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CALIFORNIA ENERGY DEMAND 2012-2022 FINAL FORECAST

Volume 2: Electricity Demand by Utility Planning Area

CALIFORNIA
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Edmund G. Brown Jr., Governor

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ABSTRACT

The *California Energy Demand 2012-2022 Final Forecast* describes the California Energy Commission's final forecasts for 2012–2022 electricity consumption, peak, and natural gas demand for each of five major electricity planning areas and three natural gas distribution areas and for the state as a whole. This forecast supports the analysis and recommendations of the *2011 Integrated Energy Policy Report* and the *2012 Integrated Energy Policy Report Update* and was adopted by the Energy Commission at a Business Meeting on June 13, 2012. The forecast includes three full scenarios: a *high energy demand* case, a *low energy demand* case, and a *mid energy demand* case. 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 includes lower economic/demographic growth, higher assumed rates, and higher efficiency program and self-generation impacts. The *mid* case uses input assumptions at levels between the *high* and *low* cases.

Keywords

Electricity, demand, consumption, forecast, weather normalization, peak, natural gas, self-generation, conservation, energy efficiency

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EXECUTIVE SUMMARY

Introduction

The *California Energy Demand 2012-2022 Final Forecast* (*CED 2011 Final*) forecasts electricity and end-user natural gas consumption and peak electricity demand for the State of California and for each major utility planning area within the state for 2012-2022. *CED 2011 Final* supports the analysis and recommendations of the *2011 Integrated Energy Policy Report (2011 IEPR)* and *2012 Integrated Energy Policy Report Update (2012 IEPR Update)*, including electricity and natural gas system assessments and analysis of progress toward increased energy efficiency, and provides detail on the impacts of energy efficiency programs and standards, continuing a major staff effort to improve the measurement and attribution of efficiency impacts within the energy demand forecast.

CED 2011 Final includes three full scenarios: a *high energy demand* case, a *low energy demand* case, and a *mid energy demand* case. 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 includes lower economic/demographic growth, higher assumed rates, and higher efficiency program and self-generation impacts. The *mid* case uses input assumptions at levels between the *high* and *low* cases.

This report is organized into two volumes. Volume 1 examines electricity and end-user natural gas consumption as well as peak electricity demand for California as a whole. Also, Volume 1 describes key aspects of the method used to produce the forecast, including economic and demographic assumptions; historical consumption estimates; electricity and natural gas rate projections; conservation and efficiency impacts; and demand response, distributed generation, and electric vehicle considerations. Volume 2 presents forecasts of electricity consumption and peak electricity demand for each of five utility planning areas: Los Angeles Department of Water and Power, Pacific Gas and Electric, Southern California Edison, San Diego Gas & Electric, and Sacramento Municipal Utility District.

This report was adopted by the Energy Commission at a Business Meeting on June 13, 2012.

Electricity Forecast Results

Each chapter in Volume 2 describes electricity forecast results for a particular utility planning area. Forecasts of total consumption and peak loads lead into a discussion of per capita values, load factors, key economic and demographic drivers, and individual sector results. Demand impacts due to electric vehicles, distributed generation, and conservation/energy efficiency are considered at the end of each chapter. For each result, the *CED 2011 Final* values are presented alongside the adopted *California Energy Demand 2010-*

2020 Adopted Forecast (CED 2009) forecast, accompanied by an explanation of any significant differences between the two.

Pacific Gas and Electric

Chapter 1 describes the Pacific Gas and Electric (PG&E) planning area and forecast results. Notable features of the PG&E forecast include the following.

- Electricity consumption and peak demand are lower than *CED 2009* levels due primarily to the recent economic downturn, causing 2010 recorded consumption to be lower than projected. In the mid demand case, electricity consumption and peak demand grow at a rate similar to what was projected in *CED 2009*.
- The PG&E planning area experienced relatively mild temperatures in 2011 such that the recorded peak load was lower than would have been expected under average weather conditions. A higher, weather-normalized peak value represents this expected load and is used as the basis of the peak forecast.
- Historical estimates of population were adjusted to agree with the 2010 U.S. Census. For PG&E, this translated to a lower population projection than seen in *CED 2009* and, consequently, higher projections of per capita consumption and per capita peak demand.
- Self-generation is expected to reduce peak demand in the PG&E planning area by nearly 1,500 megawatts (MW) in the mid demand case by 2022, more than 600 MW of which is due to photovoltaic systems.
- Electric vehicles are expected to increase electricity consumption by more than 1,500 gigawatt hours (GWh) in the mid demand case by 2022.

Southern California Edison

Chapter 2 describes the Southern California Edison (SCE) planning area and forecast results. Notable features of the SCE forecast include the following.

- Electricity consumption and peak demand are lower than *CED 2009* levels due primarily to the recent economic downturn, causing 2010 recorded consumption to be lower than projected. In the mid demand case, forecast electricity consumption grows at a slightly lower rate than projected in *CED 2009*.
- Historical estimates of population were adjusted to agree with the 2010 U.S. Census. For SCE, this translated to a lower population projection than assumed in *CED 2009* and, consequently, higher projections of per capita consumption and per capita peak demand.

- Self-generation is expected to reduce peak demand in the SCE planning area by nearly 1,400 MW in the mid demand case by 2022, more than 550 MW of which is due to photovoltaic systems.
- Electric vehicles are expected to increase electricity consumption by more than 1,500 GWh in the mid demand case by 2022.

San Diego Gas & Electric

Chapter 3 describes the San Diego Gas & Electric (SDG&E) planning area and forecast results. Notable features of the SDG&E forecast include the following.

- Electricity consumption is lower in 2010 than projected by *CED 2009* but grows at a higher rate in all three demand scenarios. Increased growth in the SDG&E planning area is driven in part by higher projections of population, employment, income, and manufacturing output.
- Increased growth in the peak demand forecast in all three demand scenarios relative to *CED 2009* is driven primarily by higher growth in consumption and incremental climate change considerations.
- Self-generation is expected to reduce peak demand in the SDG&E planning area by more than 300 MW in the mid demand case by 2022, nearly 200 MW of which is due to photovoltaic systems.
- Electric vehicles are expected to increase electricity consumption by nearly 1000 GWh in the mid demand case by 2022.

Sacramento Municipal Utility District

Chapter 4 describes the Sacramento Municipal Utility District (SMUD) planning area and forecast results. Notable features of the SMUD forecast include the following.

- Electricity consumption is lower than *CED 2009* levels due primarily to the recent economic downturn, causing 2010 recorded consumption to be lower than projected. In the mid demand case, forecast consumption grows at a rate similar to what was projected in *CED 2009*.
- The SMUD planning area experienced relatively mild temperatures in 2011 such that the weather-normalized peak load is higher than the recorded peak value. This higher, adjusted value is the basis of the peak forecast.
- Self-generation is expected to reduce peak demand in the SMUD planning area by nearly 40 MW in the mid demand case by 2022, most of which is due to photovoltaic systems.

- Electric vehicles are expected to increase electricity consumption by nearly 100 GWh in the mid demand case by 2022.

Los Angeles Department of Water and Power

Chapter 5 describes the Los Angeles Department of Water and Power (LADWP) planning area and forecast results. Notable features of the LADWP forecast include the following.

- Forecast electricity consumption is lower than *CED 2009* levels due primarily to the recent economic downturn, causing 2010 recorded consumption to be lower than projected. In the mid demand case, electricity consumption grows at a faster rate than what was projected in *CED 2009*.
- Peak demand grows at a higher rate in all three demand scenarios than what was projected in *CED 2009*, due in part to increasing saturation of air conditioning in the residential sector as well as higher projected growth in households and commercial floor space.
- The LADWP planning area experienced relatively mild temperatures in 2011 such that the weather-normalized peak load is higher than the recorded peak value. This higher, adjusted value is the basis of the peak forecast.
- Self-generation is expected to reduce peak demand in the LADWP planning area by roughly 270 MW in the mid demand case, of which about 50 MW is due to photovoltaic systems.
- Electric vehicles are expected to increase electricity consumption by roughly 600 GWh in the mid demand case by 2022.

CHAPTER 1: Pacific Gas and Electric Planning Area

The Pacific Gas and Electric (PG&E) planning area includes:

- PG&E bundled retail customers.
- Customers served by energy service providers (ESPs) using the PG&E distribution system to deliver electricity to end users.
- Customers of publicly owned utilities and irrigation districts in PG&E's transmission system, with the exception of Sacramento Municipal Utility District (SMUD). SMUD is treated as its own planning area, as discussed in a later chapter.

For purposes of this chapter, the PG&E planning area forecast includes other members of the SMUD control area, which are not in the SMUD service area. These entities include Roseville, Redding, and the Western Area Power Administration (WAPA).

To support electricity and transmission system analysis, staff uses historical consumption and load data to develop individual forecasts for all medium and large utilities in the planning area. Those results are presented in Forms 1.5a through 1.5c in the statewide forms accompanying this forecast report. The results in this chapter are for the entire PG&E transmission planning area.

This chapter is organized as follows. First, forecasted consumption and peak loads for the PG&E planning area are discussed; both total and per capita values are presented. The *CED 2011 Final* values are compared to the adopted *CED 2009* forecast, with differences between the two forecasts explained. The forecasted load factor, jointly determined by the consumption and peak load estimates, is also discussed. Second, the chapter presents sector consumption and peak load forecasts. The residential, commercial, industrial, and "other" sector forecasts are compared to those in *CED 2009,* and differences between the two are discussed. Third, the chapter discusses the forecasts of electric vehicles, self-generation, and the impacts of conservation and efficiency programs.

Forecast Results

For this forecast, three demand scenarios were developed. The high demand scenario includes high economic and demographic projections, low energy price projections, and low efficiency impact assumptions. The low demand scenario included low economic and demographic projections, high energy price projections, and high efficiency impact assumptions. Volume 1 provides more detail on the construction of the demand scenarios.

Table 1-1 presents a comparison of *CED 2011 Final* high, mid and low demand scenarios with *CED 2009* for electricity consumption and peak demand for selected years. Comprehensive results are available electronically as a set of forms posted alongside this report (http://www.energy.ca.gov/2012_energypolicy/documents/#no-meeting).

In the PG&E planning area, the *CED 2011 Final* mid demand electricity consumption is 1.7 percent lower than *CED 2009* in 2020. This is primarily a result of the recent economic downturn, causing 2010 recorded consumption to be 1.6 percent lower than was projected in *CED 2009*. The long-term growth rate of the mid demand scenario is nearly identical to that projected in *CED 2009*. The *CED 2011 Final* high demand level is 3.8 percent higher than *CED 2009* in 2020 while the low demand scenario is 4.6 percent lower. Weather-normalized peak demand in 2011 is 6.3 percent lower than predicted in *CED 2009* but grows at a faster rate in the mid and high cases from 2011-2020 due to the projected economic recovery and climate change impacts.

