	100	1800	ODP	94.1%	95.4%	96.4%	\$ 7,154.13	\$ 9,373.68
125 HP 1800 RPM ODP	125	1800	ODP	94.5%	95.4%	96.4%	\$ 8,514.50	\$ 11,297.99
150 HP 1800 RPM ODP	150	1800	ODP	95.0%	95.8%	96.8%	\$ 9,729.63	\$ 13,016.85
200 HP 1800 RPM ODP	200	1800	ODP	95.0%	95.8%	96.8%	\$ 11,653.55	\$ 15,738.32
250 HP 1800 RPM ODP	250	1800	ODP	95.4%	95.8%	96.8%	\$ 13,935.15	\$ 18,965.76
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400 HP 1800 RPM ODP	400	1800	ODP	95.4%	95.8%	96.8%	\$ 29,656.70	\$ 41,204.66
450 HP 1800 RPM ODP	450	1800	ODP	95.8%	96.2%	97.2%	\$ 33,407.70	\$ 46,510.64
500 HP 1800 RPM ODP	500	1800	ODP	95.8%	96.2%	97.2%	\$ 34,526.40	\$ 48,093.09
1 HP 3600 RPM ODP	1	3600	ODP	76.3%	77.0%	78.0%	\$ 683.54	\$ 817.66
1.5 HP 3600 RPM ODP	1.5	3600	ODP	82.5%	84.0%	85.0%	\$ 718.34	\$ 866.89
2 HP 3600 RPM ODP	2	3600	ODP	84.0%	85.5%	86.5%	\$ 726.88	\$ 878.97
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20 HP 1200 RPM TEFC	20	1200	TEFC	90.2%	91.7%	92.7%	\$ 2,369.70	\$ 2,904.34
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40 HP 1200 RPM TEFC	40	1200	TEFC	93.0%	94.1%	95.1%	\$ 3,403.22	\$ 4,366.31
50 HP 1200 RPM TEFC	50	1200	TEFC	93.0%	94.1%	95.1%	\$ 3,728.24	\$ 4,826.07
60 HP 1200 RPM TEFC	60	1200	TEFC	93.6%	94.5%	95.5%	\$ 4,731.77	\$ 6,245.61
75 HP 1200 RPM TEFC	75	1200	TEFC	93.6%	94.5%	95.5%	\$ 5,507.32	\$ 7,342.66
100 HP 1200 RPM TEFC	100	1200	TEFC	94.1%	95.0%	96.0%	\$ 7,154.13	\$ 9,373.68
125 HP 1200 RPM TEFC	125	1200	TEFC	94.1%	95.0%	96.0%	\$ 8,514.50	\$ 11,297.99
150 HP 1200 RPM TEFC	150	1200	TEFC	95.0%	95.8%	96.8%	\$ 9,729.63	\$ 13,016.85
200 HP 1200 RPM TEFC	200	1200	TEFC	95.0%	95.8%	96.8%	\$ 11,653.55	\$ 15,738.32
250 HP 1200 RPM TEFC	250	1200	TEFC	95.0%	95.8%	96.8%	\$ 13,935.15	\$ 18,965.76
300 HP 1200 RPM TEFC	300	1200	TEFC	95.0%	95.8%	96.8%	\$ 16,722.72	\$ 22,908.92
350 HP 1200 RPM TEFC	350	1200	TEFC	95.0%	95.8%	96.8%	\$ 26,199.40	\$ 36,314.14
400 HP 1200 RPM TEFC	400	1200	TEFC	95.0%	95.8%	96.8%	\$ 29,656.70	\$ 41,204.66
450 HP 1200 RPM TEFC	450	1200	TEFC	95.0%	95.8%	96.8%	\$ 33,407.70	\$ 46,510.64
500 HP 1200 RPM TEFC	500	1200	TEFC	95.0%	95.8%	96.8%	\$ 34,526.40	\$ 48,093.09
1 HP 1800 RPM TEFC	1	1800	TEFC	82.5%	85.5%	86.5%	\$ 683.54	\$ 817.66
1.5 HP 1800 RPM TEFC	1.5	1800	TEFC	84.0%	86.5%	87.5%	\$ 718.34	\$ 866.89
2 HP 1800 RPM TEFC	2	1800	TEFC	84.0%	86.5%	87.5%	\$ 726.88	\$ 878.97
3 HP 1800 RPM TEFC	3	1800	TEFC	87.5%	89.5%	90.5%	\$ 759.91	\$ 925.69
5 HP 1800 RPM TEFC	5	1800	TEFC	87.5%	89.5%	90.5%	\$ 802.06	\$ 985.31
7.5 HP 1800 RPM TEFC	7.5	1800	TEFC	89.5%	91.7%	92.7%	\$ 996.00	\$ 1,259.65
10 HP 1800 RPM TEFC	10	1800	TEFC	89.5%	91.7%	92.7%	\$ 1,117.02	\$ 1,430.85
15 HP 1800 RPM TEFC	15	1800	TEFC	91.0%	92.4%	93.4%	\$ 2,144.34	\$ 2,585.56

