Statewide Energy Demand

In odd-numbered years, the California Energy Commission provides 10-year forecasts for electricity demand in California as part of the *Integrated Energy Policy Report* (*IEPR*) process, with an update in even-numbered years. The *California Energy Demand Updated Forecast, 2017-2027* (*CEDU 2016*)[1] updates the forecasts provided in the *California Energy Demand 2016–2026*, *Revised Electricity Forecast* [2] (*CED 2015*) by incorporating more recent economic and demographic projections and adjusting for the latest historical data available for consumption, peak demand, temperatures, and electricity rates.

These forecasts are used in various proceedings, including the California Public Utility Commission's Long-Term Procurement Planning process and the California Independent System Operator's Transmission Planning Process. The IEPR forecast consists of two parts: a baseline forecast, which includes energy efficiency savings from initiatives already in place or approved; and forecasted energy efficiency savings, referred to as *additional achievable energy efficiency savings*. Together, these two parts yield a "managed" forecast for resource planning.

As in previous forecasts, *CEDU 2016* includes three baseline cases: high energy demand, low energy demand, and mid energy demand. The high energy demand case incorporates relatively high economic/demographic growth, relatively low electricity and natural gas rates, and relatively low efficiency program and self-generation impacts. The low energy demand case assumes lower economic/demographic growth, higher rates, and higher efficiency program and self-generation impacts. The mid case uses assumptions at levels between the high and low cases.

California has demonstrated that it is possible to grow the economy with only a small increase in energy consumption. From 2015 to 2016, electricity consumption in California grew less than 1 percent from 2015, totaling 285,701 gigawatt-hours (GWh). With this slight increase in electricity consumption, job growth increased nearly 2 percent, and California's gross state product grew almost 3 percent.[3]Between 2000 and 2016, job growth increased nearly 13 percent, while electricity consumption grew almost 9 percent. California's gross state product grew by 40 percent —more than four times as fast as electricity consumption.[4] Meanwhile, the state's population grew by 15 percent from about 34 million in 2000 to 39 million in 2016.[5]

Below compares the results of the *CEDU 2016* with the *CED 2015,* including changes in statewide electricity consumption and peak, impacts from self-generation, statewide personal income, commercial employment, population, and manufacturing output.

1 Garcia, Cary and Chris Kavalec. 2017. *California Energy Demand Updated Forecast, 2017-2027*. California Energy Commission. Publication Number: CEC-200-2016-016-CMF.

2 Kavalec, Chris, Nick Fugate, Cary Garcia, and Asish Gautam. 2016. *California Energy Demand 2016-2026, Revised Electricity Forecast*. California Energy Commission. Publication Number: CEC-200-2016-001-V1.

3 Jobs data are from the Employment Development Department and reflect civilian employment growth. The source of gross state product numbers is Moody's Analytics, June 2017.

4 Gross state product data are from U.S. Bureau of Economic Analysis, Moody's Analytics, June 2017.

5 Population data are from California Department of Finance, December 2016.

Results of the 2016 Electricity Updated Forecast

Table 1 compares the *CEDU 2016* baseline forecast for selected years with the *CED 2015* mid demand case. For statewide electricity consumption, the new forecast begins about 1 percent below *CED 2015* in 2015, reflecting less actual economic growth in California than previously predicted for the early years of the forecast, particularly in the Northern and Central Valleys. While economic growth was more modest for the near-term forecast horizon, consumption in the updated mid scenario grows at a slightly higher rate through 2026 compared with the *CED 2015* mid demand scenario due to more optimistic long-term economic growth expectations.

Updated statewide noncoincident weather-normalized peak[6] demand is around 1 percent lower than predicted in the *CED 2015* mid case in 2016 and grows at a slightly higher rate from 2016–2026 in the new mid case for the same reason as consumption—more modest expectations for near-term growth but an optimistic long-term outlook.

6 The state's coincident peak is the actual peak, while the noncoincident peak is the sum of actual peaks for the planning areas, which may occur at different times. Weather-normalized provides a benchmark for comparison to future peak demand, which assumes either average (normalized) weather or hotter conditions due to climate change.

