

**APPENDIX 16-B. ENVIRONMENTAL IMPACTS ANALYSIS  
HIGH AND LOW ECONOMIC GROWTH RESULTS**

**TABLE OF CONTENTS**

16-B.1 INTRODUCTION .....	16-B-1
16-B.2 POWER SECTOR EMISSIONS .....	16-B-1
16-B.3 EFFECT ON BUILDING EMISSIONS .....	16-B-9
16-B.4 SUMMARY OF ENVIRONMENTAL IMPACTS .....	16-B-10

**LIST OF TABLES**

Table 16-B.2.1	Power Sector Emissions Forecast from <i>AEO2009</i> High Economic Growth Case.....	16-B-1
Table 16-B.2.2	Power Sector Emissions Forecast from <i>AEO2009</i> Low Economic Growth Case.....	16-B-1
Table 16-B.2.3	Power Sector Emissions Impact Forecasts for Water Heaters (High Growth) .....	16-B-3
Table 16-B.2.4	Power Sector Emissions Impact Forecasts for Water Heaters (Low Growth) .....	16-B-4
Table 16-B.2.5	Power Sector Emissions Impact Forecasts for Direct Heating Equipment (High Growth) .....	16-B-5
Table 16-B.2.6	Power Sector Emissions Impact Forecasts for Direct Heating Equipment (Low Growth) .....	16-B-6
Table 16-B.2.7	Power Sector Emissions Impact Forecasts for Pool Heaters (High Growth) .....	16-B-7
Table 16-B.2.8	Power Sector Emissions Impact Forecasts for Pool Heaters (Low Growth) .....	16-B-8
Table 16-B.4.1	Environmental Impacts Analysis Results Summary for Water Heaters (High Growth) .....	16-B-10
Table 16-B.4.2	Environmental Impacts Analysis Results Summary for Water Heaters (Low Growth) .....	16-B-10
Table 16-B.4.3	Environmental Impacts Analysis Results Summary for Direct Heating Equipment (High Growth) .....	16-B-11
Table 16-B.4.4	Environmental Impacts Analysis Results Summary for Direct Heating Equipment (Low Growth) .....	16-B-11
Table 16-B.4.5	Environmental Impacts Analysis Results Summary for Pool Heaters (High Growth) .....	16-B-12
Table 16-B.4.6	Environmental Impacts Analysis Results Summary for Pool Heaters (Low Growth) .....	16-B-12

## APPENDIX 16-B. ENVIRONMENTAL IMPACTS ANALYSIS

### HIGH AND LOW ECONOMIC GROWTH RESULTS

#### 16-B.1 INTRODUCTION

The Environmental Impacts Analysis (Chapter 16) describes potential environmental effects that may result from amended energy conservation standards for residential heating products, modeled using the *AEO2009* Reference Case. The appendix uses the same methodology described in the Environmental Impacts Analysis (Chapter 16), and provides the impact of amended energy conservation standards on Power Sector Emission, based on the *AEO2009* High and Low Growth Economic scenarios.

#### 16-B.2 POWER SECTOR EMISSIONS

Tables 16-2.1 and 16-2.2 show the *AEO2009* high economic growth case power plant emissions in selected years. These tables display the emissions shown by the NEMS-BT model to result if none of the TSLs are promulgated (the base case).

**Table 16-B.2.1 Power Sector Emissions Forecast from *AEO2009* High Economic Growth Case**

NEMS-BT Results*						
	2005	2010	2015	2020	2025	2030
CO <sub>2</sub> (Million metric tons/year)**	2,397.0	2,352.0	2,407.0	2,502.0	2,599.0	2,670.0
NO <sub>x</sub> (Thousand metric tons/year)†	3,302.2	2,077.5	1,859.7	1,868.8	1,886.9	1,896.0
Hg (metric tons/year)†	51.5	43.9	29.2	28.7	28.8	29.7

\* All results in metric tons, equivalent to 1.1 short tons and negative values refer to a reduction compared with the Base Case

\*\* Comparable to Table A17 of *AEO2009*: Electric Generators

† Comparable to Table A8 of *AEO2009*: Emissions

**Table 16-B.2.2 Power Sector Emissions Forecast from *AEO2009* Low Economic Growth Case**

NEMS-BT Results*						
	2005	2010	2015	2020	2025	2030
CO <sub>2</sub> (Million metric tons/year)**	2,397.0	2,324.0	2,356.0	2,406.0	2,430.0	2,510.0
NO <sub>x</sub> (Thousand metric tons/year)†	3,302.2	2,077.5	1,859.7	1,868.8	1,859.7	1,877.9
Hg (metric tons/year)†	51.5	43.4	28.9	28.4	28.0	28.3

