

## **Appendix B**

# **Industrial Sector Technology Assumptions**

**Table B1. Nonmanufacturing Industry Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
All Processes	All Fuels	-0.001	-0.002	0.9	-0.002	-0.004

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B2. Nonmanufacturing Industry Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
All Processes	All Fuels	-0.0015	-0.002	0.9	-0.003	-0.004

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B3. Food Industry Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
All Processes	All Fuels	-0.0044	-0.0072	0.9	-0.0049	-0.0145

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B4. Food Industry Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
All Processes	All Fuels	-0.0058	-0.0072	0.9	-0.0097	-0.0145

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B5. Pulp and Paper Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
Wood Preparation	Electricity	-0.0037	-0.0043	0.84	-0.0004	-0.0086
Waste Pulp	Electricity	-0.0025	-0.0036	0.93	-0.002	-0.0073
Mechanical Pulp	Electricity	-0.0039	-0.0041	0.84	-0.0009	-0.0082
Semi-Chemical	Electricity	-0.0054	-0.0077	0.73	-0.0019	-0.0153
Kraft Pulp	Electricity	-0.0093	-0.0143	0.73	-0.0082	-0.0287
	Natural Gas	-0.0093	-0.0143	0.73	-0.0082	-0.0287
	Residual	-0.0093	-0.0143	0.73	-0.0082	-0.0287
	Distillate	-0.0093	-0.0143	0.73	-0.0082	-0.0287
	LPG	-0.0093	-0.0143	0.73	-0.0082	-0.0287
Bleaching	Coal	-0.0093	-0.0143	0.73	-0.0082	-0.0287
	Electric	-0.005	-0.0098	0.75	-0.0039	-0.0197
Papermaking	Electric	-0.0104	-0.0166	0.75	-0.0122	-0.0332
	Natural Gas	-0.0104	-0.0166	0.75	-0.0122	-0.0332
	Residual	-0.0104	-0.0166	0.75	-0.0122	-0.0332
	Distillate	-0.0104	-0.0166	0.75	-0.0122	-0.0332
	LPG	-0.0104	-0.0166	0.75	-0.0122	-0.0332
	Coal	-0.0104	-0.0166	0.75	-0.0122	-0.0332

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B6. Pulp and Paper Technology Possibility Curves Derived from CEF**

Process	Fuel <sup>a</sup>	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
Wood Preparation	Electricity	-0.00135	-0.0027	0.84	-0.0008	-0.001
Waste Pulp	Electricity	-0.0004	-0.0007	0.93	-0.004	-0.005
Mech Pulp	Electricity	-0.0012	-0.0024	0.84	-0.005	-0.011
Semi-Chemical	Electricity	-0.0028	-0.0049	0.73	-0.0004	-0.0004
Kraft Pulp	Electricity	-0.0028	-0.0049	0.73	-0.0025	-0.0049
	Natural Gas	-0.0029	-0.0057	0.73	-0.006	-0.0122
	Residual	-0.0029	-0.0057	0.73	-0.0062	-0.0124
	Distillate	-0.0029	-0.0057	0.73	-0.0062	-0.0124
	LPG	-0.0029	-0.0057	0.73	-0.0062	-0.0124
Bleaching	Coal	-0.005	-0.007	0.73	-0.0075	-0.015
	Electric	-0.0054	-0.0085	0.75	-0.0006	-0.0006
Papermaking	Electric	-0.0032	-0.0049	0.75	-0.002	0.0015
	Natural Gas	-0.0032	-0.0049	0.75	-0.002	-0.002
	Residual	-0.0032	-0.0049	0.75	-0.002	-0.002
	Distillate	-0.0032	-0.0049	0.75	-0.002	-0.002
	LPG	-0.0032	-0.0049	0.75	-0.002	-0.002
	Coal	-0.0032	-0.0049	0.75	-0.002	-0.002

<sup>a</sup>In some processes, a particular fuel was not represented in the CEF. In such situations, a TPC from the same process was applied.

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B7. Bulk Chemical Industry Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
Heat and Power	All Fuels	-0.0044	-0.0056	0.9	-0.0049	-0.0113
Feedstocks	All Fuels	-0.001	-0.002	0.9	-0.001	-0.002

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B8. Bulk Chemical Industry Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
Heat and Power	All Fuels	-0.005	-0.008	0.9	-0.007	-0.009
Feedstocks	All Fuels	-0.005	-0.008	0.9	-0.007	-0.009

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B9. Glass Industry Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
Batch Preparation Virgin Glass	Electricity	-0.0025	-0.0026	0.882	0	-0.0052
Batch Preparation Recycled Glass	Electricity	-0.0025	-0.0026	0.882	0	-0.0052
Melting/Refining Virgin Glass	Electricity	-0.0094	-0.0165	0.85	-0.016	-0.033
	Fuels	-0.0094	-0.0165	0.85	-0.016	-0.033
Melting/Refining Recycled Glass	Electricity	-0.0094	-0.0153	0.85	-0.016	-0.0306
	Fuels	-0.0094	-0.0153	0.85	-0.016	-0.0306
Forming	Electricity	-0.0035	-0.0054	0.818	-0.004	-0.0108
	Fuels	-0.0035	-0.0054	0.818	-0.004	-0.0108
Post-Forming	Electricity	-0.0053	-0.006	0.78	-0.0011	-0.012
	Fuels	-0.0053	-0.006	0.78	-0.0011	-0.012