Table 1-1: PG&E Planning Area Forecast Comparison

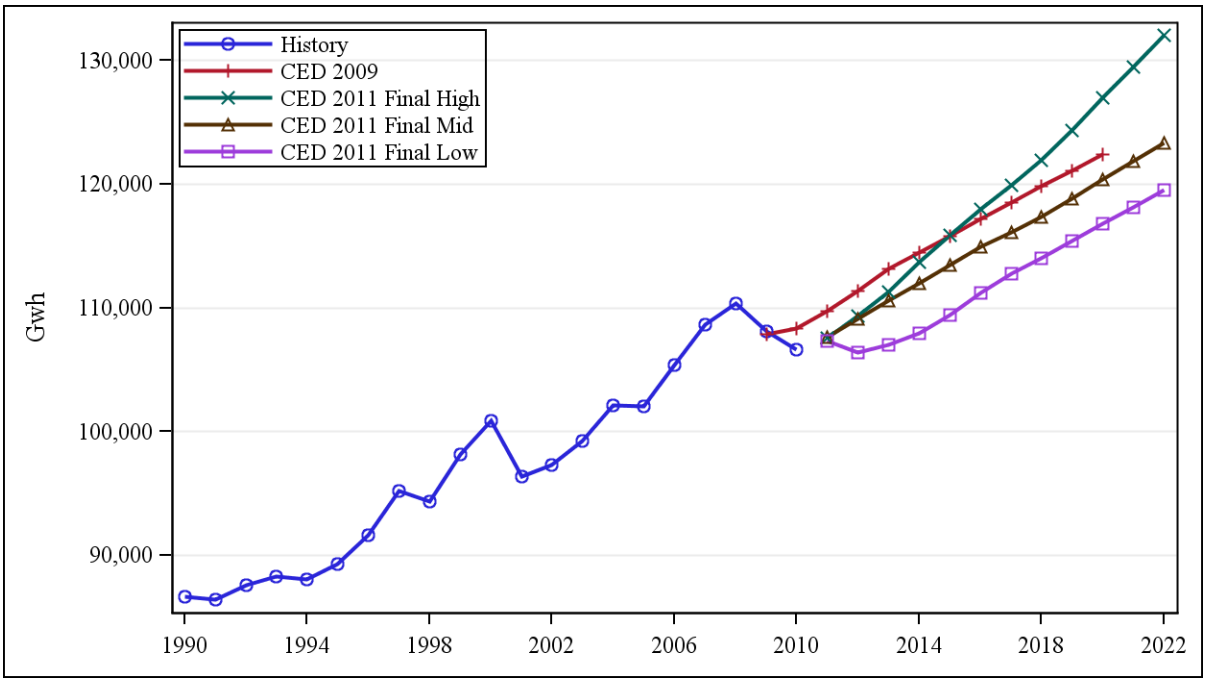
Consumption (GWH)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	86,803	86,597	86,597	86,597
2000	101,333	100,878	100,878	100,878
2010	108,344	106,657	106,657	106,657
2011	109,703	107,526	107,632	107,290
2015	115,828	115,878	113,455	109,407
2020	122,414	127,028	120,372	116,803
2022	--	132,056	123,364	119,526
Average Annual Growth Rates				
1990 - 2000	1.56%	1.54%	1.54%	1.54%
2000 - 2010	0.67%	0.56%	0.56%	0.56%
2011 - 2015	1.37%	1.89%	1.33%	0.49%
2011 - 2020	1.23%	1.87%	1.25%	0.95%
2011 - 2022	--	1.89%	1.25%	0.99%
Peak (MW)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	17,250	17,250	17,250	17,250
2000	20,628	20,628	20,628	20,628
2011	23,810	20,862	20,862	20,862
2011*	23,810	22,303	22,303	22,303
2015	25,163	24,359	24,060	22,854
2020	26,805	26,553	25,620	24,357
2022	--	27,466	26,161	24,724
Average Annual Growth Rates				
1990 - 2000	1.80%	1.80%	1.80%	1.80%
2000 - 2011	1.31%	0.10%	0.10%	0.10%
2011* - 2015	1.39%	2.23%	1.91%	0.61%
2011* - 2020	1.33%	1.96%	1.55%	0.98%
2011* - 2022	--	1.91%	1.46%	0.94%
Historical values are shaded.				
*Weather normalized: *CED 2011 Final* uses a weather-normalized peak value derived from the actual 2011 peak for calculating growth rates during the forecast period.				

Source: California Energy Commission, Demand Analysis Office, 2012

Discrepancies in historical consumption between *CED 2009* and *CED 2011 Final* result from an adjustment made to Quarterly Fuel Energy Report (QFER) filings. After the adjustment, *CED 2011 Final* consumption history more closely resembled the consumption history used as the basis for PG&E's own demand forecast.

As shown in **Figure 1-1**, *CED 2011 Final* electricity consumption forecasts are lower at the beginning of the forecast period than *CED 2009* because of the recent economic downturn, causing a greater-than-anticipated drop in 2010 consumption. The high demand scenario increases to a level above *CED 2009* by 2016. Growth in the mid and low scenarios is similar to *CED 2009*, while growth in the high scenario is significantly faster.

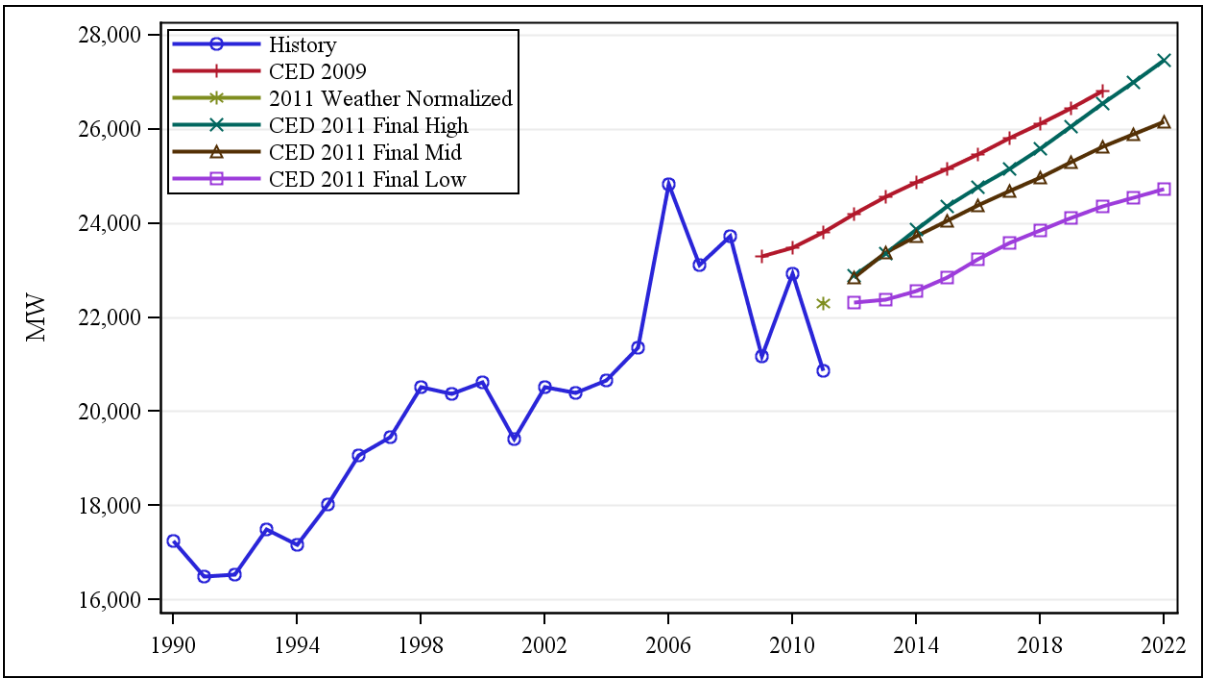
Figure 1-1: PG&E Planning Area Electricity Forecast



Source: California Energy Commission, Demand Analysis Office, 2012

The weather-normalized peak value in 2011 is significantly lower than projected in *CED 2009*. As a result, all three of the *CED 2011 Final* PG&E planning area peak demand forecasts, shown in **Figure 1-2**, are lower than *CED 2009* over the entire forecast period, though the high demand scenario approaches *CED 2009* by 2020. Growth is slightly higher in the peak forecast than in the consumption forecast. This is due in part to efficiency considerations—such as increased lighting efficiency—that have a greater impact on consumption than on peak.

Figure 1-2: PG&E Planning Area Peak

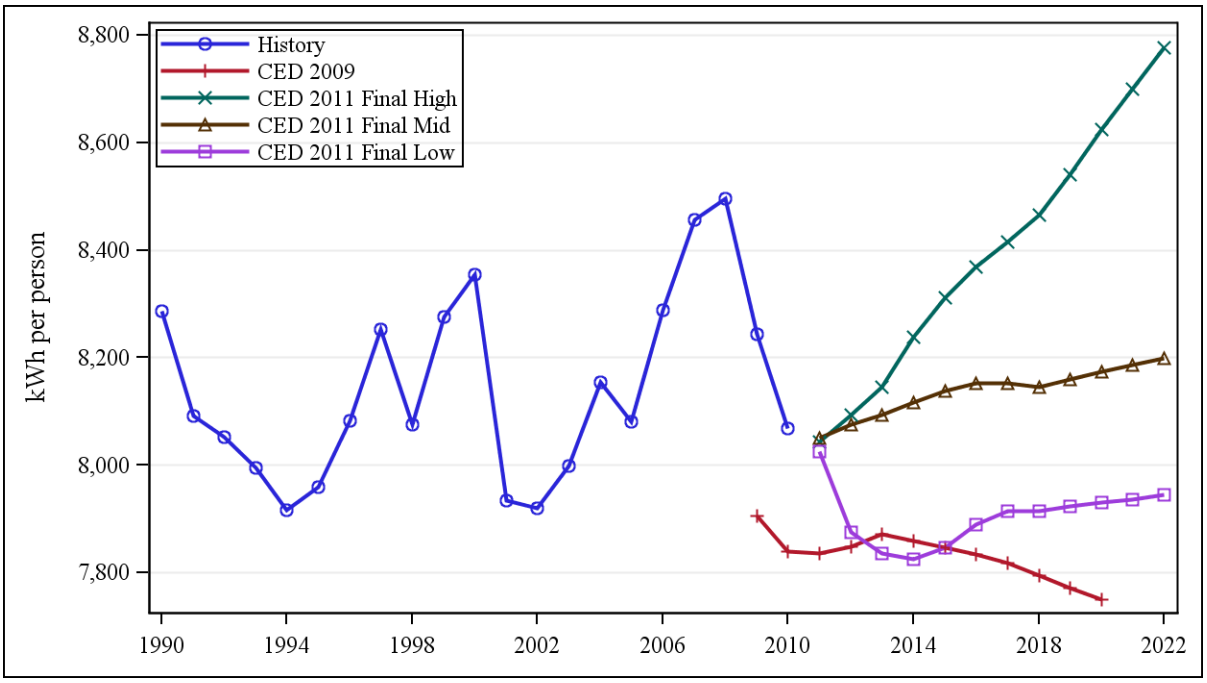


Source: California Energy Commission, Demand Analysis Office, 2012

PG&E's projected peaks were adjusted downward slightly to reflect staff estimates of future non-event-based demand response program impacts. The adjustments were calculated as the impacts from permanent load shifting and time-of-use programs incremental to 2011 impacts, and reach around 50 MW in 2022. See Volume I, Chapter 1 for more details.

As **Figure 1-3** shows, per capita electricity consumption is higher in the *CED 2011 Final* mid and high demand scenarios throughout the forecast period compared to *CED 2009*. For the low demand scenario, per capita consumption declines in the early period and then increases to the level of the previous forecast by the end of the period. Per capita consumption is higher in recent history compared to *CED 2009* because of inclusion of the 2010 Census estimates of population, lower than the California Department of Finance estimates used in *CED 2009*. *CED 2011 Final* projections remain below levels witnessed in recent history in the mid and low demand cases, although they increase slightly toward the end of the forecast period due to growing electric vehicle use.