\* All results in metric tons, equivalent to 1.1 short tons and negative values refer to a reduction compared with the Base Case

\*\* Comparable to Table A17 of *AEO2009*: Electric Generators

† Comparable to Table A8 of *AEO2009*: Emissions

Table 16-2.3 through Table 16-2.8 show the estimated changes in power plant emissions in selected years for all the TSLs. Changes in CO<sub>2</sub>, NO<sub>x</sub>, and Hg emissions from power plants are shown in these tables. The high growth economic cases do not show significantly reduced emissions because the generation savings are primarily in nuclear energy. The low growth scenarios show the greatest emissions savings because the generation savings are mostly in fossil fuels.

Compared to the anticipated reference case emissions impacts forecast shown in Table 16-2.2, changes in emission levels shown in Table 16-2.3 through 16-2.8 are very small.

**Table 16-B.2.3 Power Sector Emissions Impact Forecasts for Water Heaters (High Growth)**

NEMS-BT Results*	Difference from AEO2009 High Growth Reference Case								
	2010	2015	2020	2025	2030	Extapolation			Total
						2035	2040	2044	2015-2045
Standard Level 1									
CO <sub>2</sub> (Mt/a)	0.052	1.300	0.829	0.172	0.272	0.272	0.272	0.272	12.5
NOx (kt/a)	0.046	1.004	0.619	0.125	0.193	0.193	0.193	0.193	9.19
Hg (t/a)	-0.003	0.004	0.005	0.004	-0.012	-0.012	-0.012	-0.012	-0.217
Standard Level 2									
CO <sub>2</sub> (Mt/a)	0.084	2.103	1.335	0.276	0.436	0.436	0.436	0.436	20.0
NOx (kt/a)	0.075	1.625	0.997	0.200	0.310	0.310	0.310	0.310	14.8
Hg (t/a)	-0.005	0.007	0.008	0.007	-0.020	-0.020	-0.020	-0.020	-0.348
Standard Level 3									
CO <sub>2</sub> (Mt/a)	0.096	2.397	1.527	0.316	0.499	0.499	0.499	0.499	22.9
NOx (kt/a)	0.085	1.852	1.140	0.229	0.354	0.354	0.354	0.354	16.9
Hg (t/a)	-0.006	0.007	0.009	0.007	-0.022	-0.022	-0.022	-0.022	-0.398
Standard Level 4									
CO <sub>2</sub> (Mt/a)	0.105	2.627	1.676	0.347	0.548	0.548	0.548	0.548	25.1
NOx (kt/a)	0.093	2.029	1.252	0.252	0.389	0.389	0.389	0.389	18.5
Hg (t/a)	-0.006	0.008	0.010	0.008	-0.025	-0.025	-0.025	-0.025	-0.437
Standard Level 5									
CO <sub>2</sub> (Mt/a)	-0.049	2.597	1.089	-1.081	0.390	0.390	0.390	0.390	9.88
NOx (kt/a)	-0.044	2.006	0.814	-0.785	0.277	0.277	0.277	0.277	7.42
Hg (t/a)	0.005	0.013	0.018	0.009	-0.032	-0.032	-0.032	-0.032	-0.472
Standard Level 6									
CO <sub>2</sub> (Mt/a)	-0.063	3.33	1.39	-1.38	0.50	0.50	0.50	0.50	12.6
NOx (kt/a)	-0.056	2.58	1.04	-1.00	0.35	0.35	0.35	0.35	9.5
Hg (t/a)	0.007	0.017	0.023	0.012	-0.041	-0.041	-0.041	-0.041	-0.600
Standard Level 7									
CO <sub>2</sub> (Mt/a)	-0.204	10.75	4.55	-4.54	1.64	1.64	1.64	1.64	41.2
NOx (kt/a)	-0.180	8.31	3.40	-3.29	1.17	1.17	1.17	1.17	30.9
Hg (t/a)	0.021	0.054	0.076	0.038	-0.137	-0.137	-0.137	-0.137	-1.99
Standard Level 8									
CO <sub>2</sub> (Mt/a)	-0.319	16.81	7.06	-7.02	2.54	2.54	2.54	2.54	64.0
NOx (kt/a)	-0.282	12.98	5.27	-5.09	1.80	1.80	1.80	1.80	48.1
Hg (t/a)	0.033	0.084	0.118	0.059	-0.211	-0.211	-0.211	-0.211	-3.07

