International Energy Outlook 2021

Release date: October 2021

Table E1.gen. Electricity generation: World, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	692	688	328	154	74	35	18	-11.5
Natural gas	6,450	6,967	7,738	7,614	7,956	8,262	8,747	1.0
Coal	8,232	8,102	7,657	8,042	8,317	9,051	9,717	0.6
Nuclear	2,630	2,836	2,922	3,046	3,092	3,028	3,043	0.5
Renewables	6,989	10,306	13,566	17,332	21,345	25,474	29,554	4.9
Hydro	4,034	4,631	5,029	5,230	5,426	5,738	5,946	1.3
Wind	1,741	2,870	3,849	5,135	6,384	7,416	8,102	5.3
Geothermal	90	130	195	221	243	254	257	3.6
Solar	832	2,333	4,055	6,182	8,636	11,330	14,402	10.0
Other	291	343	437	564	655	737	847	3.6
Net generation to grid	24,993	28,900	32,210	36,188	40,785	45,851	51,078	2.4

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813; and EIA, *Annual Energy Outlook 2021* , (February 2021), www.eia.gov/aeo

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E2.gen. Electricity generation: OECD, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	182	175	83	45	25	13	9	-9.6
Natural gas	3,346	3,322	3,327	3,404	3,628	3,824	3,983	0.6
Coal	1,842	1,584	1,476	1,443	1,322	1,264	1,183	-1.5
Nuclear	1,859	1,898	1,776	1,725	1,602	1,412	1,294	-1.2
Renewables	3,127	4,318	5,339	6,227	7,116	8,137	9,171	3.7
Hydro	1,479	1,607	1,680	1,701	1,727	1,791	1,812	0.7
Wind	960	1,516	1,856	2,414	3,023	3,683	4,243	5.1
Geothermal	52	58	83	96	103	108	111	2.6
Solar	466	954	1,513	1,759	1,967	2,246	2,668	6.0
Other	171	183	207	256	295	308	337	2.3
Net generation to grid	10,356	11,297	12,001	12,845	13,694	14,649	15,640	1.4

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813; and EIA, *Annual Energy Outlook 2021* , (February 2021), www.eia.gov/aeo

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E3.gen. Electricity generation: United States, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	16	10	9	8	7	6	6	-3.2
Natural gas	1,629	1,544	1,435	1,519	1,674	1,837	1,996	0.7
Coal	782	661	636	595	557	539	533	-1.3
Nuclear	785	745	638	602	604	608	601	-0.9
Renewables	850	1,391	1,825	2,039	2,176	2,309	2,476	3.6
Hydro	283	296	295	294	294	293	293	0.1
Wind	343	655	715	779	799	817	855	3.1
Geothermal	16	19	29	39	44	50	53	4.1
Solar	132	338	696	831	935	1,040	1,163	7.5
Other	76	84	89	97	103	108	112	1.3
Net generation to grid	4,061	4,351	4,543	4,764	5,017	5,298	5,612	1.1

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813; and EIA, *Annual Energy Outlook 2021* , (February 2021), www.eia.gov/aeo

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E4.gen. Electricity generation: Canada, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	5	5	1	0	0	0	0	-13.4
Natural gas	64	83	106	143	197	245	282	5.1
Coal	34	28	9	0	0	0	0	-100.0
Nuclear	87	71	77	72	51	39	28	-3.7
Renewables	430	487	533	569	601	634	670	1.5
Hydro	389	411	430	430	430	430	430	0.3
Wind	33	65	88	120	153	185	215	6.4
Geothermal	0	0	0	0	0	0	0	0.0
Solar	4	4	4	4	4	4	4	0.3
Other	4	7	11	15	15	16	22	5.9
Net generation to grid	620	674	726	784	849	919	980	1.5

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E5.gen. Electricity generation: Mexico and other OECD Americas, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	38	38	18	10	5	1	0	-17.1
Natural gas	256	273	307	346	376	374	331	0.9
Coal	39	27	27	27	27	27	30	-0.9
Nuclear	11	11	20	28	23	17	17	1.3
Renewables	153	180	214	244	293	379	491	4.0
Hydro	114	136	142	148	148	148	148	0.9
Wind	17	19	34	45	69	106	118	6.7
Geothermal	5	5	8	8	8	8	8	1.5
Solar	8	10	19	31	55	103	202	11.5
Other	9	10	11	12	14	15	16	1.9
Net generation to grid	497	529	585	654	724	798	869	1.9

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E6.gen. Electricity generation: OECD Europe, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	57	57	27	11	3	0	0	-15.7
Natural gas	796	769	788	752	773	812	823	0.1
Coal	397	373	314	295	220	225	231	-1.8
Nuclear	741	728	674	658	607	459	363	-2.3
Renewables	1,378	1,825	2,237	2,703	3,163	3,680	4,188	3.8
Hydro	568	637	683	698	720	779	800	1.2
Wind	531	678	859	1,209	1,595	1,954	2,278	5.0
Geothermal	21	24	36	39	40	40	40	2.2
Solar	201	427	590	652	684	769	915	5.2
Other	58	59	69	104	123	138	154	3.3
Net generation to grid	3,369	3,752	4,041	4,419	4,766	5,177	5,605	1.7

