Independent Statistics & Analysis
U.S. Energy Information Administration

Short-Term Energy Outlook Supplement: Expanded Forecasts for Renewable Energy Capacity and Generation

July 2017

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Overview

Beginning with the July 2017 *Short-Term Energy Outlook* (*STEO*), EIA is expanding its presentation of data and forecasts for electric generating capacity and electricity generation from renewable energy sources. EIA is now publishing forecasts for capacity and electricity generation from small-scale solar photovoltaic (PV) systems. The new small-scale solar PV forecasts are presented in a new standard *STEO* table (Table 8b). This table also shows capacity and electricity generation estimates for large-scale power plants from all renewable technologies.

Small-scale solar PV systems are defined in EIA publications as those smaller than 1 megawatt (MW)[1] in size and are typically of the type installed on the rooftops of residences or businesses. They are also referred to as distributed generation systems in order to distinguish them from electric generating units at centrally-located power plants. In most cases, small-scale solar PV systems are interconnected with local electric distribution lines, allowing them to export electricity to the power grid. Owners of the small-scale systems are often reimbursed by electric utilities for supplying electricity onto the grid through a process called net metering.

EIA currently publishes historical U.S. data starting in 2014 for small-scale solar PV gross generation in the *Electric Power Monthly* and in the *Monthly Energy Review*. The historical values for small scale solar PV generation and capacity are based on net metering data collected on the annual Form EIA-861 and the monthly Form EIA-861M surveys. Detailed state-level data for both generation and capacity are available online in the monthly EIA-861M database.[2]

EIA's surveys collect information from electric utilities and other providers on data such as the number of customers with small-scale solar PV systems and the aggregate capacity of those systems. Much of the electricity generated by small-scale solar PV systems is consumed on-site (that is, behind the customer's meter) and is otherwise masked by net metering. So, electric utilities do not necessarily know the total amount of electricity generated by their customers' solar PV systems. EIA has developed statistical methods to make state-level estimates of monthly generation by small-scale solar PV for the residential, commercial, and industrial sectors using information from its surveys and other sources.[3]

Small-scale solar PV forecasts in the *STEO*

The *STEO* incorporates historical small-scale solar PV data from the Form EIA-861M database and forecasts monthly U.S. generation and capacity values through the end of the *STEO* forecast horizon (12-24 months) for the residential, commercial, and industrial sectors.

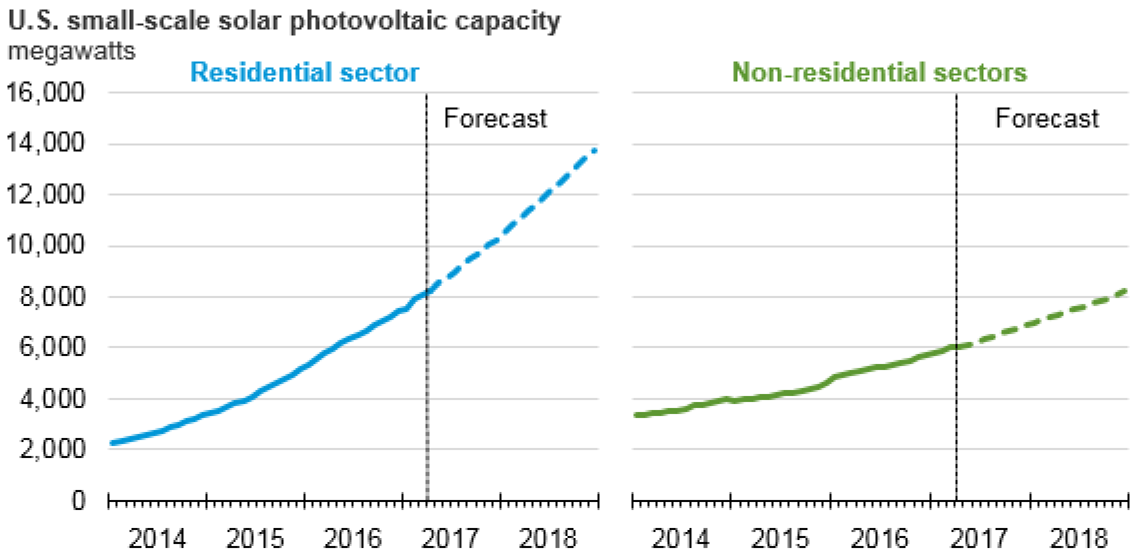
Residential small-scale solar PV capacity was about 7,400 MW at the end of 2016, which is 43% higher than a year earlier. Installations of small-scale solar PV in nonresidential (commercial and industrial)

[1] Most EIA publications report generating capacity data for all energy sources in terms of alternating current (AC), which is the type of electricity that flows on the transmission grid. Some organizations report small-scale solar PV capacity in direct current (DC) since PV panels produce DC electricity.