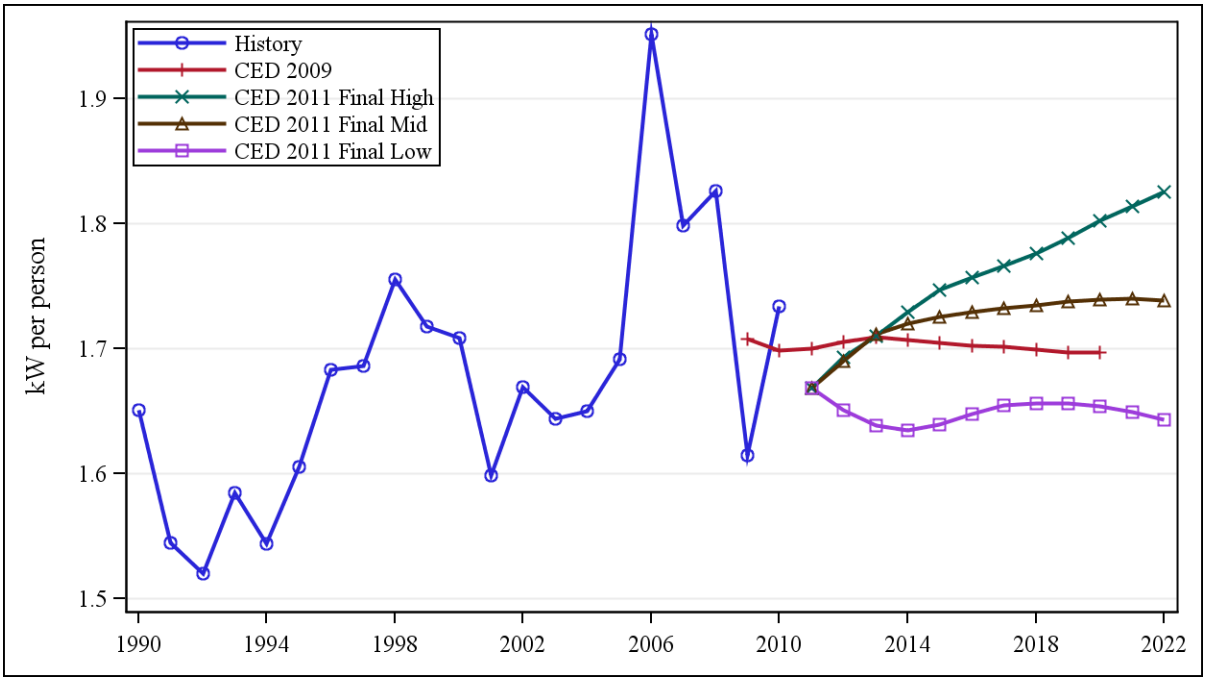
Figure 1-3: PG&E Planning Area Per Capita Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-4 shows per capita peak demand. *CED 2011 Final* per capita peak scenarios follow the same pattern as the per capita consumption scenarios. The per capita peak values are projected to remain in the range of recent historical levels for the mid and low demand scenarios. The high demand scenario approaches historically high levels toward the end of the forecast period.

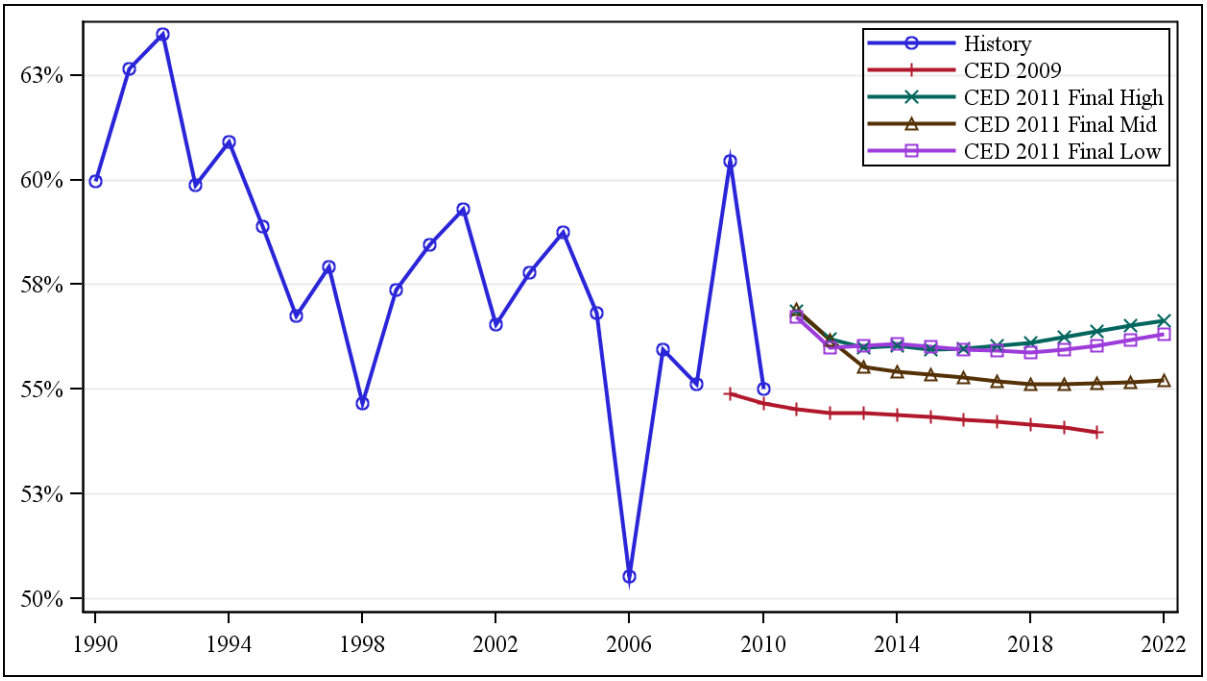
Figure 1-4: PG&E Planning Area per Capita Peak Demand



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-5 compares forecasted load factors. The load factor is a measure of the increase in peak demand relative to annual electricity consumption. Lower load factors indicate "a needle peak"; higher load factors indicate a more stable load. Historical data show a long-term downward trend as consumption shifted away from the industrial sector toward residential and commercial use. Further, more population and economic growth in the PG&E planning area has been taking place in hotter inland areas, leading to greater saturation of central air conditioning. In addition, recent years have seen a greater use of air conditioning equipment in the cooler Bay Area on warm days. *CED 2011 Final* projected load factors are relatively constant over the forecast period and slightly higher than the *CED 2009* forecast.

Figure 1-5: PG&E Planning Area Load Factors



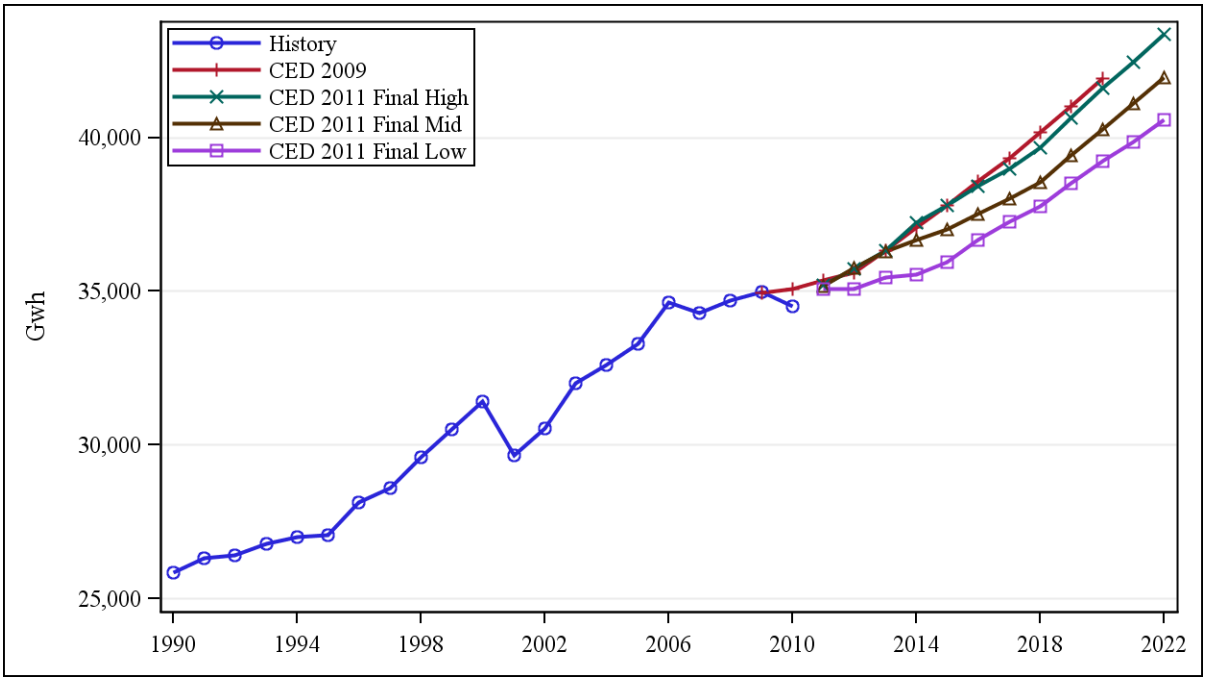
Source: California Energy Commission, Demand Analysis Office, 2012

Sector Level Results and Input Assumptions

Residential Sector

Figure 1-6 compares *CED 2011 Final* and *CED 2009* PG&E planning area residential forecasts. All three *CED 2011 Final* forecast scenarios are lower at the end of the forecast period, mainly due to lower number-of-household projections.

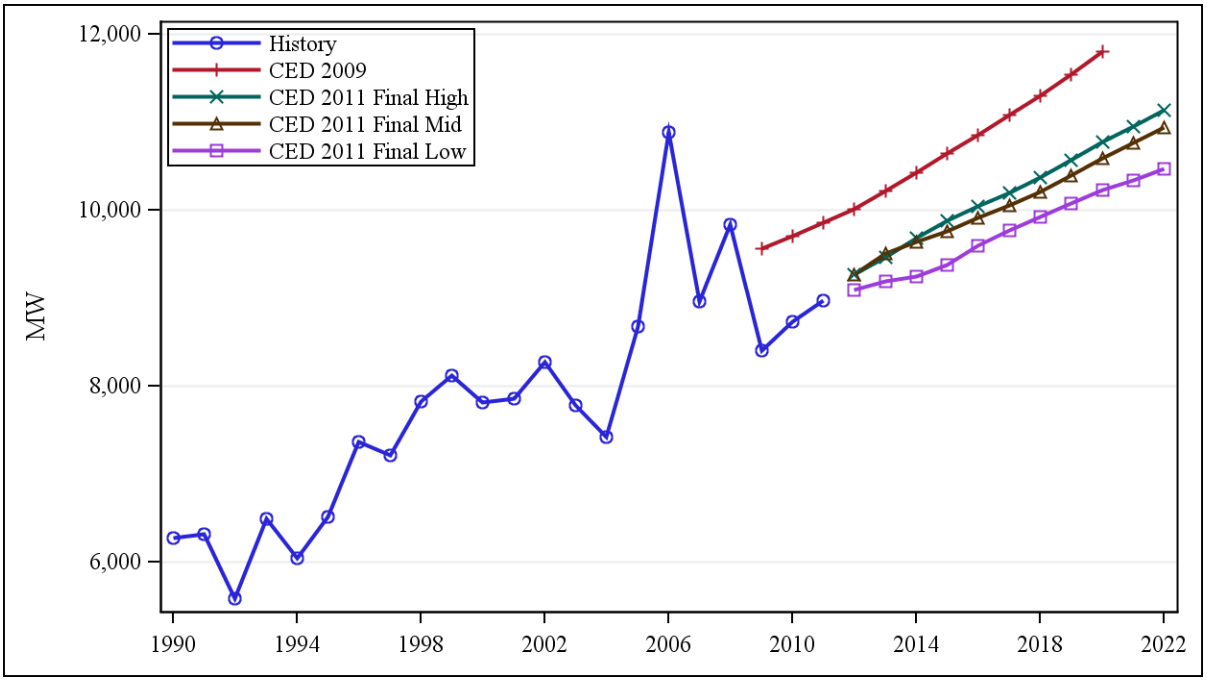
Figure 1-6: PG&E Planning Area Residential Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-7 compares *CED 2011 Final* and *CED 2009* residential peak demand forecasts. The *CED 2011 Final* residential peak forecasts are lower than the *CED 2009* forecast due to a lower estimated residential actual peak in 2011. The differences between peak forecasts follow a similar pattern to differences in the consumption forecasts since the peak forecasts are driven primarily by electricity consumption.