\*All results in metric tons (t), equivalent to 1.1 short tons

**Table 16-B.2.4 Power Sector Emissions Impact Forecasts for Water Heaters (Low Growth)**

<b>NEMS-BT Results*</b>	<b>Difference from AEO2009 Low Growth Reference Case</b>								
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Extapolation</b>			<b>Total</b>
						<b>2035</b>	<b>2040</b>	<b>2044</b>	<b>2015-2045</b>
<b>Standard Level 1</b>									
CO <sub>2</sub> (Mt/a)	0.086	-0.199	-1.143	-1.818	-2.152	-2.152	-2.152	-2.152	<b>-52.6</b>
NO <sub>x</sub> (kt/a)	0.077	-0.157	-0.888	-1.391	-1.610	-1.610	-1.610	-1.610	<b>-39.7</b>
Hg (t/a)	0.004	0.001	-0.006	0.004	0.016	0.016	0.016	0.016	<b>0.184</b>
<b>Standard Level 2</b>									
CO <sub>2</sub> (Mt/a)	0.139	-0.322	-1.841	-2.917	-3.444	-3.444	-3.444	-3.444	<b>-84.3</b>
NO <sub>x</sub> (kt/a)	0.124	-0.254	-1.430	-2.233	-2.577	-2.577	-2.577	-2.577	<b>-63.7</b>
Hg (t/a)	0.007	0.001	-0.010	0.006	0.026	0.026	0.026	0.026	<b>0.294</b>
<b>Standard Level 3</b>									
CO <sub>2</sub> (Mt/a)	0.158	-0.367	-2.105	-3.339	-3.941	-3.941	-3.941	-3.941	<b>-96.4</b>
NO <sub>x</sub> (kt/a)	0.142	-0.290	-1.635	-2.555	-2.949	-2.949	-2.949	-2.949	<b>-72.8</b>
Hg (t/a)	0.008	0.002	-0.011	0.007	0.030	0.030	0.030	0.030	<b>0.336</b>
<b>Standard Level 4</b>									
CO <sub>2</sub> (Mt/a)	0.173	-0.402	-2.311	-3.667	-4.330	-4.330	-4.330	-4.330	<b>-106</b>
NO <sub>x</sub> (kt/a)	0.155	-0.318	-1.795	-2.807	-3.239	-3.239	-3.239	-3.239	<b>-80.0</b>
Hg (t/a)	0.009	0.002	-0.012	0.008	0.033	0.033	0.033	0.033	<b>0.369</b>
<b>Standard Level 5</b>									
CO <sub>2</sub> (Mt/a)	0.25	-0.56	-3.81	-6.01	-6.98	-6.98	-6.98	-6.98	<b>-171</b>
NO <sub>x</sub> (kt/a)	0.23	-0.44	-2.96	-4.60	-5.22	-5.22	-5.22	-5.22	<b>-129</b>
Hg (t/a)	0.003	0.005	-0.015	0.013	0.030	0.030	0.030	0.030	<b>0.334</b>
<b>Standard Level 6</b>									
CO <sub>2</sub> (Mt/a)	0.33	-0.72	-4.87	-7.65	-8.88	-8.88	-8.88	-8.88	<b>-218</b>
NO <sub>x</sub> (kt/a)	0.29	-0.57	-3.78	-5.86	-6.64	-6.64	-6.64	-6.64	<b>-165</b>
Hg (t/a)	0.004	0.007	-0.020	0.016	0.038	0.038	0.038	0.038	<b>0.424</b>
<b>Standard Level 7</b>									
CO <sub>2</sub> (Mt/a)	1.05	-2.33	-15.93	-25.22	-29.40	-29.40	-29.40	-29.40	<b>-720</b>
NO <sub>x</sub> (kt/a)	0.94	-1.84	-12.37	-19.30	-22.00	-22.00	-22.00	-22.00	<b>-543</b>
Hg (t/a)	0.014	0.022	-0.065	0.053	0.127	0.127	0.127	0.127	<b>1.41</b>
<b>Standard Level 8</b>									
CO <sub>2</sub> (Mt/a)	1.65	-3.64	-24.72	-39.00	-45.36	-45.36	-45.36	-45.36	<b>-1112</b>
NO <sub>x</sub> (kt/a)	1.47	-2.87	-19.20	-29.84	-33.94	-33.94	-33.94	-33.94	<b>-840</b>
Hg (t/a)	0.021	0.035	-0.100	0.081	0.197	0.197	0.197	0.197	<b>2.17</b>