[2] https://www.eia.gov/electricity/data/eia861m/

[3] More information about the imputation methodology for small-scale solar PV generation is available in the appendix to the *Electric Power Monthly* publication <https://www.eia.gov/electricity/monthly/pdf/epm.pdf>

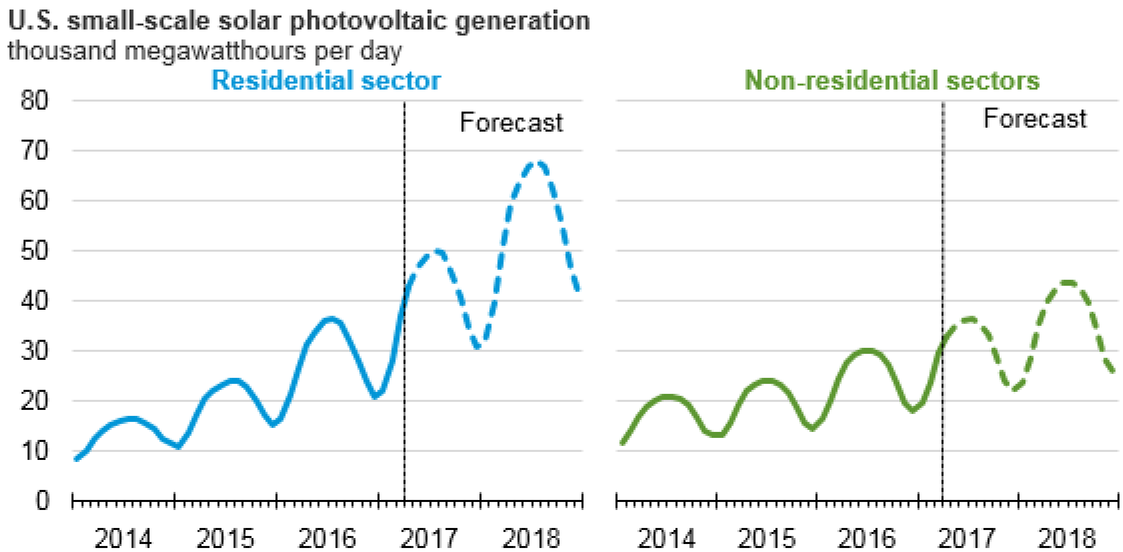
sectors have not been growing as strong as in the residential market. Nonresidential capacity at the end 2016 was almost 5,800 MW, which is 26% higher than at the end of 2015. The July 2017 *STEO* forecasts installed small-scale solar PV capacity in the residential and nonresidential sectors will grow to 13,700 MW and 8,200 MW, respectively, by the end of 2018.



Source: EIA, *Short-Term Energy Outlook*, July 2017

Electricity generation from small-scale solar PV systems has been growing along with the increase in capacity. Monthly generation from solar PV systems follows a regular seasonal pattern that peaks in July and reaches its lowest point in January, proportional to the number of hours of sunlight in each month.

The July 2017 *STEO* projects that residential small-scale solar PV systems in the United States will generate an average of 39.8 thousand megawatthours per day (MWh/day) in 2017, which is 39% higher than in 2016. Small-scale solar PV generation from non-residential sector is expected to grow by 21% this year, averaging 29.7 thousand MWh/day.



Source: EIA, *Short-Term Energy Outlook*, July 2017

Small-scale solar PV capacity and generation model

The small-scale solar PV component of the *STEO* model is designed to provide monthly projections of U.S. capacity and generation for the residential sector and the non-residential (commercial and industrial) sectors. The projections are developed using econometric regression equations, one for each sector and each component (capacity and generation).

The econometric regression equations are structured using time-series techniques, specifically autoregressive integrated moving average estimation with explanatory variables (ARIMAX), in which the small-scale solar PV capacity projections are based on recent trends in small-scale solar PV additions along with pertinent economic factors. For, example, the residential capacity econometric equation uses personal income as an explanatory variable. These capacity forecasts are then used in other econometric regression equations to produce forecasts of monthly electricity generation, which are based on historical seasonal patterns in the utilization rate of small-scale solar PV capacity. All equations in the small-scale solar model are estimated using data from January 2014 through the most recent available month.