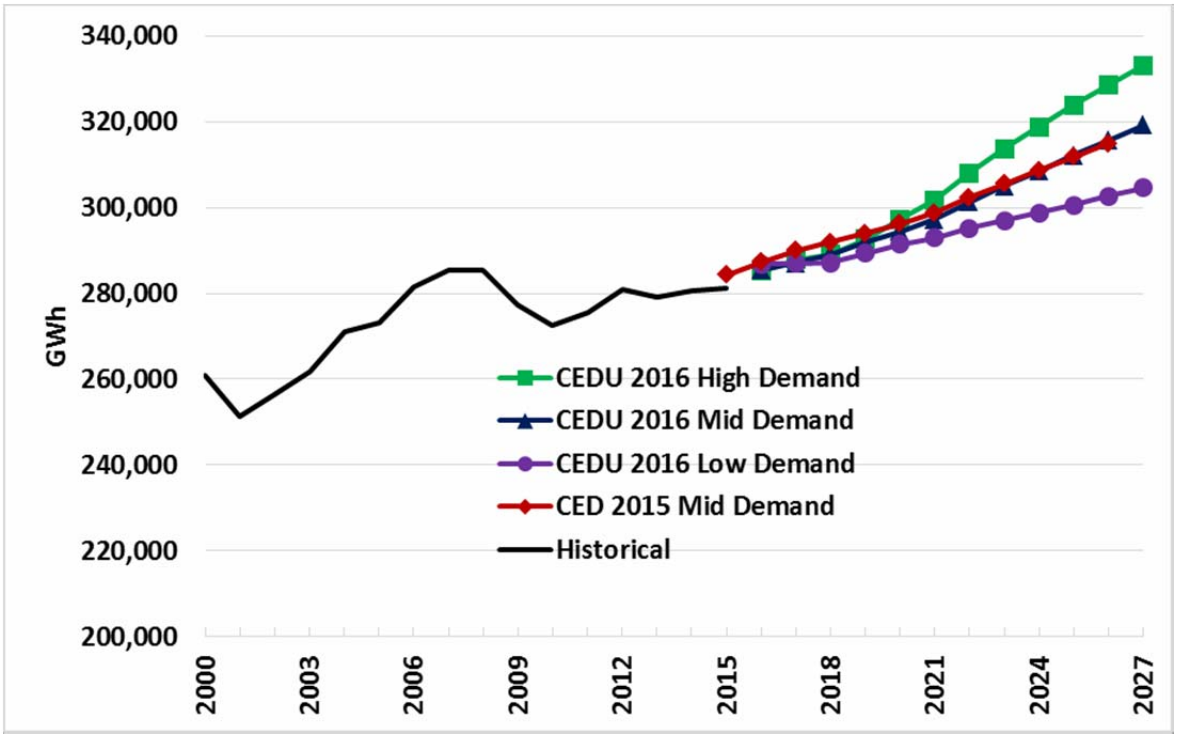
Table 1: Comparison of *CEDU 2016* and *CED 2015* Mid Case Demand Baseline Forecasts of Statewide Electricity Demand

Consumption (GWh)				
	CED 2015 Mid Energy Demand	***CEDU 2016 High Energy Demand***	***CEDU 2016 Mid Energy Demand***	***CEDU 2016 Low Energy Demand***
1990	227,606	227,606	227,606	227,606
2000	261,036	261,036	261,036	261,036
2015	284,343	281,334	281,334	281,334
2020	296,244	297,280	294,474	291,477
2026	314,970	328,559	315,683	302,603
2027	-	333,100	319,256	304,639
	Average Annual Growth Rates			
1990-2000	1.38%	1.38%	1.38%	1.38%
2000-2015	0.57%	0.50%	0.50%	0.50%
2015-2020	0.82%	1.11%	0.92%	0.71%
2015-2026	0.93%	1.42%	1.05%	0.66%
2015-2027	-	1.42%	1.06%	0.67%
Noncoincident Peak (MW)				
	CED 2015 Mid Energy Demand	***CEDU 2016 High Energy Demand***	***CEDU 2016 Mid Energy Demand***	***CEDU 2016 Low Energy Demand***
1990	47,123	47,123	47,123	47,123
2000	53,529	53,529	53,529	53,529
2016*	61,219	60,543	60,543	60,543
2020	62,414	62,644	61,444	60,332
2026	64,007	67,072	63,275	58,750
2027	--	67,772	63,501	58,370
	Average Annual Growth Rates			
1990-2000	1.28%	1.28%	1.28%	1.28%
2000-2016	0.84%	0.77%	0.77%	0.77%
2016-2020	0.48%	0.86%	0.37%	-0.09%
2016-2026	0.45%	1.03%	0.44%	-0.30%
2016-2027	-	1.03%	0.43%	-0.33%
Historical values are shaded.				
*Weather normalized: *CEDU 2016* uses a weather-normalized peak value derived from the actual 2016 peak for calculating growth rates during the forecast period.				

Source: California Energy Commission, Demand Analysis Office, 2016.

Figure 1 shows projected *CEDU 2016* electricity consumption for the three baseline cases and the *CED 2015* mid demand forecast. By 2026, consumption in the updated mid case is projected to be 0.23 percent lower than the *CED 2015* mid case. Annual growth rates from 2015–2026 for the *CEDU 2016* cases average 1.42 percent, 1.05 percent, and 0.66 percent in the high, mid, and low cases, respectively, compared to 0.93 percent in the *CED 2015* mid case. Although there is a small reduction in starting point due to more pessimistic economic growth in the near term, long-term growth in consumption remains comparable to *CED 2015* mid case.

