

Table A1. Total energy supply, disposition, and price summary
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Production								
Crude oil and lease condensate	23.87	27.43	28.57	28.57	27.31	27.39	26.64	0.4%
Natural gas plant liquids	6.58	7.61	7.90	7.93	7.92	8.07	8.05	0.7%
Dry natural gas	35.14	37.60	39.28	40.04	41.39	43.08	44.58	0.8%
Coal ¹	10.80	10.38	10.14	9.71	9.28	9.03	9.08	-0.6%
Nuclear / uranium ²	8.21	7.79	6.59	6.37	6.22	6.27	6.21	-0.9%
Conventional hydroelectric power	2.53	2.54	2.43	2.39	2.36	2.32	2.29	-0.3%
Biomass ³	4.47	4.82	4.89	4.95	5.00	5.16	5.39	0.6%
Other renewable energy ⁴	4.43	7.98	9.52	10.99	11.84	12.79	14.11	3.9%
Other ⁵	0.69	0.83	0.65	0.66	0.69	0.69	0.71	0.1%
Total	96.72	106.99	109.97	111.62	112.00	114.80	117.08	0.6%
Imports								
Crude oil	13.44	16.69	15.42	15.53	16.68	16.19	17.02	0.8%
Petroleum and other liquids ⁶	4.17	4.14	3.90	3.67	3.66	3.68	3.69	-0.4%
Natural gas	2.65	2.53	2.22	2.08	2.10	2.00	1.92	-1.1%
Other imports ⁷	0.24	0.15	0.19	0.19	0.18	0.18	0.17	-1.1%
Total	20.51	23.51	21.72	21.47	22.63	22.05	22.80	0.4%
Exports								
Petroleum and other liquids ⁸	16.43	21.38	21.32	21.07	20.69	19.81	19.04	0.5%
Natural gas	5.31	7.86	8.93	9.14	9.23	9.28	9.36	1.9%
Coal	1.81	2.52	2.48	2.51	2.43	2.41	2.45	1.0%
Total	23.55	31.76	32.74	32.72	32.35	31.50	30.85	0.9%
Discrepancy⁹	0.75	0.29	0.39	0.38	0.35	0.33	0.36	--
Consumption								
Petroleum and other liquids ¹⁰	33.55	37.00	36.88	37.09	37.39	38.12	39.08	0.5%
Natural gas	31.89	31.96	32.12	32.55	33.86	35.38	36.70	0.5%
Coal ¹¹	8.99	7.82	7.61	7.16	6.81	6.59	6.60	-1.0%
Nuclear / uranium ²	8.21	7.79	6.59	6.37	6.22	6.27	6.21	-0.9%
Conventional hydroelectric power	2.53	2.54	2.43	2.39	2.36	2.32	2.29	-0.3%
Biomass ¹²	3.05	3.10	3.12	3.15	3.18	3.28	3.40	0.4%
Other renewable energy ⁴	4.43	7.98	9.52	10.99	11.84	12.79	14.11	3.9%
Other ¹³	0.27	0.26	0.30	0.30	0.29	0.28	0.27	0.0%
Total	92.92	98.45	98.56	99.99	101.94	105.02	108.66	0.5%
Prices (2020 dollars per unit)								
Crude oil spot prices (dollars per barrel)								
Brent	41	61	73	80	87	91	95	2.8%
West Texas Intermediate	39	59	71	77	84	88	91	2.9%
Natural gas at Henry Hub (dollars per million Btu)	2.07	2.88	3.34	3.53	3.55	3.51	3.69	2.0%
Coal (dollars per ton)								
at the minemouth ¹⁴	34.1	30.8	29.4	30.1	32.0	33.4	34.7	0.1%
Coal (dollars per million Btu)								
at the minemouth ¹⁴	1.68	1.49	1.45	1.48	1.55	1.61	1.66	0.0%
Average end-use ¹⁵	2.12	2.03	1.97	1.96	1.98	1.99	2.01	-0.2%
Average electricity (cents per kilowatthour)	10.4	10.3	10.3	10.3	10.1	9.9	9.6	-0.3%

Table A1. Total energy supply, disposition, and price summary (continued)
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Prices (nominal dollars per unit)								
Crude oil spot prices (dollars per barrel)								
Brent	41	66	89	109	132	156	185	5.1%
West Texas Intermediate	39	64	86	105	128	149	178	5.2%
Natural gas at Henry Hub (dollars per million Btu)	2.07	3.10	4.08	4.84	5.40	5.98	7.21	4.3%
Coal (dollars per ton)								
at the minemouth ¹⁴	34.1	33.1	35.8	41.2	48.7	56.9	67.7	2.3%
Coal (dollars per million Btu)								
at the minemouth ¹⁴	1.68	1.61	1.77	2.02	2.36	2.74	3.25	2.2%
Average end-use ¹⁵	2.12	2.19	2.40	2.69	3.01	3.39	3.92	2.1%
Average electricity (cents per kilowatthour)	10.4	11.1	12.5	14.1	15.3	16.9	18.8	2.0%

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

⁸Includes crude oil, petroleum products, ethanol, and biodiesel.

⁹Balancing item. Includes unaccounted for supply, losses, gains, and net storage withdrawals.

¹⁰Estimated 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.

¹¹Excludes coal converted to coal-based synthetic liquids and natural gas.

¹²Includes 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.

¹³Includes non-biogenic municipal waste, liquid hydrogen, and net electricity imports.

¹⁴Includes 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.

¹⁵Prices weighted by consumption; weighted average excludes export free-alongside-ship (f.a.s.) prices.

Btu = British thermal unit.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A2. Energy consumption by sector and source
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Energy consumption								
Residential								
Propane	0.46	0.46	0.44	0.43	0.42	0.42	0.42	-0.3%
Distillate fuel oil ¹	0.43	0.41	0.37	0.35	0.32	0.30	0.28	-1.5%
Petroleum and other liquids subtotal.....	0.88	0.87	0.82	0.78	0.74	0.72	0.69	-0.8%
Natural gas	4.97	4.97	4.90	4.86	4.84	4.83	4.82	-0.1%
Renewable energy ²	0.46	0.46	0.44	0.41	0.38	0.36	0.34	-1.0%
Electricity	5.05	5.13	5.26	5.44	5.67	5.91	6.18	0.7%
Delivered energy	11.36	11.43	11.42	11.49	11.64	11.82	12.03	0.2%
Electricity related losses	9.42	8.96	8.73	8.85	9.03	9.23	9.50	0.0%
Total	20.78	20.39	20.15	20.34	20.67	21.05	21.54	0.1%
Commercial								
Propane	0.17	0.17	0.18	0.19	0.20	0.21	0.22	0.9%
Motor gasoline ³	0.32	0.37	0.37	0.37	0.37	0.38	0.38	0.5%
Kerosene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.9%
Distillate fuel oil.....	0.31	0.33	0.32	0.31	0.30	0.29	0.28	-0.4%
Residual fuel oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0%
Petroleum and other liquids subtotal.....	0.81	0.88	0.88	0.87	0.87	0.88	0.88	0.3%
Natural gas	3.31	3.63	3.63	3.65	3.68	3.72	3.73	0.4%
Coal	0.02	0.01	0.01	0.01	0.01	0.01	0.01	-1.1%
Renewable energy ⁴	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.0%
Electricity	4.34	4.71	4.76	4.87	5.04	5.28	5.62	0.9%
Delivered energy	8.60	9.36	9.41	9.54	9.74	10.02	10.38	0.6%
Electricity related losses	8.08	8.22	7.90	7.92	8.02	8.25	8.65	0.2%
Total	16.68	17.58	17.31	17.45	17.75	18.27	19.03	0.4%
Industrial⁵								
Liquefied petroleum gases and other ⁶	3.13	3.99	4.30	4.62	4.80	4.98	5.20	1.7%
Motor gasoline ³	0.24	0.29	0.30	0.32	0.34	0.36	0.39	1.6%
Distillate fuel oil.....	1.13	1.29	1.38	1.47	1.55	1.67	1.80	1.5%
Residual fuel oil	0.03	0.03	0.04	0.04	0.04	0.04	0.04	1.0%
Petrochemical feedstocks	0.58	0.65	0.65	0.66	0.66	0.66	0.66	0.4%
Other petroleum ⁷	3.21	3.29	3.42	3.53	3.62	3.69	3.82	0.6%
Petroleum and other liquids subtotal.....	8.33	9.54	10.09	10.64	11.02	11.40	11.91	1.2%
Natural gas	8.48	9.12	9.37	9.68	10.12	10.63	11.22	0.9%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--0%
Lease and plant fuel ⁸	1.87	2.01	2.13	2.24	2.29	2.40	2.44	0.9%
Natural gas to liquefy gas for export ⁹	0.36	0.64	0.77	0.78	0.78	0.78	0.78	2.6%
Natural gas subtotal.....	10.71	11.76	12.26	12.69	13.20	13.81	14.44	1.0%
Metallurgical coal	0.47	0.46	0.41	0.40	0.39	0.41	0.41	-0.5%
Other industrial coal	0.49	0.47	0.44	0.42	0.42	0.46	0.47	-0.1%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--0%
Net coal coke imports	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.7%
Coal subtotal.....	0.93	0.90	0.83	0.80	0.79	0.84	0.86	-0.3%
Biofuels heat and coproducts	0.90	0.89	0.90	0.93	0.96	1.01	1.06	0.5%
Renewable energy ¹⁰	1.53	1.60	1.62	1.64	1.69	1.77	1.87	0.7%
Electricity	3.07	3.36	3.51	3.63	3.73	3.88	4.02	0.9%
Delivered energy	25.47	28.05	29.22	30.33	31.38	32.70	34.16	1.0%
Electricity related losses	5.72	5.86	5.83	5.90	5.93	6.06	6.18	0.3%
Total	31.18	33.91	35.06	36.23	37.31	38.77	40.34	0.9%

Table A2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Transportation								
Propane	0.01	0.01	0.01	0.01	0.01	0.01	0.01	2.5%
Motor gasoline ³	14.83	15.33	14.80	14.46	14.33	14.40	14.58	-0.1%
of which: E85 ¹¹	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-0.2%
Jet fuel ¹²	2.24	3.51	3.63	3.87	4.06	4.33	4.54	2.4%
Distillate fuel oil ¹³	6.15	6.43	6.24	6.09	6.02	6.11	6.21	0.0%
Residual fuel oil	0.43	0.61	0.61	0.55	0.52	0.50	0.47	0.3%
Other petroleum ¹⁴	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.1%
Petroleum and other liquids subtotal	23.79	26.04	25.43	25.13	25.09	25.49	25.96	0.3%
Pipeline and distribution fuel natural gas	0.71	0.66	0.61	0.63	0.65	0.68	0.71	0.0%
Compressed / liquefied natural gas	0.09	0.13	0.16	0.22	0.29	0.37	0.45	5.6%
Liquid hydrogen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3%
Electricity	0.04	0.06	0.10	0.15	0.23	0.32	0.41	8.5%
Delivered energy	24.62	26.90	26.31	26.13	26.26	26.85	27.54	0.4%
Electricity related losses	0.07	0.11	0.16	0.25	0.36	0.49	0.64	7.8%
Total	24.69	27.01	26.47	26.38	26.62	27.35	28.18	0.4%
Unspecified sector¹⁵	-0.41	-0.44	-0.42	-0.41	-0.41	-0.41	-0.42	0.1%
Delivered energy consumption for all sectors								
Liquefied petroleum gases and other ⁶	3.76	4.64	4.94	5.25	5.44	5.62	5.84	1.5%
Motor gasoline ³	15.23	15.83	15.32	15.01	14.89	14.98	15.19	0.0%
of which: E85 ¹¹	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-0.2%
Jet fuel ¹²	2.23	3.50	3.62	3.85	4.05	4.31	4.53	2.4%
Kerosene ¹⁶	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.7%
Distillate fuel oil ¹	7.77	8.20	8.06	7.96	7.94	8.11	8.31	0.2%
Residual fuel oil	0.46	0.64	0.65	0.59	0.56	0.55	0.52	0.4%
Petrochemical feedstocks	0.58	0.65	0.65	0.66	0.66	0.66	0.66	0.4%
Other petroleum ¹⁷	3.35	3.44	3.57	3.68	3.77	3.83	3.97	0.6%
Petroleum and other liquids subtotal	33.40	36.90	36.80	37.01	37.31	38.06	39.02	0.5%
Natural gas	16.85	17.84	18.07	18.41	18.93	19.55	20.22	0.6%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Lease and plant fuel ⁸	1.87	2.01	2.13	2.24	2.29	2.40	2.44	0.9%
Natural gas to liquefy gas for export ⁹	0.36	0.64	0.77	0.78	0.78	0.78	0.78	2.6%
Pipeline and distribution fuel natural gas	0.71	0.66	0.61	0.63	0.65	0.68	0.71	0.0%
Natural gas subtotal	19.78	21.15	21.57	22.05	22.66	23.41	24.16	0.7%
Metallurgical coal	0.47	0.46	0.41	0.40	0.39	0.41	0.41	-0.5%
Other coal	0.50	0.48	0.46	0.44	0.44	0.47	0.48	-0.1%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Net coal coke imports	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.7%
Coal subtotal	0.95	0.92	0.84	0.81	0.81	0.86	0.87	-0.3%
Biofuels heat and coproducts	0.90	0.89	0.90	0.93	0.96	1.01	1.06	0.5%
Renewable energy ¹⁸	2.12	2.19	2.19	2.18	2.20	2.26	2.34	0.3%
Liquid hydrogen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3%
Electricity	12.49	13.26	13.63	14.09	14.67	15.39	16.24	0.9%
Delivered energy	69.64	75.30	75.94	77.08	78.60	80.98	83.69	0.6%
Electricity related losses	23.28	23.15	22.63	22.92	23.34	24.04	24.98	0.2%
Total	92.92	98.45	98.56	99.99	101.94	105.02	108.66	0.5%
Electric power¹⁹								
Distillate fuel oil	0.07	0.07	0.05	0.05	0.04	0.04	0.04	-2.0%
Residual fuel oil	0.08	0.03	0.03	0.03	0.03	0.02	0.02	-4.9%
Petroleum and other liquids subtotal	0.15	0.10	0.08	0.08	0.07	0.06	0.06	-3.2%
Natural gas	12.11	10.80	10.55	10.50	11.20	11.97	12.54	0.1%
Steam coal	8.04	6.90	6.77	6.35	6.00	5.73	5.73	-1.1%
Nuclear / uranium ²⁰	8.21	7.79	6.59	6.37	6.22	6.27	6.21	-0.9%
Renewable energy ²¹	6.99	10.55	11.97	13.41	14.22	15.13	16.41	2.9%
Non-biogenic municipal waste	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.0%
Electricity imports	0.16	0.14	0.18	0.18	0.17	0.16	0.15	-0.2%
Total	35.77	36.41	36.26	37.00	38.00	39.43	41.21	0.5%