Residential Capacity Equation

The econometric equation for forecasting U.S. residential small-scale solar PV capacity depends mostly on peer effects in capacity installations. Personal income is included as an explanatory variable to reflect households' ability to purchase solar PV systems. Using an ARIMAX model selection procedure based on minimizing the Schwartz Information Criterion along with an analysis of out-of-sample forecasting performance, EIA has determined that second-differencing the residential capacity and personal income data with an AR(2) specification for the model equation is most appropriate. The equation used for forecasting residential U.S. small-scale solar capacity is then:

$$\Delta^2 SODRC\_USX = \alpha_0 + \alpha_1\left(\Delta^2 PYR\right) + \alpha_2 AR(1) + \alpha_3 AR(2)$$

where *SODRC_USX* = U.S. small-scale solar PV installed capacity for residential sector, in MW
PYR = Real household personal income, in 2009 dollars
AR(1) = First-order autoregressive term
AR(2) = Second-order autoregressive term
Δ^2 = Second difference of variable
α_x = estimated coefficients

An AR(2) specification allows the residential capacity forecast to adapt quickly to changes in the trend over time, compared with using a regression with a simple trend, for example.

Non-residential Capacity Equation

The econometric equation for forecasting non-residential capacity follows a different structural form than the residential equation. The commercial and industrial markets are still at the early stage of adopting PV technology. As a result, no economic explanatory variables were found to adequately explain growth in non-residential installed capacity, and the equation is structured using an automatic ARIMA selection procedure. The best fitting model consists of regressing the first difference of the log of non-residential capacity against a constant and a dummy variable that accounts for a shift in the installed capacity series in January 2016:

$$\Delta \log(SODNC\_USX) = \alpha_0 + \alpha_1 D1601$$

where *SODNC_USX* = U.S. non-residential small-scale solar PV installed capacity, in MW
D1601 = A dummy variable for the January 2016 observation
Δlog = Difference of log of variable
α_x = estimated coefficients

The econometric regression equation for non-residential capacity can be interpreted as a constant-growth model. Another equation estimates the amount of small-scale solar PV capacity in the commercial sector as a share of non-residential capacity. Forecast capacity for the industrial sector is then calculated as the difference between the forecast non-residential and commercial sector capacities.

The *STEO* model allows for adjustments based on analyst judgment. Positive or negative adjustment factors may be added to the modeled capacity estimates to produce the published capacity forecasts:

$$SODRC\_US = SODRC\_USX + SODRC\_US\_A$$
$$SODNC\_US = SODNC\_USX + SODNC\_US\_A$$

To forecast the amount of electricity generation from small-scale solar PV systems, the model equations for each sector are structured to estimate the daily utilization rate of forecast capacity using monthly dummy variables to account for the strong seasonal patterns in solar generation. For example, the equation for forecasting U.S. small-scale solar PV generation in the residential sector is specified as:

$$1{,}000 * \left(\frac{SODRP\_US}{24 * SODRC\_US}\right) = \alpha_0 + \alpha_1 JAN + \alpha_2 FEB + \cdots + \alpha_{12} DEC + \alpha_{13} AR(1)$$

where *SODRP_US* = U.S. residential sector small-scale solar PV generation, in thousand MWh/day
SODRC_US = U.S. residential small-scale solar PV installed capacity, in MW
JAN, FEB, … = Monthly dummy variables for observations in January, February, etc.
AR(1) = First-order autoregressive term
α_x= estimated coefficients

The model equations were estimated using the Eviews 9.5 software package. Detailed econometric estimation results for the small-scale solar PV capacity and generation equations in each sector are shown in the appendix to this supplement. EIA periodically re-evaluates the specification of equations in the *STEO* model to reflect the current market and regulatory structure of the industry.

Changes to *STEO* renewable energy tables

EIA has expanded its presentation of renewable energy data in the *STEO* standard tables and associated datasets to include the new small-scale solar PV capacity and generation forecasts. The former *STEO* Table 8 (U.S. Renewable Energy Consumption) has been renamed Table 8a, but it continues to show historical data and forecasts for renewable energy consumption by sector and source, as measured in quadrillion British thermal units (Btu). For the electric power, industrial, and commercial sectors, the data for solar energy consumption in Table 8a now reflects electricity generated by both large-scale solar generating units (i.e., 1 MW or larger) and electricity produced by small-scale solar PV systems. The residential solar consumption data only reflects energy produced from small-scale systems. Note that the consumption of solar energy in the residential sector also includes a small amount of energy used for solar heating by all sectors, following the same convention as other EIA publications.

A new table 8b (U.S. Renewable Electricity Generation and Capacity) has been added to the *STEO* standard tables. The top section of Table 8b shows historical data and forecasts for end-of-period capacity by renewable energy source, and values are shown for the electric power sector and for all other sectors. Most of the data in Table 8b represents capacity at large-scale power plants with aggregate capacity of at least 1 MW. The small-scale solar PV capacity data (< 1 MW) is broken out for the residential, commercial, and industrial sectors. Historical data and forecasts for renewable energy generation (measured in thousand MWh/day) are presented on the bottom half of *STEO* Table 8b in a similar fashion as renewable capacity.