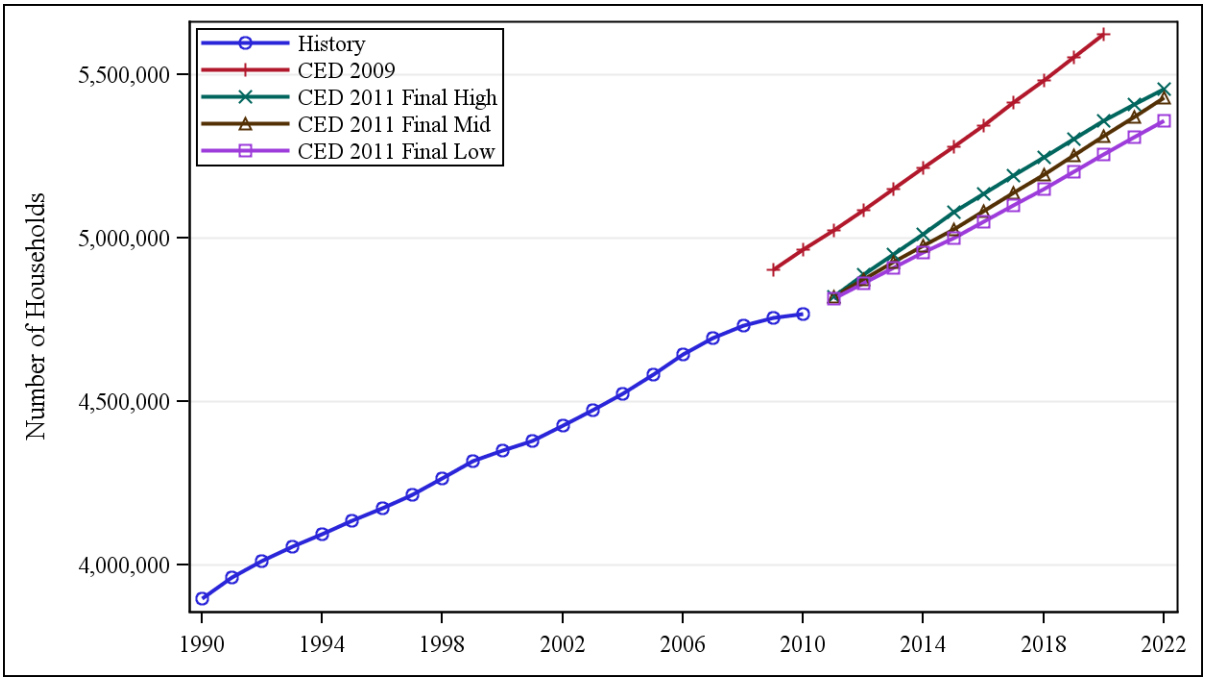
Figure 1-7: PG&E Planning Area Residential Peak



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-8, **Figure 1-9**, and **Figure 1-10** compare residential drivers used in *CED 2011 Final* with those used for *CED 2009*. **Figure 1-8** shows total households. The *CED 2011 Final* mid and low demand scenarios are lower than the previous forecast because of lower population and number-of-household values estimated by the 2010 U.S. Census. The *CED 2011 Final* forecast includes the most recent updated county population estimates from the California Department of Finance, which incorporates information from the 2010 U.S. Census.

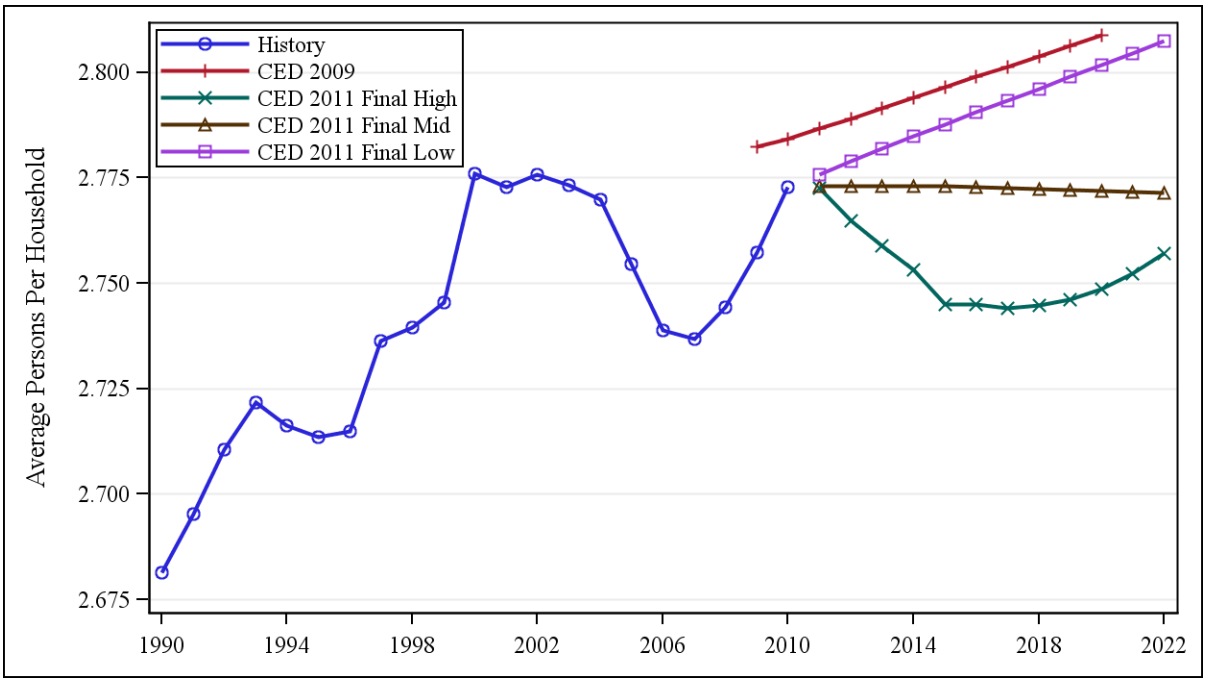
Figure 1-8: PG&E Planning Area Residential Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

The household scenarios are based on persons-per-household changes, shown in **Figure 1-9**. The high demand scenario uses a lower persons-per-household projection (more households) and the low demand scenario uses a higher persons-per-household projection (fewer households). See Volume 1 for a discussion of assumptions driving these projections. The mid demand scenario uses a relatively constant projection for persons per household. All three scenarios use the same population forecast.

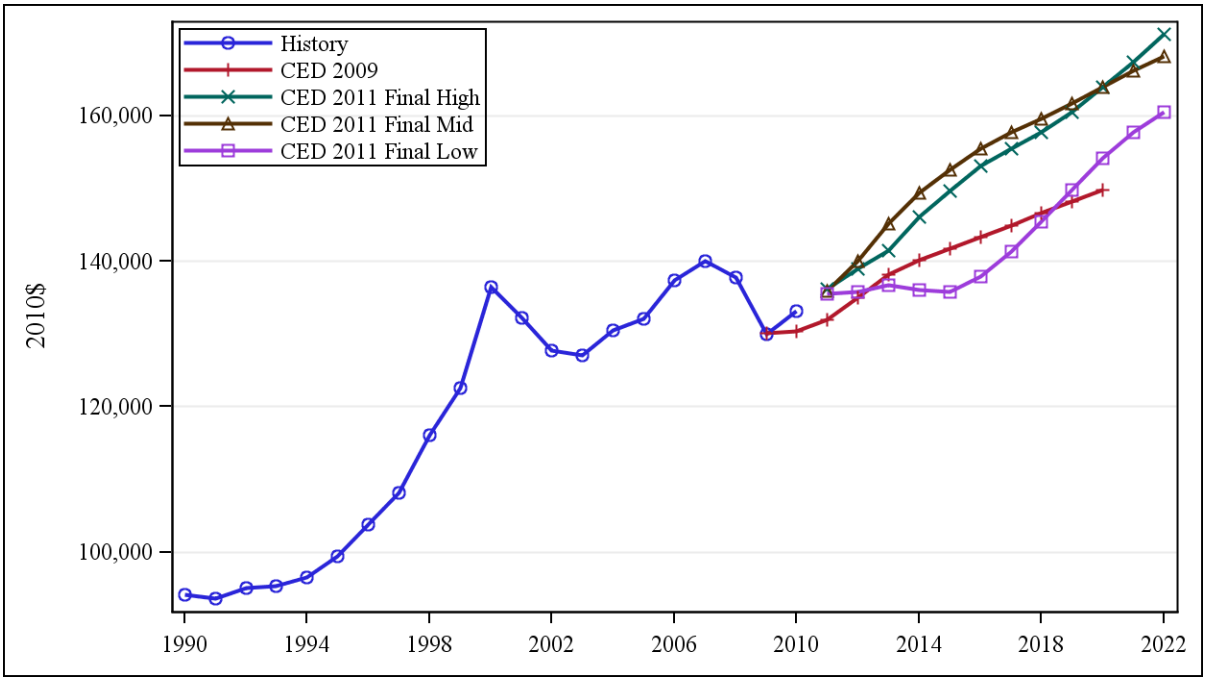
Figure 1-9: PG&E Planning Area Persons per Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-10 compares average household income (per capita income multiplied by persons per household) in the two forecasts. In all three scenarios, *CED 2011 Final* estimates of household income are higher and grow faster at the end of the forecast period than *CED 2009*. This is caused by higher growth projections for personal income than were used in the previous forecast. The difference between scenarios is a function of the variation in per capita income and persons per household used to define the scenarios.

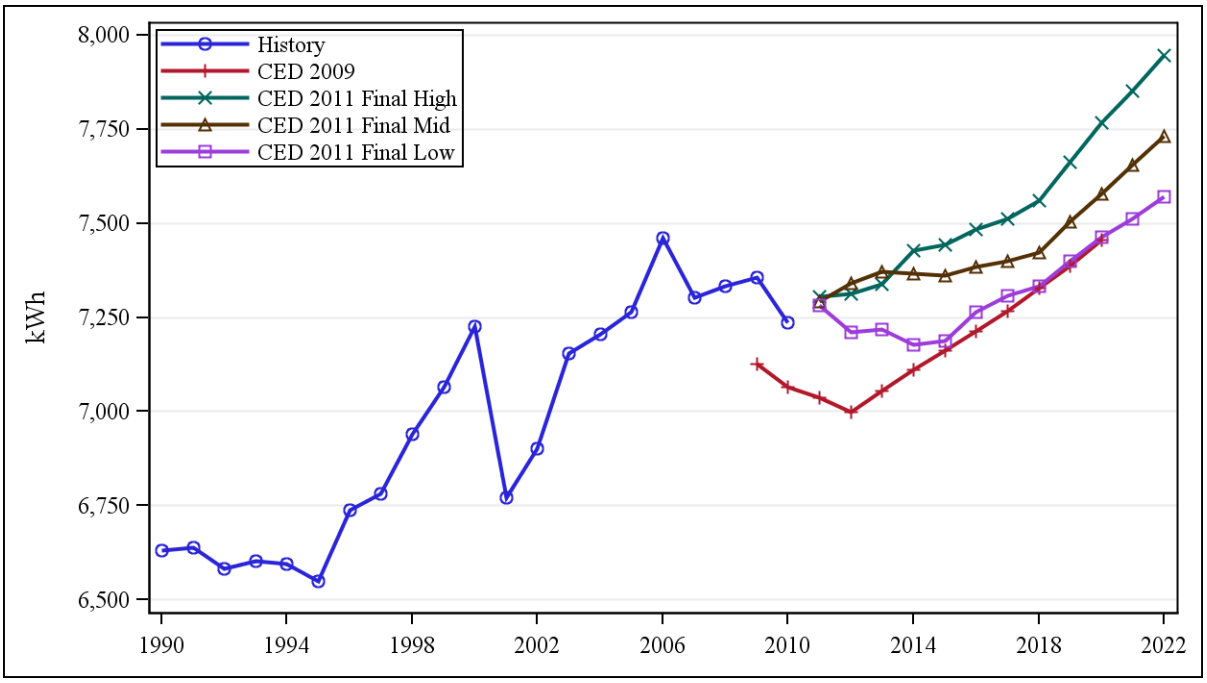
Figure 1-10: PG&E Planning Area Average Household Income Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-11 gives a comparison of annual electricity consumption per household. *CED 2011 Final* growth rates are similar to *CED 2009* beyond 2015, though higher throughout the forecast period. This is caused by differences in the underlying economic and demographic assumptions. Most of the growth in use per household after 2015 is caused by increased numbers of electric vehicles in the residential sector. In the mid demand case, this adds roughly 290 kilowatt hours (kWh) per household to the residential total by 2022 in the PG&E planning area. Without the inclusion of electric vehicle charging, residential use would remain relatively constant over the forecast period after the economic recovery.

