

Appendix B

Economic growth case comparisons

Table B1. Total energy supply, disposition, and price summary
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Production										
Crude oil and lease condensate.....	19.7	19.5	19.6	19.6	20.8	21.0	21.2	23.3	23.5	23.8
Natural gas plant liquids.....	4.4	6.0	6.1	6.2	6.4	6.5	6.5	6.5	6.7	6.7
Dry natural gas.....	28.0	30.9	31.4	31.7	37.9	38.9	38.8	42.5	43.4	44.0
Coal ¹	17.2	16.6	17.5	18.5	13.6	13.3	13.7	13.3	13.1	13.8
Nuclear / uranium ²	8.3	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2
Conventional hydroelectric power.....	2.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.9
Biomass ³	4.1	4.2	4.2	4.4	4.3	4.4	4.7	4.1	4.6	5.4
Other renewable energy ⁴	2.6	4.9	4.6	4.9	5.6	6.6	9.6	6.4	8.8	13.3
Other ⁵	0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.1
Total.....	87.3	93.9	95.4	97.0	100.4	102.7	106.5	107.9	112.2	119.1
Imports										
Crude oil.....	16.1	16.0	16.8	17.7	14.0	16.0	18.0	12.5	15.9	18.5
Petroleum and other liquids ⁶	3.9	4.5	4.5	4.6	4.2	4.3	4.4	4.1	4.3	4.7
Natural gas ⁷	2.8	2.1	2.1	2.2	1.5	1.6	1.6	1.4	1.4	1.5
Other imports ⁸	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2
Total.....	23.2	22.7	23.6	24.7	19.8	22.0	24.2	18.1	21.8	24.9
Exports										
Petroleum and other liquids ⁹	9.0	11.7	11.6	11.6	13.4	13.5	13.5	15.1	15.2	15.2
Natural gas ¹⁰	1.8	5.0	5.0	5.0	8.1	7.6	7.2	9.7	9.0	8.3
Coal.....	2.0	1.9	1.9	1.9	1.9	1.9	1.8	2.3	2.3	2.3
Total.....	12.8	18.5	18.5	18.4	23.4	23.0	22.5	27.1	26.6	25.8
Discrepancy¹¹.....	1.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.3
Consumption										
Petroleum and other liquids ¹²	36.5	36.8	37.8	39.0	34.2	36.6	39.0	33.5	37.5	41.1
Natural gas.....	28.3	27.7	28.3	28.6	31.0	32.5	32.8	33.7	35.4	36.8
Coal ¹³	15.5	14.6	15.6	16.5	11.7	11.3	11.9	10.9	10.7	11.4
Nuclear / uranium ²	8.3	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2
Conventional hydroelectric power.....	2.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.9
Biomass ¹⁴	2.8	2.7	2.8	2.9	2.8	3.0	3.3	2.8	3.1	3.8
Other renewable energy ⁴	2.6	4.9	4.6	4.9	5.6	6.6	9.6	6.4	8.8	13.3
Other ¹⁵	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Total.....	96.7	98.1	100.5	103.3	96.7	101.5	108.0	98.7	107.1	117.9
Prices (2015 dollars per unit)										
Crude oil spot prices (dollars per barrel)										
Brent.....	52	76	77	77	102	104	106	133	136	139
West Texas Intermediate.....	49	70	71	72	96	97	99	125	129	132
Natural gas at Henry Hub (dollars per million Btu).....										
Coal (dollars per ton).....	2.62	4.24	4.43	4.58	4.70	5.06	4.96	4.54	4.86	5.04
at the minemouth ¹⁶										
Coal (dollars per million Btu).....	33.8	33.9	33.6	33.9	34.1	33.8	34.0	39.7	38.7	40.0
at the minemouth ¹⁶										
Average end-use ¹⁷	1.69	1.70	1.68	1.69	1.73	1.71	1.71	1.95	1.91	1.96
Average electricity (cents per kilowatthour)...	2.37	2.42	2.43	2.48	2.58	2.55	2.62	2.70	2.68	2.79
Average electricity (cents per kilowatthour)...	10.3	10.7	10.5	10.5	10.9	10.9	10.8	10.5	10.5	10.5

Table B1. Total energy supply, disposition, and price summary (continued)
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Prices (nominal dollars per unit)										
Crude oil spot prices (dollars per barrel)										
Brent.....	52	86	85	84	160	141	140	294	229	230
West Texas Intermediate	49	80	79	78	150	131	131	276	217	218
Natural gas at Henry Hub (dollars per million Btu)	2.62	4.82	4.90	4.99	7.36	6.84	6.58	10.00	8.17	8.32
Coal (dollars per ton) at the minemouth ¹⁶	33.8	38.5	37.1	37.0	53.4	45.8	45.0	87.4	65.1	66.1
Coal (dollars per million Btu) at the minemouth ¹⁶	1.69	1.93	1.86	1.85	2.70	2.31	2.27	4.30	3.21	3.24
Average end-use ¹⁷	2.37	2.75	2.69	2.70	4.04	3.45	3.47	5.95	4.50	4.62
Average electricity (cents per kilowatthour)...	10.3	12.1	11.6	11.5	17.1	14.7	14.3	23.2	17.6	17.3

¹Includes waste coal.

²These values represent the energy obtained from uranium when it is used in light water reactors. The total energy content of uranium is much larger, but alternative processes are required to take advantage of it.