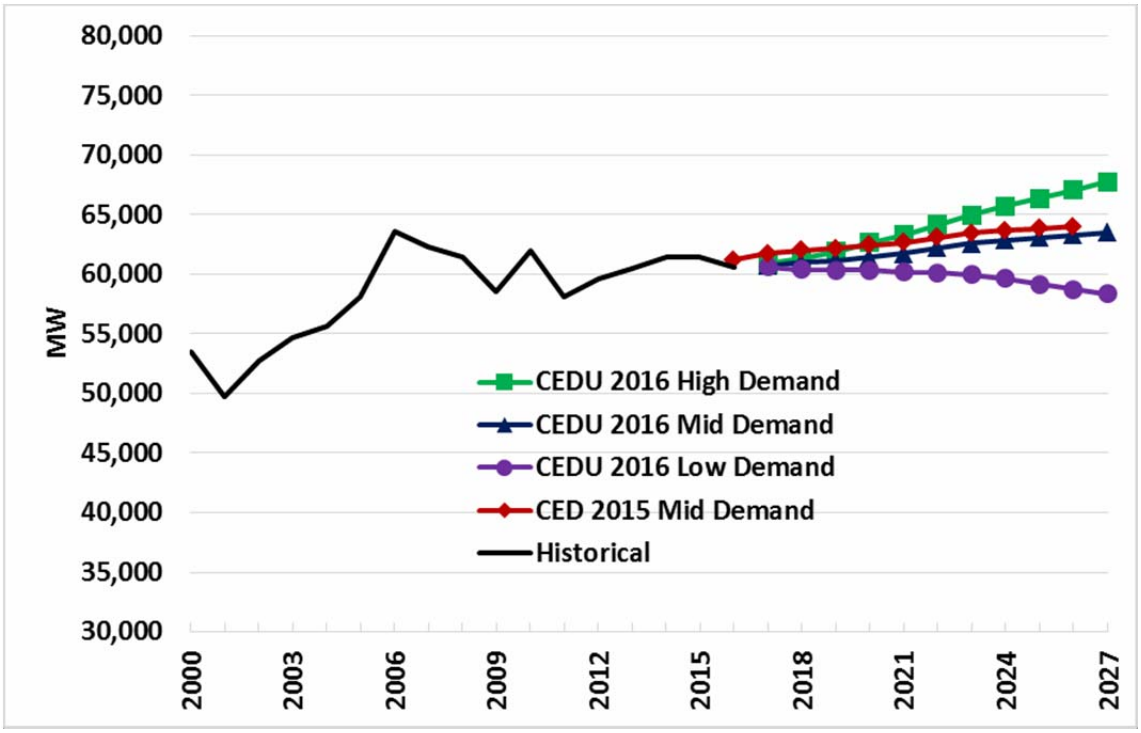
Figure 1: Statewide Baseline Annual Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2016.

Figure 2 shows projected *CEDU 2016* noncoincident peak demand for the three baseline cases and the *CED 2015* mid demand peak forecast. By 2026, statewide peak demand in the updated mid case is projected to be 1.1 percent lower than the *CED 2015* mid case. Annual growth rates from 2016–2026 for the *CEDU 2016* cases average 1.03 percent, 0.44 percent, and -0.30 percent in the high, mid, and low cases, respectively, compared to 0.45 percent in the *CED 2015* mid case. Comparable growth in personal income and residential consumption results in similar growth of noncoincident net peak demand in the updated mid demand case compared to *CED 2015*.

Figure 2: Statewide Baseline Annual Noncoincident Peak Demand



Source: California Energy Commission, Demand Analysis Office, 2016.

Table 2 shows the effect of incorporating updated historical distributed generation adoptions and pending adoptions on projected statewide self-generation impacts. The updated stock for 2015 is slightly lower compared to *CED 2015*, but the large number of pending applications (through mid-2016) for photovoltaic (PV) systems quickly drive the *CEDU 2016* mid case impacts above those in *CED 2015*. The demand forms accompanying the *CEDU 2016* provide annual results for the state and each planning area for self-generation, broken out into PV and non-PV technologies.

Table 2: Comparison of *CEDU 2016* and *CED 2015*
Mid Case Statewide Self-Generation Impacts

Energy (GWH)				
	CED 2015 Mid Energy Demand	***CEDU 2016 High Energy Demand***	***CEDU 2016 Mid Energy Demand***	***CEDU 2016 Low Energy Demand***
2015	19,233	19,212	19,212	19,212
2016	21,595	22,924	22,943	22,962
2018	24,209	25,989	26,512	27,028
2020	26,339	27,007	28,523	30,218
2026	36,616	30,535	38,110	46,987
2027	--	31,290	40,164	50,583
Peak (MW)				
	CED 2015 Mid Energy Demand	***CEDU 2016 High Energy Demand***	***CEDU 2016 Mid Energy Demand***	***CEDU 2016 Low Energy Demand***
2015	3,277	3,256	3,256	3,256
2016	3,777	3,794	3,799	3,804
2018	4,406	4,661	4,783	4,901
2020	4,957	4,957	5,293	5,670
2026	7,407	5,991	7,603	9,496
2027	--	6,197	8,078	10,292

Source: California Energy Commission, Demand Analysis Office, 2016.

Table 3 compares projected baseline annual electricity consumption in each *CEDU 2016* scenario for the three major economic sectors, residential, commercial, and industrial (a combination of manufacturing, construction, and resource extraction industries), with the *CED 2015* mid demand case. Residential and commercial consumption in the updated mid demand case grows at similar rates from 2016–2026 compared to *CED 2015* due mainly to comparable projected growth in personal income and commercial employment. Residential consumption in the mid case begins in 2015 with a historical measurement about 1 percent lower than predicted in *CED 2015*, due to lower economic growth than was expected in that sector. On the other hand, historical commercial and industrial mid case consumption began higher in 2015 than projected in *CED 2015*, exceeding previous expectations. Moreover, growth in industrial consumption is increasing at a positive rate in the updated mid case compared to the negative rate predicted in *CED 2015*, the result of more optimistic projections for manufacturing output.