In addition to the standard *STEO* Tables 8a and 8b, the renewable energy historical data and forecasts for generation and capacity are also accessible through the *STEO* Custom Table Builder, EIA's Microsoft Excel add-in, and the EIA Application Programming Interface (API).[4]

[4] STEO Custom Table Builder: https://www.eia.gov/outlooks/steo/query/
EIA Microsoft Excel add-in: https://www.eia.gov/opendata/excel/
Application Programming Interface: https://www.eia.gov/opendata/

Table 8a. U.S. Renewable Energy Consumption (Quadrillion Btu)

U.S. Energy Information Administration | Short-Term Energy Outlook - July 2017

	2016				2017				2018				Year		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	2016	2017	2018
Electric Power Sector															
Geothermal	0.040	0.039	0.040	0.043	0.041	0.042	0.041	0.040	0.040	0.039	0.040	0.041	0.162	0.164	0.160
Hydroelectric Power (a)	0.710	0.684	0.528	0.543	0.771	0.885	0.655	0.550	0.679	0.725	0.639	0.538	2.465	2.861	2.581
Solar (b)	0.062	0.095	0.110	0.077	0.087	0.151	0.147	0.091	0.102	0.181	0.178	0.107	0.344	0.477	0.567
Waste Biomass (c)	0.070	0.072	0.072	0.072	0.071	0.068	0.073	0.072	0.069	0.072	0.074	0.073	0.287	0.284	0.288
Wood Biomass	0.061	0.049	0.060	0.052	0.057	0.056	0.064	0.056	0.056	0.050	0.062	0.056	0.222	0.233	0.225
Wind	0.577	0.531	0.452	0.596	0.643	0.637	0.441	0.621	0.646	0.668	0.475	0.684	2.155	2.342	2.473
Subtotal	1.521	1.470	1.261	1.384	1.671	1.840	1.420	1.430	1.592	1.736	1.469	1.497	5.636	6.361	6.294
Industrial Sector															
Biofuel Losses and Co-products (d)	0.196	0.193	0.203	0.205	0.202	0.203	0.207	0.207	0.200	0.203	0.206	0.207	0.796	0.819	0.816
Geothermal	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.004	0.004	0.004
Hydroelectric Power (a)	0.004	0.003	0.002	0.003	0.004	0.003	0.002	0.003	0.004	0.003	0.002	0.003	0.012	0.012	0.012
Solar (b)	0.003	0.005	0.005	0.004	0.005	0.007	0.007	0.005	0.006	0.009	0.009	0.006	0.018	0.024	0.030
Waste Biomass (c)	0.046	0.047	0.047	0.046	0.051	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.186	0.198	0.196
Wood Biomass	0.321	0.315	0.320	0.326	0.316	0.308	0.315	0.316	0.308	0.303	0.314	0.316	1.283	1.255	1.241
Subtotal	0.573	0.564	0.578	0.585	0.578	0.570	0.579	0.580	0.566	0.563	0.577	0.580	2.300	2.306	2.287
Commercial Sector															
Geothermal	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.020	0.020	0.020