\*All results in metric tons (t), equivalent to 1.1 short tons

**Table 16-B.2.5 Power Sector Emissions Impact Forecasts for Direct Heating Equipment (High Growth)**

NEMS-BT Results*	Difference from AEO2009 High Growth Reference Case								
	2010	2015	2020	2025	2030	Extapolation			Total
						2035	2040	2042	2013-2043
<b>Standard Level 1</b>									
CO <sub>2</sub> (Mt/a)	-0.004	0.050	0.180	0.228	0.310	0.310	0.310	0.310	<b>6.85</b>
NOx (kt/a)	-0.003	0.039	0.134	0.166	0.220	0.220	0.220	0.220	<b>4.93</b>
Hg (t/a)	0.001	0.000	0.004	0.003	-0.002	-0.002	-0.002	-0.002	<b>-0.013</b>
<b>Standard Level 2</b>									
CO <sub>2</sub> (Mt/a)	-0.004	0.054	0.193	0.245	0.333	0.333	0.333	0.333	<b>7.36</b>
NOx (kt/a)	-0.003	0.042	0.144	0.178	0.237	0.237	0.237	0.237	<b>5.30</b>
Hg (t/a)	0.001	0.000	0.004	0.003	-0.002	-0.002	-0.002	-0.002	<b>-0.013</b>
<b>Standard Level 3</b>									
CO <sub>2</sub> (Mt/a)	-0.004	0.057	0.203	0.259	0.352	0.352	0.352	0.352	<b>7.77</b>
NOx (kt/a)	-0.004	0.044	0.152	0.188	0.250	0.250	0.250	0.250	<b>5.59</b>
Hg (t/a)	0.001	0.001	0.004	0.004	-0.002	-0.002	-0.002	-0.002	<b>-0.014</b>
<b>Standard Level 4</b>									
CO <sub>2</sub> (Mt/a)	-0.092	0.079	0.376	0.460	0.475	0.475	0.475	0.475	<b>11.5</b>
NOx (kt/a)	-0.081	0.061	0.281	0.334	0.337	0.337	0.337	0.337	<b>8.27</b>
Hg (t/a)	0.003	0.003	0.006	0.003	-0.004	-0.004	-0.004	-0.004	<b>-0.049</b>
<b>Standard Level 5</b>									
CO <sub>2</sub> (Mt/a)	-0.105	0.089	0.425	0.519	0.533	0.533	0.533	0.533	<b>12.9</b>
NOx (kt/a)	-0.093	0.069	0.318	0.377	0.379	0.379	0.379	0.379	<b>9.31</b>
Hg (t/a)	0.003	0.003	0.007	0.003	-0.005	-0.005	-0.005	-0.005	<b>-0.055</b>
<b>Standard Level 6</b>									
CO <sub>2</sub> (Mt/a)	-0.266	0.227	1.081	1.320	1.358	1.358	1.358	1.358	<b>32.9</b>
NOx (kt/a)	-0.235	0.175	0.807	0.959	0.964	0.964	0.964	0.964	<b>23.7</b>
Hg (t/a)	0.008	0.008	0.018	0.008	-0.013	-0.013	-0.013	-0.013	<b>-0.139</b>