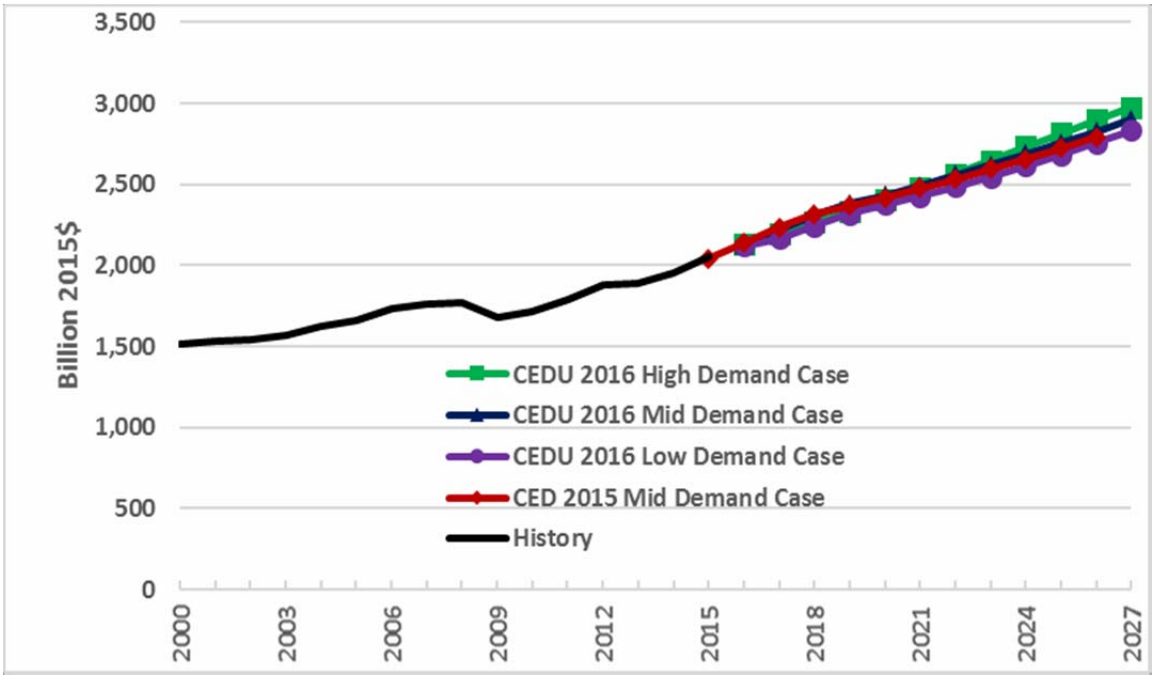
Table 3: Baseline Electricity Consumption by Sector

Residential Consumption (GWh)				
	CED 2015 Mid Energy Demand	***CEDU 2016 High Energy Demand***	***CEDU 2016 Mid Energy Demand***	***CEDU 2016 Low Energy Demand***
2015	90,288	89,192	89,192	89,192
2018	92,767	89,459	90,242	90,485
2020	94,820	92,810	92,985	92,684
2027	--	110,813	107,993	100,693
Average Annual Growth, Residential Sector				
2015-2020	0.98%	0.80%	0.84%	0.77%
2015-2026	1.45%	1.78%	1.55%	0.99%
2015-2027	--	1.83%	1.61%	1.02%
Commercial Consumption (GWh)				
	CED 2015 Mid Energy Demand	***CEDU 2016 High Energy Demand***	***CEDU 2016 Mid Energy Demand***	***CEDU 2016 Low Energy Demand***
2015	106,362	107,148	107,148	107,148
2018	110,437	111,074	110,274	109,374
2020	112,533	114,120	112,718	111,768
2027	--	125,706	120,272	117,229
Average Annual Growth, Commercial Sector				
2015-2020	1.13%	1.27%	1.02%	0.85%
2015-2026	1.01%	1.37%	0.99%	0.77%
2015-2027	--	1.34%	0.97%	0.75%
Industrial Consumption (GWh)				
	CED 2015 Mid Energy Demand	***CEDU 2016 High Energy Demand***	***CEDU 2016 Mid Energy Demand***	***CEDU 2016 Low Energy Demand***
2015	48,955	49,590	49,590	49,590
2018	49,096	50,177	49,973	49,131
2020	48,735	51,325	49,725	48,249
2027	--	55,442	50,009	46,750
Average Annual Growth, Industrial Sector				
2015-2020	-0.09%	0.69%	0.05%	-0.55%
2015-2026	-0.07%	0.94%	0.06%	-0.51%
2015-2027	--	0.93%	0.07%	-0.49%
Historical values are shaded.				

Source: California Energy Commission, Demand Analysis Office, 2016.

Figure 3 shows historical and projected personal income at the statewide level for the three *CEDU 2016* scenarios and the *CED 2015* mid demand case. By 2026, income is around 1.19 percent higher in the *CEDU 2016* mid case compared to *CED 2015*. Annual growth rates from 2015–2026 average 3.18 percent, 2.94 percent, and 2.71 percent in *the CEDU 2016* high, mid, and low scenarios, respectively, compared to 2.88 percent in the *CED 2015* mid case.