Solar (b)	0.015	0.022	0.022	0.015	0.017	0.025	0.025	0.018	0.021	0.030	0.030	0.022	0.074	0.085	0.103
Waste Biomass (c)	0.013	0.012	0.012	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.049	0.049	0.048
Wood Biomass	0.020	0.020	0.021	0.021	0.020	0.018	0.019	0.018	0.020	0.018	0.019	0.018	0.082	0.075	0.075
Subtotal	0.060	0.065	0.066	0.060	0.061	0.067	0.069	0.060	0.064	0.072	0.074	0.063	0.251	0.256	0.273
Residential Sector															
Geothermal	0.010	0.010	0.010	0.010	0.010	0.012	0.012	0.012	0.013	0.013	0.013	0.013	0.040	0.046	0.052
Solar (e)	0.030	0.047	0.049	0.034	0.037	0.059	0.062	0.045	0.048	0.074	0.078	0.056	0.161	0.203	0.256
Wood Biomass	0.093	0.093	0.094	0.094	0.095	0.098	0.099	0.099	0.103	0.103	0.104	0.104	0.373	0.392	0.413
Subtotal	0.133	0.150	0.153	0.138	0.142	0.169	0.173	0.156	0.163	0.190	0.195	0.173	0.573	0.640	0.721
Transportation Sector															
Biomass-based Diesel (f)	0.051	0.066	0.088	0.084	0.051	0.073	0.086	0.090	0.069	0.076	0.088	0.089	0.289	0.300	0.323
Ethanol (f)	0.277	0.283	0.293	0.288	0.269	0.292	0.299	0.290	0.271	0.291	0.297	0.289	1.141	1.150	1.148
Subtotal	0.328	0.349	0.381	0.372	0.320	0.364	0.385	0.380	0.340	0.367	0.385	0.379	1.430	1.449	1.470
All Sectors Total															
Biomass-based Diesel (f)	0.051	0.066	0.088	0.084	0.051	0.073	0.086	0.090	0.069	0.076	0.088	0.089	0.289	0.300	0.323
Biofuel Losses and Co-products (d)	0.196	0.193	0.203	0.205	0.202	0.203	0.207	0.207	0.200	0.203	0.206	0.207	0.796	0.819	0.816
Ethanol (f)	0.287	0.295	0.305	0.299	0.278	0.301	0.311	0.302	0.282	0.302	0.308	0.301	1.186	1.191	1.193
Geothermal	0.056	0.055	0.056	0.059	0.057	0.059	0.058	0.058	0.059	0.058	0.059	0.060	0.226	0.232	0.236
Hydroelectric Power (a)	0.714	0.687	0.530	0.546	0.775	0.889	0.657	0.553	0.683	0.729	0.642	0.540	2.477	2.874	2.594
Solar (b)(e)	0.110	0.166	0.183	0.128	0.139	0.244	0.242	0.160	0.176	0.294	0.294	0.191	0.587	0.784	0.955
Waste Biomass (c)	0.129	0.131	0.130	0.131	0.134	0.131	0.134	0.133	0.130	0.132	0.136	0.134	0.522	0.531	0.532
Wood Biomass	0.496	0.477	0.495	0.492	0.486	0.479	0.497	0.490	0.486	0.474	0.499	0.494	1.959	1.952	1.953
Wind	0.577	0.531	0.452	0.596	0.643	0.637	0.441	0.621	0.646	0.668	0.475	0.684	2.155	2.342	2.473
Total Consumption	2.614	2.598	2.439	2.538	2.742	2.997	2.626	2.606	2.725	2.928	2.699	2.692	10.190	10.971	11.045

