APPENDIX 10-B. NATIONAL IMPACT ANALYSIS SENSITIVITY ANALYSIS FOR ALTERNATIVE PRODUCT PRICE TREND SCENARIOS

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10-B.1 INTRODUCTION

The U.S. Department of Energy (DOE) used a constant price assumption for the default forecast in the National Impact Analysis (NIA) described in Chapter 10. In order to investigate the impact of different equipment price forecasts (or product price forecasts) on the consumer net present value (NPV) for the considered candidate standard levels (CSLs) for electric motors, DOE also considered two alternative price trends for a sensitivity analysis. This appendix describes the alternative price trends and compares NPV results for these scenarios with the default forecast.

10-B.2 ALTERNATIVE MOTOR PRICE TREND SCENARIOS

DOE considered two alternative price trends for a sensitivity analysis. One of these used an exponential fit on the deflated Producer Price Index (PPI) for electric motors, and the other is based on the "chained price index—industrial equipment" that was forecasted for EIA's *Annual Energy Outlook 2011* (*AEO2011)*.

10-B.2.1 Exponential Fit Approach (High Price Scenario)

For this scenario, DOE used an inflation-adjusted integral horsepower motor and generator manufacturing Producer Price Index (PPI) from 1969-2011 to fit an exponential model with *year* as the explanatory variable. DOE obtained historical PPI data for integral horsepower motors and generators manufacturing spanning the time period 1969-2011 from the Bureau of Labor Statistics' (BLS).[a] The PPI data reflect nominal prices, adjusted for product quality changes. An inflation-adjusted (deflated) price index for integral horsepower motors and generators manufacturing was calculated by dividing the PPI series by the Gross Domestic Product Chained Price Index. In this case, the exponential function takes the form of:

$$Y = a \cdot e^{bX}$$

where Y is the motor price index, X is the time variable, *a* is the constant and *b* is the slope parameter of the time variable.

To estimate these exponential parameters, a least-square fit was performed on the inflation-adjusted motor price index versus *year* from 1969 to 2011. See Figure 10-B.2.1.

[a] Series ID PCU3353123353123; http://www.bls.gov/ppi/

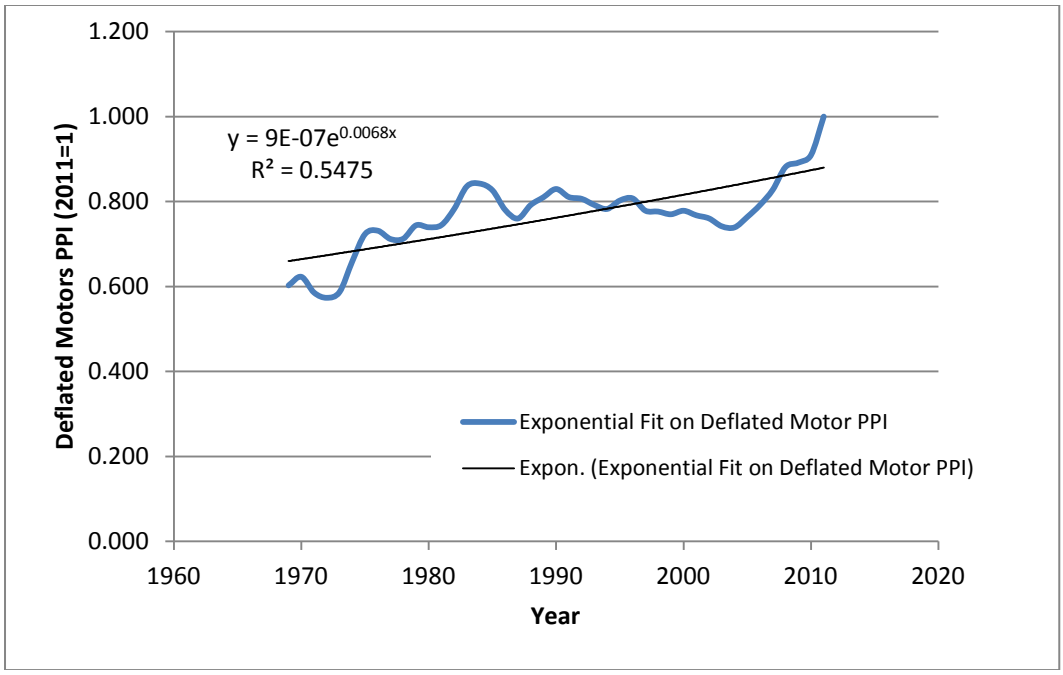

Figure 10-B.2.1 Relative Price of Electric Motors versus Year, with Exponential Fit

The regression performed as an exponential trend line fit results in an R-square of 0.55, which indicates a moderate fit to the data. The final estimated exponential function is:

$$Y = 9.21 \times 10^{(-7)} \cdot e^{0.0068X}$$

DOE then derived a price factor index for this scenario, with 2011 equal to 1, to forecast prices in each future year in the analysis period considered in the NIA. The index value in a given year is a function of the exponential parameter and *year*.

