

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

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	733	738	379	196	107	70	57	-8.7%
Natural gas	6,700	6,568	6,471	6,645	7,129	7,700	8,226	0.7%
Coal	9,696	9,504	9,317	9,547	9,519	9,527	9,595	0.0%
Nuclear	2,666	2,786	3,028	3,163	3,221	3,230	3,313	0.8%
Renewables	8,448	10,048	12,655	14,679	16,819	19,042	20,934	3.3%
Hydro	4,320	4,713	4,976	5,254	5,333	5,436	5,514	0.9%
Wind	1,967	2,361	3,245	3,993	4,984	5,525	5,711	3.9%
Geothermal	67	110	192	216	241	251	255	4.9%
Solar	1,421	2,229	3,568	4,535	5,575	7,009	8,553	6.6%
Other	673	635	673	680	686	820	901	1.0%
Net generation to grid	28,244	29,644	31,850	34,230	36,795	39,568	42,125	1.4%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E2.gen. Electricity generation: Americas, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	158	159	74	34	16	6	6	-11.3%
Natural gas	2,261	1,933	1,642	1,639	1,731	1,815	1,903	-0.6%
Coal	934	890	467	499	513	540	521	-2.1%
Nuclear	889	891	903	842	779	730	719	-0.8%
Renewables	2,491	2,914	4,039	4,482	4,821	5,202	5,618	2.9%
Hydro	1,472	1,547	1,633	1,718	1,726	1,734	1,736	0.6%
Wind	611	717	1,194	1,383	1,537	1,674	1,787	3.9%
Geothermal	25	21	39	44	48	51	56	2.8%
Solar	260	524	1,079	1,255	1,443	1,678	1,975	7.5%
Other	122	104	94	83	67	65	64	-2.3%
Net generation to grid	6,732	6,786	7,126	7,496	7,860	8,291	8,766	0.9%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

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

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	11	10	8	7	6	5	5	-3.0%
Natural gas	1,686	1,335	982	956	1,031	1,116	1,190	-1.2%
Coal	849	825	398	390	344	346	328	-3.3%
Nuclear	772	782	766	703	666	640	641	-0.7%
Renewables	1,003	1,366	2,345	2,633	2,832	3,012	3,234	4.3%
Hydro	276	300	296	292	290	290	285	0.1%
Wind	440	513	953	1,082	1,122	1,133	1,161	3.5%
Geothermal	16	17	22	26	31	34	38	3.3%
Solar	205	468	1,008	1,167	1,327	1,496	1,692	7.8%
Other	67	67	66	65	63	60	57	-0.5%
Net generation to grid	4,321	4,318	4,498	4,688	4,878	5,120	5,397	0.8%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