Table A2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Total energy consumption								
Liquefied petroleum gases and other ⁶	3.76	4.64	4.94	5.25	5.44	5.62	5.84	1.5%
Motor gasoline ³	15.23	15.83	15.32	15.01	14.89	14.98	15.19	0.0%
of which: E85 ¹¹	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-0.2%
Jet fuel ¹²	2.23	3.50	3.62	3.85	4.05	4.31	4.53	2.4%
Kerosene ¹⁶	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.7%
Distillate fuel oil ¹	7.84	8.26	8.11	8.01	7.99	8.15	8.35	0.2%
Residual fuel oil	0.54	0.68	0.68	0.63	0.59	0.56	0.53	-0.1%
Petrochemical feedstocks	0.58	0.65	0.65	0.66	0.66	0.66	0.66	0.4%
Other petroleum ¹⁷	3.35	3.44	3.57	3.68	3.77	3.83	3.97	0.6%
Petroleum and other liquids subtotal	33.55	37.00	36.88	37.09	37.39	38.12	39.08	0.5%
Natural gas	28.96	28.64	28.61	28.90	30.14	31.52	32.76	0.4%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Lease and plant fuel ⁸	1.87	2.01	2.13	2.24	2.29	2.40	2.44	0.9%
Natural gas to liquefy gas for export ⁹	0.36	0.64	0.77	0.78	0.78	0.78	0.78	2.6%
Pipeline and distribution fuel natural gas	0.71	0.66	0.61	0.63	0.65	0.68	0.71	0.0%
Natural gas subtotal	31.89	31.96	32.12	32.55	33.86	35.38	36.70	0.5%
Metallurgical coal	0.47	0.46	0.41	0.40	0.39	0.41	0.41	-0.5%
Other coal	8.54	7.38	7.23	6.79	6.44	6.20	6.21	-1.1%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Net coal coke imports	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.7%
Coal subtotal	8.99	7.82	7.61	7.16	6.81	6.59	6.60	-1.0%
Nuclear / uranium ²⁰	8.21	7.79	6.59	6.37	6.22	6.27	6.21	-0.9%
Biofuels heat and coproducts	0.90	0.89	0.90	0.93	0.96	1.01	1.06	0.5%
Renewable energy ²²	9.11	12.74	14.17	15.60	16.42	17.38	18.75	2.4%
Liquid hydrogen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3%
Non-biogenic municipal waste	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.0%
Electricity imports	0.16	0.14	0.18	0.18	0.17	0.16	0.15	-0.2%
Total	92.92	98.45	98.56	99.99	101.94	105.02	108.66	0.5%
Energy use and related statistics								
Delivered energy use	69.64	75.30	75.94	77.08	78.60	80.98	83.69	0.6%
Total energy use	92.92	98.45	98.56	99.99	101.94	105.02	108.66	0.5%
Ethanol consumed in motor gasoline and E85	1.08	1.17	1.17	1.18	1.20	1.23	1.27	0.5%
Population (millions)	330.41	341.81	352.60	362.28	370.87	378.67	386.16	0.5%
Gross domestic product (billion 2012 dollars)	18,171	21,193	23,289	25,842	28,371	31,317	34,365	2.1%
Carbon dioxide emissions (million metric tons)	4,562.5	4,622.9	4,583.5	4,552.9	4,595.8	4,691.1	4,806.9	0.2%

¹Includes residential use of kerosene.
²Includes wood used for residential heating, and electricity generation from wind and solar photovoltaic sources.
³Includes ethanol and ethers blended into gasoline.
⁴Excludes 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.
⁵Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
⁶Includes ethane, natural gasoline, and refinery olefins.
⁷Includes petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.
⁸Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
⁹Fuel used in facilities that liquefy natural gas for export.
¹⁰Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal waste, and other biomass sources. Excludes ethanol in motor gasoline.
¹¹E85 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 these projections.
¹²Includes only kerosene type.
¹³Diesel fuel for on- and off- road use.
¹⁴Includes aviation gasoline and lubricants.
¹⁵Represents consumption unattributed to the sectors above.
¹⁶Does not include residential use of kerosene.
¹⁷Includes aviation gasoline, petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.
¹⁸Includes 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.
¹⁹Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
²⁰These 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.
²¹Includes conventional hydroelectric, geothermal, wood and wood waste, biogenic municipal waste, other biomass, wind, photovoltaic, and solar thermal sources. Excludes net electricity imports.
²²Includes 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.
 -- = Not applicable.
 Note: Includes estimated consumption for petroleum and other liquids. Totals may not equal sum of components due to independent rounding.
 Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A3. Energy prices by sector and source
(2020 dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Residential								
Propane	17.30	18.94	21.30	22.89	24.16	25.21	26.16	1.4%
Distillate fuel oil	17.75	22.70	24.85	25.71	26.68	27.33	27.80	1.5%
Natural gas	10.14	10.15	10.99	11.34	11.44	11.53	11.76	0.5%
Electricity	35.77	36.24	36.54	36.63	36.14	35.73	34.96	-0.1%
Commercial								
Propane	12.77	15.61	17.34	18.38	19.30	19.93	20.63	1.6%
Distillate fuel oil	17.83	18.77	20.21	21.12	22.10	22.77	23.27	0.9%
Residual fuel oil	5.25	8.98	11.26	12.19	13.35	13.91	14.49	3.4%
Natural gas	7.23	7.60	8.20	8.41	8.45	8.50	8.69	0.6%
Electricity	31.33	30.94	30.75	30.53	29.63	28.88	27.80	-0.4%
Industrial¹								
Propane	7.62	10.38	11.85	12.86	13.83	14.47	15.24	2.3%
Distillate fuel oil	17.75	18.76	19.96	20.84	21.81	22.48	23.01	0.9%
Residual fuel oil	5.42	10.56	13.19	14.12	15.14	15.84	16.42	3.8%
Natural gas ²	3.06	3.78	4.20	4.37	4.36	4.32	4.48	1.3%
Metallurgical coal	4.02	3.10	3.11	3.28	3.45	3.63	3.83	-0.2%
Other industrial coal	2.82	2.89	2.87	2.87	2.90	2.91	2.96	0.2%
Coal to liquids	--	--	--	--	--	--	--	--
Electricity	20.71	19.74	19.56	19.47	18.98	18.50	18.06	-0.5%
Transportation								
Propane	11.99	14.65	16.35	17.23	18.01	18.50	19.10	1.6%
E85 ³	21.06	24.42	27.14	28.77	30.51	31.15	31.85	1.4%
Motor gasoline ⁴	18.75	20.88	23.28	24.55	25.94	26.44	26.99	1.2%
Jet fuel ⁵	9.57	14.32	16.44	17.70	18.93	19.89	20.52	2.6%
Diesel fuel (distillate fuel oil) ⁶	18.33	21.79	23.95	24.86	25.75	26.38	26.90	1.3%
Residual fuel oil	9.21	10.44	11.72	13.47	14.33	15.12	16.23	1.9%
Natural gas ⁷	13.01	12.98	12.76	12.01	11.58	11.30	11.35	-0.5%
Electricity	34.84	34.41	34.84	35.12	34.53	33.62	32.72	-0.2%
Electric power⁸								
Distillate fuel oil	17.71	18.20	19.12	19.99	21.08	21.83	22.38	0.8%
Residual fuel oil	8.29	12.65	14.67	15.52	16.38	16.22	16.94	2.4%
Natural gas	2.45	3.24	3.61	3.76	3.77	3.74	3.90	1.6%
Steam coal	1.96	1.89	1.83	1.81	1.81	1.79	1.79	-0.3%
Uranium	0.69	0.69	0.70	0.71	0.72	0.73	0.74	0.2%
Average price to all users⁹								
Propane	14.35	16.08	17.97	19.13	20.11	20.79	21.47	1.4%
E85 ³	21.06	24.42	27.14	28.77	30.51	31.15	31.85	1.4%
Motor gasoline ⁴	18.74	20.88	23.28	24.55	25.94	26.44	27.00	1.2%
Jet fuel ⁵	9.57	14.32	16.44	17.70	18.93	19.89	20.52	2.6%
Distillate fuel oil	18.18	21.21	23.11	23.95	24.83	25.44	25.92	1.2%
Residual fuel oil	8.84	10.55	11.94	13.60	14.47	15.20	16.26	2.1%
Natural gas	4.53	5.21	5.70	5.89	5.85	5.78	5.90	0.9%
Metallurgical coal	4.02	3.10	3.11	3.28	3.45	3.63	3.83	-0.2%
Other coal	2.02	1.97	1.91	1.89	1.89	1.89	1.89	-0.2%
Coal to liquids	--	--	--	--	--	--	--	--
Electricity	30.53	30.17	30.13	30.09	29.52	28.99	28.24	-0.3%
Non-renewable energy expenditures by sector (billion 2020 dollars)								
Residential	247	255	265	273	279	286	291	0.6%
Commercial	173	190	195	199	201	205	210	0.6%
Industrial ¹	152	189	215	235	250	266	285	2.1%
Transportation	412	513	558	582	614	642	671	1.6%
Total non-renewable expenditures	984	1,147	1,232	1,289	1,345	1,398	1,458	1.3%
Transportation renewable expenditures	1	1	1	1	1	1	1	1.1%
Total expenditures	985	1,147	1,233	1,290	1,345	1,399	1,459	1.3%

Table A3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Residential								
Propane	17.30	20.37	26.00	31.37	36.74	42.95	51.08	3.7%
Distillate fuel oil	17.75	24.42	30.32	35.23	40.58	46.57	54.29	3.8%
Natural gas	10.14	10.92	13.41	15.54	17.40	19.64	22.96	2.8%
Electricity	35.77	38.98	44.59	50.19	54.96	60.87	68.26	2.2%
Commercial								
Propane	12.77	16.79	21.16	25.19	29.36	33.95	40.29	3.9%
Distillate fuel oil	17.83	20.19	24.66	28.94	33.61	38.80	45.44	3.2%
Residual fuel oil	5.25	9.66	13.74	16.71	20.31	23.69	28.29	5.8%
Natural gas	7.23	8.17	10.00	11.52	12.85	14.47	16.96	2.9%
Electricity	31.33	33.28	37.52	41.83	45.07	49.20	54.28	1.8%
Industrial¹								
Propane	7.62	11.17	14.46	17.62	21.03	24.66	29.75	4.6%
Distillate fuel oil	17.75	20.18	24.35	28.55	33.17	38.31	44.94	3.1%
Residual fuel oil	5.42	11.36	16.10	19.34	23.02	26.98	32.06	6.1%
Natural gas ²	3.06	4.07	5.12	5.99	6.64	7.37	8.75	3.6%
Metallurgical coal	4.02	3.33	3.80	4.49	5.24	6.19	7.49	2.1%
Other industrial coal	2.82	3.11	3.50	3.94	4.41	4.96	5.79	2.4%
Coal to liquids	--	--	--	--	--	--	--	--
Electricity	20.71	21.24	23.87	26.67	28.86	31.51	35.26	1.8%
Transportation								
Propane	11.99	15.76	19.95	23.61	27.39	31.53	37.29	3.9%
E85 ³	21.06	26.27	33.12	39.41	46.40	53.07	62.20	3.7%
Motor gasoline ⁴	18.75	22.46	28.40	33.63	39.44	45.04	52.70	3.5%
Jet fuel ⁵	9.57	15.41	20.07	24.25	28.79	33.89	40.06	4.9%
Diesel fuel (distillate fuel oil) ⁶	18.33	23.43	29.22	34.06	39.16	44.94	52.53	3.6%
Residual fuel oil	9.21	11.23	14.30	18.45	21.80	25.77	31.69	4.2%
Natural gas ⁷	13.01	13.96	15.57	16.46	17.61	19.26	22.16	1.8%
Electricity	34.84	37.02	42.52	48.12	52.51	57.27	63.89	2.0%
Electric power⁸								
Distillate fuel oil	17.71	19.57	23.34	27.39	32.07	37.20	43.71	3.1%
Residual fuel oil	8.29	13.61	17.91	21.27	24.91	27.63	33.08	4.7%
Natural gas	2.45	3.48	4.41	5.16	5.74	6.37	7.62	3.9%
Steam coal	1.96	2.04	2.23	2.48	2.75	3.05	3.49	1.9%
Uranium	0.69	0.75	0.86	0.97	1.09	1.24	1.44	2.5%

Table A3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Average price to all users⁹								
Propane.....	14.35	17.30	21.92	26.22	30.58	35.42	41.93	3.6%
E85 ³	21.06	26.27	33.12	39.41	46.40	53.07	62.20	3.7%
Motor gasoline ⁴	18.74	22.46	28.41	33.64	39.46	45.06	52.71	3.5%
Jet fuel ⁵	9.57	15.41	20.07	24.25	28.79	33.89	40.06	4.9%
Distillate fuel oil.....	18.18	22.81	28.20	32.81	37.76	43.34	50.61	3.5%
Residual fuel oil.....	8.84	11.35	14.57	18.63	22.01	25.90	31.74	4.4%
Natural gas.....	4.53	5.60	6.96	8.07	8.90	9.85	11.53	3.2%
Metallurgical coal.....	4.02	3.33	3.80	4.49	5.24	6.19	7.49	2.1%
Other coal.....	2.02	2.12	2.33	2.58	2.88	3.21	3.69	2.0%
Coal to liquids.....	--	--	--	--	--	--	--	--
Electricity.....	30.53	32.46	36.76	41.22	44.89	49.39	55.14	2.0%
Non-renewable energy expenditures by sector (billion nominal dollars)								
Residential.....	247	274	323	374	425	487	569	2.8%
Commercial.....	173	204	238	272	305	349	411	2.9%
Industrial ¹	152	203	262	322	381	453	557	4.4%
Transportation.....	412	552	681	798	934	1,093	1,311	3.9%
Total non-renewable expenditures.....	984	1,233	1,504	1,767	2,045	2,382	2,847	3.6%
Transportation renewable expenditures.....	1	1	1	1	1	1	2	3.4%
Total expenditures.....	985	1,234	1,505	1,768	2,046	2,384	2,849	3.6%

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 and fuel used for liquefaction in export facilities.

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 these projections.

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.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. **Projections:** EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A4. Residential sector key indicators and consumption
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Key indicators								
Households (millions)								
Single-family	84.75	88.91	92.86	96.55	99.97	103.34	106.75	0.8%
Multifamily	31.97	33.22	34.40	35.46	36.45	37.45	38.44	0.6%
Mobile homes	6.66	6.60	6.57	6.50	6.46	6.44	6.42	-0.1%
Total	123.38	128.73	133.83	138.51	142.88	147.24	151.61	0.7%
Average house square footage	1,789	1,819	1,848	1,877	1,905	1,933	1,960	0.3%
Energy intensity								
(million Btu per household)								
Delivered energy consumption	92.7	89.8	86.6	84.6	83.5	82.7	82.2	-0.4%
Total energy consumption ¹	92.1	88.8	85.3	82.9	81.5	80.3	79.4	-0.5%
(thousand Btu per square foot)								
Delivered energy consumption	51.8	49.3	46.9	45.1	43.8	42.8	41.9	-0.7%
Total energy consumption ¹	51.5	48.8	46.2	44.2	42.8	41.5	40.5	-0.8%
Delivered energy consumption by fuel								
Purchased electricity¹								
Space heating	0.65	0.69	0.67	0.65	0.63	0.62	0.60	-0.3%
Space cooling	0.81	0.90	0.97	1.06	1.17	1.29	1.42	1.9%
Water heating	0.61	0.62	0.62	0.62	0.64	0.65	0.67	0.3%
Refrigeration	0.30	0.29	0.29	0.29	0.30	0.31	0.33	0.3%
Cooking	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.3%
Clothes dryers	0.22	0.23	0.25	0.26	0.28	0.30	0.32	1.3%
Freezers	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.0%
Lighting	0.21	0.20	0.20	0.20	0.19	0.19	0.19	-0.4%
Clothes washers ²	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.8%
Dishwashers ²	0.03	0.03	0.03	0.03	0.04	0.04	0.04	1.6%
Televisions and related equipment ³	0.21	0.20	0.20	0.22	0.25	0.27	0.28	1.0%
Computers and related equipment ⁴	0.09	0.08	0.07	0.06	0.06	0.05	0.04	-2.5%
Furnace fans and boiler circulation pumps	0.08	0.09	0.09	0.09	0.08	0.07	0.07	-0.3%
Other uses ⁵	1.78	1.77	1.89	2.02	2.16	2.31	2.48	1.1%
Delivered energy	5.13	5.26	5.43	5.67	5.96	6.27	6.61	0.8%
Natural gas								
Space heating	3.53	3.51	3.41	3.33	3.28	3.23	3.18	-0.3%
Space cooling	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.1%
Water heating	1.01	1.03	1.06	1.09	1.12	1.15	1.18	0.5%
Cooking	0.10	0.10	0.10	0.11	0.11	0.12	0.12	0.5%
Clothes dryers	0.04	0.04	0.05	0.05	0.05	0.06	0.06	1.3%
Other uses ⁶	0.23	0.23	0.23	0.22	0.22	0.22	0.22	-0.2%
Delivered energy	4.97	4.97	4.90	4.86	4.84	4.83	4.82	-0.1%
Distillate fuel oil⁷								
Space heating	0.37	0.37	0.33	0.31	0.28	0.26	0.24	-1.4%
Water heating	0.05	0.04	0.03	0.03	0.03	0.03	0.02	-2.2%
Other uses ⁸	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.4%
Delivered energy	0.43	0.41	0.37	0.35	0.32	0.30	0.28	-1.5%
Propane								
Space heating	0.30	0.30	0.29	0.27	0.26	0.25	0.24	-0.8%
Water heating	0.07	0.06	0.05	0.05	0.04	0.04	0.04	-1.8%
Cooking	0.02	0.02	0.02	0.01	0.01	0.01	0.01	-0.9%
Other uses ⁹	0.07	0.08	0.09	0.10	0.11	0.12	0.13	1.9%
Delivered energy	0.46	0.46	0.44	0.43	0.42	0.42	0.42	-0.3%
Marketed renewables (wood) ¹⁰	0.46	0.46	0.44	0.41	0.38	0.36	0.34	-1.0%

