Appendix L

Reference case transportation sector projections

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Table L1. Transportation sector energy consumption by region and fuel, 2015-50

quadrillion Btu

Region/fuel	2015	2020	2025	2030	2035	2040	2045	2050	Average Annual percent change (2015-50)
OECD									
Motor gasoline and E85	26.8	26.0	23.9	22.6	22.0	21.8	21.7	21.7	-0.6
Distillate fuel oil and biodiesel	20.3	19.8	19.0	17.7	16.8	16.5	16.5	16.6	-0.6
Residual fuel oil	3.2	3.1	3.1	3.1	3.1	3.0	2.8	2.7	-0.5
Liquefied petroleum gas	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.1	-3.0
Jet fuel	6.9	7.5	8.5	9.5	10.5	11.6	12.8	14.1	2.1
Other liquids	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
Natural gas	1.1	1.3	1.6	1.9	2.4	3.0	3.8	4.7	4.2
Electricity	0.3	0.3	0.5	0.8	1.2	1.7	2.2	2.6	6.5
Total [a]	**59.4**	**58.8**	**57.2**	**56.2**	**56.6**	**58.2**	**60.2**	**62.8**	**0.2**
Non-OECD									
Motor gasoline and E85	17.4	19.6	21.9	24.0	26.2	28.9	31.4	33.6	1.9
Distillate fuel oil and biodiesel	20.2	21.3	23.4	24.4	25.4	26.6	27.6	28.1	0.9
Residual fuel oil	4.2	4.5	4.6	4.7	4.7	4.6	4.4	4.1	-0.1
Liquefied petroleum gas	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.1
Jet fuel	5.1	5.6	6.8	8.2	9.8	11.4	13.2	15.1	3.1
Other liquids	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	-0.3
Natural gas	2.7	3.3	4.5	5.7	7.4	9.5	12.3	16.0	5.2
Electricity	1.2	1.4	1.6	1.9	2.2	2.7	3.3	4.0	3.5
Total Non-OECD	**51.1**	**56.0**	**63.2**	**69.3**	**76.0**	**84.0**	**92.7**	**101.3**	**2.0**
World									
Motor gasoline and E85	44.2	45.6	45.8	46.6	48.2	50.7	53.1	55.2	0.6
Distillate fuel oil and biodiesel	40.5	41.0	42.4	42.1	42.3	43.1	44.1	44.7	0.3
Residual fuel oil	7.5	7.6	7.7	7.8	7.8	7.6	7.3	6.8	-0.3
Liquefied petroleum gas	0.5	0.6	0.5	0.5	0.4	0.4	0.4	0.4	-1.1
Jet fuel	12.0	13.1	15.3	17.7	20.3	23.0	26.0	29.3	2.6
Other liquids	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2
Natural gas	3.9	4.7	6.1	7.7	9.8	12.5	16.1	20.8	4.9
Electricity	1.5	1.7	2.2	2.7	3.4	4.4	5.5	6.6	4.4
Total World [a]	**110.5**	**114.8**	**120.4**	**125.5**	**132.7**	**142.2**	**152.9**	**164.1**	**1.1**

a/ Quantities include energy used for U.S military transportation and the energy content of lubricants.
Notes: Totals may not equal sum of components due to independent rounding.
Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table L2. Transportation sector passenger transport energy consumption by region and mode, 2015-50

quadrillion Btu

Region/mode	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
OECD									
Light-duty vehicles	31.8	30.7	27.9	26.1	25.3	25.3	25.5	25.9	-0.6
Air	6.5	7.1	8.0	9.0	10.0	11.1	12.2	13.5	2.1
Buses	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	0.6
2- and 3-wheel vehicles	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-0.3
Rail	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
Total OECD	**39.8**	**39.3**	**37.5**	**36.7**	**37.0**	**38.2**	**39.5**	**41.2**	**0.1**
Non-OECD									
Light-duty vehicles	16.2	18.6	21.4	24.1	27.2	31.2	35.5	39.4	2.6
Air	5.1	5.6	6.8	8.2	9.8	11.4	13.2	15.1	3.1
Buses	3.3	3.8	4.4	4.8	5.1	5.4	5.6	5.9	1.7
2- and 3-wheel vehicles	1.6	1.8	2.0	2.1	2.1	2.2	2.2	2.2	1.0
Rail	0.8	1.2	1.6	1.8	2.0	2.1	2.1	2.1	2.8
Total Non-OECD	**27.1**	**30.9**	**36.1**	**41.0**	**46.2**	**52.2**	**58.6**	**64.8**	**2.5**
World									
Light-duty vehicles	48.0	49.3	49.2	50.1	52.5	56.6	61.0	65.4	0.9
Air	11.6	12.6	14.9	17.2	19.7	22.5	25.4	28.6	2.6
Buses	4.3	4.8	5.4	5.9	6.3	6.6	6.8	7.1	1.4
2- and 3-wheel vehicles	1.8	2.0	2.2	2.3	2.4	2.4	2.4	2.4	0.9
Rail	1.1	1.5	1.9	2.2	2.3	2.4	2.5	2.5	2.3
Total World	**66.8**	**70.3**	**73.6**	**77.7**	**83.2**	**90.4**	**98.1**	**106.0**	**1.3**