\- = no data available

(a) Conventional hydroelectric power only. Hydroelectricity generated by pumped storage is not included in renewable energy.

(b) Solar consumption in the electric power, commercial, and industrial sectors includes energy produced from large scale (>1 MW) solar thermal and photovoltaic generators and small-scale (<1 MW) distributed solar photovoltaic systems.

(c) Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

(d) Losses and co-products from the production of fuel ethanol and biomass-based diesel

(e) Solar consumption in the residential sector includes energy from small-scale (<1 MW) solar photovoltaic systems. Also includes solar heating consumption in all sectors.

(f) Fuel ethanol and biomass-based diesel consumption in the transportation sector includes production, stock change, and imports less exports. Some biomass-based diesel may be consumed in the residential sector in heating oil.

Notes: The approximate break between historical and forecast values is shown with historical data printed in bold; estimates and forecasts in italics.

Historical data: Latest data available from EIA databases supporting the following reports: *Electric Power Monthly,* DOE/EIA-0226 and *Renewable Energy Annual,* DOE/EIA-0603; *Petroleum Supply Monthly,* DOE/EIA-0109.

Minor discrepancies with published historical data are due to independent rounding.

Projections: EIA Regional Short-Term Energy Model.

Table 8b. U.S. Renewable Electricity Generation and Capacity

U.S. Energy Information Administration | Short-Term Energy Outlook - July 2017

	2016				2017				2018				Year		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	2016	2017	2018
Renewable Energy Electric Generating Capacity (megawatts, end of period)															
Electric Power Sector (a)															
Biomass	7,312	7,334	7,311	7,343	7,338	7,430	7,418	7,418	7,475	7,569	7,569	7,571	7,343	7,418	7,571
Waste	4,144	4,166	4,161	4,186	4,198	4,240	4,228	4,227	4,285	4,285	4,285	4,287	4,186	4,227	4,287
Wood	3,168	3,168	3,150	3,157	3,141	3,191	3,191	3,191	3,191	3,284	3,284	3,284	3,157	3,191	3,284
Conventional Hydroelectric	79,529	79,595	79,617	79,661	79,663	79,724	79,660	79,748	79,764	79,775	79,902	80,069	79,661	79,748	80,069
Geothermal	2,514	2,514	2,514	2,514	2,454	2,454	2,454	2,491	2,491	2,491	2,491	2,522	2,514	2,491	2,522
Large-Scale Solar (b)	14,263	15,066	17,496	21,525	22,339	23,720	24,647	29,057	29,687	30,358	30,910	32,191	21,525	29,057	32,191
Wind	73,314	74,196	74,749	81,215	82,913	83,376	84,971	88,114	88,234	89,697	90,686	102,193	81,215	88,114	102,193
Other Sectors (c)															
Biomass	6,813	6,809	6,807	6,761	6,809	6,828	6,828	6,832	6,832	6,833	6,833	6,835	6,761	6,832	6,835
Waste	944	943	942	895	892	893	893	897	897	897	897	899	895	897	899
Wood	5,869	5,866	5,866	5,866	5,917	5,935	5,935	5,935	5,935	5,936	5,936	5,936	5,866	5,935	5,936
Conventional Hydroelectric	325	327	327	327	327	327	327	327	327	327	327	327	327	327	327
Large-Scale Solar (b)	303	307	309	314	314	316	330	332	332	332	332	332	314	332	332
Small-Scale Solar (d)	10,810	11,569	12,305	13,183	14,107	14,941	16,040	17,124	18,267	19,415	20,646	21,947	13,183	17,124	21,947
Residential Sector	5,775	6,352	6,874	7,421	8,070	8,735	9,460	10,235	11,055	11,911	12,807	13,743	7,421	10,235	13,743
Commercial Sector	4,104	4,239	4,405	4,681	4,727	4,840	5,135	5,372	5,622	5,844	6,104	6,390	4,681	5,372	6,390
Industrial Sector	930	978	1,027	1,081	1,311	1,365	1,445	1,517	1,590	1,660	1,735	1,813	1,081	1,517	1,813
Wind	89	89	89	89	89	89	95	95	95	95	95	95	89	95	95
Renewable Electricity Generation (thousand megawatthours per day)															
Electric Power Sector (a)															
Biomass	89	84	92	84	87	86	92	86	87	84	92	87	87	88	87
Waste	49	52	51	50	49	48	50	50	49	50	51	50	51	49	50
Wood	39	32	41	34	38	38	42	37	38	34	41	37	37	39	37
Conventional Hydroelectric	837	806	615	634	912	1,023	749	629	793	838	731	614	723	827	744
Geothermal	47	46	47	50	49	49	47	47	48	46	47	47	48	48	47
Large-Scale Solar (b)	72	110	125	88	102	175	168	104	119	209	203	122	99	137	163
Wind	667	613	517	681	751	736	504	709	754	772	543	782	619	675	712
Other Sectors (c)															
Biomass	85	82	85	83	86	83	85	83	86	83	85	83	84	84	84
Waste	75	72	75	74	76	73	75	74	76	73	75	74	74	75	75
Wood	11	10	9	9	10	9	9	9	10	9	9	9	10	9	9
Conventional Hydroelectric	5	4	3	3	5	4	3	3	5	4	3	3	4	4	4
Large-Scale Solar (b)	1	2	2	1	1	2	2	2	2	3	3	2	2	2	2
Small-Scale Solar (d)	42	63	64	45	53	81	84	60	70	105	108	77	53	70	90
Residential Sector	21	34	35	24	29	46	49	35	41	63	66	48	29	40	54
Commercial Sector	16	23	23	16	19	27	27	19	22	32	32	22	20	23	27
Industrial Sector	4	6	6	4	5	8	8	6	7	10	10	7	5	7	8
Wind	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1

-- = no data available

Notes: The approximate break between historical and forecast values is shown with historical data printed in bold; estimates and forecasts in italics.

(a) Power plants larger than or equal to one megawatt in size that are operated by electric utilities or independent power producers.

(b) Solar thermal and photovoltaic generating units at power plants larger than or equal to 1 megawatt.

(c) Businesses or individual households not primarily engaged in electric power production for sale to the public, whose generating capacity is at least one megawatt (except for small-scale solar photovoltaic data, which consists of systems smaller than 1 megawatt).

(d) Solar photovoltaic systems smaller than one megawatt.

Historical data: Latest data available from EIA databases supporting the Electric Power Monthly, DOE/EIA-0226.

Minor discrepancies with published historical data are due to independent rounding.

Projections: EIA-860M database, EIA-826 Solar PV database, and EIA Regional Short-Term Energy Model.