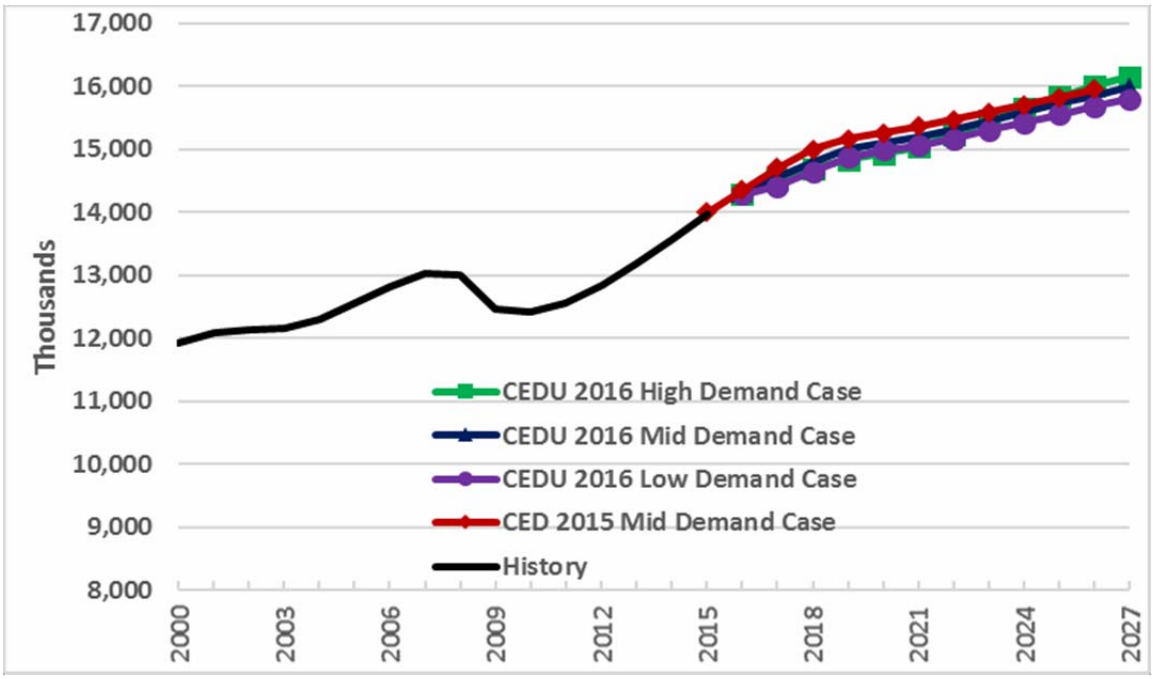
Figure 3: Statewide Personal Income



Sources: Moody's Analytics and IHS Global Insight, 2015-2016.

As shown in **Figure 4**, the projection for statewide commercial employment in the *CEDU 2016* mid case is lower than in *CED 2015*. By 2026, commercial employment is around 0.58 percent lower in the new mid case compared to *CED 2015*. Annual growth rates from 2015–2026 average 1.25 percent, 1.17 percent, and 1.06 percent in the *CEDU 2016* high, mid, and low scenarios, respectively, compared to 1.19 percent in the *CED 2015* mid case.

Figure 4: Statewide Commercial Employment

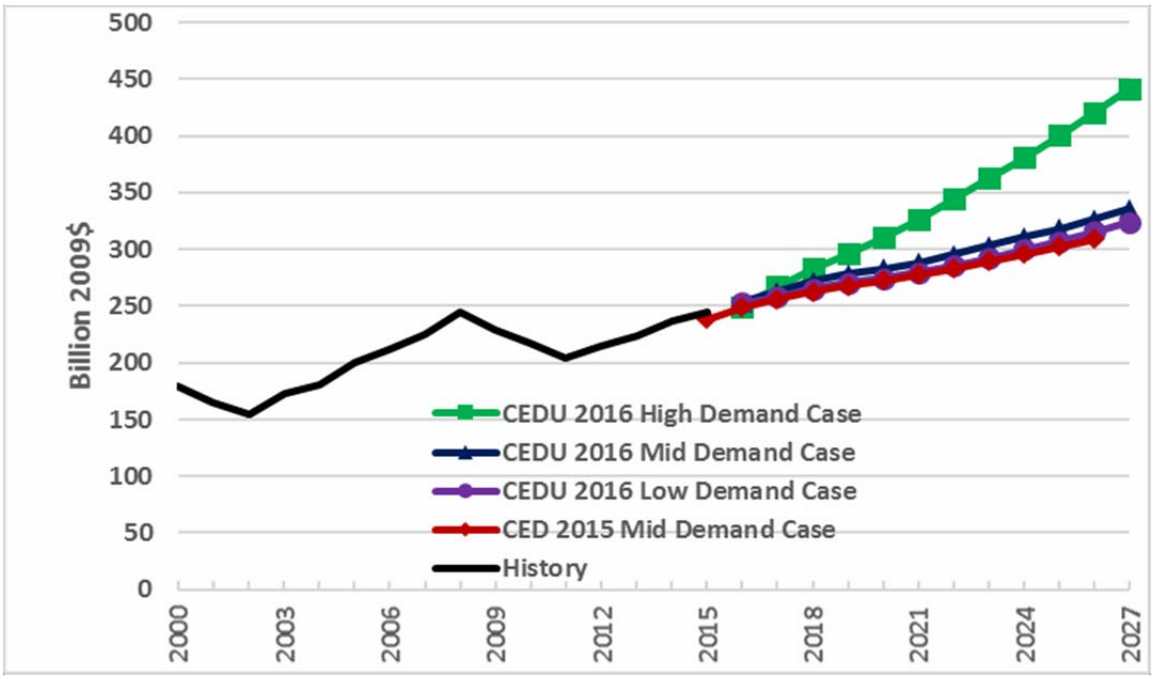


Sources: Moody's Analytics and IHS Global Insight, 2015-2016.