³Includes grid-connected electricity from wood and wood waste; biomass, such as corn, used for liquid fuels production; and non-electric energy demand from wood. Refer to Table A17 for details.

⁴Includes grid-connected electricity from landfill gas; biogenic municipal waste; wind; photovoltaic and solar thermal sources; and non-electric energy from renewable sources, such as active and passive solar systems. Excludes electricity imports using renewable sources and nonmarketed renewable energy. See Table A17 for selected nonmarketed residential and commercial renewable energy data.

⁵Includes non-biogenic municipal waste, liquid hydrogen, methanol, and some domestic inputs to refineries.

⁶Includes imports of finished petroleum products, unfinished oils, alcohols, ethers, blending components, and renewable fuels such as ethanol.

⁷Includes imports of liquefied natural gas that are later re-exported.

⁸Includes coal, coal coke (net), and electricity (net). Excludes imports of fuel used in nuclear power plants.

⁹Includes crude oil, petroleum products, ethanol, and biodiesel.

¹⁰Includes re-exported liquefied natural gas.

¹¹Balancing item. Includes unaccounted for supply, losses, gains, and net storage withdrawals.

¹²Estimated consumption. Includes petroleum-derived fuels and non-petroleum derived fuels, such as ethanol and biodiesel, and coal-based synthetic liquids. Petroleum coke, which is a solid, is included. Also included are hydrocarbon gas liquids and crude oil consumed as a fuel. Refer to Table A17 for detailed renewable liquid fuels consumption.

¹³Excludes coal converted to coal-based synthetic liquids and natural gas.

¹⁴Includes grid-connected electricity from wood and wood waste, non-electric energy from wood, and biofuels heat and coproducts used in the production of liquid fuels, but excludes the energy content of the liquid fuels.

¹⁵Includes non-biogenic municipal waste, liquid hydrogen, and net electricity imports.

¹⁶Includes reported prices for both open market and captive mines. Prices weighted by production, which differs from average minemouth prices published in EIA data reports where it is weighted by reported sales.

¹⁷Prices weighted by consumption; weighted average excludes export free-alongside-ship (f.a.s.) prices.

Btu = British thermal unit.

Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.

Sources: 2015: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, February 2016 and EIA, AEO2016 National Energy Modeling System run ref2016.d032416a. Projections: EIA, AEO2016 National Energy Modeling System runs lowmacro.d032516a, ref2016.d032416a, and highmacro.d032516a.

Table B2. Energy consumption by sector and source
(quadrillion Btu per year, unless otherwise noted)

Sector and source	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Energy consumption										
Residential										
Propane	0.43	0.42	0.42	0.43	0.37	0.38	0.39	0.32	0.34	0.36
Kerosene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Distillate fuel oil	0.50	0.43	0.43	0.43	0.34	0.34	0.34	0.27	0.27	0.27
Petroleum and other liquids subtotal.....	0.93	0.86	0.86	0.87	0.71	0.72	0.73	0.59	0.61	0.64
Natural gas	4.77	4.80	4.87	4.92	4.57	4.80	5.08	4.30	4.73	5.20
Renewable energy ¹	0.44	0.41	0.42	0.42	0.38	0.39	0.40	0.35	0.37	0.38
Electricity	4.78	4.64	4.76	4.85	4.53	4.83	5.21	4.66	5.20	5.90
Delivered energy	10.92	10.72	10.90	11.05	10.18	10.74	11.42	9.91	10.91	12.12
Electricity related losses	9.44	9.14	9.37	9.56	8.44	8.77	9.50	8.38	9.15	10.44
Total	20.37	19.85	20.27	20.62	18.62	19.50	20.92	18.28	20.05	22.56
Commercial										
Propane	0.17	0.18	0.18	0.18	0.19	0.19	0.20	0.19	0.20	0.21
Motor gasoline ²	0.04	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07
Kerosene	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Distillate fuel oil	0.37	0.36	0.36	0.36	0.32	0.32	0.32	0.29	0.29	0.29
Residual fuel oil.....	0.07	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10
Petroleum and other liquids subtotal.....	0.66	0.70	0.70	0.71	0.67	0.68	0.69	0.65	0.67	0.68
Natural gas	3.32	3.45	3.45	3.45	3.51	3.53	3.60	3.77	3.81	3.87
Coal	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Renewable energy ³	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Electricity	4.64	4.65	4.69	4.71	4.96	5.09	5.19	5.41	5.62	5.80
Delivered energy	8.81	8.99	9.03	9.05	9.34	9.49	9.67	10.02	10.28	10.54
Electricity related losses	9.16	9.15	9.23	9.29	9.24	9.23	9.47	9.72	9.89	10.28
Total	17.97	18.14	18.26	18.34	18.58	18.72	19.13	19.74	20.17	20.82
Industrial⁴										
Liquefied petroleum gases and other ⁵	2.38	3.00	3.10	3.21	3.46	3.66	3.80	3.96	4.22	4.22
Motor gasoline ²	0.27	0.27	0.28	0.28	0.26	0.27	0.28	0.26	0.27	0.29
Distillate fuel oil	1.34	1.36	1.44	1.51	1.33	1.44	1.53	1.35	1.47	1.60
Residual fuel oil.....	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.05	0.05	0.06
Petrochemical feedstocks	0.66	0.94	0.96	1.00	1.24	1.31	1.36	1.55	1.66	1.64
Other petroleum ⁶	3.38	3.39	3.59	3.78	3.45	3.82	4.15	3.59	4.15	4.63
Petroleum and other liquids subtotal.....	8.07	9.00	9.40	9.82	9.80	10.55	11.19	10.75	11.82	12.45
Natural gas	7.75	8.35	8.55	8.84	8.67	9.13	9.78	9.16	9.89	10.93
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lease and plant fuel ⁷	1.63	1.73	1.76	1.77	2.02	2.06	2.06	2.26	2.31	2.33
Natural gas liquefaction for export ⁸	0.00	0.26	0.26	0.26	0.57	0.53	0.49	0.75	0.69	0.62
Natural gas subtotal.....	9.38	10.34	10.57	10.87	11.25	11.72	12.33	12.16	12.89	13.89
Metallurgical coal	0.54	0.39	0.41	0.52	0.47	0.47	0.60	0.37	0.40	0.59
Other industrial coal	0.82	0.79	0.82	0.87	0.81	0.88	1.00	0.82	0.93	1.16
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net coal coke imports	-0.02	-0.03	-0.01	-0.03	-0.02	0.00	-0.01	0.00	0.01	0.02
Coal subtotal.....	1.34	1.16	1.23	1.36	1.26	1.35	1.59	1.19	1.34	1.78
Biofuels heat and coproducts.....	0.78	0.81	0.83	0.83	0.81	0.81	0.82	0.74	0.84	0.90
Renewable energy ⁹	1.48	1.40	1.48	1.58	1.49	1.67	1.94	1.53	1.79	2.34
Electricity	3.27	3.45	3.61	3.82	3.69	3.98	4.36	3.86	4.26	4.90
Delivered energy	24.33	26.16	27.11	28.28	28.31	30.07	32.25	30.23	32.94	36.26
Electricity related losses	6.46	6.79	7.11	7.52	6.88	7.22	7.96	6.94	7.50	8.69
Total	30.79	32.95	34.22	35.80	35.19	37.29	40.21	37.17	40.44	44.95