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E7.gen. Electricity generation: Japan, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	48	48	25	15	9	5	2	-10.1
Natural gas	367	380	396	353	334	334	332	-0.3
Coal	283	278	274	328	328	275	203	-1.1
Nuclear	58	115	139	139	121	102	102	1.9
Renewables	204	214	228	257	326	437	546	3.3
Hydro	86	86	86	86	86	86	86	0.0
Wind	11	20	34	62	120	240	349	12.3
Geothermal	3	3	3	3	3	3	3	0.0
Solar	92	92	92	92	92	92	92	0.0
Other	11	11	12	13	24	14	15	1.1
Net generation to grid	959	1,035	1,063	1,092	1,119	1,153	1,185	0.7

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E8.gen. Electricity generation: South Korea, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	13	12	2	0	0	0	0	-14.6
Natural gas	173	216	236	237	225	175	173	0.0
Coal	159	133	141	141	146	155	151	-0.2
Nuclear	178	228	228	226	196	186	183	0.1
Renewables	27	38	61	99	168	250	287	8.3
Hydro	3	4	4	5	5	5	5	1.1
Wind	3	9	24	55	121	205	242	16.3
Geothermal	0	0	0	0	0	0	0	--
Solar	10	16	21	27	29	29	29	3.8
Other	11	9	12	13	12	11	11	0.1
Net generation to grid	549	626	668	704	735	767	794	1.2

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E9.gen. Electricity generation: Australia and New Zealand, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	4	4	0	0	0	0	0	-11.5
Natural gas	61	56	59	53	48	46	46	-0.9
Coal	149	85	74	57	45	44	35	-4.7
Nuclear	0	0	0	0	0	0	0	0.0
Renewables	86	184	241	317	389	448	513	6.1
Hydro	36	38	39	41	45	51	51	1.2
Wind	22	70	101	143	165	176	186	7.3
Geothermal	7	7	7	7	7	7	7	0.0
Solar	19	67	91	122	167	208	263	9.2
Other	3	3	3	4	5	5	6	2.9
Net generation to grid	300	329	375	427	483	538	594	2.3

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E10.gen. Electricity generation: Non-OECD, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	511	513	245	109	49	22	9	-12.6
Natural gas	3,105	3,645	4,411	4,211	4,328	4,438	4,763	1.4
Coal	6,390	6,518	6,181	6,599	6,995	7,787	8,535	1.0
Nuclear	771	939	1,146	1,320	1,490	1,617	1,749	2.8
Renewables	3,862	5,988	8,227	11,105	14,229	17,337	20,383	5.7
Hydro	2,555	3,023	3,349	3,529	3,698	3,947	4,134	1.6
Wind	781	1,354	1,993	2,721	3,361	3,733	3,859	5.5
Geothermal	38	72	112	125	141	145	146	4.6
Solar	366	1,379	2,542	4,423	6,669	9,084	11,734	12.3
Other	120	160	230	308	360	429	510	4.9
Net generation to grid	14,638	17,603	20,210	23,343	27,091	31,201	35,438	3.0

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E11.gen. Electricity generation: Russia, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	7	7	0	0	0	0	0	-13.9
Natural gas	499	570	650	643	656	665	665	1.0
Coal	180	190	192	246	254	239	251	1.1
Nuclear	204	229	234	234	234	234	227	0.4
Renewables	189	206	218	258	323	404	467	3.1
Hydro	187	203	203	205	206	208	209	0.4
Wind	0	0	6	30	69	98	104	23.6
Geothermal	0	1	1	1	1	0	1	1.3
Solar	1	3	7	20	45	95	149	20.0
Other	0	0	0	3	3	4	4	14.1
Net generation to grid	1,078	1,202	1,293	1,380	1,467	1,542	1,610	1.3

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E12.gen. Electricity generation: Other Europe and Eurasia, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	9	9	6	4	3	3	4	-2.8
Natural gas	200	224	233	241	238	250	267	1.0
Coal	157	176	173	181	194	208	233	1.3
Nuclear	118	126	140	146	146	146	156	0.9
Renewables	141	181	220	287	374	452	515	4.4
Hydro	124	128	131	131	131	131	131	0.2
Wind	12	24	36	57	101	159	213	10.1
Geothermal	0	0	0	1	1	1	1	--
Solar	5	27	51	95	138	158	166	12.1
Other	0	2	2	3	3	4	4	--
Net generation to grid	625	716	773	859	956	1,059	1,175	2.1

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E13.gen. Electricity generation: China, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	10	10	2	0	0	0	0	-14.9
Natural gas	267	604	1,200	923	997	1,096	1,178	5.1
Coal	4,313	4,171	3,556	3,632	3,556	3,556	3,556	-0.6
Nuclear	331	416	538	674	795	905	1,002	3.8
Renewables	1,973	3,007	3,892	5,072	6,283	7,493	8,493	5.0
Hydro	1,117	1,266	1,381	1,448	1,448	1,448	1,448	0.9
Wind	574	916	1,183	1,370	1,370	1,370	1,370	2.9
Geothermal	0	0	0	0	0	0	0	0.0
Solar	281	824	1,304	2,217	3,423	4,629	5,624	10.5
Other	0	0	23	38	42	47	51	--
Net generation to grid	6,893	8,207	9,188	10,301	11,631	13,050	14,229	2.4