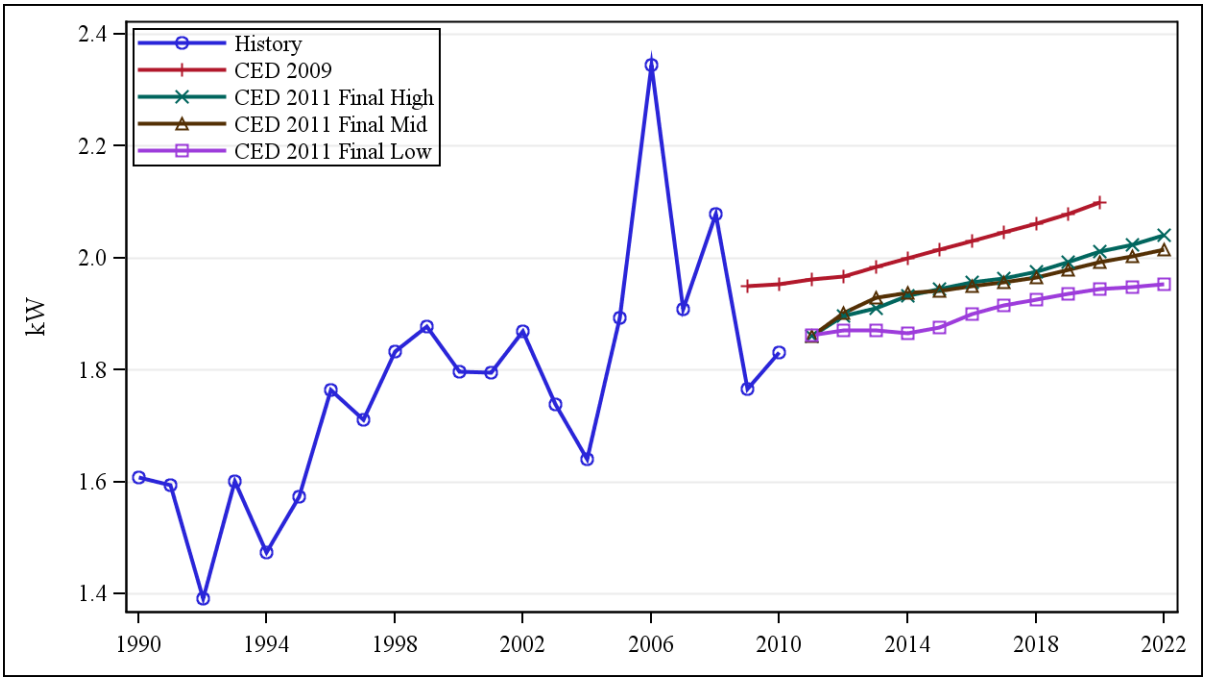
Figure 1-11: PG&E Planning Area Consumption per Household



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-12 shows forecasts of peak use per household. The *CED 2011 Final* projections grow modestly over the forecast period in a pattern similar to but at slightly lower levels than the *CED 2009* forecast. The decrease in level is caused by lower recent historical estimates of residential peak. When compared to consumption per household, the forecast of peak per household shows relatively little impact from electric vehicle adoption. This is due to the assumption that personal electric vehicles will be charged primarily during off-peak hours.

Figure 1-12: PG&E Planning Area Peak Use per Household

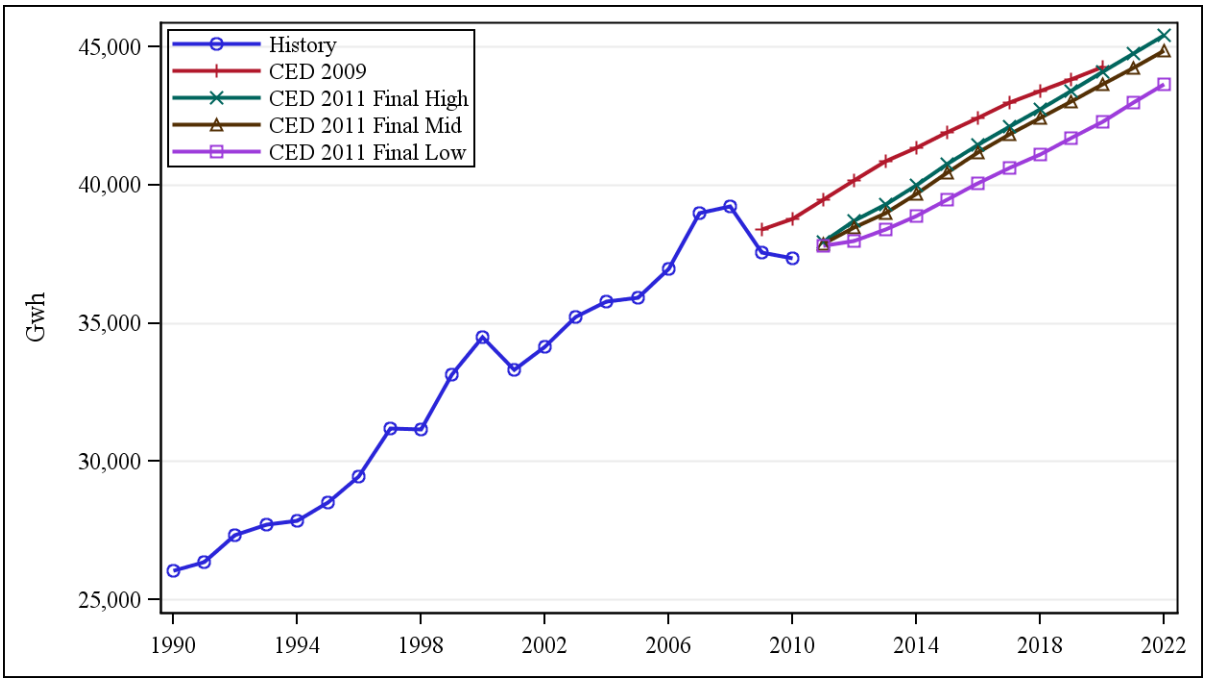


Source: California Energy Commission, Demand Analysis Office, 2012

Commercial Sector

Figure 1-13 compares the commercial sector forecasts. The *CED 2011 Final* demand scenarios are lower than *CED 2009* throughout the forecast period. The differences are primarily caused by a lower starting point due to lower estimates of recent historical commercial consumption. The growth rate of commercial consumption is slightly higher in the mid and high demand cases than in *CED 2009* because of faster growth in projected floor space.

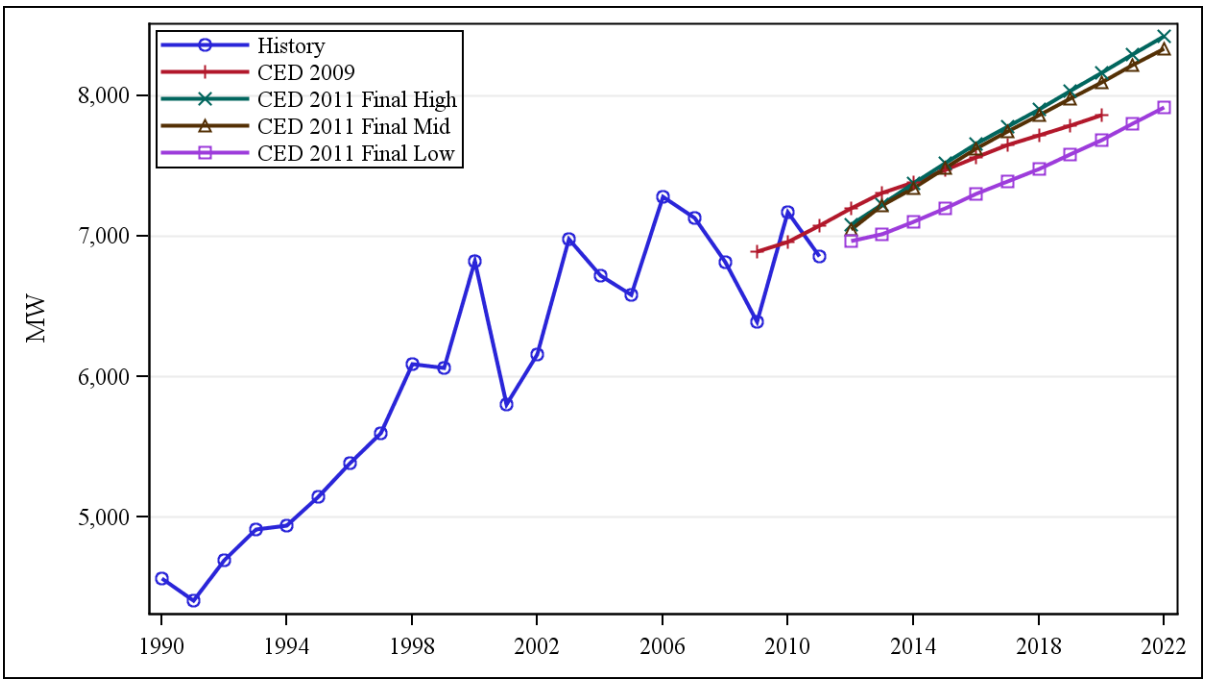
Figure 1-13: PG&E Planning Area Commercial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-14 compares the commercial peak demand forecasts. Growth in both forecasts is driven by the underlying electricity consumption forecast, which exhibits a similar pattern. The *CED 2011 Final* mid and high demand scenarios produce a higher peak forecast due to faster growth in projected floor space.