Table B2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Transportation										
Propane	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03
Motor gasoline ²	17.01	16.52	16.79	17.05	12.65	13.62	14.35	10.57	12.55	13.77
of which: E85 ¹⁰	0.05	0.04	0.04	0.04	0.33	0.22	0.19	0.36	0.28	0.30
Jet fuel ¹¹	2.84	2.92	2.99	3.06	3.18	3.32	3.49	3.40	3.56	3.74
Distillate fuel oil ¹²	6.67	6.66	6.99	7.38	6.93	7.49	8.28	7.21	8.01	9.54
Residual fuel oil	0.45	0.36	0.37	0.38	0.40	0.42	0.43	0.42	0.45	0.49
Other petroleum ¹³	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.16	0.17
Petroleum and other liquids subtotal	27.14	26.64	27.32	28.04	23.33	25.01	26.72	21.76	24.75	27.73
Pipeline fuel natural gas	0.89	0.82	0.83	0.84	0.91	0.94	0.95	1.04	1.07	1.10
Compressed / liquefied natural gas	0.07	0.08	0.08	0.09	0.16	0.17	0.18	0.57	0.59	0.73
Liquid hydrogen	0.00	0.01	0.01	0.01	0.04	0.04	0.05	0.05	0.06	0.07
Electricity	0.03	0.05	0.05	0.05	0.10	0.11	0.12	0.13	0.15	0.17
Delivered energy	28.13	27.59	28.29	29.02	24.54	26.28	28.01	23.56	26.63	29.79
Electricity related losses	0.06	0.09	0.09	0.09	0.19	0.20	0.21	0.24	0.27	0.29
Total	28.19	27.68	28.38	29.11	24.74	26.48	28.23	23.80	26.90	30.08
Unspecified sector¹⁴	-0.58	-0.57	-0.58	-0.60	-0.41	-0.46	-0.50	-0.33	-0.42	-0.50
Delivered energy consumption for all sectors										
Liquefied petroleum gases and other ⁵	2.99	3.61	3.71	3.83	4.03	4.24	4.40	4.49	4.79	4.82
Motor gasoline ²	16.96	16.28	16.55	16.80	12.55	13.49	14.21	10.54	12.47	13.66
of which: E85 ¹⁰	0.05	0.04	0.04	0.04	0.33	0.22	0.19	0.36	0.28	0.30
Jet fuel ¹¹	3.18	3.15	3.22	3.30	3.43	3.58	3.76	3.66	3.83	4.03
Kerosene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Distillate fuel oil	8.33	8.59	8.98	9.44	8.68	9.33	10.20	8.87	9.77	11.39
Residual fuel oil	0.56	0.51	0.52	0.53	0.55	0.57	0.59	0.56	0.60	0.65
Petrochemical feedstocks	0.66	0.94	0.96	1.00	1.24	1.31	1.36	1.55	1.66	1.64
Other petroleum ¹⁵	3.54	3.55	3.75	3.94	3.61	3.98	4.32	3.74	4.31	4.80
Petroleum and other liquids subtotal	36.23	36.63	37.70	38.84	34.10	36.51	38.84	33.43	37.44	41.00
Natural gas	15.90	16.68	16.95	17.29	16.91	17.63	18.64	17.79	19.02	20.73
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lease and plant fuel ⁷	1.63	1.73	1.76	1.77	2.02	2.06	2.06	2.26	2.31	2.33
Pipeline natural gas	0.00	0.26	0.26	0.26	0.57	0.53	0.49	0.75	0.69	0.62
Natural gas liquefaction for export ⁸	0.89	0.82	0.83	0.84	0.91	0.94	0.95	1.04	1.07	1.10
Natural gas subtotal	18.43	19.49	19.80	20.16	20.41	21.16	22.13	21.84	23.09	24.79
Metallurgical coal	0.54	0.39	0.41	0.52	0.47	0.47	0.60	0.37	0.40	0.59
Other coal	0.88	0.84	0.88	0.93	0.86	0.93	1.05	0.88	0.98	1.22
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net coal coke imports	-0.02	-0.03	-0.01	-0.03	-0.02	0.00	-0.01	0.00	0.01	0.02
Coal subtotal	1.40	1.21	1.28	1.42	1.32	1.40	1.65	1.24	1.39	1.83
Biofuels heat and coproducts	0.78	0.81	0.83	0.83	0.81	0.81	0.82	0.74	0.84	0.90
Renewable energy ¹⁶	2.06	1.95	2.03	2.13	2.01	2.19	2.48	2.01	2.29	2.86
Liquid hydrogen	0.00	0.01	0.01	0.01	0.04	0.04	0.05	0.05	0.06	0.07
Electricity	12.72	12.78	13.11	13.42	13.28	14.01	14.88	14.07	15.23	16.77
Delivered energy	71.62	72.89	74.75	76.81	71.96	76.12	80.85	73.38	80.34	88.21
Electricity related losses	25.12	25.17	25.80	26.46	24.76	25.41	27.14	25.28	26.81	29.70
Total	96.74	98.06	100.55	103.27	96.72	101.54	107.99	98.66	107.15	117.91
Electric power¹⁷										
Distillate fuel oil	0.09	0.08	0.09	0.09	0.07	0.06	0.07	0.06	0.05	0.06
Residual fuel oil	0.17	0.06	0.06	0.06	0.04	0.04	0.05	0.03	0.03	0.03
Petroleum and other liquids subtotal	0.26	0.14	0.15	0.15	0.11	0.11	0.11	0.09	0.09	0.09
Natural gas	9.89	8.18	8.50	8.44	10.56	11.34	10.70	11.85	12.31	12.01
Steam coal	14.08	13.42	14.34	15.13	10.33	9.92	10.22	9.64	9.36	9.56
Nuclear / uranium ¹⁸	8.34	8.12	8.12	8.12	8.25	8.25	8.25	8.25	8.25	8.25
Renewable energy ¹⁹	4.86	7.67	7.37	7.62	8.40	9.41	12.34	9.15	11.67	16.18
Non-biogenic municipal waste	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Electricity imports	0.19	0.19	0.19	0.20	0.17	0.17	0.17	0.15	0.15	0.15
Total	37.85	37.95	38.90	39.89	38.04	39.42	42.02	39.35	42.04	46.47