Population in the *CEDU 2016* mid and high demand scenarios differs from the *CED 2015* counterparts. In 2026, population is down 1.13 percent in both the new mid and high cases versus *CED 2015*. Population and other key input data are provided in the demand forms accompanying this report.

Statewide manufacturing dollar output is shown in **Figure 5**, including the three *CEDU 2016* scenarios and the *CED 2015* mid case. By 2026, manufacturing output in the *CEDU 2016* mid case is around 5.58 percent higher than the *CED 2015* mid scenario. As in recent past forecasts, IHS Global Insight is much more optimistic about manufacturing than Moody's; thus, the high scenario is significantly above the mid and low. Annual growth rates from 2015-2026 average 5.07 percent, 2.68 percent, and 2.35 percent in the *CEDU 2016* high, mid, and low scenarios, respectively, compared to 2.38 percent in *the CED 2015* mid case.

Figure 5: Statewide Manufacturing Output



Sources: Moody's Analytics and IHS Global Insight, 2015-2016.

Electricity Consumption and Economic Growth by County

Table 4 shows the change from 2015 to 2016 in economic growth per county and electricity consumption. In several counties, the economy grew while electricity consumption decreased. For example, San Francisco County's economy grew by 5.0 percent while its electricity consumption decreased by almost 1.0 percent. San Diego County's economy grew by 2.2 percent while its electricity consumption decreased by almost 1.5 percent. Orange County's economy increased by 2.1 percent while its electricity consumption decreased by 2.6 percent. Also, Madera County's economy grew by 6.0 percent while its electricity consumption decreased by 4.6 percent.

Table 4: Electricity Consumption and Gross County Product for California Counties, 2015 and 2016

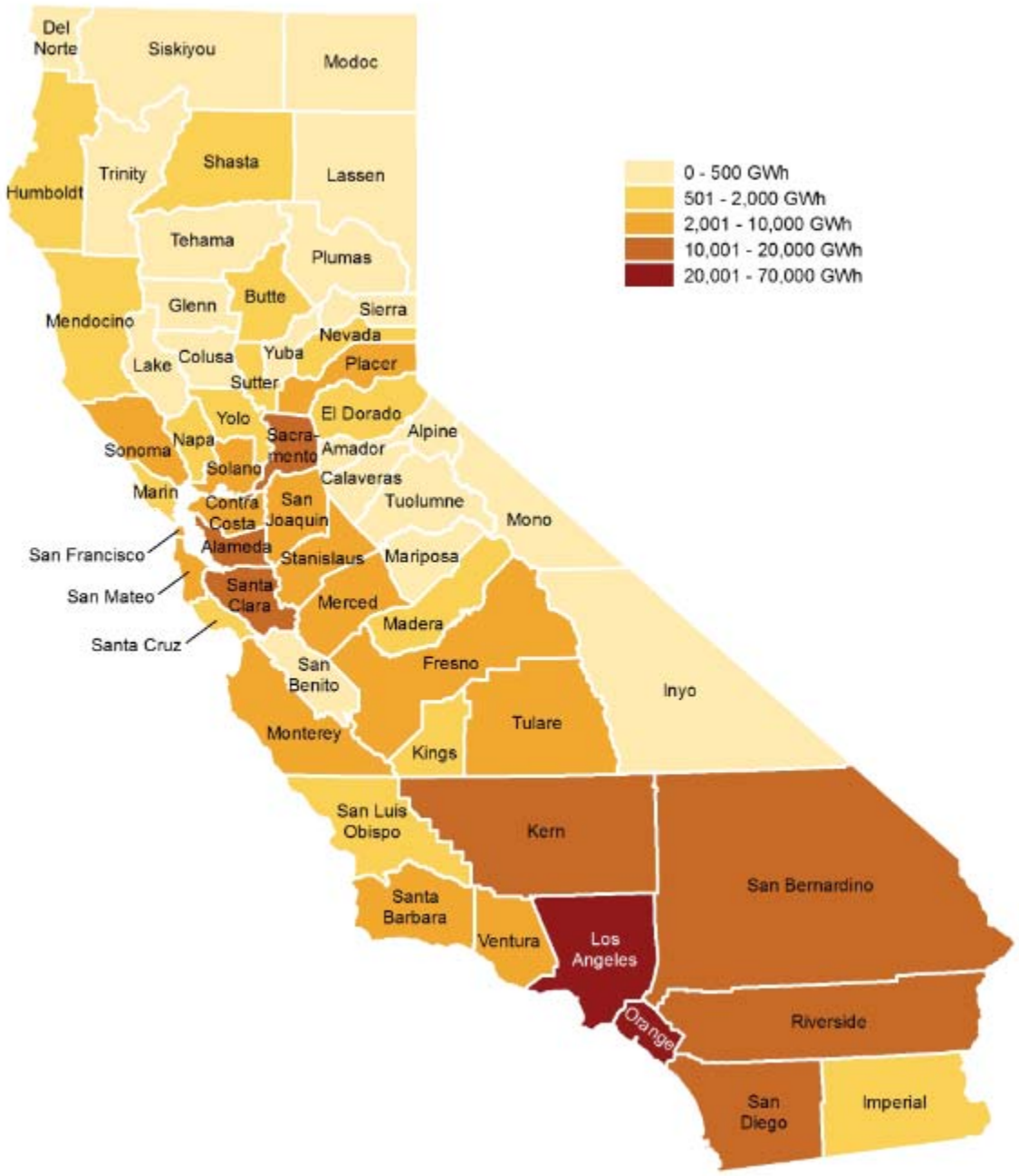
County	2015 GWh Consumption	2016 GWh Consumption	% Change	2015 GCP	2016 GCP	% Change
Alameda	10,258	10,815	5.4%	113.4	116.2	2.5%
Alpine	16	17	7.4%	0.2	0.2	0.2%
Amador	286	310	8.4%	1.5	1.6	5.6%
Butte	1,492	1,477	-1.0%	10.9	11.2	2.2%
Calaveras	311	316	1.5%	1.1	1.2	5.1%
Colusa	309	299	-3.2%	1.8	1.9	5.6%
Contra Costa	9,518	9,644	1.3%	60.9	63.4	4.1%
Del Norte	211	204	-3.4%	1.1	1.2	5.0%
El Dorado	1,174	1,215	3.5%	7.4	7.6	3.1%
Fresno	7,689	7,629	-0.8%	47.6	48.8	2.6%
Glenn	385	367	-4.5%	1.9	2.0	6.1%
Humboldt	825	808	-2.0%	6.0	6.3	5.1%
Imperial	1,405	1,419	1.0%	7.5	7.2	-3.0%
Inyo	211	234	11.0%	1.0	1.0	3.9%
Kern	15,109	16,485	9.1%	45.2	43.9	-2.7%
Kings	1,787	1,807	1.1%	5.5	5.5	0.1%
Lake	431	441	2.4%	2.1	2.2	4.0%
Lassen	401	457	14.1%	1.6	1.6	2.7%
Los Angeles	69,750	69,614	-0.2%	688.6	709.7	3.1%
Madera	1,672	1,595	-4.6%	5.3	5.7	6.0%
Marin	1,355	1,343	-0.9%	17.3	17.6	1.9%
Mariposa	107	108	1.0%	0.7	0.7	3.4%
Mendocino	568	581	2.2%	4.3	4.5	4.3%
Merced	2,928	3,472	18.6%	8.9	9.2	2.5%
Modoc	164	152	-7.7%	0.5	0.5	3.5%
Mono	190	190	-0.4%	1.1	1.2	3.6%
Monterey	2,674	2,587	-3.2%	21.4	22.4	4.5%
Napa	1,053	1,058	0.4%	9.3	9.3	-0.1%
Nevada	628	661	5.3%	4.4	4.6	4.1%
Orange	20,927	20,391	-2.6%	259.5	264.9	2.1%
Placer	2,895	2,939	1.5%	23.1	23.9	3.5%
Plumas	194	202	4.2%	0.9	1.0	5.9%
Riverside	15,668	15,928	1.7%	85.2	88.4	3.7%
Sacramento	10,927	10,850	-0.7%	86.0	88.6	3.0%
San Benito	367	382	3.9%	3.3	3.5	5.1%
San Bernardino	14,793	15,008	1.4%	88.5	91.3	3.2%
San Diego	20,012	19,704	-1.5%	223.3	228.1	2.2%