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

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	5	5	0	0	0	0	0	-13.5%
Natural gas	81	85	128	144	147	138	153	2.3%
Coal	39	18	0	0	0	0	0	-100.0%
Nuclear	79	71	77	72	51	39	28	-3.7%
Renewables	452	470	503	544	623	714	771	1.9%
Hydro	399	417	430	430	430	430	430	0.3%
Wind	41	45	64	106	185	275	334	7.8%
Geothermal	0	0	0	0	0	0	0	0.0%
Solar	6	6	6	6	6	6	5	-0.5%
Other	5	3	4	2	3	2	2	-2.8%
Net generation to grid	656	648	708	760	821	891	952	1.3%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E5.gen. Electricity generation: Mexico, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	46	48	23	12	5	0	0	-19.0%
Natural gas	191	195	199	216	247	257	259	1.1%
Coal	9	9	19	19	19	19	19	2.8%
Nuclear	11	11	20	28	23	17	17	1.4%
Renewables	86	81	103	113	123	154	186	2.8%
Hydro	32	35	39	39	39	39	40	0.8%
Wind	35	33	36	36	36	36	36	0.1%
Geothermal	5	0	8	8	8	8	8	1.5%
Solar	12	12	20	30	40	71	103	8.1%
Other	2	1	1	1	0	0	0	-100.0%
Net generation to grid	342	344	364	388	417	447	480	1.2%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E6.gen. Electricity generation: Brazil, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	23	23	9	1	0	0	0	-15.3%
Natural gas	97	110	110	89	73	69	66	-1.4%
Coal	13	13	9	9	16	9	9	-1.3%
Nuclear	14	14	23	23	23	18	18	0.9%
Renewables	531	561	596	666	693	729	756	1.3%
Hydro	410	430	471	536	539	539	539	1.0%
Wind	62	83	85	96	131	166	192	4.1%
Geothermal	0	0	0	0	0	0	0	0.0%
Solar	21	21	22	22	22	22	22	0.1%
Other	38	26	19	12	1	1	2	-9.5%
Net generation to grid	678	721	747	789	805	825	849	0.8%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E7.gen. Electricity generation: Other Americas, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	73	74	35	13	4	0	0	-18.2%
Natural gas	205	208	223	234	234	234	234	0.5%
Coal	25	25	42	82	135	166	166	7.0%
Nuclear	12	12	18	15	15	15	15	0.8%
Renewables	419	436	491	527	550	594	672	1.7%
Hydro	354	366	398	421	428	436	442	0.8%
Wind	34	43	56	63	63	64	64	2.3%
Geothermal	5	4	9	9	9	9	9	2.5%
Solar	16	17	23	31	48	83	154	8.4%
Other	10	6	4	3	1	2	2	-5.2%
Net generation to grid	734	756	809	871	938	1,009	1,087	1.4%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E8.gen. Electricity generation: Europe and Eurasia, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	117	117	76	55	41	40	39	-3.8%
Natural gas	1,473	1,499	1,583	1,629	1,728	1,833	1,961	1.0%
Coal	802	749	558	533	520	595	617	-0.9%
Nuclear	995	1,003	1,044	1,062	1,055	1,036	1,039	0.2%
Renewables	1,963	2,180	2,495	2,838	3,177	3,357	3,587	2.2%
Hydro	915	984	990	1,056	1,058	1,061	1,061	0.5%
Wind	483	552	632	725	954	968	983	2.6%
Geothermal	23	39	53	52	52	59	59	3.4%
Solar	218	197	355	502	577	695	865	5.1%
Other	324	408	465	503	535	576	619	2.3%
Net generation to grid	5,350	5,548	5,755	6,116	6,521	6,862	7,243	1.1%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E9.gen. Electricity generation: Western Europe, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	97	97	67	50	37	36	36	-3.5%
Natural gas	777	792	792	751	719	691	669	-0.5%
Coal	501	448	271	259	247	322	344	-1.3%
Nuclear	734	723	733	727	720	702	702	-0.2%
Renewables	1,649	1,864	2,163	2,476	2,824	2,994	3,221	2.4%
Hydro	621	697	706	753	755	755	755	0.7%
Wind	474	544	623	706	935	947	963	2.6%
Geothermal	22	38	52	51	51	57	57	3.4%
Solar	209	184	332	478	553	664	831	5.1%
Other	323	400	450	489	530	571	615	2.3%
Net generation to grid	3,758	3,924	4,026	4,263	4,546	4,746	4,971	1.0%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E10.gen. Electricity generation: Russia, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	17	16	6	2	2	1	1	-10.3%