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

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table L3. Transportation sector freight transport energy consumption by region and mode, 2015-50

quadrillion Btu

Region/mode	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
OECD									
Heavy-duty trucks	10.4	10.3	10.3	9.9	9.7	9.8	10.2	10.7	0.1
Rail	0.9	0.9	1.0	1.0	1.0	0.9	1.0	1.0	0.2
Marine vessels	6.7	6.6	6.7	6.9	7.1	7.4	7.5	7.8	0.5
Natural gas pipeline	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.1	0.7
Total Non OECD	**18.9**	**18.7**	**18.9**	**18.7**	**18.8**	**19.2**	**19.8**	**20.6**	**0.3**
Non-OECD									
Heavy-duty trucks	14.9	15.2	16.2	16.5	17.0	17.8	19.0	20.2	0.9
Rail	1.5	1.7	1.8	1.9	1.9	1.9	2.0	2.0	0.7
Marine vessels	6.3	6.7	7.4	8.2	9.0	10.0	10.9	12.0	1.9
Natural gas pipeline	1.4	1.5	1.6	1.7	1.9	2.0	2.2	2.4	1.5
Total Non-OECD	**24.1**	**25.1**	**27.1**	**28.3**	**29.8**	**31.8**	**34.0**	**36.5**	**1.2**
World									
Heavy-duty trucks	25.3	25.5	26.6	26.4	26.7	27.7	29.2	31.0	0.6
Rail	2.4	2.6	2.8	2.9	2.9	2.9	2.9	2.9	0.5
Marine vessels	12.9	13.3	14.2	15.1	16.2	17.3	18.4	19.8	1.2
Natural gas pipeline	2.3	2.3	2.5	2.7	2.9	3.1	3.3	3.5	1.2
Total World	**42.9**	**43.8**	**46.0**	**47.0**	**48.6**	**50.9**	**53.8**	**57.1**	**0.8**

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

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table L4. Aircraft efficiency, 2015-50

seat-miles per gallon

Type/vintage	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
Narrow body aircraft									
New	75.3	77.2	80.0	85.3	88.9	92.8	93.3	93.4	0.6
Stock	71.8	74.3	75.6	77.5	79.9	82.6	85.3	87.5	0.6
Wide body aircraft									
New	73.5	75.4	78.1	83.3	86.8	90.6	91.1	91.1	0.6
Stock	63.9	72.2	74.0	76.0	78.3	80.8	83.7	86.5	0.9
Regional jets									
New	48.1	49.3	51.1	54.5	56.8	59.3	59.6	59.6	0.6
Stock	46.4	47.6	48.4	49.6	51.1	52.8	54.5	56.0	0.5
Average aircraft									
New	70.8	72.8	75.5	80.5	84.0	87.7	88.2	88.3	0.6
Stock	66.7	70.0	71.4	73.3	75.5	78.1	80.7	83.1	0.6

Notes: Totals may not equal sum of components due to independent rounding.
Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table L5. Passenger air travel, 2015-50

billion revenue-passenger-miles

Region/type	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
United States /a									
Domestic	642	712	797	877	958	1,051	1,145	1,236	1.9
International	267	306	358	411	469	537	612	690	2.8
Total	908	1,018	1,155	1,288	1,427	1,588	1,757	1,926	2.2
Canada									
Domestic	28	31	34	38	41	44	47	50	1.7
International	94	109	127	147	171	197	226	258	2.9
Total	122	140	161	185	212	241	273	308	2.7
Central America									
Domestic	26	30	35	40	46	53	60	67	2.7
International	93	107	127	149	174	202	233	269	3.1
Total	120	137	162	189	220	255	293	336	3.0
South America									
Domestic	99	118	150	184	224	273	332	402	4.1
International	70	83	103	124	149	178	212	250	3.7
Total	169	201	253	308	373	451	544	653	3.9
Europe									
Domestic	495	564	642	725	815	915	1,022	1,149	2.4
International	448	524	611	707	814	935	1,069	1,229	2.9
Total	943	1,088	1,253	1,431	1,629	1,850	2,090	2,378	2.7
Africa									
Domestic	37	46	59	76	97	126	162	208	5.1
International	71	85	106	131	163	203	252	313	4.3
Total	108	130	164	207	261	329	415	521	4.6
Mideast									
Domestic	64	77	92	110	130	151	174	197	3.3
International	187	233	287	352	431	520	626	739	4.0
Total	251	310	379	462	560	670	800	936	3.8
Commonwealth of Independent States									
Domestic	86	93	101	111	123	135	146	157	1.7
International	94	106	120	136	158	181	206	232	2.6
Total	180	200	221	247	281	315	351	389	2.2
China									
Domestic	351	485	646	835	1,053	1,298	1,570	1,846	4.9
International	142	198	263	337	419	508	603	694	4.6
Total	493	683	908	1,172	1,472	1,807	2,173	2,540	4.8