Table A4. Residential sector key indicators and consumption (continued)
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Delivered energy consumption by end use¹								
Space heating.....	5.31	5.33	5.14	4.97	4.83	4.72	4.61	-0.5%
Space cooling.....	0.86	0.96	1.03	1.12	1.23	1.35	1.48	1.8%
Water heating.....	1.73	1.74	1.76	1.79	1.83	1.86	1.91	0.3%
Refrigeration.....	0.30	0.29	0.29	0.29	0.30	0.31	0.33	0.3%
Cooking.....	0.18	0.18	0.18	0.18	0.18	0.19	0.20	0.4%
Clothes dryers.....	0.26	0.28	0.29	0.31	0.33	0.36	0.38	1.3%
Freezers.....	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.0%
Lighting.....	0.21	0.20	0.20	0.20	0.19	0.19	0.19	-0.4%
Clothes washers ²	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.8%
Dishwashers ²	0.03	0.03	0.03	0.03	0.04	0.04	0.04	1.6%
Televisions and related equipment ³	0.21	0.20	0.20	0.22	0.25	0.27	0.28	1.0%
Computers and related equipment ⁴	0.09	0.08	0.07	0.06	0.06	0.05	0.04	-2.5%
Furnace fans and boiler circulation pumps.....	0.08	0.09	0.09	0.09	0.08	0.07	0.07	-0.3%
Other uses ¹¹	2.10	2.09	2.21	2.35	2.49	2.65	2.83	1.0%
Delivered energy.....	11.44	11.56	11.59	11.72	11.93	12.17	12.46	0.3%
Electricity related losses.....	9.42	8.96	8.73	8.85	9.03	9.23	9.50	0.0%
Total energy consumption by end use¹								
Space heating.....	6.52	6.54	6.25	6.03	5.84	5.68	5.53	-0.5%
Space cooling.....	2.37	2.54	2.65	2.85	3.09	3.36	3.66	1.5%
Water heating.....	2.86	2.81	2.78	2.81	2.84	2.88	2.94	0.1%
Refrigeration.....	0.85	0.79	0.76	0.76	0.77	0.80	0.83	-0.1%
Cooking.....	0.28	0.27	0.27	0.27	0.28	0.28	0.29	0.1%
Clothes dryers.....	0.66	0.68	0.71	0.74	0.78	0.83	0.87	0.9%
Freezers.....	0.20	0.19	0.18	0.17	0.17	0.17	0.17	-0.4%
Lighting.....	0.60	0.55	0.53	0.51	0.50	0.48	0.48	-0.8%
Clothes washers ²	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.4%
Dishwashers ²	0.08	0.08	0.08	0.09	0.10	0.10	0.11	1.2%
Televisions and related equipment ³	0.60	0.54	0.54	0.59	0.65	0.68	0.71	0.6%
Computers and related equipment ⁴	0.25	0.21	0.18	0.16	0.14	0.13	0.10	-2.9%
Furnace fans and boiler circulation pumps.....	0.22	0.24	0.23	0.22	0.21	0.19	0.18	-0.7%
Other uses ¹¹	5.42	5.19	5.34	5.63	5.93	6.26	6.64	0.7%
Total.....	21.01	20.74	20.61	20.94	21.42	21.96	22.63	0.2%
Nonmarketed renewables¹²								
Geothermal heat pumps.....	0.01	0.02	0.03	0.03	0.04	0.05	0.05	4.8%
Solar hot water heating.....	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.6%
Solar photovoltaic.....	0.22	0.36	0.51	0.66	0.84	1.03	1.24	5.9%
Wind.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1%
Total.....	0.28	0.43	0.58	0.74	0.93	1.13	1.34	5.4%
Heating degree days.....	3,995	4,068	4,004	3,941	3,877	3,812	3,749	-0.2%
Cooling degree days.....	1,496	1,569	1,629	1,690	1,751	1,812	1,874	0.8%

¹Unless otherwise specified, energy consumption by end use includes all electricity consumed for that end use, including purchased electricity and onsite generation for own use.

²Does not include water heating portion of load.

³Includes televisions, set-top boxes, home theater systems, DVD players, and video game consoles.

⁴Includes desktop and laptop computers, monitors, and networking equipment.

⁵Includes electric and electronic devices, heating elements, and motors not listed above. Electric vehicles are included in the transportation sector.

⁶Includes such appliances as outdoor grills, natural gas-fueled lights, pool heaters, spa heaters, and backup electricity generators.

⁷Includes kerosene use.

⁸Includes such appliances as pool heaters, spa heaters, and backup electricity generators.

⁹Includes such appliances as outdoor grills, propane-fueled lights, pool heaters, spa heaters, and backup electricity generators.

¹⁰Includes wood used for primary and secondary heating in wood stoves or fireplaces as reported in the *Residential Energy Consumption Survey*.

¹¹Includes electric and electronic devices, heating elements, motors, outdoor grills, natural gas- and propane-fueled lights, pool heaters, spa heaters, and backup electricity generators not listed above. Electric vehicles are included in the transportation sector.

¹²Consumption determined by using the average electric power sector net heat rate for fossil fuels.

Btu = British thermal unit.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A5. Commercial sector key indicators and consumption
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Key indicators								
Total floorspace (billion square feet)								
Surviving.....	91.7	96.1	101.0	106.1	111.2	116.4	121.8	0.9%
New additions.....	1.8	2.1	2.2	2.3	2.3	2.4	2.5	1.1%
Total.....	93.6	98.2	103.1	108.3	113.5	118.8	124.3	1.0%
Energy consumption intensity (thousand Btu per square foot)								
Delivered energy consumption.....	92.9	96.6	92.7	89.7	87.7	86.4	85.6	-0.3%
Electricity related losses.....	91.9	95.3	91.2	88.0	85.8	84.3	83.5	-0.3%
Total energy consumption.....	184.8	191.8	184.0	177.7	173.5	170.7	169.1	-0.6%
Delivered energy consumption by fuel								
Purchased electricity								
Space heating ¹	0.11	0.11	0.11	0.10	0.10	0.09	0.08	-1.1%
Space cooling ¹	0.53	0.55	0.57	0.59	0.62	0.65	0.70	0.9%
Water heating ¹	0.03	0.02	0.02	0.02	0.02	0.02	0.02	-1.0%
Ventilation.....	0.51	0.49	0.45	0.42	0.41	0.40	0.40	-0.7%
Cooking.....	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-0.3%
Lighting.....	0.53	0.48	0.43	0.39	0.36	0.35	0.34	-1.5%
Refrigeration.....	0.65	0.64	0.64	0.65	0.66	0.68	0.70	0.2%
Computing.....	0.33	0.32	0.32	0.34	0.35	0.36	0.35	0.2%
Office equipment.....	0.44	0.53	0.60	0.66	0.72	0.79	0.90	2.5%
Other uses ²	1.21	1.61	1.69	1.79	1.93	2.09	2.32	2.2%
Delivered energy.....	4.42	4.83	4.92	5.05	5.25	5.52	5.89	1.0%
Natural gas								
Space heating ¹	1.77	1.84	1.81	1.80	1.78	1.76	1.73	-0.1%
Space cooling ¹	0.03	0.03	0.02	0.02	0.02	0.02	0.02	-0.6%
Water heating ¹	0.61	0.62	0.63	0.65	0.67	0.69	0.71	0.5%
Cooking.....	0.34	0.36	0.38	0.40	0.43	0.45	0.47	1.1%
Other uses ³	0.56	0.78	0.78	0.78	0.79	0.79	0.80	1.2%
Delivered energy.....	3.31	3.63	3.63	3.65	3.68	3.72	3.73	0.4%
Distillate fuel oil								
Space heating ¹	0.22	0.22	0.21	0.20	0.19	0.18	0.16	-0.9%
Water heating ¹	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.5%
Other uses ⁴	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.7%
Delivered energy.....	0.31	0.33	0.32	0.31	0.30	0.29	0.28	-0.4%
Marketed renewables (biomass).....	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.0%
Other fuels ⁵	0.51	0.56	0.57	0.58	0.59	0.60	0.61	0.6%
Delivered energy consumption by end use								
Space heating ¹	2.10	2.17	2.13	2.09	2.06	2.02	1.97	-0.2%
Space cooling ¹	0.56	0.58	0.59	0.61	0.64	0.68	0.72	0.9%
Water heating ¹	0.64	0.65	0.66	0.67	0.69	0.71	0.73	0.4%
Ventilation.....	0.51	0.49	0.45	0.42	0.41	0.40	0.40	-0.7%
Cooking.....	0.43	0.45	0.46	0.48	0.51	0.53	0.55	0.8%
Lighting.....	0.53	0.48	0.43	0.39	0.36	0.35	0.34	-1.5%
Refrigeration.....	0.65	0.64	0.64	0.65	0.66	0.68	0.70	0.2%
Computing.....	0.33	0.32	0.32	0.34	0.35	0.36	0.35	0.2%
Office equipment.....	0.44	0.53	0.60	0.66	0.72	0.79	0.90	2.5%
Other uses ⁶	2.50	3.18	3.27	3.39	3.54	3.73	3.97	1.6%
Delivered energy.....	8.60	9.36	9.41	9.54	9.74	10.02	10.38	0.6%

Table A5. Commercial sector key indicators and consumption (continued)
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Electricity related losses	8.08	8.22	7.90	7.92	8.02	8.25	8.65	0.2%
Total energy consumption by end use								
Space heating ¹	2.31	2.36	2.30	2.25	2.21	2.16	2.09	-0.3%
Space cooling ¹	1.53	1.52	1.50	1.54	1.59	1.65	1.74	0.4%
Water heating ¹	0.69	0.69	0.69	0.71	0.72	0.74	0.76	0.3%
Ventilation.....	1.43	1.33	1.18	1.09	1.04	1.00	1.00	-1.2%
Cooking.....	0.58	0.59	0.60	0.61	0.63	0.64	0.66	0.4%
Lighting.....	1.51	1.29	1.13	1.00	0.92	0.87	0.85	-1.9%
Refrigeration.....	1.84	1.73	1.68	1.67	1.68	1.70	1.73	-0.2%
Computing.....	0.93	0.85	0.84	0.86	0.89	0.90	0.87	-0.2%
Office equipment.....	1.23	1.43	1.57	1.70	1.82	1.98	2.23	2.0%
Other uses ⁶	4.71	5.91	5.99	6.21	6.48	6.86	7.37	1.5%
Total	16.77	17.70	17.47	17.63	17.97	18.51	19.30	0.5%
Nonmarketed renewable fuels⁷								
Solar thermal.....	0.07	0.07	0.07	0.07	0.07	0.07	0.07	-0.3%
Solar photovoltaic.....	0.17	0.25	0.31	0.38	0.45	0.51	0.56	4.2%
Wind.....	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.2%
Total	0.25	0.32	0.39	0.45	0.52	0.59	0.64	3.2%
Heating degree days								
New England.....	5,958	6,165	6,107	6,048	5,988	5,929	5,869	-0.1%
Middle Atlantic.....	5,371	5,538	5,487	5,436	5,386	5,335	5,285	-0.1%
East North Central.....	6,000	6,159	6,138	6,118	6,097	6,076	6,055	0.0%
West North Central.....	6,410	6,485	6,474	6,462	6,449	6,434	6,420	0.0%
South Atlantic.....	2,335	2,495	2,455	2,417	2,378	2,339	2,301	0.0%
East South Central.....	3,119	3,306	3,284	3,262	3,238	3,215	3,191	0.1%
West South Central.....	1,829	1,999	1,973	1,947	1,922	1,897	1,873	0.1%
Mountain.....	4,810	4,755	4,691	4,624	4,557	4,490	4,423	-0.3%
Pacific.....	3,335	3,222	3,169	3,116	3,061	3,005	2,950	-0.4%
United States	3,995	4,068	4,004	3,941	3,877	3,812	3,749	-0.2%
Cooling degree days								
New England.....	652	596	626	656	686	716	747	0.5%
Middle Atlantic.....	840	850	891	932	973	1,014	1,054	0.8%
East North Central.....	831	876	907	939	970	1,002	1,033	0.7%
West North Central.....	975	1,051	1,079	1,108	1,137	1,166	1,195	0.7%
South Atlantic.....	2,274	2,402	2,474	2,546	2,618	2,690	2,763	0.7%
East South Central.....	1,623	1,838	1,888	1,939	1,990	2,041	2,092	0.8%
West South Central.....	2,730	2,904	2,976	3,047	3,119	3,190	3,261	0.6%
Mountain.....	1,639	1,586	1,631	1,678	1,725	1,772	1,820	0.3%
Pacific.....	1,012	982	1,013	1,045	1,078	1,110	1,143	0.4%
United States	1,496	1,569	1,629	1,690	1,751	1,812	1,874	0.8%

¹Unless otherwise specified, energy consumption by end use includes all electricity consumed for that end use, including purchased electricity and onsite generation for own use.

²Includes fuel consumption for district services.

³Includes (but is not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, and water services.

⁴Includes miscellaneous uses, such as emergency generators, combined heat and power in commercial buildings, and manufacturing performed in commercial buildings.

⁵Includes miscellaneous uses, such as cooking, emergency generators, and combined heat and power in commercial buildings.

⁶Includes residual fuel oil, propane, coal, motor gasoline, and kerosene.

⁷Includes (but is not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, water services, emergency generators, combined heat and power in commercial buildings, manufacturing performed in commercial buildings, and cooking (distillate). Also includes residual fuel oil, propane, coal, motor gasoline, kerosene, and marketed renewable fuels (biomass).

⁸Consumption determined by using the average electric power sector net heat rate for fossil fuels.

Btu = British thermal unit.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A6. Industrial sector key indicators and consumption

Shipments, prices, and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Key indicators								
Value of shipments (billion 2012 dollars)								
Manufacturing	5,632	6,347	6,753	7,255	7,772	8,411	9,051	1.6%
Agriculture, mining, and construction	2,535	2,773	2,954	3,137	3,304	3,556	3,822	1.4%
Total	8,168	9,121	9,707	10,392	11,076	11,967	12,874	1.5%
Energy prices								
(2020 dollars per million Btu)								
Propane	7.62	10.38	11.85	12.86	13.83	14.47	15.24	2.3%
Motor gasoline	18.42	20.79	22.86	24.09	25.50	26.02	26.60	1.2%
Distillate fuel oil	17.75	18.76	19.96	20.84	21.81	22.48	23.01	0.9%
Residual fuel oil	5.42	10.56	13.19	14.12	15.14	15.84	16.42	3.8%
Asphalt and road oil	4.71	7.42	8.68	9.34	9.97	10.59	10.98	2.9%
Natural gas heat and power	3.04	3.78	4.20	4.38	4.37	4.33	4.49	1.3%
Natural gas feedstocks	3.08	3.78	4.20	4.37	4.36	4.32	4.47	1.3%
Metallurgical coal	4.02	3.10	3.11	3.28	3.45	3.63	3.83	-0.2%
Other industrial coal	2.82	2.89	2.87	2.87	2.90	2.91	2.96	0.2%
Coal to liquids	--	--	--	--	--	--	--	--
Electricity	20.71	19.74	19.56	19.47	18.98	18.50	18.06	-0.5%
(nominal dollars per million Btu)								
Propane	7.62	11.17	14.46	17.62	21.03	24.66	29.75	4.6%
Motor gasoline	18.42	22.36	27.89	33.01	38.78	44.34	51.95	3.5%
Distillate fuel oil	17.75	20.18	24.35	28.55	33.17	38.31	44.94	3.1%
Residual fuel oil	5.42	11.36	16.10	19.34	23.02	26.98	32.06	6.1%
Asphalt and road oil	4.71	7.98	10.60	12.80	15.17	18.04	21.44	5.2%
Natural gas heat and power	3.04	4.07	5.12	6.00	6.65	7.38	8.76	3.6%
Natural gas feedstocks	3.08	4.06	5.12	5.98	6.63	7.35	8.74	3.5%
Metallurgical coal	4.02	3.33	3.80	4.49	5.24	6.19	7.49	2.1%
Other industrial coal	2.82	3.11	3.50	3.94	4.41	4.96	5.79	2.4%
Coal to liquids	--	--	--	--	--	--	--	--
Electricity	20.71	21.24	23.87	26.67	28.86	31.51	35.26	1.8%
Energy consumption (quadrillion Btu)¹								
Industrial consumption excluding refining								
Propane heat and power	0.15	0.21	0.22	0.23	0.24	0.26	0.28	2.1%
Liquefied petroleum gas and other feedstocks ² ..	2.97	3.78	4.08	4.39	4.56	4.72	4.92	1.7%
Propylene	0.43	0.42	0.42	0.42	0.42	0.42	0.42	0.0%
Motor gasoline	0.24	0.29	0.30	0.32	0.34	0.36	0.39	1.6%
Distillate fuel oil	1.13	1.29	1.38	1.47	1.55	1.67	1.80	1.5%
Residual fuel oil	0.03	0.03	0.04	0.04	0.04	0.04	0.04	1.0%
Petrochemical feedstocks	0.58	0.65	0.65	0.66	0.66	0.66	0.66	0.4%
Petroleum coke	0.04	0.07	0.09	0.09	0.09	0.10	0.10	2.8%
Asphalt and road oil	0.84	0.87	0.90	0.95	1.01	1.08	1.18	1.1%
Miscellaneous petroleum ³	0.52	0.40	0.44	0.46	0.46	0.47	0.50	-0.2%
Petroleum and other liquids subtotal	6.51	7.59	8.10	8.62	8.96	9.37	9.86	1.4%
Natural gas heat and power	6.44	7.08	7.30	7.52	7.84	8.29	8.75	1.0%
Natural gas feedstocks	0.57	0.66	0.69	0.73	0.75	0.77	0.78	1.1%
Lease and plant fuel ⁴	1.87	2.01	2.13	2.24	2.29	2.40	2.44	0.9%
Natural gas to liquefy gas for export ⁵	0.36	0.64	0.77	0.78	0.78	0.78	0.78	2.6%
Natural gas subtotal	9.24	10.38	10.88	11.27	11.67	12.23	12.76	1.1%
Metallurgical coal and coke ⁶	0.45	0.44	0.39	0.38	0.37	0.39	0.39	-0.5%
Other industrial coal	0.46	0.47	0.44	0.42	0.42	0.43	0.44	-0.2%
Coal subtotal	0.91	0.90	0.83	0.80	0.79	0.81	0.83	-0.3%
Renewables ⁷	1.53	1.60	1.62	1.64	1.69	1.77	1.87	0.7%
Purchased electricity	2.88	3.17	3.32	3.42	3.52	3.67	3.79	0.9%
Delivered energy	21.07	23.63	24.75	25.75	26.63	27.85	29.11	1.1%
Electricity related losses	5.37	5.53	5.51	5.57	5.60	5.72	5.83	0.3%
Total	26.45	29.16	30.26	31.32	32.22	33.57	34.95	0.9%