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B10. Glass Industry Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		REI 1994	New Equipment	
		Moderate	Advanced		Moderate	Advanced
Batch Preparation Virgin Glass	Electricity	-0.001	-0.001	0.882	0	0
Batch Preparation Recycled Glass	Electricity	-0.001	-0.001	0.882	0	0
Melting/Refining Virgin Glass	Electricity	-0.00575	-0.0115	0.85	-0.0115	-0.023
	Fuels	-0.0068	-0.0136	0.85	-0.0136	-0.0272
Melting/Refining Recycled Glass	Electricity	-0.00575	-0.0115	0.85	-0.0115	-0.023
	Fuels	-0.0068	-0.0136	0.85	-0.0136	-0.0272
Forming	Electricity	-0.0014	-0.0014	0.818	-0.0015	-0.003
	Fuels	-0.0025	-0.0025	0.818	-0.00205	-0.0041
Post-Forming	Electricity	-0.0021	-0.0021	0.78	-0.0008	-0.0015
	Fuels	-0.0037	-0.0037	0.78	-0.0009	-0.0018

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B11. Cement Industry Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
Grinding	Electricity	-0.0041	-0.0088	0.813	0	-0.0177
Dry Process	Electricity	-0.0031	-0.0115	0.79	-0.0031	-0.023
	Natural Gas	-0.0078	-0.0115	0.79	-0.0077	-0.023
	Distillate	-0.0078	-0.0115	0.79	-0.0077	-0.023
	Steam Coal	-0.0078	-0.0115	0.79	-0.0077	-0.023
	Other	-0.0078	-0.0115	0.79	-0.0077	-0.023
Wet Process	Electricity	-0.0025	0	NA	NA	NA
	Natural Gas	-0.0025	0.0006	NA	NA	NA
	Distillate	-0.0025	-0.0045	NA	NA	NA
	Steam Coal	-0.0025	-0.0057	NA	NA	NA
	Other	-0.0025	-0.0057	NA	NA	NA

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B12. Cement Industry Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		REI 1994	New Equipment	
		Moderate	Advanced		Moderate	Advanced
Grinding	Electricity	-0.0032	-0.0032	0.813	-0.0027	-0.0049
Dry Process	Electricity	0	0	0.79	0	-0.0049
	Natural Gas	0.0002	-0.0035	0.79	0.0039	-0.0027
	Distillate	-0.0032	-0.0045	0.79	-0.0032	-0.0045
	Steam Coal	-0.0032	-0.0042	0.79	-0.00323	-0.0042
	Other	-0.0033	-0.043	0.79	-0.0033	-0.0043
Wet Process	Electricity	0	0	NA	NA	NA
	Natural Gas	-0.0023	0.0006	NA	NA	NA
	Distillate	-0.0045	-0.0045	NA	NA	NA
	Steam Coal	-0.0051	-0.0057	NA	NA	NA
	Other	-0.0051	-0.0057	NA	NA	NA

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B13. Steel Industry Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
Cold Rolling	Electricity	-0.0101	-0.022	0.84	-0.0162	-0.044
	Fuels	-0.0101	-0.022	0.84	-0.0162	-0.044
Hot Rolling	Electricity	-0.0152	-0.0532	0.5	-0.0104	-0.1065
	Fuels	-0.0152	-0.0532	0.5	-0.0104	-0.1065
Ingot	Electricity	0	0	NA	NA	NA
	Fuels	0	0	NA	NA	NA
Continuous Cast	Electricity	0	0	1	0	0
	Fuels	0	0	1	0	0
Blast Furnace/ Basic Oxygen Furnace	Electricity	-0.0041	-0.0155	1	-0.0086	-0.031
	Natural Gas	0.005	-0.0155	1	0.02	-0.031
	Coke	-0.002	-0.0155	1	-0.004	-0.031
	Steam Coal	-0.0041	-0.0155	1	0.002	-0.031
	Other Fuels	-0.0041	-0.0067	1	-0.0086	-0.031
Electric Arc Furnace	Electricity	-0.0032	-0.0056	0.96	-0.0051	-0.0112
	Fuels	-0.0032	-0.0056	0.96	-0.0051	-0.0112
Coke Plant	Electricity	-0.0039	-0.0078	0.84	-0.0012	-0.0024
	Fuels	-0.0039	-0.0078	0.84	-0.0009	-0.0018