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

20 HP 1800 RPM TEFC	20	1800	TEFC	91.0%	93.0%	94.0%	\$ 2,369.70	\$ 2,904.34
25 HP 1800 RPM TEFC	25	1800	TEFC	92.4%	93.6%	94.6%	\$ 2,675.38	\$ 3,336.74
30 HP 1800 RPM TEFC	30	1800	TEFC	92.4%	93.6%	94.6%	\$ 2,921.91	\$ 3,685.47
40 HP 1800 RPM TEFC	40	1800	TEFC	93.0%	94.1%	95.1%	\$ 3,403.22	\$ 4,366.31
50 HP 1800 RPM TEFC	50	1800	TEFC	93.0%	94.5%	95.5%	\$ 3,728.24	\$ 4,826.07
60 HP 1800 RPM TEFC	60	1800	TEFC	93.6%	95.0%	96.0%	\$ 4,731.77	\$ 6,245.61
75 HP 1800 RPM TEFC	75	1800	TEFC	94.1%	95.4%	96.4%	\$ 5,507.32	\$ 7,342.66
100 HP 1800 RPM TEFC	100	1800	TEFC	94.5%	95.4%	96.4%	\$ 7,154.13	\$ 9,373.68
125 HP 1800 RPM TEFC	125	1800	TEFC	94.5%	95.4%	96.4%	\$ 8,514.50	\$ 11,297.99
150 HP 1800 RPM TEFC	150	1800	TEFC	95.0%	95.8%	96.8%	\$ 9,729.63	\$ 13,016.85
200 HP 1800 RPM TEFC	200	1800	TEFC	95.0%	96.2%	97.2%	\$ 11,653.55	\$ 15,738.32
250 HP 1800 RPM TEFC	250	1800	TEFC	95.0%	96.2%	97.2%	\$ 13,935.15	\$ 18,965.76
300 HP 1800 RPM TEFC	300	1800	TEFC	95.4%	96.2%	97.2%	\$ 16,722.72	\$ 22,908.92
350 HP 1800 RPM TEFC	350	1800	TEFC	95.4%	96.2%	97.2%	\$ 26,199.40	\$ 36,314.14
400 HP 1800 RPM TEFC	400	1800	TEFC	95.4%	96.2%	97.2%	\$ 29,656.70	\$ 41,204.66
450 HP 1800 RPM TEFC	450	1800	TEFC	95.4%	96.2%	97.2%	\$ 33,407.70	\$ 46,510.64
500 HP 1800 RPM TEFC	500	1800	TEFC	95.8%	96.2%	97.2%	\$ 34,526.40	\$ 48,093.09
1 HP 3600 RPM TEFC	1	3600	TEFC	75.5%	77.0%	78.0%	\$ 683.54	\$ 817.66
1.5 HP 3600 RPM TEFC	1.5	3600	TEFC	82.5%	84.0%	85.0%	\$ 718.34	\$ 866.89
2 HP 3600 RPM TEFC	2	3600	TEFC	84.0%	85.5%	86.5%	\$ 726.88	\$ 878.97
3 HP 3600 RPM TEFC	3	3600	TEFC	85.5%	86.5%	87.5%	\$ 759.91	\$ 925.69
5 HP 3600 RPM TEFC	5	3600	TEFC	87.5%	88.5%	89.5%	\$ 802.06	\$ 985.31
7.5 HP 3600 RPM TEFC	7.5	3600	TEFC	88.5%	89.5%	90.5%	\$ 996.00	\$ 1,259.65
10 HP 3600 RPM TEFC	10	3600	TEFC	89.5%	90.2%	91.2%	\$ 1,117.02	\$ 1,430.85
15 HP 3600 RPM TEFC	15	3600	TEFC	90.2%	91.0%	92.0%	\$ 2,144.34	\$ 2,585.56
20 HP 3600 RPM TEFC	20	3600	TEFC	90.2%	91.0%	92.0%	\$ 2,369.70	\$ 2,904.34
25 HP 3600 RPM TEFC	25	3600	TEFC	91.0%	91.7%	92.7%	\$ 2,675.38	\$ 3,336.74
30 HP 3600 RPM TEFC	30	3600	TEFC	91.0%	91.7%	92.7%	\$ 2,921.91	\$ 3,685.47
40 HP 3600 RPM TEFC	40	3600	TEFC	91.7%	92.4%	93.4%	\$ 3,403.22	\$ 4,366.31
50 HP 3600 RPM TEFC	50	3600	TEFC	92.4%	93.0%	94.0%	\$ 3,728.24	\$ 4,826.07
60 HP 3600 RPM TEFC	60	3600	TEFC	93.0%	93.6%	94.6%	\$ 4,731.77	\$ 6,245.61
75 HP 3600 RPM TEFC	75	3600	TEFC	93.0%	93.6%	94.6%	\$ 5,507.32	\$ 7,342.66
100 HP 3600 RPM TEFC	100	3600	TEFC	93.6%	94.1%	95.1%	\$ 7,154.13	\$ 9,373.68
125 HP 3600 RPM TEFC	125	3600	TEFC	94.5%	95.0%	96.0%	\$ 8,514.50	\$ 11,297.99
150 HP 3600 RPM TEFC	150	3600	TEFC	94.5%	95.0%	96.0%	\$ 9,729.63	\$ 13,016.85
200 HP 3600 RPM TEFC	200	3600	TEFC	95.0%	95.4%	96.4%	\$ 11,653.55	\$ 15,738.32
250 HP 3600 RPM TEFC	250	3600	TEFC	95.4%	95.8%	96.8%	\$ 13,935.15	\$ 18,965.76
300 HP 3600 RPM TEFC	300	3600	TEFC	95.4%	95.8%	96.8%	\$ 16,722.72	\$ 22,908.92
350 HP 3600 RPM TEFC	350	3600	TEFC	95.4%	95.8%	96.8%	\$ 26,199.40	\$ 36,314.14
400 HP 3600 RPM TEFC	400	3600	TEFC	95.4%	95.8%	96.8%	\$ 29,656.70	\$ 41,204.66
450 HP 3600 RPM TEFC	450	3600	TEFC	95.4%	95.8%	96.8%	\$ 33,407.70	\$ 46,510.64
500 HP 3600 RPM TEFC	500	3600	TEFC	95.4%	95.8%	96.8%	\$ 34,526.40	\$ 48,093.09