Table B2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Total energy consumption										
Liquefied petroleum gases and other ⁵	2.99	3.61	3.71	3.83	4.03	4.24	4.40	4.49	4.79	4.82
Motor gasoline ²	16.96	16.28	16.55	16.80	12.55	13.49	14.21	10.54	12.47	13.66
of which: E85 ¹⁰	0.05	0.04	0.04	0.04	0.33	0.22	0.19	0.36	0.28	0.30
Jet fuel ¹¹	3.18	3.15	3.22	3.30	3.43	3.58	3.76	3.66	3.83	4.03
Kerosene.....	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Distillate fuel oil.....	8.42	8.67	9.07	9.53	8.75	9.40	10.26	8.93	9.82	11.44
Residual fuel oil.....	0.73	0.57	0.58	0.59	0.59	0.62	0.64	0.59	0.64	0.68
Petrochemical feedstocks.....	0.66	0.94	0.96	1.00	1.24	1.31	1.36	1.55	1.66	1.64
Other petroleum ¹⁵	3.54	3.55	3.75	3.94	3.61	3.98	4.32	3.74	4.31	4.80
Petroleum and other liquids subtotal.....	36.49	36.77	37.85	38.99	34.21	36.62	38.96	33.51	37.52	41.09
Natural gas.....	25.79	24.87	25.45	25.73	27.47	28.97	29.33	29.64	31.33	32.74
Natural-gas-to-liquids heat and power.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lease and plant fuel ⁷	1.63	1.73	1.76	1.77	2.02	2.06	2.06	2.26	2.31	2.33
Natural gas liquefaction for export ⁸	0.00	0.26	0.26	0.26	0.57	0.53	0.49	0.75	0.69	0.62
Pipeline natural gas.....	0.89	0.82	0.83	0.84	0.91	0.94	0.95	1.04	1.07	1.10
Natural gas subtotal.....	28.31	27.67	28.30	28.60	30.96	32.51	32.83	33.69	35.39	36.80
Metallurgical coal.....	0.54	0.39	0.41	0.52	0.47	0.47	0.60	0.37	0.40	0.59
Other coal.....	14.96	14.26	15.22	16.06	11.20	10.86	11.28	10.52	10.34	10.78
Coal-to-liquids heat and power.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net coal coke imports.....	-0.02	-0.03	-0.01	-0.03	-0.02	0.00	-0.01	0.00	0.01	0.02
Coal subtotal.....	15.48	14.63	15.62	16.54	11.65	11.32	11.87	10.89	10.75	11.39
Nuclear / uranium ¹⁸	8.34	8.12	8.12	8.12	8.25	8.25	8.25	8.25	8.25	8.25
Biofuels heat and coproducts.....	0.78	0.81	0.83	0.83	0.81	0.81	0.82	0.74	0.84	0.90
Renewable energy ²⁰	6.92	9.62	9.40	9.75	10.41	11.60	14.82	11.17	13.96	19.05
Liquid hydrogen.....	0.00	0.01	0.01	0.01	0.04	0.04	0.05	0.05	0.06	0.07
Non-biogenic municipal waste.....	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Electricity imports.....	0.19	0.19	0.19	0.20	0.17	0.17	0.17	0.15	0.15	0.15
Total.....	96.74	98.06	100.55	103.27	96.72	101.54	107.99	98.66	107.15	117.91
Energy use and related statistics										
Delivered energy use.....	71.62	72.89	74.75	76.81	71.96	76.12	80.85	73.38	80.34	88.21
Total energy use.....	96.74	98.06	100.55	103.27	96.72	101.54	107.99	98.66	107.15	117.91
Ethanol consumed in motor gasoline and E85.....	1.18	1.17	1.19	1.20	1.12	1.12	1.16	1.12	1.24	1.35
Population (millions).....	322	334	335	336	355	360	364	371	381	391
Gross domestic product (billion 2009 dollars)....	16,349	17,576	18,555	19,499	20,749	23,113	25,606	24,511	28,397	32,967
Carbon dioxide emissions (million metric tons).....	5,273	5,098	5,289	5,458	4,762	4,961	5,176	4,720	5,044	5,417