Appendix – Small-scale solar photovoltaic model equations

Variable Definitions

Variable name	Variable description	Units
SODRC_US	Small-scale solar PV capacity, residential sector	megawatts
SODNC_US	Small-scale solar PV capacity, non-residential sectors	megawatts
SODCC_US	Small-scale solar PV capacity, commercial sector	megawatts
SODIC_US	Small-scale solar PV capacity, industrial sector	megawatts
SODRP_US	Small-scale solar PV generation, residential sector	megawatthours per day
SODCP_US	Small-scale solar PV generation, commercial sector	megawatthours per day
SODIP_US	Small-scale solar PV generation, industrial sector	megawatthours per day
PYR	Real personal income	millions of dollars
D1601	Dummy variable for January 2016 observation	=1 if Jan 2016, 0 otherwise
JAN	Dummy variable for month of January	=1 if January, 0 otherwise
FEB	Dummy variable for month of February	=1 if February, 0 otherwise
MAR	Dummy variable for month of March	=1 if March, 0 otherwise
APR	Dummy variable for month of April	=1 if April, 0 otherwise
MAY	Dummy variable for month of May	=1 if May, 0 otherwise
JUN	Dummy variable for month of June	=1 if June, 0 otherwise
JUL	Dummy variable for month of July	=1 if July, 0 otherwise
AUG	Dummy variable for month of August	=1 if August 0 otherwise
SEP	Dummy variable for month of September	=1 if September, 0 otherwise
OCT	Dummy variable for month of October	=1 if October, 0 otherwise
NOV	Dummy variable for month of November	=1 if November, 0 otherwise
DEC	Dummy variable for month of December	=1 if December 0 otherwise
D(Var,x)	x-th order difference of variable Var	N/A
AR(x)	Autoregressive term of order x	N/A

Small-scale solar PV capacity, residential sector (SODRC_US)

Dependent Variable: D(SODRC_USX,2)
Method: ARMA Conditional Least Squares (Marquardt - EViews legacy)
Date: 05/25/17 Time: 08:30
Sample (adjusted): 2014M05 2017M03
Included observations: 35 after adjustments
Convergence achieved after 10 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.625245	2.059626	2.245672	0.0320
D(PYR,2)	0.235712	0.211795	1.112930	0.2743
AR(1)	-1.147585	0.164214	-6.988334	0.0000
AR(2)	-0.714528	0.243499	-2.934421	0.0062

R-squared	0.636450	Mean dependent var	2.888543
Adjusted R-squared	0.601268	S.D. dependent var	54.91833
S.E. of regression	34.67831	Akaike info criterion	10.03732
Sum squared resid	37280.13	Schwarz criterion	10.21507
Log likelihood	-171.6530	Hannan-Quinn criter.	10.09868
F-statistic	18.09010	Durbin-Watson stat	2.136521
Prob(F-statistic)	0.000001		

Inverted AR Roots	-.57+.62i	-.57-.62i

Residential capacity adjusted for analyst judgement:

SODRC_US = SODRC_USX + SODRC_US_A

Small-scale solar PV capacity, non-residential sectors (SODNC_US)

Dependent Variable: DLOG(SODNC_USX)
Method: Least Squares
Date: 05/25/17 Time: 08:29
Sample (adjusted): 2014M02 2017M03
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.014461	0.001219	11.86282	0.0000
D1601	0.046215	0.007515	6.149844	0.0000

R-squared	0.512331	Mean dependent var	0.015678
Adjusted R-squared	0.498785	S.D. dependent var	0.010474
S.E. of regression	0.007415	Akaike info criterion	-6.919363
Sum squared resid	0.001979	Schwarz criterion	-6.833174
Log likelihood	133.4679	Hannan-Quinn criter.	-6.888698
F-statistic	37.82058	Durbin-Watson stat	2.127135
Prob(F-statistic)	0.000000		

Non-residential capacity adjusted for analyst judgement:

SODNC_US = SODNC_USX + SODNC_US_A

Small-scale solar PV capacity, commercial and industrial sectors (SODCC_US and SODIC_US)

Commercial sector capacity

Dependent Variable: D(SODCC_US)
Method: Least Squares
Date: 05/25/17 Time: 08:28
Sample (adjusted): 2014M02 2017M03
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.40575	6.388632	-1.785319	0.0826
D(SODNC_US)	0.883293	0.073414	12.03161	0.0000

R-squared	0.800840	Mean dependent var	51.58403
Adjusted R-squared	0.795308	S.D. dependent var	49.88678
S.E. of regression	22.57021	Akaike info criterion	9.122335
Sum squared resid	18338.92	Schwarz criterion	9.208524
Log likelihood	-171.3244	Hannan-Quinn criter.	9.153000
F-statistic	144.7596	Durbin-Watson stat	0.974263
Prob(F-statistic)	0.000000		

Industrial sector capacity (Non-residential capacity – commercial capacity)

SODIC_US = SODNC_US – SODCC_US

Small-scale solar PV generation, residential sector (SODRP_US)