\*All results in metric tons (t), equivalent to 1.1 short tons

**Table 16-B.2.6 Power Sector Emissions Impact Forecasts for Direct Heating Equipment (Low Growth)**

<b>NEMS-BT Results*</b>	<b>Difference from AEO2009 Low Growth Reference Case</b>								
	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Extapolation</b>			<b>Total</b>
						<b>2035</b>	<b>2040</b>	<b>2042</b>	<b>2013-2043</b>
<b>Standard Level 1</b>									
CO <sub>2</sub> (Mt/a)	-0.111	-0.226	-0.091	-0.097	-0.043	-0.043	-0.043	-0.043	<b>-2.81</b>
NO <sub>x</sub> (kt/a)	-0.099	-0.178	-0.071	-0.075	-0.032	-0.032	-0.032	-0.032	<b>-2.21</b>
Hg (t/a)	0.003	0.001	0.001	0.001	0.003	0.003	0.003	0.003	<b>0.030</b>
<b>Standard Level 2</b>									
CO <sub>2</sub> (Mt/a)	-0.120	-0.243	-0.098	-0.105	-0.046	-0.046	-0.046	-0.046	<b>-3.02</b>
NO <sub>x</sub> (kt/a)	-0.107	-0.192	-0.076	-0.080	-0.034	-0.034	-0.034	-0.034	<b>-2.37</b>
Hg (t/a)	0.003	0.001	0.001	0.001	0.003	0.003	0.003	0.003	<b>0.033</b>
<b>Standard Level 3</b>									
CO <sub>2</sub> (Mt/a)	-0.126	-0.257	-0.103	-0.111	-0.048	-0.048	-0.048	-0.048	<b>-3.19</b>
NO <sub>x</sub> (kt/a)	-0.113	-0.203	-0.080	-0.085	-0.036	-0.036	-0.036	-0.036	<b>-2.50</b>
Hg (t/a)	0.003	0.001	0.001	0.001	0.003	0.003	0.003	0.003	<b>0.034</b>
<b>Standard Level 4</b>									
CO <sub>2</sub> (Mt/a)	-0.244	-0.459	-0.255	-0.229	-0.141	-0.141	-0.141	-0.141	<b>-6.95</b>
NO <sub>x</sub> (kt/a)	-0.218	-0.362	-0.198	-0.175	-0.105	-0.105	-0.105	-0.105	<b>-5.42</b>
Hg (t/a)	0.002	-0.001	0.001	0.008	0.011	0.011	0.011	0.011	<b>0.140</b>
<b>Standard Level 5</b>									
CO <sub>2</sub> (Mt/a)	-0.277	-0.521	-0.289	-0.258	-0.158	-0.158	-0.158	-0.158	<b>-7.86</b>
NO <sub>x</sub> (kt/a)	-0.248	-0.412	-0.224	-0.198	-0.118	-0.118	-0.118	-0.118	<b>-6.13</b>
Hg (t/a)	0.002	-0.001	0.001	0.010	0.013	0.013	0.013	0.013	<b>0.157</b>
<b>Standard Level 6</b>									
CO <sub>2</sub> (Mt/a)	-0.702	-1.321	-0.734	-0.657	-0.402	-0.402	-0.402	-0.402	<b>-20.0</b>
NO <sub>x</sub> (kt/a)	-0.627	-1.042	-0.570	-0.503	-0.301	-0.301	-0.301	-0.301	<b>-15.6</b>
Hg (t/a)	0.005	-0.003	0.001	0.024	0.033	0.033	0.033	0.033	<b>0.399</b>

\*All results in metric tons (t), equivalent to 1.1 short tons

**Table 16-B.2.7 Power Sector Emissions Impact Forecasts for Pool Heaters (High Growth)**

NEMS-BT Results*	Difference from AEO2009 High Growth Reference Case								
	2010	2015	2020	2025	2030	Extapolation			Total
						2035	2040	2042	2013-2043
Standard Level 1									
CO <sub>2</sub> (Mt/a)	-0.002	0.002	0.007	0.007	0.008	0.008	0.008	0.008	0.192
NOx (kt/a)	-0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.138
Hg (t/a)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Standard Level 2									
CO <sub>2</sub> (Mt/a)	-0.004	0.003	0.013	0.013	0.014	0.014	0.014	0.014	0.347
NOx (kt/a)	-0.003	0.003	0.009	0.010	0.010	0.010	0.010	0.010	0.251
Hg (t/a)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Standard Level 3									
CO <sub>2</sub> (Mt/a)	-0.008	0.007	0.028	0.030	0.031	0.031	0.031	0.031	0.779
NOx (kt/a)	-0.007	0.006	0.021	0.022	0.022	0.022	0.022	0.022	0.562
Hg (t/a)	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.003
Standard Level 4									
CO <sub>2</sub> (Mt/a)	-0.010	0.010	0.037	0.039	0.041	0.041	0.041	0.041	1.02
NOx (kt/a)	-0.009	0.007	0.028	0.028	0.029	0.029	0.029	0.029	0.736
Hg (t/a)	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.004
Standard Level 5									
CO <sub>2</sub> (Mt/a)	-0.016	0.015	0.057	0.060	0.062	0.062	0.062	0.062	1.55
NOx (kt/a)	-0.014	0.011	0.042	0.043	0.044	0.044	0.044	0.044	1.12
Hg (t/a)	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.006
Standard Level 6									
CO <sub>2</sub> (Mt/a)	-0.039	0.036	0.140	0.148	0.153	0.153	0.153	0.153	3.86
NOx (kt/a)	-0.035	0.028	0.105	0.107	0.109	0.109	0.109	0.109	2.78
Hg (t/a)	0.001	0.001	0.003	0.001	0.000	0.000	0.000	0.000	0.014