10-B.2.2 Annual Energy Outlook 2011 Price Forecast (Low Price Scenario)

DOE also examined a forecast based on the "chained price index—industrial equipment" that was forecasted for *AEO2011* out to 2035. This index is the most disaggregated category that includes electric motors. To develop an inflation-adjusted index, DOE normalized the above index with the "chained price index—gross domestic product" forecasted for *AEO2011*. To extend the price index beyond 2035, DOE used the average annual price growth rate in 2026 to 2035.

10-B.2.3 Summary

Table 10-B.2.1 shows the summary of the average annual rates of changes for the product price index in each scenario. Figure 10-B.2.2 shows the resulting price trends.

Table 10-B.2.1 Price Trend Sensitivities

Sensitivity	Price Trend	Average Annual rate of change
Medium (Default)	Constant Price Projection	0.0%
Low Price Scenario	AEO2011-- "chained price index—industrial equipment"	-1.0%
High Price Scenario	Exponential Fit using data from 1969 to 2011	0.7%

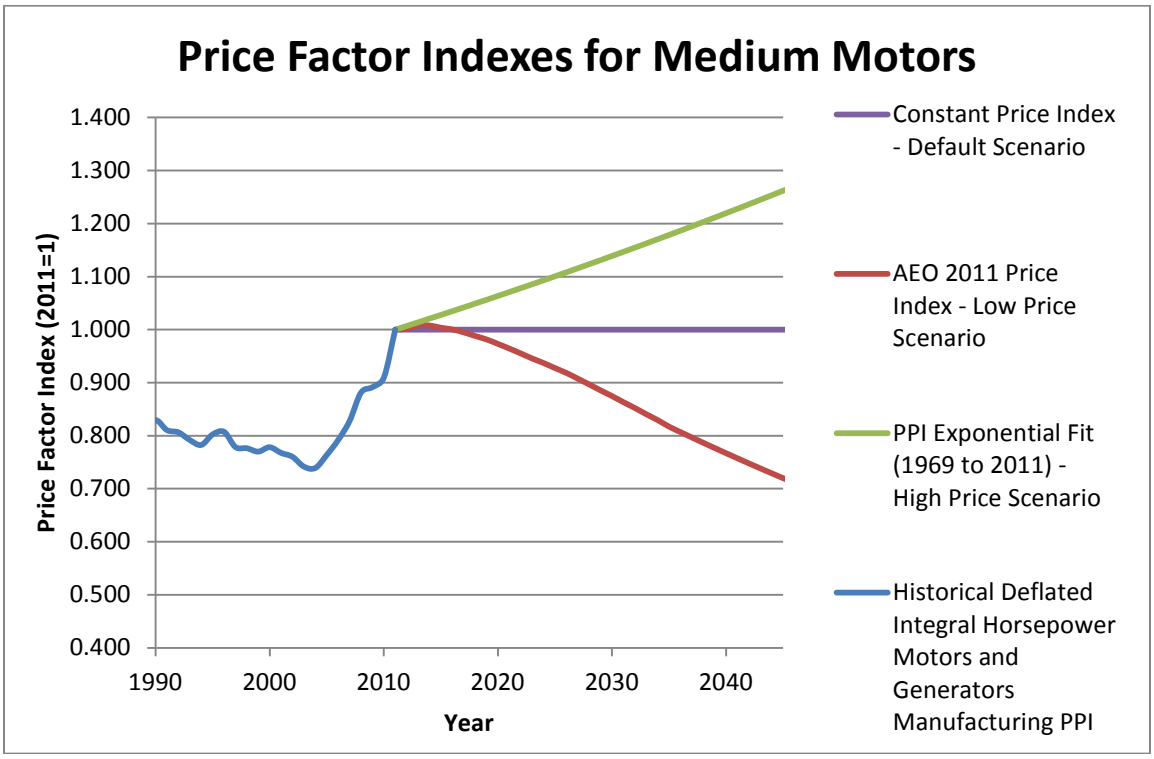

Figure 10-B.2.2 Electric Motor Price Forecast Indexes

10-B.3 NET PRESENT VALUE RESULTS BY PRICE TREND SCENARIO

Table 10-B.3.1 through Table 10-B.3.3 present, for each equipment class group and CSL, equipment incremental non-energy costs and energy cost savings, with their corresponding NPV results, across discount rates and the three product price trend scenarios.