Table A6. Industrial sector key indicators and consumption (continued)

Shipments, prices, and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Refining consumption								
Liquefied petroleum gas heat and power ²	0.01	0.00	0.00	0.00	0.00	0.00	0.00	--
Distillate fuel oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Residual fuel oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Petroleum coke	0.47	0.49	0.51	0.51	0.51	0.51	0.52	0.4%
Still gas	1.33	1.45	1.48	1.51	1.55	1.52	1.53	0.5%
Miscellaneous petroleum ³	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-19.8%
Petroleum and other liquids subtotal	1.81	1.96	1.99	2.02	2.06	2.03	2.05	0.4%
Natural gas heat and power	1.25	1.19	1.20	1.23	1.29	1.34	1.42	0.4%
Natural gas feedstocks	0.22	0.19	0.18	0.20	0.23	0.23	0.26	0.7%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Natural gas subtotal	1.47	1.38	1.38	1.43	1.53	1.57	1.68	0.5%
Other industrial coal	0.02	0.00	0.00	0.00	0.00	0.03	0.03	0.8%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Coal subtotal	0.02	0.00	0.00	0.00	0.00	0.03	0.03	0.8%
Biofuels heat and coproducts	0.90	0.89	0.90	0.93	0.96	1.01	1.06	0.5%
Purchased electricity	0.18	0.19	0.20	0.20	0.21	0.22	0.23	0.7%
Delivered energy	4.39	4.42	4.47	4.58	4.75	4.86	5.04	0.5%
Electricity related losses	0.34	0.33	0.33	0.33	0.34	0.34	0.35	0.1%
Total	4.74	4.75	4.80	4.91	5.09	5.19	5.39	0.4%
Total industrial sector consumption								
Liquefied petroleum gas heat and power ²	0.16	0.21	0.22	0.23	0.24	0.26	0.28	1.9%
Liquefied petroleum gas and other feedstocks ² ..	2.97	3.78	4.08	4.39	4.56	4.72	4.92	1.7%
Motor gasoline	0.24	0.29	0.30	0.32	0.34	0.36	0.39	1.6%
Distillate fuel oil	1.13	1.29	1.38	1.47	1.55	1.67	1.80	1.5%
Residual fuel oil	0.03	0.03	0.04	0.04	0.04	0.04	0.04	1.0%
Petrochemical feedstocks	0.58	0.65	0.65	0.66	0.66	0.66	0.66	0.4%
Petroleum coke	0.51	0.56	0.60	0.61	0.60	0.61	0.62	0.7%
Asphalt and road oil	0.84	0.87	0.90	0.95	1.01	1.08	1.18	1.1%
Still gas	1.33	1.45	1.48	1.51	1.55	1.52	1.53	0.5%
Miscellaneous petroleum ³	0.53	0.41	0.44	0.46	0.46	0.47	0.50	-0.2%
Petroleum and other liquids subtotal	8.33	9.54	10.09	10.64	11.02	11.40	11.91	1.2%
Natural gas heat and power	7.69	8.27	8.50	8.74	9.14	9.63	10.17	0.9%
Natural gas feedstocks	0.79	0.85	0.88	0.93	0.98	1.00	1.04	1.0%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Lease and plant fuel ⁴	1.87	2.01	2.13	2.24	2.29	2.40	2.44	0.9%
Natural gas to liquefy gas for export ⁵	0.36	0.64	0.77	0.78	0.78	0.78	0.78	2.6%
Natural gas subtotal	10.71	11.76	12.26	12.69	13.20	13.81	14.44	1.0%
Metallurgical coal and coke ⁶	0.45	0.44	0.39	0.38	0.37	0.39	0.39	-0.5%
Other industrial coal	0.49	0.47	0.44	0.42	0.42	0.46	0.47	-0.1%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Coal subtotal	0.93	0.90	0.83	0.80	0.79	0.84	0.86	-0.3%
Biofuels heat and coproducts	0.90	0.89	0.90	0.93	0.96	1.01	1.06	0.5%
Renewables ⁷	1.53	1.60	1.62	1.64	1.69	1.77	1.87	0.7%
Purchased electricity	3.07	3.36	3.51	3.63	3.73	3.88	4.02	0.9%
Delivered energy	25.47	28.05	29.22	30.33	31.38	32.70	34.16	1.0%
Electricity related losses	5.72	5.86	5.83	5.90	5.93	6.06	6.18	0.3%
Total	31.18	33.91	35.06	36.23	37.31	38.77	40.34	0.9%

Table A6. Industrial sector key indicators and consumption (continued)

Shipments, prices, and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Energy consumption per dollar of shipments (thousand Btu per 2012 dollar)								
Petroleum and other liquids	1.02	1.05	1.04	1.02	0.99	0.95	0.92	-0.3%
Natural gas	1.31	1.29	1.26	1.22	1.19	1.15	1.12	-0.5%
Coal	0.11	0.10	0.09	0.08	0.07	0.07	0.07	-1.8%
Renewable fuels ⁷	0.30	0.27	0.26	0.25	0.24	0.23	0.23	-0.02
Purchased electricity	0.38	0.37	0.36	0.35	0.34	0.32	0.31	-0.6%
Delivered energy	3.12	3.08	3.01	2.92	2.83	2.73	2.65	-0.5%
Industrial combined heat and power¹								
Capacity (gigawatts)	27.1	29.0	30.6	32.2	34.0	36.4	40.2	1.3%
Generation (billion kilowatthours).....	155	165	173	182	192	205	226	1.3%

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

²Includes ethane, natural gasoline, and refinery olefins.

³Includes lubricants and miscellaneous petroleum products.

⁴Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.

⁵Fuel used in facilities that liquefy natural gas for export.

⁶Includes net coal coke imports.

⁷Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal waste, and other biomass sources.

Btu = British thermal unit.

-- = Not applicable.

Note: Includes estimated consumption for petroleum and other liquids. Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A7. Transportation sector key indicators and delivered energy consumption

Key indicators and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Key indicators								
Travel indicators								
(billion vehicle miles traveled)								
Light-duty vehicles less than 8,501 pounds	2,627	3,002	3,121	3,204	3,278	3,360	3,446	0.9%
Commercial light trucks ¹	90	101	107	113	120	128	136	1.4%
Freight trucks greater than 10,000 pounds	275	306	324	345	366	393	421	1.4%
(billion passenger miles traveled)								
Bus transportation.....	108	190	210	215	217	217	217	2.3%
Passenger rail.....	25	40	43	46	49	51	54	2.6%
(billion seat miles available)								
Air	739	1,383	1,512	1,690	1,859	2,070	2,282	3.8%
(billion ton miles traveled)								
Rail	1,522	1,611	1,680	1,732	1,735	1,797	1,873	0.7%
Domestic shipping	348	339	297	279	259	254	250	-1.1%
Energy efficiency indicators								
(miles per gallon)								
New light-duty vehicle CAFE standard ²	34.6	37.7	38.5	38.7	38.7	38.7	38.6	0.4%
New car ²	42.2	46.9	47.7	47.7	47.7	47.7	47.7	0.4%
New light truck ²	30.9	33.4	34.0	34.0	34.0	34.0	34.0	0.3%
Compliance new light-duty vehicle ³	35.6	38.6	39.8	40.5	41.4	41.9	42.5	0.6%
New car ³	43.3	47.6	48.9	50.0	51.6	52.8	54.3	0.8%
New light truck ³	31.8	34.3	35.2	35.6	36.1	36.4	36.8	0.5%
Tested new light-duty vehicle ⁴	35.4	38.5	39.5	40.0	40.6	41.0	41.4	0.5%
New car ⁴	43.1	47.3	48.4	49.2	50.3	51.1	52.1	0.6%
New light truck ⁴	31.7	34.2	34.9	35.2	35.5	35.8	36.0	0.4%
On-road new light-duty vehicle ⁵	28.9	31.4	32.2	32.6	33.1	33.4	33.8	0.5%
New car ⁵	35.2	38.6	39.5	40.2	41.1	41.7	42.6	0.6%
New light truck ⁵	25.9	27.9	28.5	28.7	29.0	29.2	29.4	0.4%
Light-duty stock ⁶	24.0	26.5	28.6	30.1	31.1	31.8	32.3	1.0%
New commercial light truck ¹	15.2	16.1	16.8	16.8	16.7	16.7	16.7	0.3%
Stock commercial light truck ¹	14.0	14.9	15.7	16.2	16.4	16.6	16.6	0.6%
Freight truck.....	7.2	7.7	8.4	9.1	9.5	9.8	10.0	1.1%
(seat miles per gallon)								
Aircraft	71.0	74.4	76.9	79.8	82.9	85.7	88.5	0.7%
(ton miles per thousand Btu)								
Rail	3.5	3.6	3.7	3.8	4.0	4.1	4.2	0.6%
Domestic shipping	4.8	5.0	5.1	5.3	5.5	5.6	5.8	0.6%
Energy use by mode								
(quadrillion Btu)								
Light-duty vehicles	13.67	14.18	13.67	13.33	13.18	13.21	13.33	-0.1%
Commercial light trucks ¹	0.80	0.85	0.85	0.88	0.91	0.97	1.02	0.8%
Bus transportation.....	0.12	0.22	0.23	0.24	0.24	0.23	0.23	2.0%
Freight trucks.....	5.22	5.48	5.31	5.22	5.27	5.49	5.76	0.3%
Rail, passenger.....	0.03	0.05	0.05	0.06	0.06	0.06	0.07	2.7%
Rail, freight	0.44	0.45	0.45	0.45	0.44	0.44	0.44	0.0%
Shipping, domestic	0.08	0.07	0.06	0.06	0.05	0.05	0.05	-1.7%
Shipping, international	0.86	0.93	0.93	0.92	0.91	0.90	0.89	0.1%
Recreational boats.....	0.20	0.20	0.19	0.19	0.18	0.18	0.18	-0.3%
Air	1.86	3.09	3.21	3.44	3.63	3.89	4.10	2.7%
Military use	0.54	0.52	0.52	0.53	0.53	0.53	0.54	0.0%
Lubricants.....	0.12	0.13	0.13	0.13	0.12	0.12	0.12	0.1%
Pipeline and distribution fuel.....	0.71	0.66	0.61	0.63	0.65	0.68	0.71	0.0%
Total	24.63	26.83	26.23	26.04	26.16	26.75	27.44	0.4%

Table A7. Transportation sector key indicators and delivered energy consumption (continued)

Key indicators and consumption	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Energy use by mode								
(million barrels per day oil equivalent)								
Light-duty vehicles.....	7.41	7.69	7.42	7.24	7.15	7.17	7.23	-0.1%
Commercial light trucks ¹	0.42	0.44	0.44	0.46	0.48	0.51	0.54	0.9%
Bus transportation.....	0.06	0.11	0.11	0.11	0.11	0.11	0.11	2.0%
Freight trucks.....	2.51	2.64	2.56	2.52	2.55	2.66	2.79	0.4%
Rail, passenger.....	0.01	0.02	0.02	0.03	0.03	0.03	0.03	2.7%
Rail, freight.....	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.0%
Shipping, domestic.....	0.04	0.03	0.03	0.03	0.02	0.02	0.02	-1.7%
Shipping, international.....	0.39	0.42	0.42	0.41	0.41	0.41	0.41	0.1%
Recreational boats.....	0.11	0.11	0.10	0.10	0.10	0.10	0.10	-0.3%
Air.....	0.90	1.49	1.55	1.66	1.75	1.88	1.98	2.7%
Military use.....	0.26	0.25	0.25	0.25	0.25	0.26	0.26	0.0%
Lubricants.....	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.1%
Pipeline and distribution fuel.....	0.33	0.31	0.29	0.30	0.31	0.32	0.34	0.0%
Total.....	12.71	13.79	13.48	13.38	13.44	13.73	14.08	0.3%

¹Commercial trucks 8,501 to 10,000 pounds gross vehicle weight rating.

²CAFE standard based on projected new vehicle sales.

³Includes CAFE credits for alternative fueled vehicle sales and credit banking.

⁴U.S. Environmental Protection Agency rated miles per gallon.

⁵Tested new vehicle efficiency revised for on-road performance.

⁶Combined "on-the-road" estimate for all cars and light trucks.

CAFE = Corporate average fuel economy.