¹Includes wood used for residential heating. See Table A4 and/or Table A17 for estimates of nonmarketed renewable energy consumption for geothermal heat pumps, solar thermal water heating, and electricity generation from wind and solar photovoltaic sources.

²Includes ethanol and ethers blended into gasoline.

³Excludes ethanol. Includes commercial sector consumption of wood and wood waste, landfill gas, municipal waste, and other biomass for combined heat and power.

See Table A5 and/or Table A17 for estimates of nonmarketed renewable energy consumption for solar thermal water heating and electricity generation from wind and solar photovoltaic sources.

⁴Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.

⁵Includes ethane, natural gasoline, and refinery olefins.

⁶Includes petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.

⁷Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.

⁸Fuel used in facilities that liquefy natural gas for export.

⁹Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal waste, and other biomass sources. Excludes ethanol in motor gasoline.

¹⁰E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for this forecast.

¹¹Includes only kerosene type.

¹²Diesel fuel for on- and off- road use.

¹³Includes aviation gasoline and lubricants.

¹⁴Represents consumption unattributed to the sectors above.

¹⁵Includes aviation gasoline, petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.

¹⁶Includes electricity generated for sale to the grid and for own use from renewable sources, and non-electric energy from renewable sources. Excludes ethanol and nonmarketed renewable energy consumption for geothermal heat pumps, buildings photovoltaic systems, and solar thermal water heaters.

¹⁷Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.

¹⁸These values represent the energy obtained from uranium when it is used in light water reactors. The total energy content of uranium is much larger, but alternative processes are required to take advantage of it.

¹⁹Includes conventional hydroelectric, geothermal, wood and wood waste, biogenic municipal waste, other biomass, wind, photovoltaic, and solar thermal sources.

Excludes net electricity imports.

²⁰Includes conventional hydroelectric, geothermal, wood and wood waste, biogenic municipal waste, other biomass, wind, photovoltaic, and solar thermal sources.

Excludes ethanol, net electricity imports, and nonmarketed renewable energy consumption for geothermal heat pumps, buildings photovoltaic systems, and solar thermal water heaters.

Btu = British thermal unit.

Note: Includes estimated consumption for petroleum and other liquids. Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.

Sources: 2015: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, February 2016 and EIA, AEO2016 National Energy Modeling System run ref2016.d032416a. Projections: EIA, AEO2016 National Energy Modeling System runs lowmacro.d032516a, ref2016.d032416a, and highmacro.d032516a.

Table B3. Energy prices by sector and source
(2015 dollars per million Btu, unless otherwise noted)