Table 15.7 Incremental Costs for VFDs (Derived from customer invoices)

HP	VFDs	Switched Reluctance Motor	EC Motor	
	1	\$2,182.10	\$1,034.00	\$2,588.78
	2	\$2,493.50	\$1,073.00	\$2,752.19
	2	\$2,741.03	\$1,132.00	\$2,915.60
	3	\$3,132.19	\$1,282.00	\$3,388.43
	5	\$3,705.41	\$2,271.00	\$3,594.60
	8	\$4,234.18	\$3,030.00	\$4,592.88
	10	\$4,654.52	\$3,500.00	\$5,648.33
	15	\$5,318.74	\$4,619.00	NA
	20	\$5,846.74	\$5,409.00	NA
	25	\$6,292.12	NA	NA
	30	\$6,681.09	NA	NA
	40	\$7,344.33	NA	NA
	50	\$7,903.80	NA	NA
	60	\$8,392.40	NA	NA
	75	\$9,031.71	NA	NA
	100	\$9,928.29	NA	NA
	125	\$10,684.59	NA	NA
	150	\$11,345.11	NA	NA
	200	\$12,471.35	NA	NA

Table 15.8 Average Motor Efficiency (Derived From Past Participation)

HP	EPACT	NEMA	NEMA +1%	Switched Reluctance	
	1	81.4%	84.1%	85.1%	86.7%
	1.5	83.7%	86.1%	87.1%	87.7%
	2	84.1%	86.4%	87.4%	89.6%
	3	86.5%	88.9%	89.9%	91.5%
	5	87.4%	89.2%	90.2%	92.6%
	7.5	88.7%	90.9%	91.9%	93.8%
	10	89.4%	91.4%	92.4%	93.6%
	15	90.8%	92.4%	93.4%	93.6%
	20	90.9%	92.8%	93.8%	94.0%
	25	91.8%	93.3%	94.3%	NA
	30	92.2%	93.5%	94.5%	NA
	40	92.8%	93.8%	94.8%	NA
	50	92.9%	94.3%	95.3%	NA
	60	93.5%	94.6%	95.6%	NA
	75	93.9%	95.0%	96.0%	NA
	100	94.2%	95.2%	96.2%	NA
	125	94.4%	95.3%	96.3%	NA
	150	94.9%	95.6%	96.6%	NA
	200	94.9%	95.8%	96.8%	NA
	250	95.0%	95.8%	96.8%	NA
	300	95.4%	95.8%	96.8%	NA
	350	95.4%	96.0%	97.0%	NA
	400	95.4%	96.2%	97.2%	NA
	450	95.6%	96.2%	97.2%	NA
	500	95.8%	96.2%	97.2%	NA

Table 14.9 VFD Energy Savings Factors ⁶

Application	ESF
Pumps	
Hot Water Pump	0.333
Chiller Water or Condensor Water Pump	0.333
Industrial	0.333
Other	0.333