County	2015 GWh Consumption	2016 GWh Consumption	% Change	2015 GCP	2016 GCP	% Change
San Francisco	5,806	5,759	-0.8%	118.8	124.7	5.0%
San Joaquin	5,167	5,457	5.6%	29.2	30.1	3.0%
San Luis Obispo	1,712	1,739	1.5%	16.0	16.2	1.2%
San Mateo	4,432	4,340	-2.1%	71.6	75.0	4.7%
Santa Barbara	3,121	2,867	-8.2%	28.9	29.1	0.7%
Santa Clara	16,807	16,777	-0.2%	193.6	201.7	4.2%
Santa Cruz	1,234	1,224	-0.8%	14.0	14.3	2.1%
Shasta	1,567	1,560	-0.4%	8.0	8.3	2.8%
Sierra	24	26	7.4%	0.1	0.1	3.6%
Siskiyou	490	487	-0.6%	2.0	2.0	4.8%
Solano	3,216	3,207	-0.3%	18.7	19.2	2.5%
Sonoma	2,945	2,965	0.7%	28.3	28.8	1.8%
Stanislaus	4,763	4,764	0.0%	22.5	23.4	4.0%
Sutter	648	632	-2.4%	3.9	3.9	1.7%
Tehama	496	497	0.2%	2.6	2.7	4.7%
Trinity	111	129	15.6%	0.4	0.4	2.1%
Tulara	4,493	4,423	-1.6%	18.1	18.8	4.3%
Tuoumne	442	448	1.3%	2.5	2.6	4.7%
Ventura	5,657	5,505	-2.7%	47.7	48.1	1.0%
Yolo	1,703	1,705	0.2%	13.9	14.4	3.4%
Yuba	479	483	0.7%	2.1	2.1	4.1%
California Total	**284,005**	**285,701**	**0.6%**	**2491.2**	**2564.0**	**2.9%**

Source: California Energy Commission Staff using data from the Quarterly Fuel and Energy Report, U.S. Bureau of Economic Analysis, and Moody's Analytics