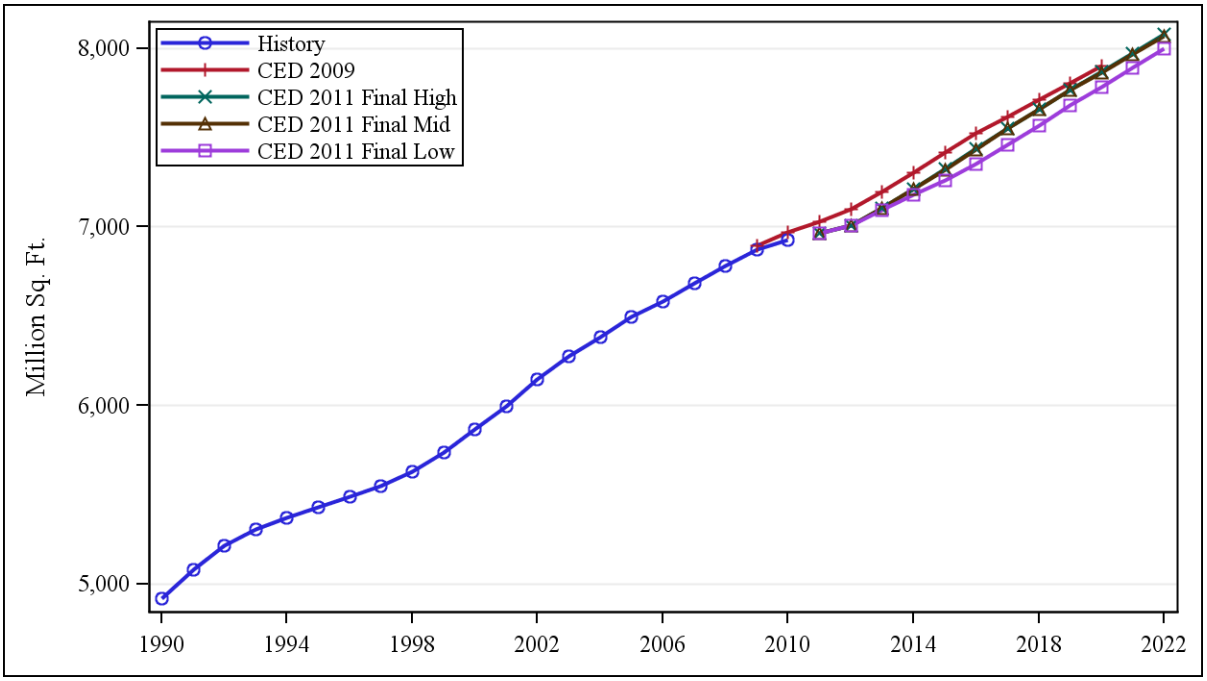
Figure 1-14: PG&E Planning Area Commercial Sector Peak



Source: California Energy Commission, Demand Analysis Office, 2012

In staff's commercial building sector forecasting model, floor space by building type (such as retail, offices, and schools) is the key driver. **Figure 1-15** compares total commercial floor space projections. *CED 2011 Final* floor space projections are somewhat lower over the forecast period than those used in the previous forecast due to a lower starting point. However, the growth rate in each of the three *CED 2011 Final* scenarios is slightly higher than in *CED 2009*.

Figure 1-15: PG&E Planning Area Commercial Floor Space

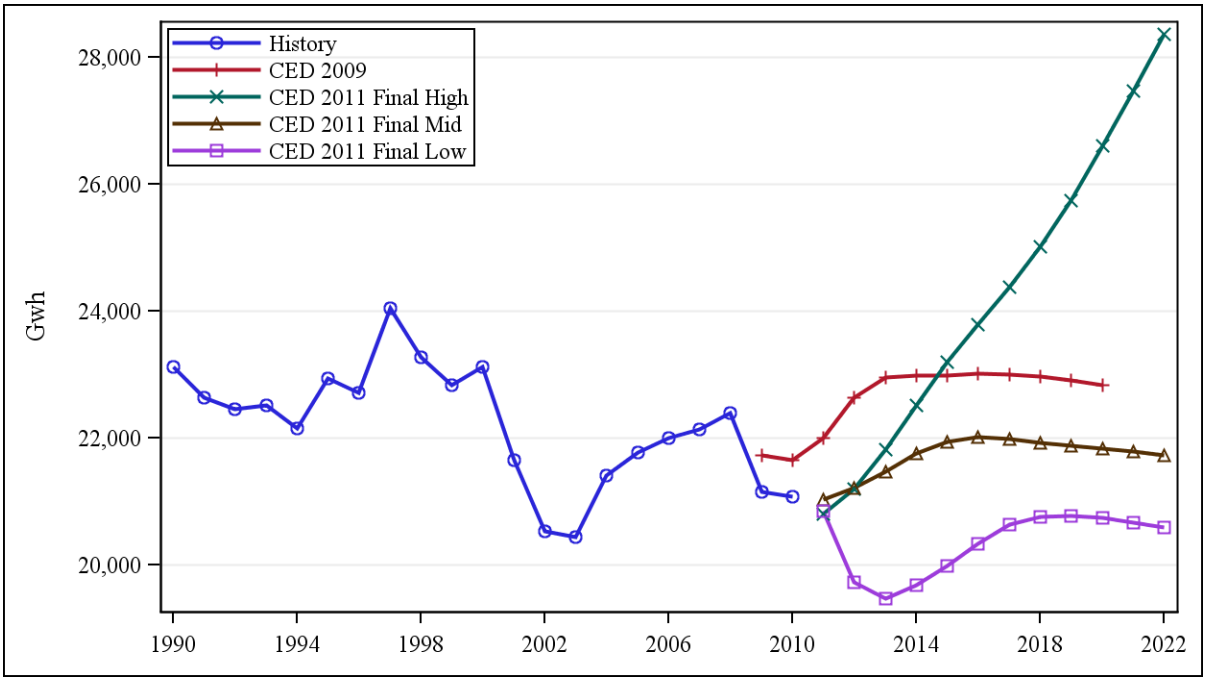


Source: California Energy Commission, Demand Analysis Office, 2012

Industrial Sector

Figure 1-16 compares the PG&E planning area industrial sector electricity consumption forecasts. *CED 2011 Final* industrial consumption forecasts are all lower than the *CED 2009* forecast in the short term. However, projected growth in the high demand case is higher in the longer term than was projected in the *CED 2009* forecast due to more optimistic economic projections. The mid demand scenario follows the same growth pattern as the *CED 2009* forecast but starts from a lower historical starting point. The differences in demand scenarios are mainly driven by differences in economic output.

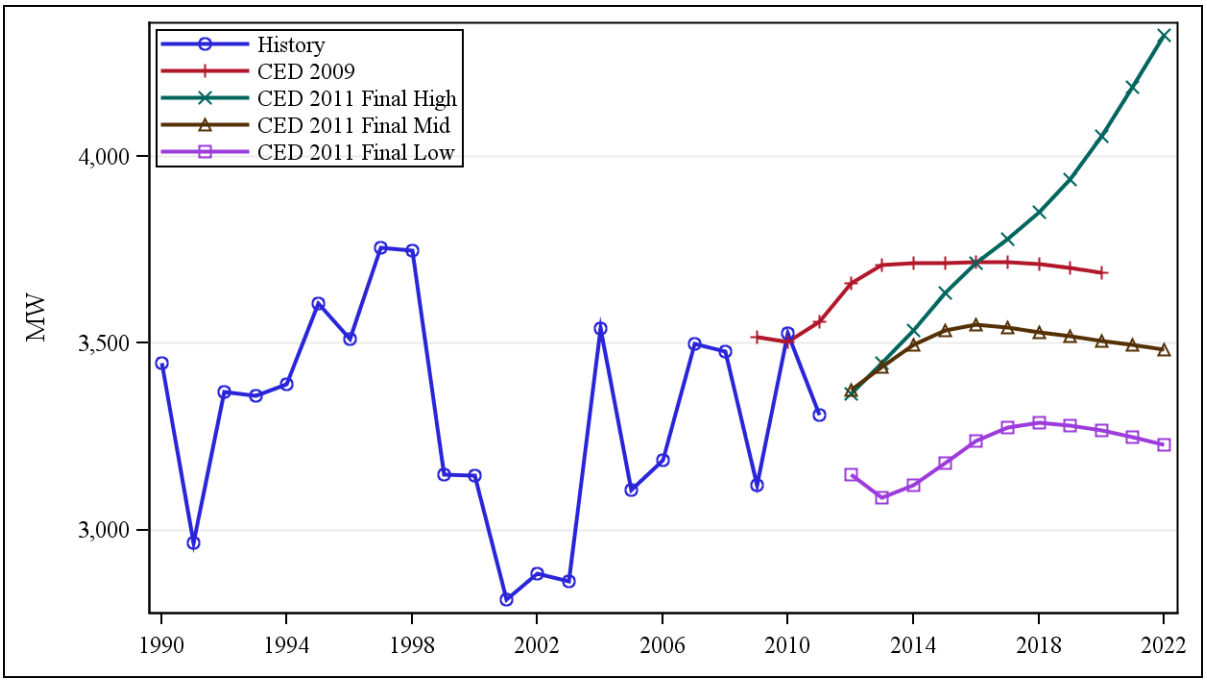
Figure 1-16: PG&E Planning Area Industrial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-17 compares the industrial sector peak forecasts. The *CED 2011 Final* industrial peak forecasts follow the same pattern as the consumption forecasts.

Figure 1-17: PG&E Planning Area Industrial Sector Peak

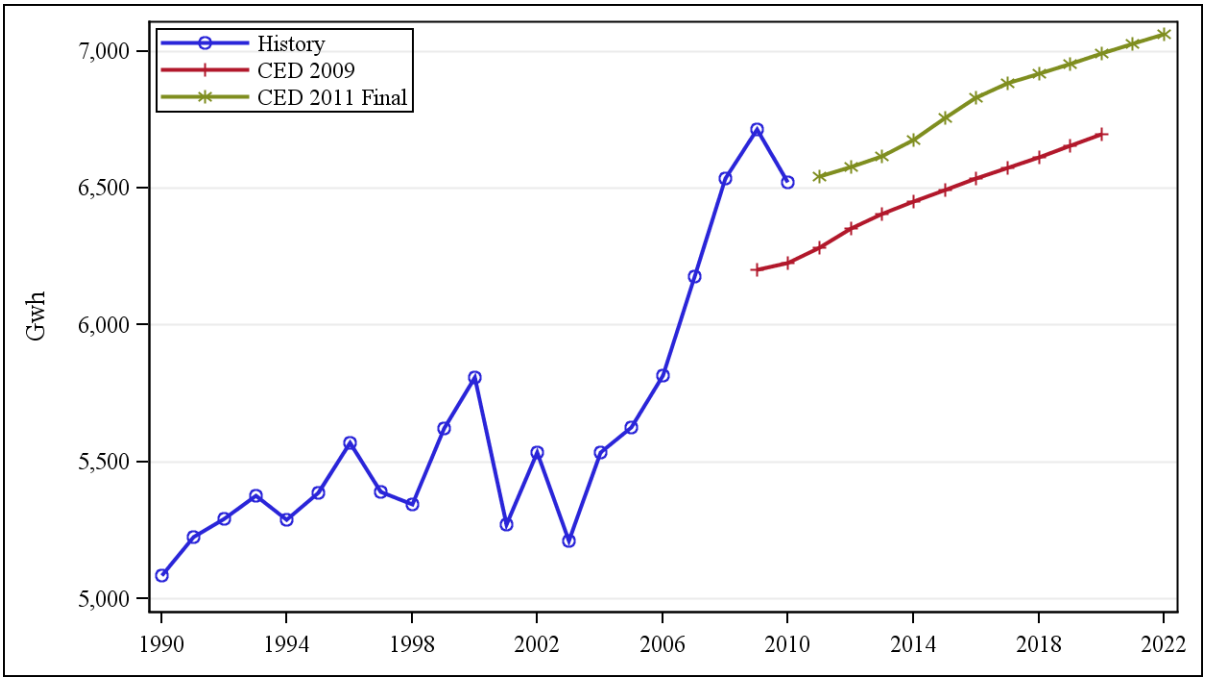


Source: California Energy Commission, Demand Analysis Office, 2012

Other Sectors

Figure 1-18 compares the electricity consumption forecasts for the Transportation, Communications, and Utilities (TCU) sector, which includes street lighting. In this case, a single scenario was run.[1] *CED 2011 Final* is higher than *CED 2009,* given the higher starting point, a result of assigning previously unclassified consumption to this sector based on recent QFER filings.