\*All results in metric tons (t), equivalent to 1.1 short tons



**Table 16-B.2.8 Power Sector Emissions Impact Forecasts for Pool Heaters (Low Growth)**

NEMS-BT Results*	Difference from AEO2009 Low Growth Reference Case								
	2010	2015	2020	2025	2030	Extapolation			Total
						2035	2040	2042	2013-2043
<b>Standard Level 1</b>									
CO <sub>2</sub> (Mt/a)	-0.004	-0.010	-0.006	-0.006	-0.003	-0.003	-0.003	-0.003	<b>-0.158</b>
NO <sub>x</sub> (kt/a)	-0.004	-0.008	-0.004	-0.004	-0.003	-0.003	-0.003	-0.003	<b>-0.123</b>
Hg (t/a)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	<b>0.003</b>
<b>Standard Level 2</b>									
CO <sub>2</sub> (Mt/a)	-0.008	-0.018	-0.010	-0.010	-0.006	-0.006	-0.006	-0.006	<b>-0.286</b>
NO <sub>x</sub> (kt/a)	-0.007	-0.014	-0.008	-0.008	-0.005	-0.005	-0.005	-0.005	<b>-0.223</b>
Hg (t/a)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	<b>0.006</b>
<b>Standard Level 3</b>									
CO <sub>2</sub> (Mt/a)	-0.018	-0.040	-0.023	-0.023	-0.014	-0.014	-0.014	-0.014	<b>-0.642</b>
NO <sub>x</sub> (kt/a)	-0.016	-0.032	-0.018	-0.017	-0.010	-0.010	-0.010	-0.010	<b>-0.499</b>
Hg (t/a)	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	<b>0.013</b>
<b>Standard Level 4</b>									
CO <sub>2</sub> (Mt/a)	-0.024	-0.053	-0.030	-0.030	-0.018	-0.018	-0.018	-0.018	<b>-0.841</b>
NO <sub>x</sub> (kt/a)	-0.021	-0.042	-0.023	-0.023	-0.014	-0.014	-0.014	-0.014	<b>-0.654</b>
Hg (t/a)	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	<b>0.017</b>
<b>Standard Level 5</b>									
CO <sub>2</sub> (Mt/a)	-0.036	-0.081	-0.045	-0.045	-0.028	-0.028	-0.028	-0.028	<b>-1.28</b>
NO <sub>x</sub> (kt/a)	-0.033	-0.064	-0.035	-0.034	-0.021	-0.021	-0.021	-0.021	<b>-0.997</b>
Hg (t/a)	0.000	-0.001	0.000	0.001	0.002	0.002	0.002	0.002	<b>0.025</b>
<b>Standard Level 6</b>									
CO <sub>2</sub> (Mt/a)	-0.090	-0.200	-0.112	-0.112	-0.068	-0.068	-0.068	-0.068	<b>-3.18</b>
NO <sub>x</sub> (kt/a)	-0.081	-0.158	-0.087	-0.085	-0.051	-0.051	-0.051	-0.051	<b>-2.48</b>
Hg (t/a)	0.001	-0.001	-0.001	0.002	0.005	0.005	0.005	0.005	<b>0.063</b>

\*All results in metric tons (t), equivalent to 1.1 short tons

### **16-B.3 EFFECT ON BUILDING EMISSIONS**

For residential heating products, impacts on household emissions at the site are also reported. NEMS-BT does not account for these emissions at the site. Household emissions are not affected by the high and low growth economic scenarios because they are computed outside of the NEMS-BT model using the energy savings inputs. The different economic scenarios only effect emissions from the power sector. See the Chapter 16 (Environmental Impacts Analysis) for building emissions impacts.