Btu = British thermal unit.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A8. Electricity supply, disposition, prices, and emissions
(billion kilowatthours, unless otherwise noted)

Supply, disposition, prices, and emissions	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Net generation by fuel type								
Electric power sector¹								
Power only²								
Coal	756	690	679	637	603	576	577	-0.9%
Petroleum	14	9	8	7	6	5	5	-3.5%
Natural gas ³	1,390	1,300	1,304	1,316	1,424	1,541	1,629	0.5%
Nuclear power	785	745	630	609	595	599	594	-0.9%
Pumped storage/other ⁴	1	0	0	-1	-1	-2	-3	--
Renewable sources ⁵	751	1,194	1,421	1,609	1,725	1,852	2,023	3.4%
Distributed generation (natural gas)	0	1	3	4	7	10	14	--
Total power only	3,697	3,940	4,045	4,182	4,360	4,582	4,839	0.9%
Combined heat and power⁶								
Coal	10	10	10	10	10	10	10	-0.1%
Petroleum	1	1	1	1	1	1	1	0.0%
Natural gas	132	125	123	122	123	123	123	-0.2%
Renewable sources	4	4	4	4	4	4	5	0.2%
Other	0	0	0	0	0	0	0	-0.2%
Total combined heat and power	147	140	138	137	138	138	138	-0.2%
Total electric power sector net generation	3,844	4,080	4,183	4,320	4,498	4,721	4,978	0.9%
Less direct use	15	14	14	14	14	14	14	-0.3%
Net available to the grid	3,829	4,065	4,169	4,306	4,484	4,707	4,964	0.9%
End-use sector⁷								
Coal	7	7	7	7	7	7	7	-0.2%
Petroleum	1	1	1	1	1	1	1	-1.4%
Natural gas	115	125	132	142	152	166	186	1.6%
Other gaseous fuels ⁸	12	13	13	13	13	13	13	0.3%
Renewable sources ⁹	79	109	136	165	197	232	270	4.2%
Other ¹⁰	3	3	3	3	3	3	3	0.3%
Total end-use sector net generation	217	257	292	330	373	421	480	2.7%
Less direct use	162	205	234	265	299	337	383	2.9%
Total sales to the grid	55	51	58	66	74	84	97	1.9%
Total net electricity generation by fuel								
Coal	774	706	696	654	620	593	593	-0.9%
Petroleum	16	10	9	8	8	6	6	-3.1%
Natural gas	1,636	1,551	1,562	1,584	1,706	1,840	1,953	0.6%
Nuclear power	785	745	630	609	595	599	594	-0.9%
Renewable sources ^{5,9}	834	1,307	1,562	1,779	1,927	2,089	2,298	3.4%
Other ¹¹	16	17	16	15	15	15	14	-0.6%
Total net electricity generation	4,061	4,336	4,475	4,650	4,871	5,142	5,458	1.0%
Net generation to the grid	3,884	4,117	4,227	4,372	4,558	4,791	5,061	0.9%
Net imports	46	42	52	52	49	46	44	-0.2%
Electricity sales by sector								
Residential	1,481	1,504	1,541	1,595	1,663	1,733	1,811	0.7%
Commercial	1,271	1,379	1,395	1,426	1,476	1,548	1,649	0.9%
Industrial	899	984	1,030	1,063	1,093	1,138	1,178	0.9%
Transportation	10	19	29	44	66	93	121	8.5%
Total	3,661	3,886	3,995	4,128	4,298	4,511	4,758	0.9%
Direct use	177	219	248	278	313	351	397	2.7%
Total electricity use	3,838	4,105	4,243	4,407	4,611	4,862	5,155	1.0%

Table A8. Electricity supply, disposition, prices, and emissions (continued)
(billion kilowatthours, unless otherwise noted)

Supply, disposition, prices, and emissions	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
End-use prices								
(2020 cents per kilowatthour)								
Residential.....	12.2	12.4	12.5	12.5	12.3	12.2	11.9	-0.1%
Commercial.....	10.7	10.6	10.5	10.4	10.1	9.9	9.5	-0.4%
Industrial.....	7.1	6.7	6.7	6.6	6.5	6.3	6.2	-0.5%
Transportation.....	11.9	11.7	11.9	12.0	11.8	11.5	11.2	-0.2%
All sectors average.....	10.4	10.3	10.3	10.3	10.1	9.9	9.6	-0.3%
(nominal cents per kilowatthour)								
Residential.....	12.2	13.3	15.2	17.1	18.8	20.8	23.3	2.2%
Commercial.....	10.7	11.4	12.8	14.3	15.4	16.8	18.5	1.8%
Industrial.....	7.1	7.2	8.1	9.1	9.8	10.8	12.0	1.8%
Transportation.....	11.9	12.6	14.5	16.4	17.9	19.5	21.8	2.0%
All sectors average.....	10.4	11.1	12.5	14.1	15.3	16.9	18.8	2.0%
Prices by service category								
(2020 cents per kilowatthour)								
Generation.....	5.8	5.7	5.4	5.3	5.0	4.8	4.7	-0.7%
Transmission.....	1.4	1.4	1.5	1.5	1.6	1.6	1.5	0.4%
Distribution.....	3.3	3.2	3.3	3.5	3.5	3.5	3.4	0.1%
(nominal cents per kilowatthour)								
Generation.....	5.8	6.1	6.6	7.2	7.6	8.2	9.1	1.5%
Transmission.....	1.4	1.6	1.8	2.1	2.4	2.7	3.0	2.7%
Distribution.....	3.3	3.4	4.1	4.7	5.3	6.0	6.6	2.4%
Electric power sector emissions¹								
Sulfur dioxide (million short tons).....	0.61	0.50	0.48	0.45	0.48	0.48	0.48	-0.8%
Nitrogen oxide (million short tons).....	0.77	0.56	0.53	0.49	0.47	0.46	0.47	-1.7%
Mercury (short tons).....	3.38	3.02	3.07	2.88	2.87	2.86	2.85	-0.6%

¹Includes electricity-only and combined heat and power plants that have a regulatory status.

²Includes plants that only produce electricity and that have a regulatory status.

³Includes electricity generation from fuel cells.

⁴Includes non-biogenic municipal waste and battery storage.

⁵Includes conventional hydroelectric, geothermal, wood, wood waste, biogenic municipal waste, landfill gas, other biomass, solar, and wind power in the electric power sector.

⁶Includes combined heat and power plants whose primary business is to sell electricity and heat to the public (i.e., those that report North American Industry Classification System code 22 or that have a regulatory status).

⁷Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.

⁸Includes refinery gas and still gas.

⁹Includes conventional hydroelectric, geothermal, wood, wood waste, all municipal waste, landfill gas, other biomass, solar, and wind power in the end use sectors.

¹⁰Includes batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

¹¹Includes pumped storage, non-biogenic municipal waste in the electric power sector, refinery gas, still gas, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

**Table A9. Electricity generating capacity
(gigawatts)**

Net summer capacity ¹	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Electric power sector²								
Power only³								
Coal ⁴	217.3	136.0	117.9	110.5	105.4	102.6	102.1	-2.5%
Oil and natural gas steam ^{4,5}	72.6	56.3	47.0	42.7	43.4	43.3	43.3	-1.7%
Combined cycle.....	245.4	282.7	308.4	329.1	348.0	367.8	394.7	1.6%
Combustion turbine/diesel.....	140.0	179.7	197.2	215.3	239.1	271.4	304.3	2.6%
Nuclear power ⁶	97.1	91.9	76.9	74.3	72.4	73.0	72.3	-1.0%
Pumped storage.....	22.8	22.8	22.8	22.8	22.8	22.8	22.8	0.0%
Diurnal storage.....	3.2	10.6	12.8	16.0	16.4	17.7	20.6	6.5%
Fuel cells.....	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.4%
Renewable sources ⁷	263.9	397.7	476.2	539.4	576.0	624.7	688.2	3.2%
Distributed generation (natural gas) ⁸	0.0	2.8	5.8	9.8	16.1	23.6	33.0	--
Total power only.....	1,062.6	1,180.7	1,265.2	1,360.2	1,440.0	1,547.2	1,681.5	1.5%
Combined heat and power⁹								
Coal.....	1.9	1.8	1.8	1.8	1.8	1.8	1.8	-0.2%
Oil and natural gas steam ⁵	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0%
Combined cycle.....	22.0	21.8	21.8	21.8	21.8	21.8	21.8	0.0%
Combustion turbine/diesel.....	3.1	3.1	3.1	3.1	3.1	3.1	3.1	0.0%
Renewable sources ⁷	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0%
Total combined heat and power.....	28.6	28.3	28.3	28.3	28.3	28.3	28.3	0.0%
Cumulative planned additions¹⁰								
Coal.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Oil and natural gas steam ⁵	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Combined cycle.....	--	17.0	17.0	17.0	17.0	17.0	17.0	--
Combustion turbine/diesel.....	--	4.5	4.5	4.5	4.5	4.5	4.5	--
Nuclear power.....	--	2.2	2.2	2.2	2.2	2.2	2.2	--
Pumped storage.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Diurnal storage.....	--	7.5	9.5	12.5	12.7	13.0	13.0	--
Fuel cells.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Renewable sources ⁷	--	33.4	42.5	55.9	55.9	55.9	55.9	--
Distributed generation ⁸	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Total planned additions.....	--	64.7	75.8	92.2	92.4	92.7	92.7	--
Cumulative unplanned additions¹⁰								
Coal.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Oil and natural gas steam ⁵	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Combined cycle.....	--	25.5	52.4	74.4	94.7	116.4	144.2	--
Combustion turbine/diesel.....	--	36.5	55.5	73.9	97.7	130.3	163.2	--
Nuclear power.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Pumped storage.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Diurnal storage.....	--	0.0	0.1	0.4	0.6	1.6	4.5	--
Fuel cells.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Renewable sources ⁷	--	100.4	170.1	219.9	256.5	305.2	368.8	--
Distributed generation ⁸	--	2.8	5.8	9.8	16.1	23.6	33.0	--
Total unplanned additions.....	--	165.2	283.9	378.5	465.6	577.2	713.7	--
Cumulative electric power sector additions¹⁰ ..	--	229.9	359.7	470.6	558.0	669.9	806.3	--
Cumulative retirements¹¹								
Coal.....	--	78.1	96.1	103.6	107.8	110.6	111.1	--
Oil and natural gas steam ⁵	--	19.7	29.0	33.3	33.4	33.5	33.5	--
Combined cycle.....	--	5.4	6.6	7.9	9.3	11.2	12.1	--
Combustion turbine/diesel.....	--	1.3	2.9	3.1	3.1	3.5	3.5	--
Nuclear power.....	--	7.6	22.9	26.1	28.1	28.1	29.1	--
Pumped storage.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Diurnal storage.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Fuel cells.....	--	0.0	0.0	0.0	0.0	0.0	0.0	--
Renewable sources ⁷	--	0.1	0.3	0.3	0.3	0.4	0.4	--
Total retirements.....	--	112.2	157.8	174.2	182.1	187.3	189.7	--
Total electric power sector capacity.....	1,091.2	1,209.1	1,293.5	1,388.6	1,468.3	1,575.5	1,709.9	1.5%

Table A9. Electricity generating capacity (continued)
(gigawatts)

Net summer capacity ¹	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
End-use generators¹²								
Coal	1.9	1.9	1.9	1.9	1.9	1.9	1.8	-0.2%
Petroleum	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0%
Natural gas	17.8	19.6	21.2	22.8	24.7	27.1	30.8	1.8%
Other gaseous fuels ¹³	2.8	2.9	2.9	2.9	2.9	2.9	2.9	0.1%
Renewable sources ⁷	40.2	61.1	80.6	100.7	123.1	147.0	172.7	5.0%
Other ¹⁴	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.3%
Total end-use generators	64.0	86.8	107.8	129.5	153.7	180.1	209.5	4.0%
Cumulative end-use capacity additions¹⁰	--	22.8	43.9	65.8	90.0	116.5	145.8	--

¹Net summer capacity is the steady hourly output that generating equipment is expected to supply to system load (exclusive of auxiliary power), as demonstrated by tests during summer peak demand.

²Includes electricity-only and combined heat and power plants that have a regulatory status.

³Includes plants that only produce electricity and that have a regulatory status. Includes capacity increases (uprates) at existing units.

⁴Total coal and oil and natural gas steam capacity account for the conversion of coal capacity to gas steam capacity, but the conversions are not included explicitly as additions or retirements. No planned conversions are assumed. The totals may reflect any conversions projected by the model.

⁵Includes oil-, gas-, and dual-fired capacity.

⁶Nuclear capacity includes 2.1 gigawatts of uprates.

⁷Includes conventional hydroelectric, geothermal, wood, wood waste, all municipal waste, landfill gas, other biomass, solar, and wind power. Facilities co-firing biomass and coal are classified as coal.

⁸Primarily peak load capacity fueled by natural gas.

⁹Includes combined heat and power plants whose primary business is to sell electricity and heat to the public (i.e., those that report North American Industry Classification System code 22 or that have a regulatory status).

¹⁰Cumulative additions after December 31, 2020.

¹¹Cumulative retirements after December 31, 2020.

¹²Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.

¹³Includes refinery gas and still gas.

¹⁴Includes batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A10. Electricity trade
(billion kilowatthours, unless otherwise noted)

Electricity trade	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Interregional electricity trade								
Gross domestic sales								
Firm power.....	52	50	49	46	42	37	36	-1.3%
Economy.....	209	272	312	312	330	335	384	2.1%
Total.....	261	322	361	358	371	372	420	1.6%
Gross domestic sales (million 2020 dollars)								
Firm power.....	3,615	3,480	3,394	3,216	2,899	2,587	2,470	-1.3%
Economy.....	5,997	8,281	11,543	11,372	11,502	11,776	14,229	2.9%
Total.....	9,612	11,761	14,937	14,588	14,401	14,362	16,699	1.9%
International electricity trade								
Imports from Canada and Mexico								
Firm power.....	19.3	18.6	20.2	19.0	17.4	17.2	17.2	-0.4%
Economy.....	40.8	38.0	45.8	47.8	46.5	43.4	40.9	0.0%
Total.....	60.1	56.7	65.9	66.8	63.9	60.6	58.1	-0.1%
Exports to Canada and Mexico								
Firm power.....	1.2	1.2	1.2	0.6	0.0	0.0	0.0	--
Economy.....	13.2	13.2	13.2	13.8	14.4	14.4	14.4	0.3%
Total.....	14.4	14.4	14.4	14.4	14.4	14.4	14.4	0.0%

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding. Firm power sales are capacity sales, meaning the delivery of the power is scheduled as part of the normal operating conditions of the affected electric systems. Economy sales are subject to curtailment or cessation of delivery by the supplier in accordance with prior agreements or under specified conditions.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A11. Petroleum and other liquids supply and disposition
(million barrels per day, unless otherwise noted)

Supply and disposition	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Crude oil								
Domestic crude production ¹	11.47	13.23	13.77	13.76	13.17	13.22	12.87	0.4%
Alaska.....	0.46	0.57	0.57	0.67	0.56	0.76	0.62	1.0%
Lower 48 states.....	11.01	12.66	13.20	13.09	12.62	12.46	12.26	0.4%
Net imports.....	2.83	4.20	3.81	3.71	4.26	4.19	4.50	1.6%
Gross imports.....	6.05	7.53	6.94	6.96	7.47	7.26	7.62	0.8%
Exports.....	3.22	3.33	3.13	3.25	3.21	3.07	3.13	-0.1%
Other crude supply ²	0.04	0.07	0.00	0.00	0.00	0.00	0.00	--
Total crude supply.....	14.34	17.50	17.58	17.47	17.43	17.41	17.37	0.6%
Net product imports.....	-3.22	-5.55	-5.85	-5.61	-5.46	-5.14	-4.63	1.2%
Gross refined product imports ³	0.97	0.64	0.74	0.73	0.75	0.77	0.76	-0.8%
Unfinished oil imports.....	0.56	0.65	0.58	0.57	0.56	0.55	0.55	-0.1%
Blending component imports.....	0.36	0.64	0.48	0.38	0.36	0.36	0.39	0.2%
Exports.....	5.11	7.48	7.64	7.30	7.13	6.83	6.33	0.7%
Refinery processing gain ⁴	0.96	0.99	1.01	1.05	1.09	1.08	1.09	0.4%
Product stock withdrawal.....	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	--
Natural gas plant liquids.....	5.03	5.89	6.12	6.15	6.15	6.27	6.26	0.7%
Supply from renewable sources.....	0.97	1.13	1.14	1.15	1.15	1.17	1.21	0.8%
Ethanol.....	0.80	0.87	0.87	0.88	0.89	0.92	0.95	0.6%
Domestic production.....	0.88	1.00	1.01	1.04	1.08	1.13	1.20	1.0%
Net imports.....	-0.08	-0.12	-0.14	-0.16	-0.18	-0.21	-0.25	4.0%
Stock withdrawal.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Biodiesel.....	0.12	0.14	0.14	0.14	0.13	0.14	0.14	--
Domestic production.....	0.11	0.13	0.13	0.13	0.13	0.13	0.13	0.5%
Net imports.....	0.00	0.01	0.01	0.01	0.01	0.01	0.01	3.7%
Stock withdrawal.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Other biomass-derived liquids ⁵	0.05	0.12	0.13	0.13	0.12	0.11	0.12	2.9%
Domestic production.....	0.03	0.09	0.11	0.10	0.09	0.09	0.09	3.5%
Net imports.....	0.02	0.03	0.03	0.03	0.03	0.03	0.03	1.5%
Stock withdrawal.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Liquids from gas.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Liquids from coal.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Other ⁶	0.21	0.25	0.23	0.24	0.25	0.25	0.26	0.7%
Total primary supply⁷.....	18.21	20.20	20.24	20.44	20.62	21.03	21.55	0.6%
Product supplied								
by fuel								
Liquefied petroleum gases and other ⁸	2.99	3.90	4.16	4.43	4.57	4.71	4.86	1.6%
Motor gasoline ⁹	8.22	8.59	8.32	8.16	8.10	8.16	8.28	0.0%
of which: E85 ¹⁰	0.02	0.02	0.02	0.02	0.02	0.02	0.02	-0.2%
Jet fuel ¹¹	1.08	1.69	1.75	1.86	1.96	2.09	2.19	2.4%
Distillate fuel oil ¹²	3.75	3.92	3.85	3.80	3.79	3.87	3.96	0.2%
of which: Diesel.....	3.46	3.51	3.45	3.41	3.41	3.49	3.58	0.1%
Residual fuel oil.....	0.22	0.30	0.30	0.27	0.26	0.25	0.23	0.2%
Other ¹³	1.79	1.82	1.88	1.93	1.97	2.00	2.05	0.5%
by sector								
Residential and commercial.....	0.97	1.01	0.98	0.96	0.94	0.93	0.92	-0.2%
Industrial ¹⁴	5.03	5.97	6.36	6.74	6.95	7.19	7.47	1.3%
Transportation.....	12.30	13.41	13.10	12.94	12.92	13.13	13.37	0.3%
Electric power ¹⁵	0.07	0.05	0.04	0.04	0.03	0.03	0.03	-3.1%
Unspecified sector ¹⁶	-0.21	-0.22	-0.21	-0.21	-0.20	-0.21	-0.21	0.1%
Total product supplied.....	18.05	20.22	20.26	20.46	20.65	21.06	21.58	0.6%
Discrepancy ¹⁷	0.15	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	--

Table A11. Petroleum and other liquids supply and disposition (continued)
(million barrels per day, unless otherwise noted)

Supply and disposition	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Domestic refinery distillation capacity ¹⁸	18.7	19.1	19.1	19.1	19.1	19.1	19.1	0.1%
Capacity utilization rate (percent) ¹⁹	79.7	92.8	93.1	92.5	92.3	92.2	91.9	0.5%
Total gross imports	7.99	9.49	8.77	8.68	9.18	8.98	9.36	0.5%
Total gross exports	8.44	10.93	10.91	10.71	10.52	10.11	9.70	0.5%
Total net imports	-0.44	-1.44	-2.14	-2.03	-1.34	-1.13	-0.35	-0.8%
Net import share of product supplied (percent).....	-2.4	-7.1	-10.6	-9.9	-6.5	-5.4	-1.6	-1.4%
Expenditures for imported crude oil and petroleum products (billion 2020 dollars)	96	177	191	206	240	247	267	3.5%

¹Includes lease condensate.