Figure 1-18: PG&E Planning Area Transportation, Communication, Utilities, and Street Lighting Sector Electricity Forecasts

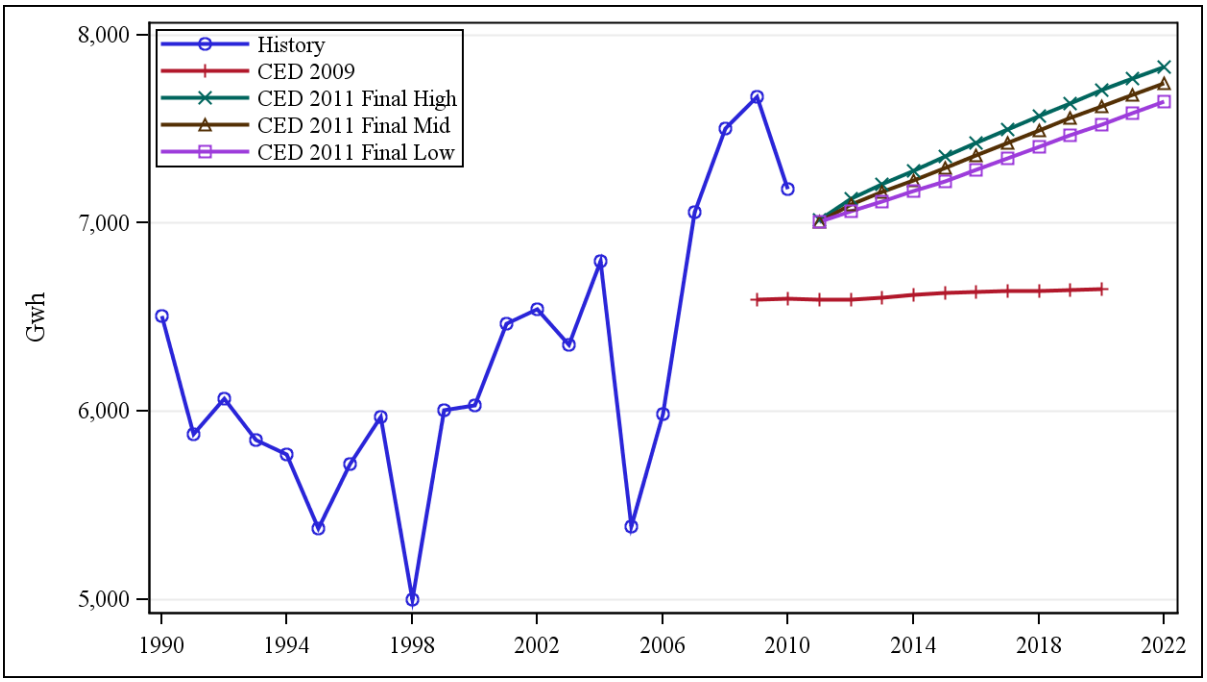


Source: California Energy Commission, Demand Analysis Office, 2012

1 Growth in TCU consumption depends mainly on population, for which there is only one scenario.

Figure 1-19 compares the electricity consumption forecasts for the agriculture and water pumping sectors. The *CED 2011 Final* agriculture and water pumping forecasts are higher than *CED 2009* because of a higher starting point. All three demand scenarios are projected to grow slightly over time rather than remain flat as projected in the *CED 2009* forecast. This is caused by a projected increase in ground-water pumping. The small difference in consumption between the *CED 2011 Final* demand scenarios is a result of differing rate and number-of-household projections.

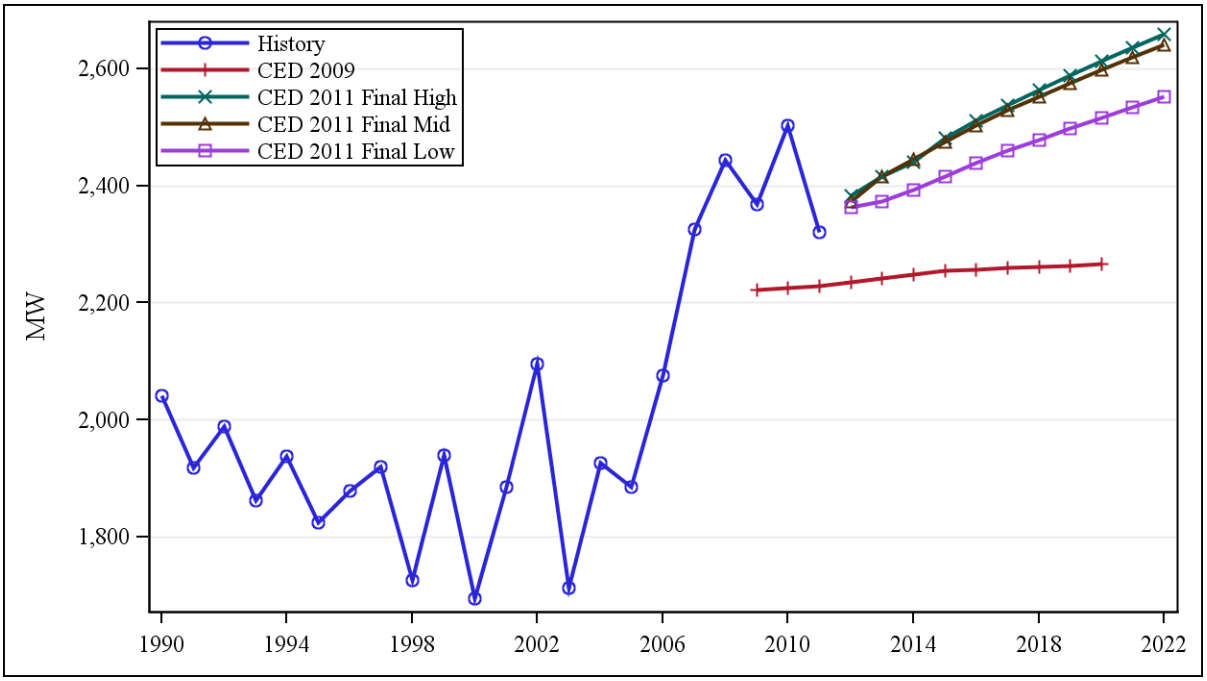
Figure 1-19: PG&E Planning Area Agriculture and Water Pumping Sector Electricity Forecasts



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-20 compares projected combined peak for the transportation, communication, utilities, street lighting, agriculture, and water pumping sectors. *CED 2011 Final* is higher over the entire forecast period in all three scenarios compared to *CED 2009* because of a higher starting point. *CED 2011 Final* growth rates are also higher than that of the *CED 2009* forecast due to higher projected water pumping loads.

Figure 1-20: PG&E Planning Area Other Sector Peak

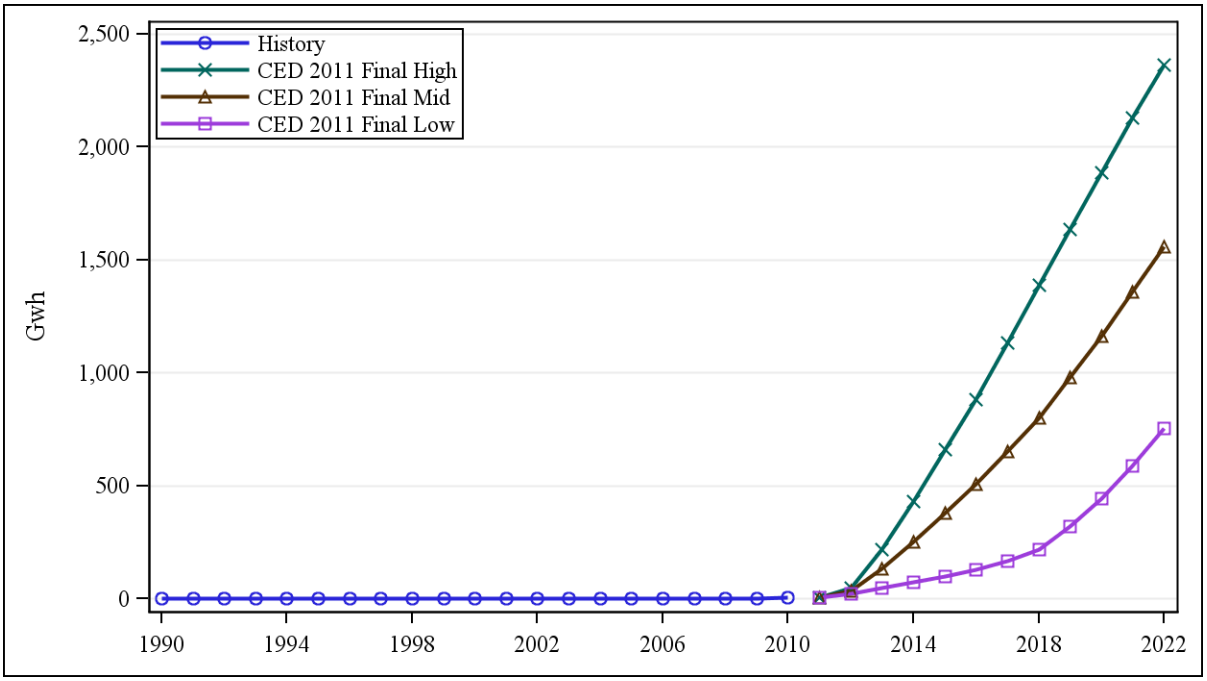


Source: California Energy Commission, Demand Analysis Office, 2012

Electric Vehicles

The consumption of electric vehicles in 2010 is estimated to be around 4 GWh for the PG&E planning area and is expected to rise to more than 500 GWh by 2016. By the end of the forecast period, consumption by electric vehicles is projected to reach more than 750 GWh in the low demand scenario and nearly 2,400 GWh in the high demand scenario. Staff assumed most recharging would occur during off-peak hours, so peak impacts are projected to be relatively small—just 32 MW in the low case and 100 MW in the high case. **Figure 1-21** presents the PG&E planning area electric vehicle consumption forecast for each of the demand scenarios.

Figure 1-21: PG&E Electricity Consumption of Electric Vehicles



Source: California Energy Commission, Demand Analysis Office, 2012

Self-Generation

The peak demand forecast is reduced by the projected impacts of distributed photovoltaic (PV), solar thermal, and combined heat and power systems, including the effects of Self-Generation Incentive Program (SGIP), California Solar Initiative (CSI), and other programs, as discussed in Volume 1, Chapter 1. The effects of these programs are forecast based on recent trends in installations and a residential predictive model. **Table 1-2** shows the forecast of peak impacts from PV and non-PV self-generation. Only residential PV impacts varied in the demand scenarios, based on differences in households and energy rates. Staff projects between 584 and 707 MW of peak reduction from PV systems by 2022. Peak reductions are based on installed PV system capacities ranging from 1,173 MW by 2022 in the high demand case to 1,400 MW by 2022 in the low demand case.