## 16-B.4 SUMMARY OF ENVIRONMENTAL IMPACTS

**Table 16-B.4.1 Environmental Impacts Analysis Results Summary for Water Heaters (High Growth)**

Environmental Effects	Reference Case*	Trial Standard Level							
		1	2	3	4	5	6	7	8
Cumulative Total Emission Reductions**									
CO <sub>2</sub> (Million metric tons)	78,171	24.7	42.0	39.4	37.2	33.4	55.6	101	216
NO <sub>x</sub> (Thousand tons)	56,626	21.1	35.8	33.9	32.3	27.8	46.1	84.7	180
Hg (tons)	880	0.217	0.348	0.398	0.437	0.472	0.600	1.99	3.07
Cumulative Power Sector Emission Reductions**									
CO <sub>2</sub> (Million metric tons)	78,171	(12.5)	(20.0)	(22.9)	(25.1)	(9.88)	(12.6)	(41.2)	(64.0)
NO <sub>x</sub> (Thousand tons)	56,626	(9.19)	(14.8)	(16.9)	(18.5)	(7.42)	(9.5)	(30.9)	(48.1)
Hg (tons)	880	0.217	0.348	0.398	0.437	0.472	0.600	1.99	3.07
Cumulative Household Emission Reductions**									
CO <sub>2</sub> (Million metric tons)	-	37.1	62.0	62.3	62.3	43.2	68.2	142	280
NO <sub>x</sub> (Thousand tons)	-	30.3	50.6	50.8	50.8	35.2	55.6	116	228

\* The reference case reflects total cumulative emissions (power sector only) in the absence of an amended energy conservation standard.

\*\* Cumulative total is over 2015 to 2045 for water heaters.

**Table 16-B.4.2 Environmental Impacts Analysis Results Summary for Water Heaters (Low Growth)**

Environmental Effects	Reference Case*	Trial Standard Level							
		1	2	3	4	5	6	7	8
Cumulative Total Emission Reductions**									
CO <sub>2</sub> (Million metric tons)	73,916	89.7	146	159	168	214	286	861	1,391
NO <sub>x</sub> (Thousand tons)	56,100	70.0	114	124	131	164	220	659	1,068
Hg (tons)	851	(0.184)	(0.294)	(0.336)	(0.369)	(0.334)	(0.424)	(1.41)	(2.17)
Cumulative Power Sector Emission Reductions**									
CO <sub>2</sub> (Million metric tons)	73,916	52.6	84.3	96.4	106	171	218	720	1,112
NO <sub>x</sub> (Thousand tons)	56,100	39.7	63.7	72.8	80.0	129	165	543	840
Hg (tons)	851	(0.184)	(0.294)	(0.336)	(0.369)	(0.334)	(0.424)	(1.41)	(2.17)
Cumulative Household Emission Reductions**									
CO <sub>2</sub> (Million metric tons)	-	37.1	62.0	62.3	62.3	43.2	68.2	142	280
NO <sub>x</sub> (Thousand tons)	-	30.3	50.6	50.8	50.8	35.2	55.6	116	228

\* The reference case reflects total cumulative emissions (power sector only) in the absence of an amended energy conservation standard.

\*\* Cumulative total is over 2015 to 2045 for water heaters.

**Table 16-B.4.3 Environmental Impacts Analysis Results Summary for Direct Heating Equipment (High Growth)**

Environmental Effects	Reference Case*	Trial Standard Level					
		1	2	3	4	5	6
Cumulative Total Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	77,643	4.33	4.63	4.86	13.3	15.0	36.7
NO <sub>x</sub> (Thousand tons)	56,980	4.75	5.06	5.32	13.2	14.9	36.6
Hg (tons)	908	0.013	0.013	0.014	0.049	0.055	0.139
Cumulative Power Sector Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	77,643	(6.85)	(7.36)	(7.77)	(11.5)	(12.9)	(32.9)
NO <sub>x</sub> (Thousand tons)	56,980	(4.93)	(5.30)	(5.59)	(8.27)	(9.31)	(23.7)
Hg (tons)	908	0.013	0.013	0.014	0.049	0.055	0.139
Cumulative Household Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	-	11.2	12.0	12.6	24.8	27.9	69.5
NO <sub>x</sub> (Thousand tons)	-	9.68	10.4	10.9	21.4	24.2	60.3

\* The reference case reflects total cumulative emissions (power sector only) in the absence of an amended energy conservation standard.