²Strategic petroleum reserve stock additions plus unaccounted for crude oil and crude oil stock withdrawals.

³Includes other hydrocarbons and alcohols.

⁴The volumetric amount by which total output is greater than input due to the processing of crude oil into products which, in total, have a lower specific gravity than the crude oil processed.

⁵Includes pyrolysis oils, biomass-derived Fischer-Tropsch liquids, biobutanol, and renewable feedstocks used for the on-site production of diesel and gasoline.

⁶Includes domestic sources of other blending components, other hydrocarbons, and ethers.

⁷Total crude supply, net product imports, refinery processing gain, product stock withdrawal, natural gas plant liquids, supply from renewable sources, liquids from gas, liquids from coal, and other supply.

⁸Includes ethane, natural gasoline, and refinery olefins.

⁹Includes ethanol and ethers blended into 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 these projections.

¹¹Includes only kerosene type.

¹²Includes distillate fuel oil from petroleum and biomass feedstocks and kerosene use in the residential sector.

¹³Includes aviation gasoline, petrochemical feedstocks, lubricants, waxes, asphalt, road oil, still gas, special naphthas, petroleum coke, crude oil product supplied, methanol, miscellaneous petroleum products, and kerosene not used in the residential sector.

¹⁴Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.

¹⁵Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.

¹⁶Represents consumption unattributed to the sectors above.

¹⁷Balancing item. Includes unaccounted for supply, losses, and gains.

¹⁸End-of-year operable capacity.

¹⁹Rate is calculated by dividing the gross annual input to atmospheric crude oil distillation units by their operable refining capacity in barrels per calendar day.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A12. Petroleum and other liquids prices
(2020 dollars per gallon, unless otherwise noted)

Sector and fuel	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Crude oil prices (2020 dollars per barrel)								
Brent spot	41	61	73	80	87	91	95	2.8%
West Texas Intermediate spot	39	59	71	77	84	88	91	2.9%
Average imported refiners acquisition cost ¹	37	60	70	75	82	87	90	3.0%
Brent / West Texas Intermediate spread	2	2	2	3	3	4	4	1.5%
Delivered sector product prices								
Residential								
Propane	1.58	1.73	1.95	2.09	2.21	2.31	2.39	1.4%
Distillate fuel oil	2.44	3.12	3.41	3.53	3.67	3.75	3.82	1.5%
Commercial								
Distillate fuel oil	2.45	2.58	2.78	2.90	3.04	3.13	3.20	0.9%
Residual fuel oil	0.79	1.34	1.69	1.83	2.00	2.08	2.17	3.4%
Residual fuel oil (2020 dollars per barrel)	33	56	71	77	84	87	91	3.4%
Industrial²								
Propane	0.70	0.95	1.08	1.18	1.26	1.32	1.39	2.3%
Distillate fuel oil	2.44	2.58	2.74	2.86	3.00	3.09	3.16	0.9%
Residual fuel oil	0.81	1.58	1.97	2.11	2.27	2.37	2.46	3.8%
Residual fuel oil (2020 dollars per barrel)	34	66	83	89	95	100	103	3.8%
Transportation								
Propane	1.10	1.34	1.50	1.58	1.65	1.69	1.75	1.6%
E85 ³	2.00	2.32	2.58	2.74	2.90	2.96	3.03	1.4%
Ethanol wholesale price	1.39	1.38	1.40	1.42	1.51	1.45	1.44	0.1%
Motor gasoline ⁴	2.26	2.51	2.80	2.95	3.11	3.17	3.23	1.2%
Jet fuel ⁵	1.29	1.93	2.22	2.39	2.56	2.69	2.77	2.6%
Diesel fuel (distillate fuel oil) ⁶	2.52	2.99	3.29	3.41	3.54	3.62	3.69	1.3%
Residual fuel oil	1.38	1.56	1.75	2.02	2.15	2.26	2.43	1.9%
Residual fuel oil (2020 dollars per barrel)	58	66	74	85	90	95	102	1.9%
Electric power⁷								
Distillate fuel oil	2.43	2.50	2.63	2.75	2.90	3.00	3.07	0.8%
Residual fuel oil	1.24	1.89	2.20	2.32	2.45	2.43	2.54	2.4%
Residual fuel oil (2020 dollars per barrel)	52	80	92	98	103	102	107	2.4%
Average prices, all sectors⁸								
Propane	1.31	1.47	1.64	1.75	1.84	1.90	1.96	1.4%
Motor gasoline ⁴	2.25	2.51	2.80	2.95	3.11	3.17	3.23	1.2%
Jet fuel ⁵	1.29	1.93	2.22	2.39	2.56	2.69	2.77	2.6%
Distillate fuel oil	2.50	2.91	3.17	3.29	3.41	3.49	3.56	1.2%
Residual fuel oil	1.32	1.58	1.79	2.04	2.17	2.28	2.43	2.1%
Residual fuel oil (2020 dollars per barrel)	56	66	75	86	91	96	102	2.1%
Average	1.90	2.13	2.33	2.43	2.54	2.60	2.66	1.1%

Table A12. Petroleum and other liquids prices (continued)
(nominal dollars per gallon, unless otherwise noted)

Sector and fuel	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Crude oil prices (nominal dollars per barrel)								
Brent spot	41	66	89	109	132	156	185	5.1%
West Texas Intermediate spot	39	64	86	105	128	149	178	5.2%
Average imported refiners acquisition cost ¹	37	64	85	103	125	148	176	5.3%
Delivered sector product prices								
Residential								
Propane	1.58	1.86	2.38	2.87	3.36	3.93	4.67	3.7%
Distillate fuel oil	2.44	3.35	4.17	4.84	5.57	6.40	7.46	3.8%
Commercial								
Distillate fuel oil	2.45	2.77	3.39	3.98	4.62	5.33	6.24	3.2%
Residual fuel oil	0.79	1.45	2.06	2.50	3.04	3.55	4.23	5.8%
Residual fuel oil (nominal dollars per barrel)	32.98	60.72	86.41	105.04	127.67	148.96	177.86	5.8%
Industrial²								
Propane	0.70	1.02	1.32	1.61	1.92	2.25	2.72	4.6%
Distillate fuel oil	2.44	2.77	3.35	3.92	4.56	5.26	6.17	3.1%
Residual fuel oil	0.81	1.70	2.41	2.90	3.45	4.04	4.80	6.1%
Residual fuel oil (nominal dollars per barrel)	34.09	71.41	101.19	121.60	144.75	169.63	201.55	6.1%
Transportation								
Propane	1.10	1.44	1.82	2.16	2.50	2.88	3.41	3.9%
E85 ³	2.00	2.50	3.15	3.75	4.41	5.05	5.92	3.7%
Ethanol wholesale price	1.39	1.49	1.71	1.94	2.30	2.47	2.81	2.4%
Motor gasoline ⁴	2.26	2.70	3.41	4.04	4.73	5.40	6.31	3.5%
Jet fuel ⁵	1.29	2.08	2.71	3.27	3.89	4.58	5.41	4.9%
Diesel fuel (distillate fuel oil) ⁶	2.52	3.22	4.01	4.68	5.38	6.17	7.21	3.6%
Residual fuel oil	1.38	1.68	2.14	2.76	3.26	3.86	4.74	4.2%
Residual fuel oil (nominal dollars per barrel)	57.89	70.58	89.92	116.00	137.03	162.00	199.23	4.2%
Electric power⁷								
Distillate fuel oil	2.43	2.69	3.21	3.76	4.41	5.11	6.00	3.1%
Residual fuel oil	1.24	2.04	2.68	3.18	3.73	4.14	4.95	4.7%
Residual fuel oil (nominal dollars per barrel)	52.12	85.57	112.58	133.71	156.60	173.72	207.98	4.7%
Average prices, all sectors⁸								
Propane	1.31	1.58	2.00	2.40	2.80	3.24	3.83	3.6%
Motor gasoline ⁴	2.25	2.70	3.41	4.04	4.73	5.40	6.31	3.5%
Jet fuel ⁵	1.29	2.08	2.71	3.27	3.89	4.58	5.41	4.9%
Distillate fuel oil	2.50	3.13	3.87	4.51	5.19	5.95	6.95	3.5%
Residual fuel oil	1.32	1.70	2.18	2.79	3.30	3.88	4.75	4.4%
Residual fuel oil (nominal dollars per barrel)	56	71	92	117	138	163	200	4.4%
Average	1.90	2.29	2.84	3.32	3.87	4.44	5.20	3.4%

¹Weighted average price delivered to U.S. refiners.

²Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.

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 these projections.

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

⁵Includes only kerosene type.

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

⁷Includes electricity-only and combined heat and power plants that have a regulatory status.

⁸Weighted averages of end-use fuel prices are derived from the prices in each sector and the corresponding sectoral consumption.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A13. Natural gas supply, disposition, and prices
(trillion cubic feet, unless otherwise noted)

Supply, disposition, and prices	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Supply								
Dry gas production ¹	33.89	36.26	37.88	38.61	39.92	41.54	42.99	0.8%
Supplemental natural gas ²	0.07	0.06	0.06	0.06	0.06	0.06	0.06	-0.2%
Net imports	-2.67	-5.32	-6.69	-7.03	-7.09	-7.25	-7.40	3.5%
Pipeline ³	-0.42	-1.30	-1.84	-2.08	-2.13	-2.30	-2.46	6.1%
Liquefied natural gas	-2.25	-4.02	-4.85	-4.95	-4.96	-4.95	-4.95	2.7%
Total supply	31.29	31.00	31.26	31.65	32.89	34.35	35.65	0.4%
Consumption by sector								
Residential	4.78	4.78	4.72	4.68	4.66	4.65	4.64	-0.1%
Commercial	3.19	3.49	3.49	3.51	3.54	3.58	3.59	0.4%
Industrial ⁴	10.31	11.33	11.81	12.22	12.71	13.30	13.90	1.0%
Other industrial ⁴	8.16	8.77	9.02	9.31	9.74	10.23	10.80	0.9%
Lease and plant fuel ⁵	1.80	1.94	2.05	2.16	2.21	2.31	2.35	0.9%
Fuel used to liquefy gas for export ⁶	0.35	0.61	0.74	0.75	0.76	0.75	0.75	2.6%
Natural-gas-to-liquids heat and power ⁷	0.00	0.00	0.00	0.00	0.00	0.00	--	--
Natural gas to liquids production ⁸	0.00	0.00	0.00	0.00	0.00	0.00	--	--
Transportation.....	0.77	0.77	0.75	0.82	0.91	1.01	1.13	1.3%
Motor vehicles, trains, and ships.....	0.08	0.12	0.16	0.22	0.28	0.36	0.44	5.6%
Pipeline and distribution fuel.....	0.68	0.64	0.59	0.61	0.63	0.66	0.69	0.0%
Electric power ⁹	11.71	10.45	10.20	10.15	10.83	11.58	12.13	0.1%
Discrepancy ¹⁰	0.53	0.19	0.29	0.26	0.23	0.24	0.26	--
Natural gas spot price at Henry Hub								
(2020 dollars per million Btu)	2.07	2.88	3.34	3.53	3.55	3.51	3.69	2.0%
(nominal dollars per million Btu).....	2.07	3.10	4.08	4.84	5.40	5.98	7.21	4.3%
Delivered prices								
(2020 dollars per thousand cubic feet)								
Residential	10.54	10.55	11.42	11.78	11.89	11.98	12.22	0.5%
Commercial.....	7.51	7.89	8.52	8.74	8.78	8.83	9.02	0.6%
Industrial ¹¹	3.18	3.93	4.36	4.54	4.54	4.49	4.66	1.3%
Transportation ¹²	13.52	13.49	13.25	12.48	12.03	11.75	11.79	-0.5%
Electric power ⁹	2.53	3.35	3.73	3.89	3.90	3.87	4.03	1.6%
Average ¹³	4.69	5.40	5.91	6.11	6.07	5.99	6.12	0.9%
(nominal dollars per thousand cubic feet)								
Residential	10.54	11.34	13.94	16.14	18.08	20.40	23.86	2.8%
Commercial.....	7.51	8.49	10.39	11.97	13.35	15.04	17.62	2.9%
Industrial ¹¹	3.18	4.22	5.32	6.23	6.90	7.65	9.09	3.6%
Transportation ¹²	13.52	14.51	16.17	17.10	18.30	20.01	23.02	1.8%
Electric power ⁹	2.53	3.60	4.55	5.33	5.93	6.59	7.88	3.9%
Average ¹³	4.69	5.81	7.21	8.37	9.23	10.21	11.96	3.2%

¹Marketed production (wet) minus extraction losses.
²Synthetic natural gas, propane air, coke oven gas, refinery gas, biomass gas, air injected for Btu stabilization, and manufactured gas commingled and distributed with natural gas.
³Natural gas imported to and exported from Canada and Mexico.
⁴Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
⁵Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
⁶Fuel used in facilities that liquefy natural gas for export.
⁷Includes any natural gas used in the process of converting natural gas to liquid fuel that is not actually converted.
⁸Includes any natural gas converted into liquid fuel.
⁹Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
¹⁰Balancing item. Natural gas lost as a result of converting flow data measured at varying temperatures and pressures to a standard temperature and pressure and the merger of different data reporting systems which vary in scope, format, definition, and respondent type.
¹¹Excludes use for lease and plant fuel and fuel used for liquefaction in export facilities. Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
¹²Natural gas used as fuel in motor vehicles, trains, and ships. Price includes estimated motor vehicle fuel taxes and estimated dispensing costs or charges.
¹³Weighted average prices. Weights used are the sectoral consumption values excluding lease, plant, pipeline and distribution fuel, and fuel used for liquefaction in export facilities.
-- = Not applicable.
Note: Totals may not equal sum of components due to independent rounding.
Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A14. Oil and gas supply