Sector and source	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Residential										
Propane	16.9	20.1	20.2	20.3	22.2	22.4	22.6	25.5	25.6	26.1
Distillate fuel oil	19.3	22.2	22.4	22.6	27.3	27.8	28.3	33.0	33.8	34.6
Natural gas.....	10.1	10.5	10.7	11.0	11.5	12.0	12.2	11.7	12.3	13.0
Electricity.....	36.3	38.5	37.7	37.7	40.0	39.4	39.0	38.9	38.1	37.8
Commercial										
Propane	15.1	17.9	17.9	18.0	19.7	19.8	20.0	22.5	22.5	23.0
Distillate fuel oil	17.0	19.5	19.7	19.9	24.1	24.4	24.9	29.8	30.5	31.3
Residual fuel oil.....	6.9	10.8	11.0	11.1	15.0	15.3	15.6	19.4	19.9	20.4
Natural gas.....	7.7	9.1	9.3	9.5	10.0	10.4	10.4	9.9	10.4	10.8
Electricity.....	30.6	31.7	31.5	31.7	32.3	32.3	32.4	30.8	30.7	31.1
Industrial¹										
Propane	12.2	15.5	15.6	15.7	17.7	17.8	18.1	21.1	21.1	21.7
Distillate fuel oil	17.0	19.5	19.7	19.9	24.2	24.4	24.9	29.9	30.5	31.3
Residual fuel oil.....	6.8	11.1	11.3	11.4	15.7	15.9	16.2	20.0	20.6	21.1
Natural gas ²	3.7	5.2	5.4	5.5	5.6	6.0	5.9	5.4	5.7	5.9
Metallurgical coal	5.4	6.0	6.0	6.1	7.0	7.0	7.0	7.2	7.3	7.3
Other industrial coal	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.6	3.6	3.7
Coal to liquids	--	--	--	--	--	--	--	--	--	--
Electricity.....	20.3	21.0	20.9	21.0	21.7	22.1	22.1	21.0	21.2	21.6
Transportation										
Propane	18.0	21.2	21.2	21.4	23.3	23.4	23.7	26.6	26.6	27.2
E85 ³	23.3	31.7	32.0	31.6	27.4	30.8	31.7	30.1	35.0	36.0
Motor gasoline ⁴	20.9	22.5	22.7	22.8	26.1	26.5	26.9	30.4	31.8	32.6
Jet fuel ⁵	12.0	16.0	16.2	16.4	20.9	21.3	21.9	27.2	27.7	28.4
Diesel fuel (distillate fuel oil) ⁶	19.8	22.9	23.1	23.3	27.8	28.0	28.5	33.4	34.1	34.8
Residual fuel oil.....	8.1	11.5	11.7	11.8	14.8	15.0	15.3	18.8	19.2	19.7
Natural gas ⁷	16.6	16.4	16.6	16.9	15.0	15.5	15.6	15.3	15.9	16.3
Electricity.....	29.5	33.3	33.0	33.2	37.1	37.4	37.0	35.4	35.5	35.6
Electric power⁸										
Distillate fuel oil	15.0	18.2	18.4	18.7	23.0	23.5	24.0	28.6	29.4	30.2
Residual fuel oil.....	10.2	13.6	13.8	13.9	17.8	18.1	18.4	21.8	22.4	23.0
Natural gas.....	3.3	4.5	4.7	4.8	5.2	5.6	5.4	5.1	5.4	5.5
Steam coal.....	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4
Average price to all users⁹										
Propane	14.9	18.0	18.0	18.1	20.0	20.1	20.3	23.1	23.2	23.7
E85 ³	23.3	31.7	32.0	31.6	27.4	30.8	31.7	30.1	35.0	36.0
Motor gasoline ⁴	20.9	22.5	22.7	22.8	26.1	26.5	26.9	30.4	31.8	32.6
Jet fuel ⁵	12.0	16.0	16.2	16.4	20.9	21.3	21.9	27.2	27.7	28.4
Distillate fuel oil	19.1	22.1	22.3	22.5	27.1	27.3	27.8	32.8	33.3	34.2
Residual fuel oil.....	8.4	11.6	11.7	11.8	15.1	15.4	15.7	19.1	19.6	20.1
Natural gas.....	5.3	6.6	6.7	6.9	7.1	7.4	7.4	7.0	7.4	7.7
Metallurgical coal	5.4	6.0	6.0	6.1	7.0	7.0	7.0	7.2	7.3	7.3
Other coal	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.5	2.5	2.6
Coal to liquids	--	--	--	--	--	--	--	--	--	--
Electricity.....	30.1	31.3	30.8	30.8	32.0	31.9	31.7	30.8	30.6	30.7
Non-renewable energy expenditures by sector (billion 2015 dollars)										
Residential	239	247	250	256	251	266	284	249	274	309
Commercial.....	178	192	193	195	210	216	221	221	230	241
Industrial ¹	168	220	232	247	275	301	325	332	369	411
Transportation.....	514	566	586	605	585	640	697	660	777	894
Total non-renewable expenditures.....	1,099	1,225	1,260	1,302	1,321	1,423	1,526	1,462	1,650	1,855
Transportation renewable expenditures.....	1	1	1	1	9	7	6	11	10	11
Total expenditures	1,100	1,226	1,262	1,303	1,330	1,430	1,532	1,472	1,660	1,866