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E14.gen. Electricity generation: India, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	8	8	3	0	0	0	0	-15.5
Natural gas	90	77	73	61	51	43	43	-2.4
Coal	965	1,053	1,057	1,071	1,121	1,357	1,355	1.1
Nuclear	36	52	69	76	106	128	151	4.9
Renewables	332	886	1,628	2,504	3,447	4,412	5,752	10.0
Hydro	138	223	287	300	305	310	315	2.8
Wind	109	219	376	674	1,070	1,312	1,335	8.7
Geothermal	0	0	0	0	0	0	0	--
Solar	45	379	877	1,412	1,917	2,592	3,850	16.0
Other	40	65	88	118	154	198	251	6.3
Net generation to grid	1,431	2,076	2,830	3,713	4,726	5,940	7,301	5.6

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E15.gen. Electricity generation: Other Non-OECD Asia, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	86	87	47	23	12	4	0	-18.5
Natural gas	606	662	662	591	526	468	468	-0.9
Coal	559	681	897	1,165	1,632	2,206	2,921	5.7
Nuclear	37	36	36	36	36	36	36	-0.1
Renewables	293	475	677	963	1,190	1,352	1,447	5.5
Hydro	219	316	373	419	472	547	557	3.2
Wind	10	30	96	199	285	298	313	12.2
Geothermal	29	49	64	65	65	65	65	2.7
Solar	15	54	111	226	313	376	433	11.7
Other	20	24	35	53	54	65	79	4.6
Net generation to grid	1,582	1,941	2,319	2,778	3,395	4,066	4,871	3.8

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

Table E16.gen. Electricity generation: Middle East, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	291	291	156	76	33	13	4	-13.2
Natural gas	872	933	933	931	984	1,068	1,190	1.0
Coal	0	0	34	36	10	36	36	--
Nuclear	6	41	58	73	83	83	83	9.2
Renewables	22	66	159	343	545	634	693	12.2
Hydro	18	18	25	25	25	25	26	1.2
Wind	1	14	46	54	59	64	69	15.8
Geothermal	0	0	1	1	1	1	1	--
Solar	3	34	86	262	459	543	597	19.0
Other	0	0	0	0	0	0	0	--
Net generation to grid	1,191	1,331	1,340	1,460	1,656	1,834	2,006	1.8

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

Table E17.gen. Electricity generation: Africa, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	65	66	22	5	0	0	0	-16.3
Natural gas	351	362	462	592	687	694	796	2.8
Coal	187	224	249	255	201	154	157	-0.6
Nuclear	13	13	30	43	52	52	62	5.4
Renewables	158	282	378	489	707	1,060	1,325	7.3
Hydro	130	172	177	191	221	284	393	3.8
Wind	13	52	86	95	108	120	131	8.0
Geothermal	5	17	37	48	64	69	69	9.2
Solar	9	38	74	149	307	578	722	15.9
Other	2	3	5	6	7	8	10	5.9
Net generation to grid	774	948	1,141	1,384	1,648	1,960	2,340	3.8

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E18.gen. Electricity generation: Brazil, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	12	12	3	0	0	0	0	-14.8
Natural gas	56	61	61	46	36	28	28	-2.3
Coal	12	8	13	13	5	4	4	-3.7
Nuclear	14	14	23	23	23	18	18	0.9
Renewables	495	570	651	757	860	941	1,022	2.4
Hydro	389	414	429	454	500	563	626	1.6
Wind	56	86	137	208	257	268	279	5.5
Geothermal	0	0	0	0	0	0	0	0.0
Solar	3	15	20	21	22	23	23	7.5
Other	48	55	64	74	81	87	94	2.2
Net generation to grid	589	665	751	840	924	991	1,072	2.0

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.

International Energy Outlook 2021

Release date: October 2021

Table E19.gen. Electricity generation: Other Non-OECD Americas, High Oil Price case

billion kilowatthours

Fuel	2020	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2020–2050
Liquid fuels	23	23	5	0	0	0	0	-15.7
Natural gas	164	152	137	182	152	127	127	-0.8
Coal	18	15	11	0	23	28	24	0.9
Nuclear	12	12	18	15	15	15	15	0.8
Renewables	258	316	404	431	499	589	669	3.2
Hydro	234	284	343	355	389	430	430	2.0
Wind	7	12	28	33	42	44	44	6.3
Geothermal	4	4	9	9	9	9	9	3.0
Solar	3	5	11	21	44	91	169	13.9
Other	10	11	12	13	15	16	18	2.0
Net generation to grid	475	518	574	628	689	760	835	1.9

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System (2021), run hp_210719.163813.

Notes:

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

* *Net generation to grid* represents gross generation less losses from thermal efficiency and parasitic load.