Production and supply	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Crude oil								
Lower 48 average wellhead price¹ (2020 dollars per barrel)	37	59	70	77	84	88	91	3.0%
Production (million barrels per day)²								
United States total	11.47	13.23	13.77	13.76	13.17	13.22	12.87	0.4%
Lower 48 onshore	9.18	10.66	10.77	10.79	10.81	10.89	10.91	0.6%
Tight oil ³	7.54	9.26	9.37	9.36	9.37	9.46	9.49	0.8%
Carbon dioxide enhanced oil recovery	0.32	0.35	0.38	0.36	0.34	0.32	0.29	-0.4%
Other	1.32	1.05	1.02	1.07	1.10	1.12	1.13	-0.5%
Lower 48 offshore	1.83	2.00	2.43	2.30	1.81	1.58	1.35	-1.0%
State	0.02	0.01	0.01	0.01	0.01	0.01	0.01	-4.2%
Federal	1.81	1.98	2.42	2.30	1.81	1.57	1.34	-1.0%
Alaska	0.46	0.57	0.57	0.67	0.56	0.76	0.62	1.0%
Onshore	0.36	0.47	0.48	0.52	0.41	0.56	0.45	0.7%
State offshore	0.09	0.10	0.08	0.15	0.14	0.20	0.17	1.9%
Federal offshore	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-8.3%
Natural gas plant liquids production (million barrels per day)								
United States total	5.03	5.89	6.13	6.16	6.15	6.27	6.26	0.7%
Lower 48 onshore	4.81	5.66	5.84	5.81	5.84	5.93	5.96	0.7%
Lower 48 offshore	0.19	0.17	0.23	0.28	0.26	0.27	0.24	0.7%
Alaska	0.02	0.06	0.06	0.07	0.06	0.08	0.06	3.1%
Natural gas								
Natural gas spot price at Henry Hub (2020 dollars per million Btu)	2.07	2.88	3.34	3.53	3.55	3.51	3.69	2.0%
Dry production (trillion cubic feet)⁴								
United States total	33.89	36.26	37.88	38.61	39.92	41.54	42.99	0.8%
Lower 48 onshore	32.35	35.12	36.33	36.72	38.06	39.65	41.10	0.8%
Tight gas	6.00	5.25	4.90	4.71	4.95	5.59	5.75	-0.1%
Shale gas and tight oil plays ³	23.16	27.23	29.24	30.08	31.40	32.54	33.94	1.3%
Coalbed methane	0.86	0.84	0.77	0.69	0.56	0.45	0.41	-2.4%
Other	2.33	1.80	1.42	1.24	1.15	1.07	0.99	-2.8%
Lower 48 offshore	1.21	0.80	1.20	1.54	1.51	1.51	1.53	0.8%
State	0.06	0.03	0.02	0.02	0.01	0.01	0.01	-6.1%
Federal	1.14	0.76	1.18	1.52	1.50	1.50	1.52	1.0%
Alaska	0.33	0.34	0.34	0.36	0.35	0.38	0.36	0.3%
Supplemental gas supplies (trillion cubic feet)⁵	0.07	0.06	0.06	0.06	0.06	0.06	0.06	-0.2%
Total lower 48 wells drilled (thousands)	14.2	28.0	29.1	30.0	31.0	30.4	31.3	2.7%

¹Represents lower 48 onshore and offshore supplies.

²Includes lease condensate.

³Tight oil represents resources in low-permeability reservoirs, including shale and chalk formations.

⁴Marketed production (wet) minus extraction losses.

⁵Synthetic natural gas, propane air, coke oven gas, refinery gas, biomass gas, air injected for Btu stabilization, and manufactured gas commingled and distributed with natural gas.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A15. Coal supply, disposition, and prices
(million short tons, unless otherwise noted)

Supply, disposition, and prices	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Production¹								
Appalachia	135	131	126	124	122	122	124	-0.3%
Interior	88	99	87	85	98	98	104	0.6%
West	298	269	282	264	226	211	205	-1.2%
East of the Mississippi	209	211	192	187	198	202	207	0.0%
West of the Mississippi	312	289	303	286	248	229	225	-1.1%
Total	521	499	495	473	447	431	432	-0.6%
Waste coal supplied²	9	6	6	5	5	6	6	-1.6%
Net imports								
Imports ³	5	1	1	1	2	2	2	-3.3%
Exports	69	99	97	98	96	95	97	1.2%
Total	-64	-97	-96	-97	-94	-93	-95	1.3%
Total supply⁴	466	408	406	381	358	343	343	-1.0%
Consumption by sector								
Commercial and institutional	1	1	1	1	1	1	1	-0.9%
Coke plants	17	16	14	14	14	14	14	-0.4%
Other industrial ⁵	25	27	26	25	25	27	27	0.2%
Coal-to-liquids heat and power	--	--	--	--	--	--	--	--
Coal to liquids production	--	--	--	--	--	--	--	--
Electric power ⁶	424	364	365	342	319	301	301	-1.1%
Total	466	408	406	381	358	343	343	-1.0%
Discrepancy and stock change⁷	0	0	0	0	0	0	0	--
Average minemouth price⁸								
(2020 dollars per short ton)	34	31	29	30	32	33	35	0.1%
(2020 dollars per million Btu)	1.68	1.49	1.45	1.48	1.55	1.61	1.66	0.0%
Delivered prices⁹								
(2020 dollars per short ton)								
Commercial and institutional	72	69	69	68	67	66	65	-0.3%
Coke plants	114	88	88	93	98	103	109	-0.2%
Other industrial ⁵	54	56	56	55	56	56	57	0.2%
Coal to liquids	--	--	--	--	--	--	--	--
Electric power ⁶								
(2020 dollars per short ton)	37	36	34	34	34	34	34	-0.3%
(2020 dollars per million Btu)	1.96	1.89	1.83	1.81	1.81	1.79	1.79	-0.3%
Average	41	39	37	37	38	39	39	-0.2%
Exports ¹⁰	92	71	71	73	75	77	80	-0.5%

Table A15. Coal supply, disposition, and prices (continued)
(million short tons, unless otherwise noted)

Supply, disposition, and prices	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Average minemouth price⁸								
(nominal dollars per short ton).....	34	33	36	41	49	57	68	2.3%
(nominal dollars per million Btu).....	1.68	1.61	1.77	2.02	2.36	2.74	3.25	2.2%
Delivered prices⁹								
(nominal dollars per short ton)								
Commercial and institutional.....	72	74	84	93	103	113	128	1.9%
Coke plants.....	114	95	108	127	149	176	213	2.1%
Other industrial ⁵	54	60	68	76	85	96	112	2.5%
Coal to liquids.....	0	0	0	0	0	0	0	--
Electric power ⁶								
(nominal dollars per short ton).....	37	39	41	46	52	58	66	2.0%
(nominal dollars per million Btu).....	1.96	2.04	2.23	2.48	2.75	3.05	3.49	1.9%
Average.....	41	42	46	51	58	66	76	2.1%
Exports ¹⁰	92	76	87	100	114	132	156	1.8%

¹Includes anthracite, bituminous coal, subbituminous coal, and lignite.

²Includes waste coal consumed by the electric power and industrial sectors. Waste coal supplied is counted as a supply-side item to balance the same amount of waste coal included in the consumption data.

³Excludes imports to Puerto Rico and the U.S. Virgin Islands.

⁴Production plus waste coal supplied plus net imports.

⁵Includes consumption for combined heat and power plants that have a non-regulatory status, and small on-site generating systems. Excludes all coal use in the coal-to-liquids process.

⁶Includes all electricity-only and combined heat and power plants that have a regulatory status.

⁷Balancing item: the sum of production, net imports, and waste coal supplied minus total consumption.

⁸Includes 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.

⁹Prices weighted by consumption; weighted average excludes commercial and institutional prices, and export free-alongside-ship prices.

¹⁰Free-alongside-ship price at U.S. port of exit.

-- = Not applicable.

Btu = British thermal unit.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A16. Renewable energy generating capacity and generation
(gigawatts, unless otherwise noted)

Net summer capacity and generation	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Electric power sector¹								
Net summer capacity								
Conventional hydroelectric power.....	79.2	79.3	79.3	79.3	79.3	79.3	79.3	0.0%
Geothermal ²	2.5	2.8	3.6	4.5	5.4	6.1	6.7	3.4%
Municipal waste ³	3.5	4.0	4.6	5.3	5.9	6.4	6.8	2.3%
Wood and other biomass ⁴	3.0	3.0	2.9	2.9	2.9	2.9	2.9	-0.1%
Solar thermal.....	1.8	1.8	1.8	1.8	1.8	1.8	1.8	0.0%
Solar photovoltaic ⁵	48.5	110.4	175.4	220.9	253.8	296.6	351.3	6.8%
Wind.....	126.5	196.5	199.5	202.4	204.5	209.1	217.0	1.8%
Offshore wind.....	0.0	0.9	10.0	23.4	23.4	23.4	23.4	24.9%
Total electric power sector capacity.....	264.9	398.7	477.2	540.4	577.0	625.6	689.2	3.2%
Generation (billion kilowatthours)								
Conventional hydroelectric power.....	281.9	294.0	294.0	293.6	293.2	292.6	292.3	0.1%
Geothermal ²	15.6	18.6	25.3	31.9	39.5	44.9	49.8	3.9%
Biogenic municipal waste ⁶	18.2	22.9	28.5	34.5	39.9	44.7	49.1	3.4%
Wood and other biomass.....	12.3	12.6	11.9	12.1	12.0	12.0	12.1	-0.1%
Dedicated plants.....	12.1	12.4	11.7	12.0	11.9	11.9	11.9	-0.1%
Cofiring.....	0.2	0.1	0.1	0.1	0.1	0.1	0.1	-1.3%
Solar thermal.....	3.3	3.2	3.1	2.9	2.7	2.6	3.1	-0.2%
Solar photovoltaic ⁵	81.9	218.2	390.4	508.4	595.7	698.7	832.4	8.0%
Wind.....	342.0	625.8	637.4	646.7	652.8	667.3	695.1	2.4%
Offshore wind.....	0.1	3.4	35.2	83.7	94.1	93.9	93.8	25.2%
Total electric power sector generation.....	755.4	1,198.6	1,425.8	1,613.8	1,729.8	1,856.8	2,027.7	3.3%
End-use sectors⁷								
Net summer capacity								
Conventional hydroelectric power.....	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0%
Geothermal.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--
Municipal waste ⁸	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.0%
Biomass.....	4.7	4.9	5.0	5.1	5.1	5.2	5.3	0.4%
Solar photovoltaic ⁵	34.2	55.0	74.3	94.4	116.7	140.6	166.1	5.4%
Wind.....	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.1%
Total end-use sector capacity.....	40.2	61.1	80.6	100.7	123.1	147.0	172.7	5.0%
Generation (billion kilowatthours)								
Conventional hydroelectric power.....	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.0%
Geothermal.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--
Municipal waste ⁸	3.4	3.4	3.4	3.4	3.4	3.4	3.4	0.0%
Biomass.....	26.1	27.2	27.7	28.0	28.2	28.6	29.3	0.4%
Solar photovoltaic ⁵	47.3	75.9	103.1	131.5	163.5	197.9	235.4	5.5%
Wind.....	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.1%
Total end-use sector generation.....	78.8	108.5	136.2	165.0	197.1	231.9	270.2	4.2%

Table A16. Renewable energy generating capacity and generation (continued)
(gigawatts, unless otherwise noted)

Net summer capacity and generation	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Total, all sectors								
Net summer capacity								
Conventional hydroelectric power.....	79.4	79.6	79.6	79.6	79.6	79.6	79.6	0.0%
Geothermal.....	2.5	2.8	3.6	4.5	5.4	6.1	6.7	3.4%
Municipal waste.....	3.9	4.5	5.1	5.7	6.4	6.9	7.3	2.1%
Wood and other biomass ⁴	7.7	8.0	7.9	8.0	8.0	8.1	8.2	0.2%
Solar ⁵	84.5	167.1	251.5	317.0	372.3	438.9	519.1	6.2%
Wind.....	127.1	197.9	210.1	226.4	228.5	233.1	241.0	2.2%
Total capacity, all sectors.....	305.1	459.8	557.8	641.1	700.1	772.6	861.9	3.5%
Generation (billion kilowatthours)								
Conventional hydroelectric power.....	283.2	295.3	295.2	294.8	294.4	293.8	293.5	0.1%
Geothermal.....	15.6	18.6	25.3	31.9	39.5	44.9	49.8	3.9%
Municipal waste.....	21.7	26.4	31.9	37.9	43.3	48.1	52.5	3.0%
Wood and other biomass.....	38.4	39.7	39.6	40.1	40.2	40.6	41.4	0.3%
Solar ⁵	132.4	297.3	496.6	642.9	761.9	899.2	1,070.9	7.2%
Wind.....	342.9	629.9	673.4	731.2	747.6	762.0	789.7	2.8%
Total generation, all sectors.....	834.1	1,307.1	1,562.1	1,778.8	1,926.9	2,088.7	2,297.8	3.4%

¹Includes electricity-only and combined heat and power plants that have a regulatory status.

²Includes both hydrothermal resources (hot water and steam) and near-field enhanced geothermal systems (EGS). Near-field EGS potential occurs on known hydrothermal sites, however this potential requires the addition of external fluids for electricity generation and is only available after 2025.

³Includes municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.

⁴Facilities co-firing biomass and coal are classified as coal.

⁵Does not include off-grid photovoltaics.

⁶Includes biogenic municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities.

⁷Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.

⁸Includes municipal waste, landfill gas, and municipal sewage sludge. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A17. Renewable energy consumption by sector and source
(quadrillion Btu per year)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Marketed renewable energy¹								
Residential (wood)	0.46	0.46	0.44	0.41	0.38	0.36	0.34	-1.0%
Commercial (biomass)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.0%
Industrial²	2.43	2.48	2.52	2.57	2.64	2.77	2.93	0.6%
Conventional hydroelectric power.....	0.01	0.02	0.02	0.02	0.02	0.02	0.02	1.8%
Municipal waste ³	0.16	0.16	0.15	0.15	0.16	0.16	0.17	0.2%
Biomass.....	1.35	1.42	1.45	1.47	1.51	1.58	1.68	0.7%
Biofuels heat and coproducts.....	0.90	0.89	0.90	0.93	0.96	1.01	1.06	0.5%
Transportation	1.33	1.59	1.62	1.62	1.61	1.64	1.70	0.8%
Ethanol used in E85 ⁴	0.02	0.02	0.02	0.02	0.02	0.02	0.02	-0.2%
Ethanol used in gasoline blending.....	1.01	1.11	1.11	1.12	1.14	1.17	1.21	0.6%
Biodiesel used in distillate blending.....	0.23	0.27	0.27	0.27	0.26	0.26	0.28	0.7%
Biobutanol.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Liquids from biomass.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Renewable diesel and gasoline ⁵	0.07	0.19	0.22	0.21	0.19	0.19	0.19	3.5%
Electric power⁶	6.99	10.55	11.97	13.41	14.22	15.13	16.41	2.9%
Conventional hydroelectric power.....	2.52	2.52	2.41	2.37	2.33	2.30	2.27	-0.3%
Geothermal.....	0.14	0.16	0.21	0.26	0.31	0.35	0.39	3.4%
Biogenic municipal waste ⁷	0.29	0.34	0.39	0.44	0.49	0.53	0.58	2.3%
Biomass.....	0.20	0.21	0.20	0.20	0.20	0.20	0.20	-0.1%
Dedicated plants.....	0.16	0.17	0.16	0.16	0.16	0.16	0.16	-0.1%
Cofiring.....	0.04	0.04	0.04	0.04	0.04	0.04	0.04	-0.1%
Solar thermal.....	0.03	0.03	0.03	0.02	0.02	0.02	0.02	-0.6%
Solar photovoltaic.....	0.74	1.90	3.25	4.21	4.92	5.74	6.81	7.7%
Wind.....	3.06	5.40	5.50	5.90	5.94	5.98	6.14	2.3%
Total marketed renewable energy	11.34	15.21	16.69	18.15	18.99	20.03	21.51	2.2%
Sources of ethanol								
from corn and other starch.....	1.13	1.29	1.30	1.35	1.39	1.46	1.54	1.0%
from cellulose.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.3%
Net imports.....	-0.10	-0.16	-0.18	-0.21	-0.24	-0.27	-0.32	4.0%
Total	1.04	1.13	1.13	1.14	1.16	1.19	1.23	0.6%

Table A17. Renewable energy consumption by sector and source (continued)
(quadrillion Btu per year)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Nonmarketed renewable energy⁸								
Selected consumption								
Residential	0.28	0.43	0.58	0.74	0.93	1.13	1.34	5.4%
Solar hot water heating	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.6%
Geothermal heat pumps	0.01	0.02	0.03	0.03	0.04	0.05	0.05	4.8%
Solar photovoltaic	0.22	0.36	0.51	0.66	0.84	1.03	1.24	5.9%
Wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1%
Commercial	0.25	0.32	0.39	0.45	0.52	0.59	0.64	3.2%
Solar thermal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	-0.3%
Solar photovoltaic	0.17	0.25	0.31	0.38	0.45	0.51	0.56	4.2%
Wind	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.2%

¹Includes nonelectric renewable energy groups for which the energy source is bought and sold in the marketplace, although all transactions may not necessarily be marketed, and renewable energy inputs for electricity entering the marketplace on the electric power grid. Excludes electricity imports; see Table A2. Actual heat rates used to determine fuel consumption for all renewable fuels except hydroelectric, geothermal, solar, and wind. Consumption at hydroelectric, geothermal, solar, and wind facilities is determined by using the average electric power sector net heat rate for fossil fuels.

²Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.

³Includes municipal waste, landfill gas, and municipal sewage sludge. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.

⁴Excludes motor gasoline component of E85. E85 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 these projections.

⁵Renewable feedstocks for the on-site production of diesel and gasoline.

⁶Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.

⁷Includes biogenic municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities.

⁸Includes selected renewable energy consumption data for which the energy is not bought or sold, either directly or indirectly as an input to marketed energy. The U.S. Energy Information Administration does not estimate or project total consumption of nonmarketed renewable energy.

-- = Not applicable.

Btu = British thermal unit.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A18. Energy-related carbon dioxide emissions by sector and source
(million metric tons, unless otherwise noted)

Sector and source	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Residential								
Petroleum	60	59	55	52	50	48	46	-0.9%
Natural gas	264	264	260	258	257	256	256	-0.1%
Electricity ¹	570	482	470	454	456	457	465	-0.7%
Total residential	894	805	785	765	763	762	768	-0.5%
Commercial								
Petroleum	57	62	61	61	61	61	61	0.3%
Natural gas	176	192	192	194	195	197	198	0.4%
Coal	2	1	1	1	1	1	1	-1.1%
Electricity ¹	483	433	416	397	396	401	415	-0.5%
Total commercial	718	689	671	653	654	660	676	-0.2%
Industrial²								
Petroleum	342	376	396	413	426	439	457	1.0%
Natural gas ³	551	605	630	652	678	710	743	1.0%
Coal	92	89	82	80	79	84	85	-0.3%
Electricity ¹	375	329	331	319	315	316	317	-0.6%
Total industrial	1,360	1,399	1,439	1,463	1,497	1,548	1,602	0.5%
Transportation								
Petroleum ⁴	1,545	1,683	1,639	1,616	1,615	1,643	1,672	0.3%
Natural gas ⁵	42	42	41	45	50	56	62	1.3%
Electricity ¹	3	5	8	11	16	22	28	7.6%
Total transportation	1,591	1,731	1,688	1,672	1,681	1,721	1,762	0.3%
Electric power⁶								
Petroleum	12	8	6	6	5	4	4	-3.3%
Natural gas	643	573	560	557	594	635	665	0.1%
Coal	767	658	648	607	572	545	545	-1.1%
Other ⁷	10	11	11	11	11	11	11	0.3%
Total electric power	1,432	1,250	1,224	1,181	1,183	1,196	1,226	-0.5%
Total by fuel								
Petroleum ⁴	2,016	2,188	2,158	2,149	2,158	2,195	2,241	0.4%
Natural gas	1,675	1,676	1,683	1,705	1,774	1,854	1,924	0.5%
Coal	861	749	731	688	653	630	631	-1.0%
Other ⁷	10	11	11	11	11	11	11	0.3%
Total	4,563	4,623	4,584	4,553	4,596	4,691	4,807	0.2%
Carbon dioxide emissions								
(metric tons per person)	13.8	13.5	13.0	12.6	12.4	12.4	12.4	-0.3%

¹Emissions from the electric power sector are distributed to the end-use sectors.

²Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.

³Includes lease and plant fuel.

⁴This includes carbon dioxide from international bunker fuels, both civilian and military, which are excluded from the accounting of carbon dioxide emissions under the United Nations convention.

⁵Includes pipeline and distribution fuel natural gas and natural gas used as fuel in motor vehicles, trains, and ships.

⁶Includes electricity-only and combined heat and power plants that have a regulatory status.

⁷Includes emissions from geothermal power and nonbiogenic emissions from municipal waste.

Note: By convention, the direct emissions from biogenic energy sources are excluded from energy-related carbon dioxide emissions. The release of carbon from these sources is assumed to be balanced by the uptake of carbon when the feedstock is grown, resulting in zero net emissions over some period of time. If, however, increased use of biomass energy results in a decline in terrestrial carbon stocks, a net positive release of carbon may occur. See Table A19, "Energy-Related Carbon Dioxide Emissions by End Use", for the emissions from biogenic energy sources as an indication of the potential net release of carbon dioxide in the absence of offsetting sequestration. Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A19. Energy-related carbon dioxide emissions by end use
(million metric tons)

Sector and end use	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Residential								
Space heating.....	308	297	283	271	262	254	247	-0.7%
Space cooling.....	95	88	91	92	98	103	110	0.5%
Water heating.....	131	119	117	115	116	116	117	-0.4%
Refrigeration.....	34	27	26	24	24	24	25	-1.1%
Cooking.....	13	12	12	11	12	12	12	-0.3%
Clothes dryers.....	27	24	25	25	26	26	27	0.0%
Freezers.....	8	6	6	6	5	5	5	-1.4%
Lighting.....	24	19	18	16	16	15	14	-1.8%
Clothes washers ¹	4	4	4	3	3	3	3	-0.6%
Dishwashers ¹	3	3	3	3	3	3	3	0.2%
Televisions and related equipment ²	24	19	18	19	20	21	21	-0.4%
Computers and related equipment ³	10	7	6	5	5	4	3	-3.9%
Furnace fans and boiler circulation pumps.....	9	8	8	7	6	6	5	-1.6%
Other uses ⁴	222	185	188	188	193	199	207	-0.2%
Discrepancy ⁵	-17	-14	-18	-21	-25	-29	-33	2.2%
Total residential.....	894	805	785	765	763	762	768	-0.5%
Commercial								
Space heating ⁶	123	124	121	118	116	113	110	-0.4%
Space cooling ⁶	62	53	52	51	51	52	54	-0.5%
Water heating ⁶	36	36	36	36	37	38	39	0.3%
Ventilation.....	58	46	40	36	33	31	30	-2.1%
Cooking.....	28	27	28	28	29	30	31	0.3%
Lighting.....	61	45	39	33	29	27	26	-2.8%
Refrigeration.....	75	60	58	55	54	53	53	-1.1%
Computing.....	38	30	29	28	29	28	27	-1.2%
Office equipment.....	50	50	54	55	58	62	68	1.0%
Other uses ⁷	187	217	214	213	218	226	237	0.8%
Total commercial.....	718	689	671	653	654	660	676	-0.2%
Industrial⁸								
Manufacturing								
Refining.....	235	235	238	241	249	253	260	0.3%
Food products.....	78	81	83	85	87	90	94	0.6%
Paper products.....	48	45	42	40	39	39	39	-0.7%
Bulk chemicals.....	274	281	299	313	320	330	341	0.7%
Glass.....	12	11	10	10	10	10	11	-0.4%
Cement and lime.....	22	20	16	13	12	12	11	-2.2%
Iron and steel.....	90	84	78	70	68	69	69	-0.9%
Aluminum.....	14	14	14	13	13	13	13	-0.4%
Fabricated metal products.....	28	27	27	28	28	29	30	0.2%
Machinery.....	12	12	12	12	12	13	13	0.2%
Computers and electronics.....	13	12	12	12	13	13	14	0.3%
Transportation equipment.....	24	23	23	24	25	26	26	0.3%
Electrical equipment.....	7	7	7	7	8	8	9	0.7%
Wood products.....	12	11	11	10	10	11	12	0.0%
Plastics.....	23	22	22	22	23	24	24	0.2%
Balance of manufacturing.....	99	100	103	106	111	118	125	0.8%
Total manufacturing.....	991	985	998	1,006	1,027	1,057	1,091	0.3%
Nonmanufacturing								
Agriculture.....	81	89	94	99	105	111	118	1.2%
Construction.....	73	78	84	89	94	102	111	1.4%
Mining.....	81	80	79	78	76	77	77	-0.2%
Total nonmanufacturing.....	236	247	258	266	275	289	305	0.9%
Discrepancy ⁵	132	167	184	191	195	202	206	1.5%
Total industrial.....	1,360	1,399	1,439	1,463	1,497	1,548	1,602	0.5%

Table A19. Energy-related carbon dioxide emissions by end use (continued)
(million metric tons)

Sector and end use	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Transportation								
Light-duty vehicles	904	933	898	874	863	863	870	-0.1%
Commercial light trucks ⁹	54	56	56	58	60	63	67	0.7%
Bus transportation.....	8	14	15	15	15	15	14	1.9%
Freight trucks.....	360	370	355	349	353	368	384	0.2%
Rail, passenger.....	3	4	4	4	4	5	5	1.8%
Rail, freight	30	30	30	29	28	27	27	-0.4%
Shipping, domestic	5	5	4	4	3	3	3	-1.8%
Shipping, international	63	69	69	67	66	65	64	0.0%
Recreational boats.....	13	13	13	12	12	12	12	-0.4%
Air	132	219	227	244	257	275	290	2.7%
Military use	38	37	37	37	37	38	38	0.0%
Lubricants	4	5	5	5	5	5	5	0.1%
Pipeline and distribution fuel.....	37	35	32	33	35	36	38	0.0%
Discrepancy ⁵	-61	-60	-58	-58	-56	-54	-54	-0.4%
Total transportation.....	1,591	1,731	1,688	1,672	1,681	1,721	1,762	0.3%
Biogenic energy combustion¹⁰								
Biomass.....	201	208	208	208	208	213	220	0.3%
Electric power sector	19	20	19	19	19	19	19	-0.1%
Other sectors	182	188	190	189	189	194	201	0.3%
Biogenic waste.....	27	30	35	40	44	48	53	2.3%
Biofuels heat and coproducts	85	83	84	87	90	94	99	0.5%
Ethanol	71	77	77	78	79	81	84	0.6%
Biobutanol.....	0	0	0	0	0	0	0	--
Biodiesel	17	19	20	20	19	19	20	0.7%
Liquids from biomass.....	0	0	0	0	0	0	0	--
Renewable diesel and gasoline	5	14	16	15	14	14	14	3.5%
Total	405	432	441	448	455	470	490	0.6%

¹Does not include water heating portion of load.

²Includes televisions, set-top boxes, home theater systems, DVD and Blu-ray players, and video game consoles.

³Includes desktop and laptop computers, monitors, and networking equipment.

⁴Includes electric and electronic devices, heating elements, motors, outdoor grills, natural gas- and propane-fueled lights, pool heaters, spa heaters, and backup electricity generators not listed above. Electric vehicles are included in the transportation sector.

⁵Represents differences between total emissions by end-use and total emissions by fuel as reported in Table A18. Emissions by fuel may reflect benchmarking and other modeling adjustments to energy use and the associated emissions that are not assigned to specific end uses.

⁶Includes emissions related to fuel consumption for district services.

⁷Includes emissions related to (but not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, water services, emergency generators, combined heat and power in commercial buildings, manufacturing performed in commercial buildings, and cooking (distillate). Also includes residual fuel oil, propane, coal, motor gasoline, kerosene, and marketed renewable fuels (biomass).

⁸Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.

⁹Commercial trucks 8,501 to 10,000 pounds gross vehicle weight rating.

¹⁰By convention, the direct emissions from biogenic energy sources are excluded from energy-related carbon dioxide emissions. The release of carbon from these sources is assumed to be balanced by the uptake of carbon when the feedstock is grown, resulting in zero net emissions over some period of time. If, however, increased use of biomass energy results in a decline in terrestrial carbon stocks, a net positive release of carbon may occur. Accordingly, the emissions from biogenic energy sources are reported here as an indication of the potential net release of carbon dioxide in the absence of offsetting sequestration.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: 2020: U.S. Energy Information Administration (EIA), *Short-Term Energy Outlook*, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. Projections: EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.

Table A20. Macroeconomic indicators
(billion 2012 chain-weighted dollars, unless otherwise noted)

Indicators	Reference case							Compound growth 2020-2050 (percent)
	2020	2025	2030	2035	2040	2045	2050	
Real gross domestic product	18,171	21,193	23,289	25,842	28,371	31,317	34,365	2.1%
Components of real gross domestic product								
Real consumption	12,557	14,555	16,466	18,761	20,943	23,291	25,740	2.4%
Real investment	2,575	3,131	3,662	4,269	4,816	5,530	6,279	3.0%
Real government spending	3,367	3,431	3,531	3,661	3,793	3,952	4,123	0.7%
Real exports	2,198	3,173	3,588	4,026	4,567	5,267	6,072	3.4%
Real imports	2,965	3,720	4,589	5,623	6,578	7,693	8,977	3.8%
Energy intensity (thousand Btu per 2012 dollar of GDP)								
Delivered energy	3.83	3.55	3.26	2.98	2.77	2.59	2.44	-1.5%
Total energy	5.11	4.65	4.23	3.87	3.59	3.35	3.16	-1.6%
Price indices								
GDP chain-type price index (2012=1.00)	1.133	1.219	1.383	1.553	1.724	1.931	2.213	2.3%
Consumer price index (1982-4=1.00)								
All-urban	2.58	2.82	3.19	3.55	3.93	4.39	5.00	2.2%
Energy commodities and services	1.95	2.20	2.65	3.04	3.49	4.03	4.77	3.0%
Wholesale price index (1982=1.00)								
All commodities	1.93	2.17	2.41	2.64	2.88	3.17	3.58	2.1%
Fuel and power	1.40	1.73	2.14	2.49	2.86	3.31	3.93	3.5%
Metals and metal products	2.21	2.56	2.65	2.65	2.65	2.65	2.65	0.6%
Industrial commodities excluding energy	2.06	2.30	2.47	2.67	2.89	3.15	3.51	1.8%
Interest rates (percent, nominal)								
Federal funds rate	0.37	0.13	1.78	2.63	2.63	2.63	2.63	--
10-year treasury note	0.81	1.80	2.77	2.92	2.95	2.91	2.94	--
AA utility bond rate	2.64	3.07	3.71	3.78	3.86	3.78	3.78	--
Value of shipments (billion 2012 dollars)								
Non-industrial and service sectors	22,985	26,599	29,650	33,212	36,598	40,347	44,300	2.2%
Total industrial	8,168	9,121	9,707	10,392	11,076	11,967	12,874	1.5%
Agriculture, mining, and construction	2,535	2,773	2,954	3,137	3,304	3,556	3,822	1.4%
Manufacturing	5,632	6,347	6,753	7,255	7,772	8,411	9,051	1.6%
Energy-intensive	2,399	2,708	2,841	3,002	3,145	3,313	3,502	1.3%
Non-energy-intensive	3,233	3,639	3,912	4,253	4,628	5,098	5,550	1.8%
Total shipments	31,152	35,719	39,356	43,604	47,674	52,314	57,174	2.0%
Population and employment (millions)								
Population, with armed forces overseas	330	342	353	362	371	379	386	0.5%
Population, aged 16 and over	266	277	287	296	304	311	318	0.6%
Population, aged 65 and over	56	65	73	78	81	83	86	1.4%
Employment, nonfarm	142	159	162	167	172	178	183	0.9%
Employment, manufacturing	12.2	12.4	12.0	11.8	11.7	11.7	11.7	-0.1%
Key labor indicators								
Labor force (millions)	161	169	174	178	184	189	194	0.6%
Nonfarm labor productivity (2012=1.00)	1.09	1.16	1.27	1.39	1.50	1.62	1.75	1.6%
Unemployment rate (percent)	8.65	3.67	4.09	3.82	4.20	4.33	4.63	--
Key indicators for energy demand								
Real disposable personal income	15,994	16,721	18,826	21,038	23,184	25,427	27,813	1.9%
Housing starts (millions)	1.35	1.38	1.29	1.23	1.19	1.21	1.21	-0.4%
Commercial floorspace (billion square feet)	94	98	103	108	113	119	124	1.0%
Unit sales of light-duty vehicles (millions)	13.6	16.2	16.3	16.6	16.4	16.6	16.5	0.7%

GDP = Gross domestic product.

Btu = British thermal unit.

-- = Not applicable.

Sources: 2020: IHS Markit, Macroeconomic model, #DRI#. Projections: U.S. Energy Information Administration, AEO2021 National Energy Modeling System run ref2021.d113020a.