Table B3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Residential										
Propane	16.9	22.8	22.3	22.2	34.8	30.3	30.0	56.3	43.0	43.1
Distillate fuel oil	19.3	25.2	24.7	24.7	42.6	37.6	37.4	72.8	56.9	57.2
Natural gas.....	10.1	12.0	11.9	12.0	18.0	16.3	16.1	25.7	20.8	21.4
Electricity.....	36.3	43.7	41.7	41.1	62.5	53.3	51.7	85.8	64.2	62.4
Commercial										
Propane	15.1	20.3	19.8	19.7	30.8	26.8	26.5	49.6	37.9	38.0
Distillate fuel oil	17.0	22.1	21.8	21.7	37.7	33.1	33.0	65.6	51.2	51.6
Residual fuel oil.....	6.9	12.3	12.1	12.1	23.5	20.7	20.7	42.7	33.6	33.7
Natural gas.....	7.7	10.4	10.3	10.4	15.6	14.1	13.8	21.9	17.5	17.8
Electricity.....	30.6	36.0	34.8	34.5	50.5	43.7	42.9	67.8	51.7	51.4
Industrial¹										
Propane	12.2	17.6	17.2	17.2	27.7	24.1	24.0	46.5	35.6	35.8
Distillate fuel oil	17.0	22.1	21.8	21.7	37.8	33.1	33.0	65.8	51.3	51.6
Residual fuel oil.....	6.8	12.6	12.4	12.4	24.5	21.6	21.5	44.2	34.7	34.8
Natural gas ²	3.7	5.9	5.9	6.1	8.8	8.1	7.8	11.9	9.6	9.7
Metallurgical coal	5.4	6.9	6.7	6.6	10.9	9.4	9.2	15.9	12.2	12.0
Other industrial coal	3.4	3.9	3.7	3.7	5.4	4.6	4.5	7.9	6.0	6.1
Coal to liquids	--	--	--	--	--	--	--	--	--	--
Electricity.....	20.3	23.8	23.1	23.0	34.0	29.9	29.3	46.2	35.7	35.7
Transportation										
Propane	18.0	24.0	23.4	23.3	36.4	31.7	31.3	58.6	44.8	44.9
E85 ³	23.3	36.0	35.4	34.4	42.9	41.7	42.0	66.3	58.8	59.5
Motor gasoline ⁴	20.9	25.6	25.1	24.8	40.8	35.9	35.6	67.1	53.6	53.9
Jet fuel ⁵	12.0	18.2	17.9	17.9	32.7	28.8	29.0	59.9	46.6	46.9
Diesel fuel (distillate fuel oil) ⁶	19.8	26.0	25.5	25.4	43.5	37.9	37.7	73.7	57.3	57.5
Residual fuel oil.....	8.1	13.1	12.9	12.8	23.2	20.3	20.3	41.4	32.3	32.5
Natural gas ⁷	16.6	18.6	18.4	18.5	23.5	21.0	20.6	33.7	26.7	26.9
Electricity.....	29.5	37.9	36.5	36.2	58.1	50.5	49.0	78.0	59.8	58.7
Electric power⁸										
Distillate fuel oil	15.0	20.7	20.4	20.4	35.9	31.8	31.8	63.1	49.4	49.9
Residual fuel oil.....	10.2	15.5	15.2	15.2	27.8	24.4	24.4	48.1	37.8	37.9
Natural gas.....	3.3	5.1	5.2	5.3	8.1	7.5	7.2	11.2	9.0	9.2
Steam coal.....	2.2	2.6	2.5	2.5	3.6	3.1	3.0	5.4	4.0	4.0

Table B3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Average price to all users⁹										
Propane	14.9	20.5	19.9	19.8	31.3	27.2	26.9	51.0	39.0	39.1
E85 ³	23.3	36.0	35.4	34.4	42.9	41.7	42.0	66.3	58.8	59.5
Motor gasoline ⁴	20.9	25.6	25.1	24.8	40.8	35.9	35.6	67.1	53.6	53.8
Jet fuel ⁵	12.0	18.2	17.9	17.9	32.7	28.8	29.0	59.9	46.6	46.9
Distillate fuel oil	19.1	25.1	24.7	24.6	42.3	36.9	36.8	72.2	56.1	56.5
Residual fuel oil	8.4	13.1	13.0	12.9	23.7	20.8	20.7	42.2	32.9	33.1
Natural gas	5.3	7.4	7.4	7.6	11.1	10.0	9.8	15.4	12.4	12.7
Metallurgical coal	5.4	6.9	6.7	6.6	10.9	9.4	9.2	15.9	12.2	12.0
Other coal	2.3	2.6	2.6	2.6	3.8	3.2	3.2	5.6	4.2	4.2
Coal to liquids	--	--	--	--	--	--	--	--	--	--
Electricity	30.1	35.5	34.1	33.6	50.1	43.1	42.0	67.9	51.6	50.7
Non-renewable energy expenditures by sector (billion nominal dollars)										
Residential	239	281	276	279	393	360	376	548	462	510
Commercial	178	217	213	213	328	292	293	487	387	398
Industrial ¹	168	250	256	269	431	407	430	732	620	678
Transportation	514	643	647	659	915	866	923	1,455	1,307	1,477
Total non-renewable expenditures	1,099	1,391	1,392	1,420	2,066	1,925	2,022	3,223	2,776	3,063
Transportation renewable expenditures	1	2	1	1	14	9	8	24	17	18
Total expenditures	1,100	1,393	1,394	1,422	2,081	1,934	2,030	3,246	2,793	3,081

¹Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.

²Excludes use for lease and plant fuel.

³E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for this forecast.

⁴Sales weighted-average price for all grades. Includes Federal, State, and local taxes.

⁵Kerosene-type jet fuel. Includes Federal and State taxes while excluding county and local taxes.

⁶Diesel fuel for on-road use. Includes Federal and State taxes while excluding county and local taxes.

⁷Natural gas used as fuel in motor vehicles, trains, and ships. Includes estimated motor vehicle fuel taxes and estimated dispensing costs or charges.

⁸Includes electricity-only and combined heat and power plants that have a regulatory status.

⁹Weighted averages of end-use fuel prices are derived from the prices shown in each sector and the corresponding sectoral consumption.

Btu = British thermal unit.

-- = Not applicable.

Note: Data for 2015 are model results and may differ from official EIA data reports.

