

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

Net summer capacity and generation	Reference case							Annual growth 2012-2040 (percent)
	2011	2012	2020	2025	2030	2035	2040	
Electric power sector¹								
Net summer capacity								
Conventional hydropower	77.96	78.10	78.41	79.10	79.75	80.07	80.35	0.1%
Geothermal ²	2.45	2.58	4.02	5.15	6.58	7.99	8.80	4.5%
Municipal waste ³	3.45	3.57	3.63	3.63	3.63	3.63	3.63	0.1%
Wood and other biomass ⁴	2.56	2.70	3.14	3.14	3.14	3.17	3.46	0.9%
Solar thermal	0.48	0.48	1.73	1.73	1.73	1.73	1.73	4.7%
Solar photovoltaic ⁵	1.05	2.49	7.90	7.96	8.62	10.33	17.07	7.1%
Wind	46.33	59.01	75.59	75.62	76.12	78.61	85.48	1.3%
Offshore wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Total electric power sector capacity	134.28	148.92	174.43	176.32	179.56	185.54	200.52	1.1%
Generation (billion kilowatthours)								
Conventional hydropower	316.65	273.89	287.67	291.17	294.35	296.14	297.34	0.3%
Geothermal ²	15.32	15.56	28.24	37.44	49.04	60.60	67.26	5.4%
Biogenic municipal waste ⁶	16.20	16.79	19.05	18.19	18.15	18.66	19.21	0.5%
Wood and other biomass	10.73	11.04	36.71	58.87	67.50	70.39	72.22	6.9%
Dedicated plants	9.55	9.84	15.31	15.95	16.17	16.80	18.99	2.4%
Cofiring	1.19	1.20	21.40	42.92	51.33	53.59	53.23	14.5%
Solar thermal	0.81	0.90	3.52	3.53	3.53	3.53	3.53	5.0%
Solar photovoltaic ⁵	0.92	3.25	14.54	14.65	16.07	19.86	35.24	8.9%
Wind	120.12	141.87	217.53	217.62	219.06	225.11	248.02	2.0%
Offshore wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Total electric power sector generation	480.74	463.29	607.26	641.47	667.71	694.30	742.82	1.7%
End-use sectors⁷								
Net summer capacity								
Conventional hydropower	0.33	0.29	0.29	0.29	0.29	0.29	0.29	0.0%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Municipal waste ⁸	0.37	0.47	0.47	0.47	0.47	0.47	0.47	0.0%
Biomass	4.85	4.89	6.27	7.17	7.95	8.74	9.62	2.4%
Solar photovoltaic ⁵	2.89	4.71	12.75	15.18	18.93	23.73	29.47	6.8%
Wind	0.14	0.15	0.70	0.74	0.90	1.09	1.42	8.3%
Total end-use sector capacity	8.58	10.51	20.48	23.84	28.53	34.31	41.26	5.0%
Generation (billion kilowatthours)								
Conventional hydropower	1.82	1.38	1.38	1.38	1.38	1.38	1.38	0.0%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
Municipal waste ⁸	2.91	3.65	3.63	3.63	3.63	3.63	3.63	0.0%
Biomass	26.69	26.53	34.10	39.18	43.75	48.37	53.50	2.5%
Solar photovoltaic ⁵	4.51	7.35	19.91	23.92	30.09	38.00	47.46	6.9%
Wind	0.18	0.20	0.96	1.03	1.25	1.53	2.01	8.6%
Total end-use sector generation	36.11	39.11	59.98	69.14	80.10	92.91	107.99	3.7%

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

Net summer capacity and generation	Reference case							Annual growth 2012-2040 (percent)
	2011	2012	2020	2025	2030	2035	2040	
Total, all sectors								
Net summer capacity								
Conventional hydropower	78.29	78.39	78.70	79.39	80.03	80.36	80.63	0.1%
Geothermal.....	2.45	2.58	4.02	5.15	6.58	7.99	8.80	4.5%
Municipal waste	3.82	4.04	4.10	4.10	4.10	4.10	4.10	0.1%
Wood and other biomass ⁴	7.42	7.59	9.41	10.30	11.08	11.91	13.08	2.0%
Solar ⁵	4.42	7.68	22.38	24.86	29.27	35.78	48.26	6.8%
Wind	46.47	59.16	76.29	76.37	77.02	79.70	86.91	1.4%
Total capacity, all sectors	142.86	159.43	194.91	200.17	208.09	219.85	241.78	1.5%
Generation (billion kilowatthours)								
Conventional hydropower	318.47	275.27	289.05	292.55	295.73	297.52	298.72	0.3%
Geothermal.....	15.32	15.56	28.24	37.44	49.04	60.60	67.26	5.4%
Municipal waste	19.11	20.44	22.68	21.82	21.78	22.29	22.84	0.4%
Wood and other biomass.....	37.42	37.57	70.81	98.06	111.25	118.76	125.72	4.4%
Solar ⁵	6.24	11.50	37.98	42.09	49.69	61.40	86.23	7.5%
Wind	120.30	142.06	218.49	218.64	220.32	226.65	250.03	2.0%
Total generation, all sectors	516.85	502.41	667.24	710.61	747.81	787.22	850.80	1.9%

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 (PV). Based on annual PV shipments from 1989 through 2012, EIA estimates that as much as 274 megawatts of remote electricity generation PV applications (i.e., off-grid power systems) were in service in 2012, plus an additional 573 megawatts in communications, transportation, and assorted other non-grid-connected, specialized applications. See U.S. Energy Information Administration, *Annual Energy Review 2011*, DOE/EIA-0384(2011) (Washington, DC, September 2012), Table 10.9 (annual PV shipments, 1989-2010), and Table 12 (U.S. photovoltaic module shipments by end use, sector, and type) in U.S. Energy Information Administration, *Solar Photovoltaic Cell/Module Shipments Report, 2011* (Washington, DC, September 2012) and U.S. Energy Information Administration, *Solar Photovoltaic Cell/Module Shipments Report, 2012* (Washington, DC, December 2013). The approach used to develop the estimate, based on shipment data, provides an upper estimate of the size of the PV stock, including both grid-based and off-grid PV. It will overestimate the size of the stock, because shipments include a substantial number of units that are exported, and each year some of the PV units installed earlier will be retired from service or abandoned.

⁶Includes biogenic municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities. Only biogenic municipal waste is included. The U.S. Energy Information Administration estimates that in 2012 approximately 7 billion kilowatthours of electricity were generated from a municipal waste stream containing petroleum-derived plastics and other non-renewable sources. See U.S. Energy Information Administration, *Methodology for Allocating Municipal Solid Waste to Biogenic and Non-Biogenic Energy* (Washington, DC, May 2007).

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. Data for 2011 and 2012 are model results and may differ from official EIA data reports.

Sources: 2011 and 2012 capacity: U.S. Energy Information Administration (EIA), Form EIA-860, "Annual Electric Generator Report" (preliminary). 2011 and 2012 generation: EIA, *Monthly Energy Review*, DOE/EIA-0035(2013/09) (Washington, DC, September 2013). Projections: EIA, AEO2014 National Energy Modeling System run REF2014.D102413A.