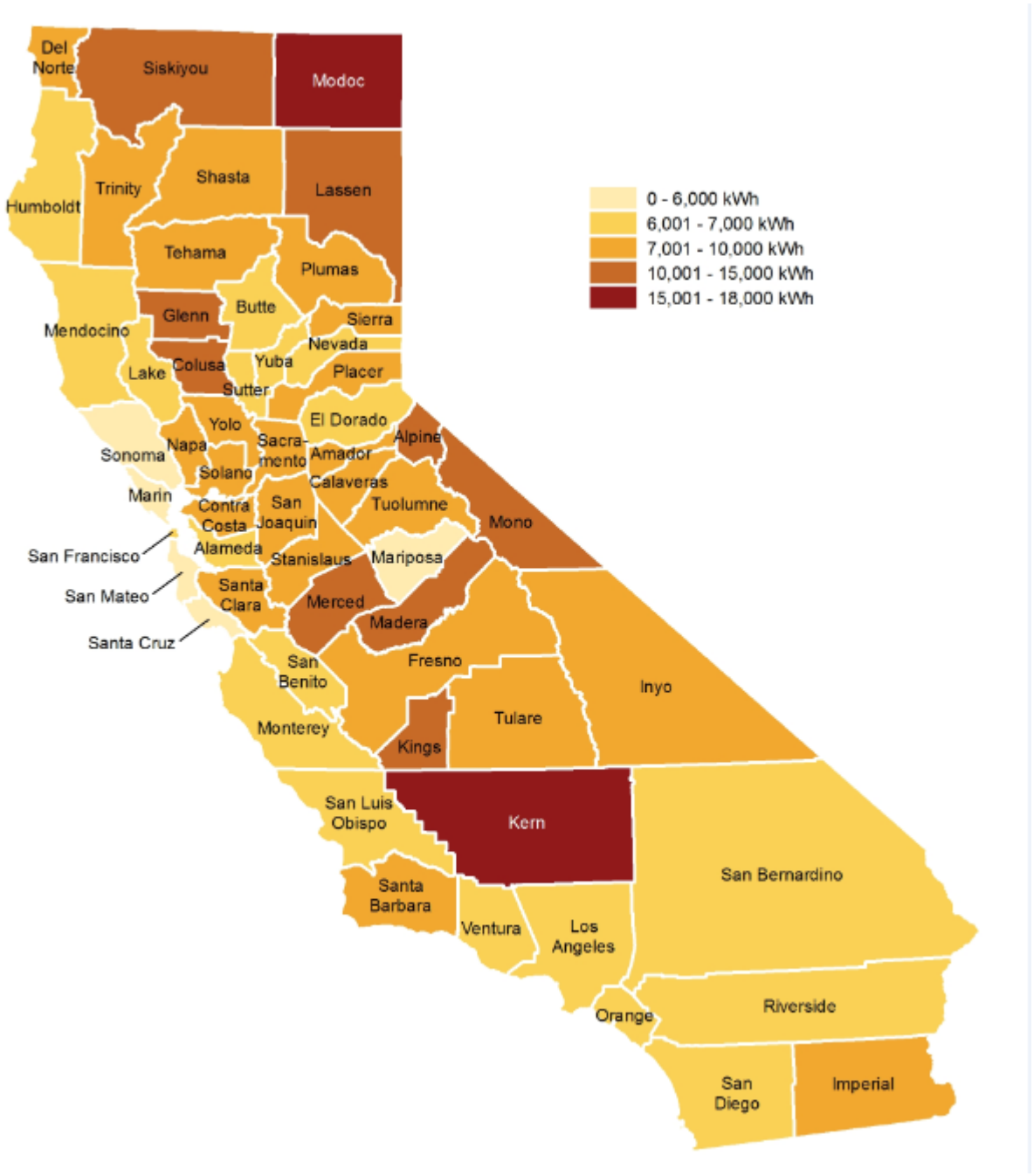
Figure 6 shows electricity consumption by county for residential and nonresidential consumers in 2016. Residential consumption increased slightly from 91,462 GWh in 2015 to 91,686 GWh in 2016 while nonresidential consumption increased from 192,543 GWh in 2015 to 194,015 GWh in 2016. **Figure 7** shows 2016 electricity consumption per capita for each county.

Figure 6: 2016 Electricity Consumption (Residential and Nonresidential) by County



Source: California Energy Commission staff, http://ecdms.energy.ca.gov/.

Figure 7: Total 2016 Electricity Consumption (Residential and Nonresidential) Per Capita by County



Source: California Energy Commission staff, http://ecdms.energy.ca.gov/.

Additional References:
Information regarding California energy consumption is available at http://www.ecdms.energy.ca.gov.

Information regarding U.S. energy consumption is available at http://www.eia.gov/.

Historical and forecasted statewide annual electricity consumption data are from the *California Energy Demand Updated Forecast, 2017-2027,* published by the California Energy Commission and available at http://docketpublic.energy.ca.gov/PublicDocuments/16-IEPR-05/TN215745_20170202T125433_FINAL_California_Energy_Demand_Updated_Forecast_2017 2027.pdf .

Information on electricity consumption can be found in the California Energy Almanac, available at http://energyalmanac.ca.gov/electricity/index.html.

Sources:

Kavalec, Chris. 2016. *California Energy Demand 2017-2027*. California Energy Commission, Energy Assessments Division. Publication Number: CEC-200-2016-001-V1. http://docketpublic.energy.ca.gov/PublicDocuments/16-IEPR-05/TN215745_20170202T125433_FINAL_California_Energy_Demand_Updated_Forecast_201 72027.pdf .

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Next update: October 2018