Table 10-B.3.1 Detailed Net Present Value Results for NEMA Designs A and B Motors (billion 2011$)

	7% discount rate			*3% discount rate*		
	Low	**Default**	**High**	**Low**	**Default**	**High**
CSL 1						
Incr Non-Energy Costs	0.473	0.501	0.533	0.986	1.052	1.124
Energy Cost Savings	2.819	2.819	2.819	6.578	6.578	6.578
NPV	2.345	2.318	2.285	5.592	5.526	5.454
CSL 2						
Incr Non-Energy Costs	5.137	5.502	5.933	10.213	11.084	12.036
Energy Cost Savings	12.572	12.572	12.572	29.504	29.504	29.504
NPV	7.435	7.070	6.638	19.291	18.420	17.467
CSL 3						
Incr Non-Energy Costs	9.199	9.925	10.782	18.245	19.976	21.870
Energy Cost Savings	21.348	21.348	21.348	50.163	50.163	50.163
NPV	12.149	11.423	10.565	31.918	30.186	28.293
CSL 4						
Incr Non-Energy Costs	37.546	41.084	45.267	70.376	78.818	88.052
Energy Cost Savings	30.716	30.716	30.716	72.184	72.184	72.184
NPV	-6.829	-10.368	-14.550	1.808	-6.634	-15.868
CSL 5						
Incr Non-Energy Costs	45.168	49.403	54.408	84.808	94.912	105.962
Energy Cost Savings	36.693	36.693	36.693	86.277	86.277	86.277
NPV	-8.475	-12.710	-17.715	1.469	-8.634	-19.684

Table 10-B.3.2 Detailed Net Present Value Results for NEMA Design C Motors (billion 2011$)

	7% discount rate			*3% discount rate*		
	Low	**Default**	**High**	**Low**	**Default**	**High**
CSL 1						
Incr Non-Energy Costs	0.013	0.014	0.015	0.025	0.027	0.030
Energy Cost Savings	0.035	0.035	0.035	0.081	0.081	0.081
NPV	0.022	0.021	0.019	0.056	0.054	0.051
CSL 2						
Incr Non-Energy Costs	0.054	0.059	0.065	0.101	0.113	0.127
Energy Cost Savings	0.052	0.052	0.052	0.123	0.123	0.123
NPV	-0.002	-0.007	-0.013	0.022	0.009	-0.004
CSL 3						
Incr Non-Energy Costs	0.069	0.075	0.083	0.129	0.144	0.161
Energy Cost Savings	0.070	0.070	0.070	0.164	0.164	0.164
NPV	0.001	-0.005	-0.013	0.035	0.020	0.003

Table 10-B.3.3 Detailed Net Present Value Results for Fire Pump Motors (billion 2011$)

	7% discount rate			*3% discount rate*		
	Low	**Default**	**High**	**Low**	**Default**	**High**
CSL 1						
Incr Non-Energy Costs	0.015	0.016	0.017	0.032	0.035	0.037
Energy Cost Savings	0.006	0.006	0.006	0.016	0.016	0.016
NPV	-0.009	-0.010	-0.011	-0.016	-0.018	-0.021
CSL 2						
Incr Non-Energy Costs	0.021	0.023	0.024	0.048	0.051	0.055
Energy Cost Savings	0.009	0.009	0.009	0.025	0.025	0.025
NPV	-0.013	-0.014	-0.016	-0.023	-0.026	-0.030
CSL 3						
Incr Non-Energy Costs	0.059	0.064	0.070	0.119	0.131	0.144
Energy Cost Savings	0.012	0.012	0.012	0.033	0.033	0.033
NPV	-0.047	-0.052	-0.058	-0.086	-0.098	-0.111
CSL 4						
Incr Non-Energy Costs	0.069	0.075	0.082	0.140	0.154	0.169
Energy Cost Savings	0.015	0.015	0.015	0.040	0.040	0.040
NPV	-0.055	-0.061	-0.068	-0.100	-0.114	-0.129