Natural gas	499	502	586	660	716	769	823	1.8%
Coal	184	186	148	122	121	121	121	-1.5%
Nuclear	217	229	234	234	234	234	227	0.2%
Renewables	220	209	213	237	229	228	228	0.1%
Hydro	211	199	195	211	211	211	211	0.0%
Wind	5	1	2	10	10	10	10	2.4%
Geothermal	0	0	0	1	1	1	1	1.0%
Solar	3	2	3	3	3	3	3	0.0%
Other	0	7	13	13	5	4	4	16.6%
Net generation to grid	1,137	1,141	1,185	1,254	1,302	1,353	1,400	0.7%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E11.gen. Electricity generation: Eastern Europe and Eurasia, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	3	3	3	3	2	2	2	-0.6%
Natural gas	197	205	205	218	293	373	469	3.1%
Coal	117	116	139	152	152	152	152	0.9%
Nuclear	44	52	77	101	101	101	111	3.4%
Renewables	94	107	119	125	124	135	137	1.4%
Hydro	82	88	89	92	92	95	95	0.5%
Wind	4	7	7	9	9	10	10	3.8%
Geothermal	0	0	1	1	1	1	1	--
Solar	6	10	20	21	21	28	30	5.8%
Other	2	2	2	2	1	1	1	-1.2%
Net generation to grid	455	483	543	598	673	763	871	2.3%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E12.gen. Electricity generation: Asia Pacific, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	110	108	50	27	16	11	8	-8.7%
Natural gas	1,617	1,738	1,827	1,773	1,898	2,135	2,325	1.3%
Coal	7,746	7,680	8,090	8,269	8,220	8,116	8,182	0.2%
Nuclear	746	837	993	1,143	1,253	1,329	1,420	2.3%
Renewables	3,725	4,552	5,556	6,703	8,084	9,587	10,689	3.8%
Hydro	1,745	1,949	2,103	2,206	2,257	2,304	2,344	1.1%
Wind	842	1,027	1,306	1,765	2,372	2,758	2,816	4.4%
Geothermal	13	44	67	74	78	78	78	6.7%
Solar	902	1,413	1,969	2,568	3,296	4,272	5,238	6.5%
Other	224	119	111	91	81	175	214	-0.2%
Net generation to grid	13,945	14,916	16,516	17,916	19,470	21,178	22,624	1.7%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E13.gen. Electricity generation: Japan, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	29	29	15	9	6	6	6	-5.8%
Natural gas	363	383	383	339	304	305	294	-0.7%
Coal	291	283	167	185	185	185	185	-1.6%
Nuclear	78	115	139	139	121	102	102	0.9%
Renewables	210	203	244	265	320	349	375	2.1%
Hydro	72	83	85	86	86	86	86	0.6%
Wind	8	8	9	14	37	57	76	8.5%
Geothermal	3	3	3	4	4	4	4	0.8%
Solar	105	101	140	154	164	173	182	2.0%
Other	23	8	8	7	30	30	28	0.6%
Net generation to grid	972	1,014	948	937	936	947	962	0.0%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E14.gen. Electricity generation: South Korea, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	8	7	4	3	2	2	2	-4.6%
Natural gas	177	174	178	161	148	137	137	-0.9%
Coal	149	147	145	152	157	160	160	0.3%
Nuclear	201	228	228	228	228	218	214	0.2%
Renewables	50	53	80	109	133	163	182	4.7%
Hydro	3	4	4	5	5	5	5	1.1%
Wind	5	18	33	61	86	116	135	12.6%
Geothermal	0	0	0	0	0	0	0	0.0%
Solar	26	26	26	26	26	26	26	0.0%
Other	16	6	16	17	17	17	17	0.2%
Net generation to grid	586	610	635	652	667	681	696	0.6%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E15.gen. Electricity generation: Australia and New Zealand, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	4	4	0	0	0	0	0	-11.9%
Natural gas	56	52	52	41	33	38	38	-1.3%
Coal	111	104	126	139	139	140	140	0.8%
Nuclear	0	0	0	0	0	0	0	0.0%
Renewables	127	149	164	190	226	245	274	2.8%
Hydro	36	41	45	45	45	45	45	0.8%
Wind	42	57	64	78	89	90	91	2.8%
Geothermal	9	9	9	9	9	9	9	0.0%
Solar	38	41	46	58	83	101	128	4.4%
Other	2	1	1	0	0	0	0	-10.0%
Net generation to grid	298	309	342	370	398	423	452	1.5%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E16.gen. Electricity generation: China, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	13	12	1	0	0	0	0	-16.8%
Natural gas	302	357	403	499	722	963	1,164	4.9%
Coal	5,248	5,203	5,298	5,327	5,063	4,848	4,813	-0.3%
Nuclear	383	416	538	674	799	903	998	3.5%