Dependent Variable: 1000*SODRP_US/(24*SODRC_US)
Method: ARMA Conditional Least Squares (Marquardt - EViews legacy)
Date: 05/25/17 Time: 08:30
Sample (adjusted): 2014M02 2017M03
Included observations: 38 after adjustments
Convergence achieved after 3 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAN	0.125935	0.005581	22.56538	0.0000
FEB	0.152346	0.005544	27.48094	0.0000
MAR	0.190838	0.005504	34.66994	0.0000
APR	0.216949	0.005691	38.12246	0.0000
MAY	0.227337	0.005803	39.17547	0.0000
JUN	0.234381	0.005857	40.01691	0.0000
JUL	0.232252	0.005868	39.58084	0.0000
AUG	0.223092	0.005848	38.14799	0.0000
SEP	0.203504	0.005808	35.03759	0.0000
OCT	0.174462	0.005756	30.30849	0.0000
NOV	0.145272	0.005698	25.49402	0.0000
DEC	0.125970	0.005639	22.33975	0.0000
AR(1)	0.859016	0.068646	12.51378	0.0000

R-squared	0.993992	Mean dependent var	0.191546
Adjusted R-squared	0.991108	S.D. dependent var	0.041527
S.E. of regression	0.003916	Akaike info criterion	-7.982007
Sum squared resid	0.000383	Schwarz criterion	-7.421781
Log likelihood	164.6581	Hannan-Quinn criter.	-7.782683
Durbin-Watson stat	1.919121		

Inverted AR Roots	.86

Small-scale solar PV generation, commercial sector (SODCP_US)

Dependent Variable: 1000*SODCP_US/(24*SODCC_US)
Method: ARMA Conditional Least Squares (Marquardt - EViews legacy)
Date: 05/25/17 Time: 08:28
Sample (adjusted): 2014M02 2017M03
Included observations: 38 after adjustments
Convergence achieved after 3 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAN	0.137057	0.001346	101.8462	0.0000
FEB	0.165176	0.001286	128.4613	0.0000
MAR	0.198844	0.001261	157.6825	0.0000
APR	0.221619	0.001329	166.7187	0.0000
MAY	0.231742	0.001354	171.1237	0.0000
JUN	0.237485	0.001360	174.5837	0.0000
JUL	0.235165	0.001359	173.0398	0.0000
AUG	0.223688	0.001356	165.0025	0.0000
SEP	0.204956	0.001352	151.5582	0.0000
OCT	0.174789	0.001350	129.5044	0.0000
NOV	0.143457	0.001348	106.4385	0.0000
DEC	0.129488	0.001347	96.16430	0.0000
AR(1)	0.706888	0.104982	6.733411	0.0000

R-squared	0.998801	Mean dependent var	0.191902
Adjusted R-squared	0.998226	S.D. dependent var	0.038500
S.E. of regression	0.001622	Akaike info criterion	-9.745156
Sum squared resid	6.57E-05	Schwarz criterion	-9.184929
Log likelihood	198.1580	Hannan-Quinn criter.	-9.545832
Durbin-Watson stat	2.048555		

Inverted AR Roots	.71

Small-scale solar PV generation, industrial sector (SODIP_US)

Dependent Variable: 1000*SODIP_US/(24*SODIC_US)
Method: ARMA Conditional Least Squares (Marquardt - EViews legacy)
Date: 05/25/17 Time: 08:29
Sample (adjusted): 2014M02 2017M03
Included observations: 38 after adjustments
Convergence achieved after 3 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAN	0.148856	0.000577	258.0670	0.0000
FEB	0.171689	0.000547	314.0517	0.0000
MAR	0.216586	0.000526	411.3972	0.0000
APR	0.239136	0.000544	439.7416	0.0000
MAY	0.252442	0.000558	452.1995	0.0000
JUN	0.259159	0.000569	455.5182	0.0000
JUL	0.255582	0.000576	443.6993	0.0000
AUG	0.246005	0.000580	424.0642	0.0000
SEP	0.229273	0.000582	394.0274	0.0000
OCT	0.201681	0.000582	346.5709	0.0000
NOV	0.163405	0.000581	281.3257	0.0000
DEC	0.142284	0.000579	245.7309	0.0000
AR(1)	0.856215	0.151227	5.661795	0.0000

R-squared	0.999930	Mean dependent var	0.209757
Adjusted R-squared	0.999896	S.D. dependent var	0.041731
S.E. of regression	0.000426	Akaike info criterion	-12.42015
Sum squared resid	4.53E-06	Schwarz criterion	-11.85992
Log likelihood	248.9829	Hannan-Quinn criter.	-12.22083
Durbin-Watson stat	1.641603		

Inverted AR Roots	.86