Table L5. Passenger air travel, 2015-50 (cont.)

billion revenue-passenger-miles

Region/type	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
Northeast Asia									
Domestic	70	76	82	87	92	96	100	106	1.2
International	145	163	184	203	222	241	263	289	2.0
Total	215	239	266	290	313	336	363	395	1.8
Southeast Asia									
Domestic	121	168	236	321	430	571	748	971	6.1
International	171	231	312	407	520	657	818	1,009	5.2
Total	292	400	547	728	950	1,228	1,565	1,980	5.6
Southwest Asia									
Domestic	49	71	99	136	182	242	313	394	6.1
International	78	103	131	163	199	239	280	319	4.1
Total	127	174	231	299	381	481	593	713	5.1
Oceania									
Domestic	64	77	93	112	136	164	197	238	3.8
International	59	71	86	103	125	150	181	217	3.8
Total	123	148	179	216	260	314	378	454	3.8
World									
Domestic	2,131	2,548	3,067	3,650	4,327	5,117	6,016	7,021	3.5
International	1,919	2,318	2,814	3,370	4,013	4,748	5,580	6,508	3.6
Total	4,049	4,866	5,880	7,020	8,340	9,864	11,596	13,529	3.5

a/ Includes the 50 states and the District of Columbia.

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

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table L6. Freight air transport, 2015-50

billion revenue-ton-miles

Region	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
United States /a	35	33	35	37	39	40	41	41	0.5
Canada	1	1	1	1	1	1	1	1	1.3
Central America	1	1	2	2	2	2	3	3	2.2
South America	3	3	4	4	5	5	6	6	2.0
Europe	26	28	31	33	35	37	40	42	1.4
Africa	2	2	3	3	4	5	6	7	3.9
Mideast	16	19	23	27	31	34	38	42	2.7
Commonwealth of Independent States	5	5	5	6	6	7	7	8	1.5
China	21	28	35	43	51	60	68	76	3.7
Northeast Asia	7	7	8	8	8	8	8	9	0.7
Southeast Asia	7	9	11	13	16	19	22	25	3.7
Southwest Asia	9	13	17	21	25	30	35	39	4.2
Oceania	1	2	2	2	2	3	3	3	2.6
World	134	151	175	199	225	251	277	301	2.4

a/ Includes the 50 states and the District of Columbia.

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

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table L7. Passenger air travel, 2015-50

billion seat-miles

Region	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
United States /a	1,090	1,204	1,364	1,519	1,683	1,873	2,074	2,275	2.1
Canada	151	173	198	226	257	291	329	369	2.6
Central America	155	177	207	241	279	320	367	421	2.9
South America	232	274	341	411	492	589	709	849	3.8
Europe	1,225	1,403	1,607	1,824	2,063	2,325	2,612	2,953	2.5
Africa	155	185	230	286	357	445	557	696	4.4
Mideast	329	404	492	596	718	850	1,011	1,179	3.7
Commonwealth of Independent States	254	276	300	329	368	403	447	493	1.9
China	611	854	1,145	1,490	1,888	2,315	2,768	3,215	4.9
Northeast Asia	290	319	351	378	403	429	462	500	1.6
Southeast Asia	381	517	703	928	1,202	1,550	1,966	2,475	5.5
Southwest Asia	165	225	296	381	483	608	746	893	4.9
Oceania	161	193	231	276	330	397	475	568	3.7
World	5,198	6,204	7,466	8,883	10,522	12,396	14,524	16,886	3.4

a/ Includes the 50 states and the District of Columbia.

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

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table L8. Total commercial jet fuel use, 2015-50

quadrillion Btu

Region	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
United States /a	2.3	2.5	2.8	3.0	3.3	3.5	3.8	4.0	1.6
Canada	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	2.2
Central America	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.7	3.7
South America	0.6	0.5	0.7	0.8	0.9	1.0	1.2	1.4	2.7
Europe	2.5	2.8	3.2	3.5	3.8	4.1	4.5	4.9	1.9
Africa	0.4	0.4	0.4	0.5	0.7	0.8	1.0	1.2	2.9
Mideast	0.7	0.9	1.0	1.2	1.4	1.6	1.8	2.1	3.1
Commonwealth of Independent States	0.7	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.7
China	1.4	1.8	2.3	2.9	3.6	4.2	4.9	5.5	4.0
Northeast Asia	0.7	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.4
Southeast Asia	1.1	1.0	1.4	1.8	2.2	2.7	3.4	4.1	3.8
Southwest Asia	0.3	0.5	0.6	0.8	1.0	1.2	1.4	1.6	4.7
Oceania	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	2.9
World	11.6	12.6	14.9	17.2	19.7	22.4	25.4	28.6	2.6

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

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.