Sources: 2015: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, February 2016 and EIA, AEO2016 National Energy Modeling System run ref2016.d032416a. Projections: EIA, AEO2016 National Energy Modeling System runs lowmacro.d032516a, ref2016.d032416a, and highmacro.d032516a.

Table B4. Macroeconomic indicators

(billion 2009 chain-weighted dollars, unless otherwise noted)

Indicators	2015	Projections								
		2020			2030			2040		
		Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth	Low economic growth	Reference	High economic growth
Real gross domestic product	16,349	17,576	18,555	19,499	20,749	23,113	25,606	24,511	28,397	32,967
Components of real gross domestic product										
Real consumption	11,221	12,197	12,861	13,436	14,356	16,092	17,863	16,827	19,870	22,954
Real investment	2,842	3,094	3,513	3,939	3,758	4,520	5,283	4,591	5,661	6,935
Real government spending	2,860	2,906	2,967	3,026	3,079	3,222	3,369	3,360	3,602	3,899
Real exports	2,119	2,475	2,615	2,733	3,635	4,178	4,692	4,954	6,113	7,595
Real imports	2,662	3,069	3,374	3,602	4,013	4,824	5,499	5,070	6,683	8,171
Energy intensity										
(thousand Btu per 2009 dollar of GDP)										
Delivered energy	4.38	4.15	4.03	3.94	3.47	3.29	3.16	2.99	2.83	2.68
Total energy	5.92	5.58	5.42	5.30	4.66	4.39	4.22	4.02	3.77	3.58
Price indices										
GDP chain-type price index (2009=1.000)	1.10	1.25	1.21	1.20	1.72	1.49	1.45	2.42	1.85	1.81
Consumer price index (1982-4=1.00)										
All-urban	2.37	2.73	2.65	2.62	3.88	3.35	3.27	5.62	4.27	4.18
Energy commodities and services	2.02	2.48	2.41	2.39	3.83	3.34	3.29	5.93	4.61	4.61
Wholesale price index (1982=1.00)										
All commodities	1.91	2.20	2.14	2.13	3.02	2.59	2.54	4.19	3.16	3.15
Fuel and power	1.60	2.14	2.10	2.10	3.30	2.91	2.87	5.04	3.92	3.96
Metals and metal products	2.01	2.20	2.15	2.18	2.93	2.55	2.55	3.92	3.06	3.24
Industrial commodities excluding energy	1.94	2.20	2.13	2.12	2.97	2.53	2.48	4.03	3.01	2.99
Interest rates (percent, nominal)										
Federal funds rate	0.13	4.91	3.32	2.88	6.10	3.24	2.97	6.20	3.08	3.12
10-year treasury note	2.14	5.55	3.83	3.44	6.66	3.77	3.50	6.87	3.72	3.53
AA utility bond rate	4.01	7.94	5.87	5.07	9.14	5.73	5.02	9.48	5.71	4.67
Value of shipments (billion 2009 dollars)										
Non-industrial and service sectors	24,085	25,327	26,750	28,025	28,651	32,042	35,673	32,130	37,701	44,520
Total industrial	7,229	7,861	8,351	8,889	8,969	9,776	10,707	10,365	11,483	13,187
Agriculture, mining, and construction	1,931	2,270	2,493	2,715	2,408	2,710	2,970	2,604	2,955	3,320
Manufacturing	5,299	5,591	5,858	6,174	6,561	7,066	7,736	7,761	8,528	9,868
Energy-intensive	1,704	1,829	1,892	1,965	2,018	2,147	2,315	2,222	2,417	2,682
Non-energy-intensive	3,594	3,763	3,967	4,208	4,543	4,920	5,421	5,539	6,111	7,186
Total shipments	31,314	33,188	35,101	36,914	37,620	41,818	46,380	42,494	49,184	57,707
Population and employment (millions)										
Population, with armed forces overseas	322	334	335	336	355	360	364	371	381	391
Population, aged 16 and over	257	269	269	270	288	292	295	304	311	319
Population, aged 65 and over	48	57	57	57	74	74	75	83	82	84
Employment, nonfarm	142	146	150	154	154	161	168	163	170	180
Employment, manufacturing	12.5	13.0	13.1	13.5	12.2	13.0	13.2	11.2	12.3	12.7
Key labor indicators										
Labor force (millions)	157	166	167	167	174	177	180	182	188	194
Non-farm labor productivity (2009=1.00)	1.06	1.11	1.15	1.18	1.28	1.37	1.43	1.46	1.63	1.74
Unemployment rate (percent)	5.31	5.12	4.72	4.66	4.98	4.78	4.53	5.01	4.78	4.33
Key indicators for energy demand										
Real disposable personal income	12,225	13,577	14,197	14,748	16,684	17,826	19,420	20,033	21,789	24,273
Housing starts (millions)	1.18	1.24	1.74	2.34	0.97	1.66	2.50	0.85	1.65	2.77
Commercial floorspace (billion square feet)	83.8	88.1	88.7	89.3	96.8	99.3	101.4	105.5	109.8	113.6
Unit sales of light-duty vehicles (millions)	17.4	15.7	17.1	18.3	15.5	17.7	18.7	14.8	19.0	21.3

GDP = Gross domestic product.

Btu = British thermal unit.

Sources: 2015: IHS Economics, Industry and Employment models, November 2015. Projections: EIA, AEO2016 National Energy Modeling System runs lowmacro.d032516a, ref2016.d032416a, and highmacro.d032516a.