\*\* Cumulative total is over 2013 to 2043 for direct heating equipment. Values in parentheses refer to emission increase.

**Table 16-B.4.4 Environmental Impacts Analysis Results Summary for Direct Heating Equipment (Low Growth)**

Environmental Effects	Reference Case*	Trial Standard Level					
		1	2	3	4	5	6
Cumulative Total Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	73,633	14.0	15.0	15.8	31.7	35.8	89.5
NO <sub>x</sub> (Thousand tons)	56,436	11.9	12.7	13.4	26.9	30.4	75.9
Hg (tons)	878	(0.030)	(0.033)	(0.034)	(0.140)	(0.157)	(0.399)
Cumulative Power Sector Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	73,633	2.81	3.02	3.19	6.95	7.86	20.0
NO <sub>x</sub> (Thousand tons)	56,436	2.21	2.37	2.50	5.42	6.13	15.6
Hg (tons)	878	(0.030)	(0.033)	(0.034)	(0.140)	(0.157)	(0.399)
Cumulative Household Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	-	11.2	12.0	12.6	24.8	27.9	69.5
NO <sub>x</sub> (Thousand tons)	-	9.68	10.4	10.9	21.4	24.2	60.3

\* The reference case reflects total cumulative emissions (power sector only) in the absence of an amended energy conservation standard.

\*\* Cumulative total is over 2013 to 2043 for direct heating equipment. Values in parentheses refer to emission increase.

**Table 16-B.4.5 Environmental Impacts Analysis Results Summary for Pool Heaters (High Growth)**

Environmental Effects	Reference Case*	Trial Standard Level					
		1	2	3	4	5	6
Cumulative Total Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	77,643	0.356	0.644	1.48	1.93	2.92	7.19
NO <sub>x</sub> (Thousand tons)	56,980	0.329	0.595	1.37	1.78	2.69	6.63
Hg (tons)	908	(0.001)	(0.001)	(0.003)	(0.004)	(0.006)	(0.014)
Cumulative Power Sector Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	77,643	(0.192)	(0.347)	(0.779)	(1.02)	(1.55)	(3.86)
NO <sub>x</sub> (Thousand tons)	56,980	(0.138)	(0.251)	(0.562)	(0.736)	(1.21)	(2.78)
Hg (tons)	908	(0.001)	(0.001)	(0.003)	(0.004)	(0.006)	(0.014)
Cumulative Household Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	-	0.548	0.991	2.26	2.95	4.47	11.0
NO <sub>x</sub> (Thousand tons)	-	0.467	0.845	1.93	2.52	3.81	9.42

\* The reference case reflects total cumulative emissions (power sector only) in the absence of an amended energy conservation standard.

\*\* Cumulative total is over 2013 to 2043 for pool heaters. Values in parentheses refer to emission increase.

**Table 16-B.4.6 Environmental Impacts Analysis Results Summary for Pool Heaters (Low Growth)**

Environmental Effects	Reference Case*	Trial Standard Level					
		1	2	3	4	5	6
Cumulative Total Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	73,633	0.706	1.28	2.90	3.79	5.75	14.2
NO <sub>x</sub> (Thousand tons)	56,436	0.590	1.07	2.43	3.17	4.81	11.9
Hg (tons)	878	(0.003)	(0.006)	(0.013)	(0.017)	(0.025)	(0.063)
Cumulative Power Sector Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	73,633	0.158	0.286	0.642	0.841	1.28	3.18
NO <sub>x</sub> (Thousand tons)	56,436	0.123	0.223	0.499	0.654	0.997	2.48
Hg (tons)	878	(0.003)	(0.006)	(0.013)	(0.017)	(0.025)	(0.063)
Cumulative Household Emission Reductions**							
CO <sub>2</sub> (Million metric tons)	-	0.548	0.991	2.26	2.95	4.47	11.0
NO <sub>x</sub> (Thousand tons)	-	0.467	0.845	1.93	2.52	3.81	9.42

\* The reference case reflects total cumulative emissions (power sector only) in the absence of an amended energy conservation standard.

\*\* Cumulative total is over 2013 to 2043 for pool heaters. Values in parentheses refer to emission increase.