Renewables	2,573	3,058	3,561	3,836	4,339	4,803	4,910	2.3%
Hydro	1,221	1,300	1,379	1,428	1,474	1,515	1,551	0.9%
Wind	653	724	863	1,044	1,397	1,729	1,748	3.6%
Geothermal	0	0	0	0	0	0	0	0.1%
Solar	575	980	1,277	1,332	1,434	1,432	1,442	3.3%
Other	123	54	42	31	34	127	169	1.1%
Net generation to grid	8,519	9,046	9,802	10,335	10,923	11,517	11,886	1.2%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E17.gen. Electricity generation: India, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	4	4	1	0	0	0	0	-14.5%
Natural gas	78	73	109	106	106	106	106	1.1%
Coal	1,240	1,264	1,473	1,461	1,498	1,452	1,340	0.3%
Nuclear	41	42	52	67	70	70	70	1.9%
Renewables	395	595	873	1,479	2,069	2,865	3,698	8.3%
Hydro	154	195	197	199	201	203	205	1.0%
Wind	119	199	299	476	661	661	661	6.3%
Geothermal	0	0	0	0	0	0	0	0.0%
Solar	99	182	361	790	1,207	2,001	2,832	12.7%
Other	23	18	16	14	0	0	0	-100.0%
Net generation to grid	1,757	1,978	2,508	3,113	3,743	4,493	5,214	4.0%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E18.gen. Electricity generation: Other Asia Pacific, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	52	53	28	15	8	3	1	-14.8%
Natural gas	641	699	703	627	585	585	585	-0.3%
Coal	706	678	880	1,006	1,178	1,331	1,543	2.8%
Nuclear	43	36	36	36	36	36	36	-0.6%
Renewables	369	493	633	825	997	1,162	1,251	4.5%
Hydro	258	326	393	444	446	451	452	2.0%
Wind	15	21	39	92	102	105	105	7.3%
Geothermal	1	32	55	61	65	65	65	17.9%
Solar	58	83	119	207	383	539	628	8.9%
Other	37	32	28	22	0	1	0	-15.0%
Net generation to grid	1,812	1,959	2,281	2,509	2,803	3,117	3,415	2.3%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E19.gen. Electricity generation: Africa and Middle East, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	348	354	179	80	35	13	3	-15.3%
Natural gas	1,349	1,398	1,419	1,604	1,771	1,918	2,038	1.5%
Coal	214	185	202	245	266	275	275	0.9%
Nuclear	37	54	87	116	135	135	135	4.8%
Renewables	269	403	566	656	737	895	1,040	4.9%
Hydro	188	233	250	274	292	338	372	2.5%
Wind	30	65	113	121	122	126	126	5.2%
Geothermal	6	6	33	46	63	63	63	8.6%
Solar	42	95	165	211	258	365	476	9.0%
Other	2	4	4	3	2	4	3	1.2%
Net generation to grid	2,217	2,394	2,454	2,701	2,944	3,236	3,491	1.6%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E20.gen. Electricity generation: Africa, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	48	47	16	3	0	0	0	-16.3%
Natural gas	358	367	388	471	553	611	665	2.2%
Coal	214	185	202	245	266	275	275	0.9%
Nuclear	13	13	30	43	52	52	52	5.1%
Renewables	227	307	412	486	560	706	843	4.8%
Hydro	165	207	225	245	263	309	343	2.7%
Wind	28	46	76	81	82	83	83	4.0%
Geothermal	6	6	33	46	63	63	63	8.6%
Solar	26	44	75	111	151	248	351	9.8%
Other	2	3	3	3	2	4	3	0.6%
Net generation to grid	861	919	1,048	1,249	1,431	1,645	1,837	2.7%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.

Table E21.gen. Electricity generation: Middle East, Low Oil Price case

billion kilowatthours

Fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Liquid fuels	300	307	164	77	34	13	3	-15.1%
Natural gas	990	1,031	1,031	1,133	1,219	1,307	1,372	1.2%
Coal	0	0	0	0	0	0	0	-6.2%
Nuclear	24	41	58	73	83	83	83	4.6%
Renewables	42	96	154	169	177	189	197	5.7%
Hydro	23	25	25	29	29	29	29	0.8%
Wind	3	19	37	40	40	42	42	10.4%
Geothermal	0	0	0	0	0	0	0	0.0%
Solar	16	51	91	100	108	117	125	7.5%
Other	0	0	0	0	0	0	1	--
Net generation to grid	1,357	1,475	1,406	1,453	1,513	1,591	1,655	0.7%

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run Ip_230823.090253

Note: Totals may not equal sum of components due to independent rounding. Net generation to grid represents gross generation minus losses from thermal efficiency and parasitic load.