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B14. Steel Industry Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
Cold Rolling	Electricity	-0.0055	-0.0058	0.84	-0.0013	-0.0013
	Fuels	0	-0.0025	0.84	-0.015	-0.015
Hot Rolling	Electricity	-0.0002	-0.0002	0.5	-0.0098	-0.0426
	Fuels	-0.0153	-0.0173	0.5	-0.0221	-0.117
Ingot	Electricity	0	0	NA	NA	NA
	Fuels	0	0	NA	NA	NA
Continuous Cast	Electricity	0	0	1	-0.0263	-0.0263
	Fuels	-0.0111	-0.0111	1	-0.011	-0.011
Blast Furnace/ Basic Oxygen Furnace	Electricity	-0.0053	-0.0053	1	-0.0227	0.0086
	Natural Gas	0	0	1	0	0
	Other Fuels	-0.0067	-0.0067	1	-0.0041	0.0006
	Electricity	-0.0086	-0.0102	0.96	-0.0107	-0.0107
	Fuels	0.0056	0.0056	0.96	-0.0054	-0.0054
Electric Arc Furnace	Electricity	0	0	0.84	-0.0401	-0.1215
	Fuels	-0.0004	-0.0004	0.84	-0.0026	-0.2731

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B15. Aluminum Industry Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
All Processes	Electricity	-0.005	-0.0087	0.76	-0.005	-0.0174
	Fuels	-0.005	-0.0087	0.76	-0.005	-0.0174

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B16. Aluminum Industry Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
All Processes	Electricity	-0.0074	-0.012	0.76	-0.0025	-0.0038
	Fuels	-0.004	-0.0058	0.76	-0.0035	-0.0048

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B17. Metal-Based Durables Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
Refrigeration	Electricity	-0.0055	-0.0043	0.9	-0.0052	-0.0086
Machine Drive	Electricity	-0.0021	-0.0024	0.9	-0.0049	-0.0049
	Fossil	-0.0044	-0.0067	0.9	-0.0049	-0.0135
Electrochemical	Electricity	-0.0008	-0.0041	0.9	-0.0046	-0.0082
Other	Electricity	-0.0008	-0.0049	0.9	-0.0046	-0.0098
	Fossil	-0.0044	-0.0067	0.9	-0.0049	-0.0135
Heating	Electricity	-0.0044	-0.0121	0.9	-0.0049	-0.0242
	Fossil	-0.0044	-0.0067	0.9	-0.0049	-0.0135

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B18. Metal-Based Durables Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
Refrigeration	Electricity	-0.0083	-0.011	0.9	-0.0078	-0.0104
Machine Drive	Electricity	-0.0032	-0.0042	0.9	-0.0074	-0.0098
	Fossil	-0.0066	-0.0088	0.9	-0.0074	-0.0098
Electrochemical	Electricity	-0.0012	-0.0041	0.9	-0.0069	-0.0082
Other	Electricity	-0.0012	-0.0049	0.9	-0.0069	-0.0098
	Fossil	-0.0066	-0.0067	0.9	-0.0074	-0.0135
Heating	Electricity	-0.0066	-0.0088	0.9	-0.0074	-0.0098
	Fossil	-0.0066	-0.0067	0.9	-0.0074	-0.0098

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B19. Other Manufacturing Technology Possibility Curves from AEO2001**

Process	Fuel	Existing Equipment		New Equipment		
		Reference	High Technology	REI 1994	Reference	High Technology
Refrigeration	Electricity	-0.0055	-0.0043	0.9	-0.0052	-0.0086
Machine Drive	Electricity	-0.0021	-0.0024	0.9	-0.0049	-0.0049
	Fossil	-0.0044	-0.0067	0.9	-0.0049	-0.0135
Electrochemical	Electricity	-0.0008	-0.0041	0.9	-0.0046	-0.0082
Other	Electricity	-0.0008	-0.0049	0.9	-0.0046	-0.0098
	Fossil	-0.0044	-0.0067	0.9	-0.0049	-0.0135
Heating	Electricity	-0.0044	-0.0121	0.9	-0.0049	-0.0242
	Fossil	-0.0044	-0.0067	0.9	-0.0049	-0.0135

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

**Table B20. Other Manufacturing Technology Possibility Curves Derived from CEF**

Process	Fuel	Existing Equipment		New Equipment		
		Moderate	Advanced	REI 1994	Moderate	Advanced
Refrigeration	Electricity	-0.0083	-0.011	0.9	-0.0078	-0.0104
Machine Drive	Electricity	-0.0032	-0.0042	0.9	-0.0074	-0.0098
	Fossil	-0.0066	-0.0088	0.9	-0.0074	-0.0098
Electrochemical	Electricity	-0.0012	-0.0041	0.9	-0.0069	-0.0082
Other	Electricity	-0.0012	-0.0049	0.9	-0.0069	-0.0098
	Fossil	-0.0066	-0.0067	0.9	-0.0074	-0.0135
Heating	Electricity	-0.0066	-0.0088	0.9	-0.0074	-0.0098
	Fossil	-0.0066	-0.0067	0.9	-0.0074	-0.0098

REI 1994 = Relative Energy Intensity of new equipment in 1994 compared with the average existing intensity. Note that in most cases, the energy intensity of new 1994 equipment is less than that of existing equipment. Hence, the TPC for new equipment occasionally is not as rapid as for existing equipment.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.