Table 1-2: PG&E Planning Area Self Generation Peak Impacts (MW)

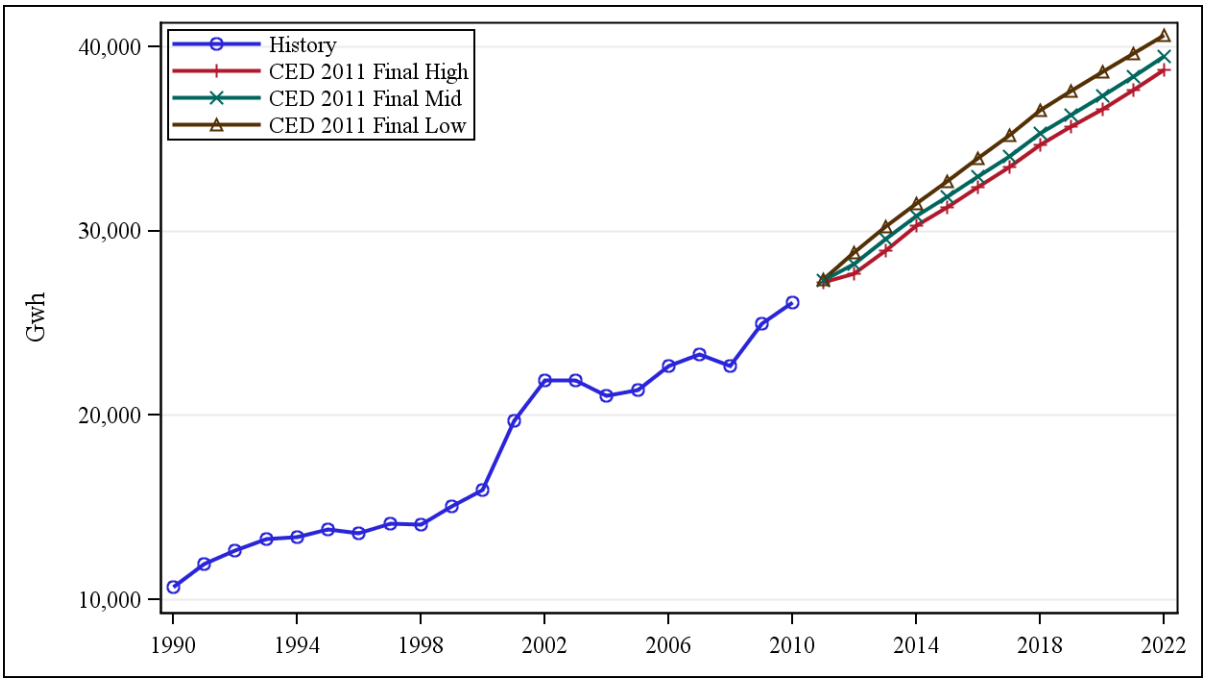
	1990	2000	2010	2015	2020	2022
Non-Photovoltaic Self-Generation	597.68	671.23	819.81	846.13	855.63	868.19
Photovoltaic, Low Demand	0.00	0.43	212.76	447.21	583.53	706.62
Photovoltaic, Mid Demand	0.00	0.43	212.76	426.05	527.44	626.15
Photovoltaic, High Demand	0.00	0.43	212.76	416.20	502.05	584.45
Total Self-Generation, Low Demand	597.68	671.67	1032.57	1293.34	1439.17	1574.81
Total Self-Generation, Mid Demand	597.68	671.67	1032.57	1272.19	1383.08	1494.34
Total Self-Generation, High Demand	597.68	671.67	1032.57	1262.33	1357.69	1452.64

Source: California Energy Commission, Demand Analysis Office, 2012

Conservation/Efficiency Impacts

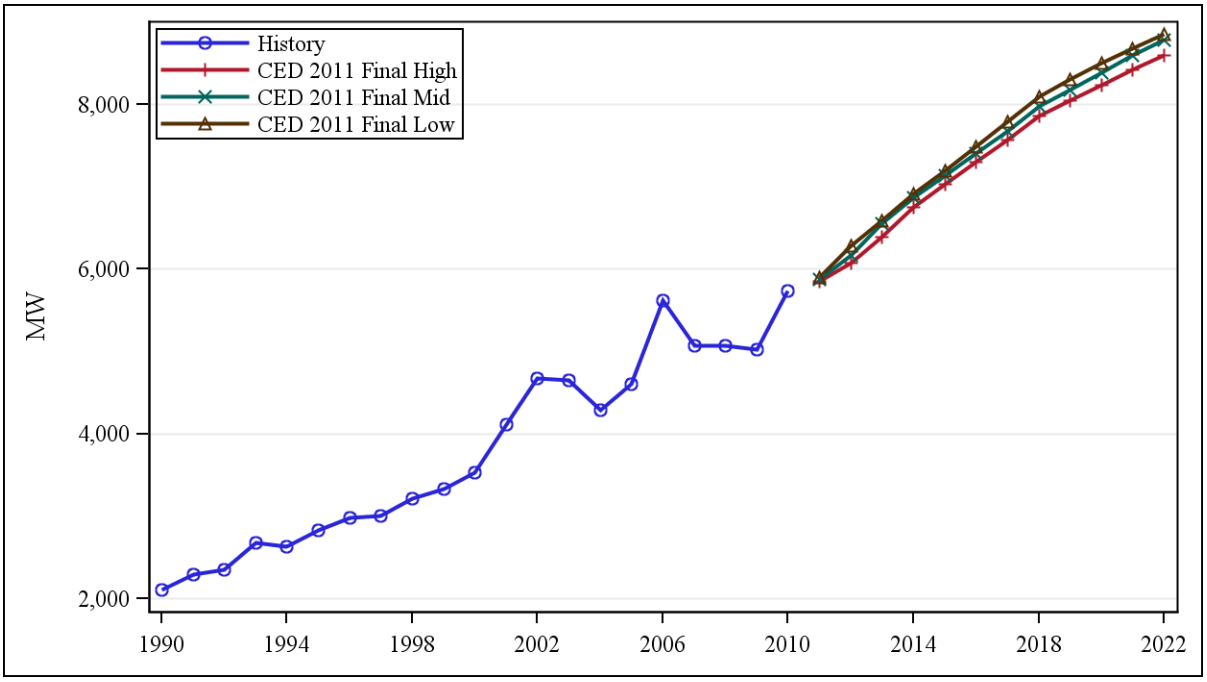
Staff has spent a great deal of time refining methods to account for energy efficiency and conservation impacts while preparing recent forecasts. **Figure 1-22** and **Figure 1-23** show committed electricity consumption and peak efficiency savings estimates from all sources, including building and appliance standards; utility programs implemented before 2013; and price and other effects, or savings associated with rate changes and certain market trends not directly related to programs or standards. Projected savings impacts are highest in the low demand scenario, since price and program effects are inversely related to the demand outcome. Peak results show less difference among the scenarios, since residential consumption savings totals are very similar and the residential sector has a disproportionately large effect on peak demand.

Figure 1-22: PG&E Planning Area Electricity Consumption Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 1-23: PG&E Planning Area Electricity Peak Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

Table 1-3 presents estimated savings for building and appliance standards in the mid demand case for selected years. Total standards impacts are higher in the high demand case by 1.5-2.0 percent due to higher home and commercial floor space construction and 1.5-2.0 percent lower in the low demand case. The standards savings estimates include the 2010 revision to Title 24 building standards as well as Assembly Bill 1109 (Huffman, Chapter 534, Statutes of 2007) lighting savings and television standard savings. Savings are measured against a baseline before 1975, so they incorporate more than 30 years of impacts. Volume 1, Chapter 3 provides more detail on staff work related to energy efficiency and conservation.

Table 1-3: PG&E Planning Area Standards Savings Estimates

Electricity Consumption Savings (GWH)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	1,101	813	1,914	421	235	655	2,569
2000	2,633	2,902	5,536	958	703	1,662	7,197
2010	2,953	6,219	9,172	1,730	1,182	2,912	12,084
2015	3,289	9,249	12,538	2,407	1,663	4,070	16,609
2020	3,689	11,582	15,271	3,212	2,385	5,597	20,868
2022	3,825	12,120	15,945	3,527	2,508	6,035	21,980
Electricity Peak Demand Savings (MW)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	267	197	464	74	41	115	579
2000	653	720	1,373	189	139	328	1,701
2010	747	1,573	2,319	332	227	559	2,878
2015	874	2,458	3,332	446	308	754	4,086
2020	980	3,076	4,056	597	443	1,040	5,096
2022	999	3,165	4,164	656	467	1,123	5,287

Source: California Energy Commission, Demand Analysis Office, 2012

CHAPTER 2: Southern California Edison Planning Area

The Southern California Edison (SCE) planning area includes

- SCE bundled retail customers.
- Customers served by energy service providers (ESPs) using the SCE distribution system to deliver electricity to end users.
- Customers of the various Southern California municipal and irrigation district utilities with the exception of Imperial Irrigation District and the cities of Los Angeles, Pasadena, Glendale, and Burbank. Also excluded from the SCE planning area are San Diego County and the southern portion of Orange County, served by SDG&E.

This chapter is organized as follows. First, forecasted consumption and peak loads for the SCE planning area are discussed; both total and per capita values are presented. The *CED 2011 Final* values are compared to the adopted *CED 2009* forecast, with differences between the two forecasts explained. The forecasted load factor, jointly determined by the consumption and peak load estimates, is also discussed. Second, the chapter presents sector consumption and peak load forecasts. The residential, commercial, industrial, and "other" sector forecasts are compared to those in *CED 2009,* and differences between the two are discussed. Third, the chapter discusses the forecasts of electric vehicles, self-generation, and the impacts of conservation and efficiency programs.

Forecast Results

Table 2-1 presents a comparison of *CED 2011 Final* high, mid and low demand scenarios with *CED 2009* for electricity consumption and peak demand for selected years. Comprehensive results are available electronically as a set of forms posted alongside this report (http://www.energy.ca.gov/2012_energypolicy/documents/#no-meeting).

CED 2011 Final mid demand electricity consumption is 2.7 percent lower than *CED 2009* in 2020. This is primarily a result of the recent economic downturn, causing 2010 recorded consumption to be 2.5 percent lower than was projected in *CED 2009*. The long-term growth rate of the mid demand scenario is only slightly lower than was projected in the *CED 2009* forecast. The *CED 2011 Final* high demand level is similar to *CED 2009* in 2020 while the low demand scenario is 5.4 percent lower.

Discrepancies in historical consumption between *CED 2009* and *CED 2011 Final* result from an adjustment made to QFER filings. After the adjustment, *CED 2011 Final* consumption history more closely resembled the consumption history used as the basis for SCE's own demand forecast.

Table 2-1: SCE Planning Area Forecast Comparison

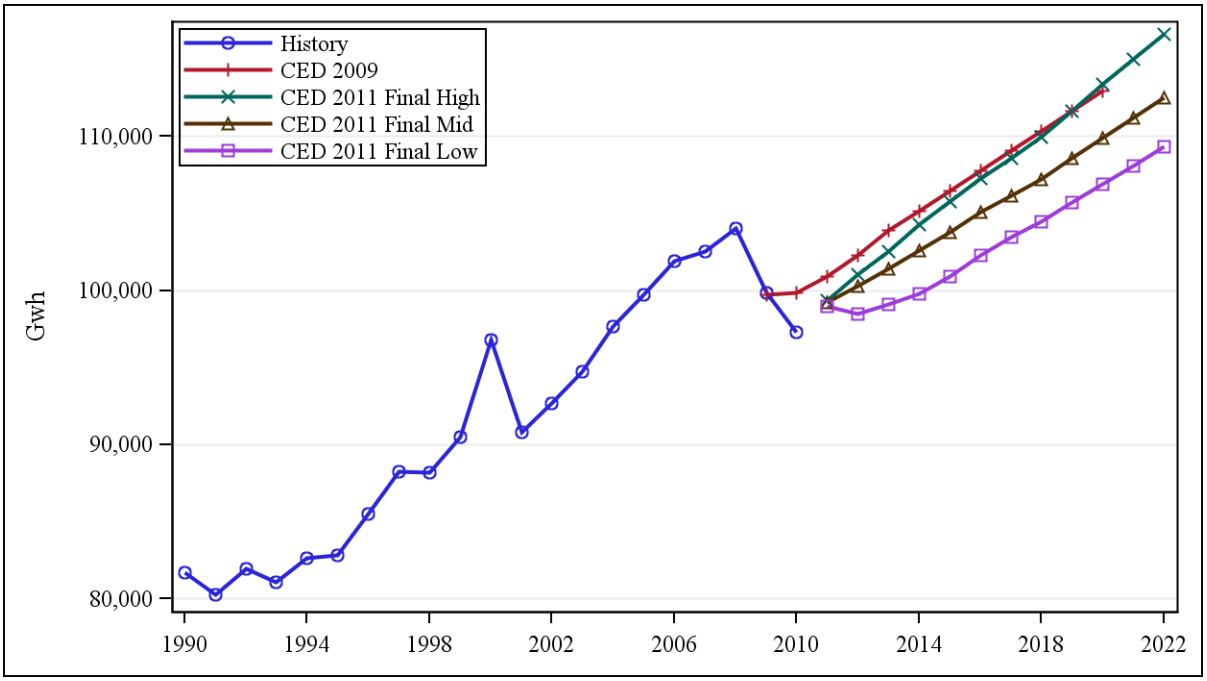
Consumption (GWH)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	82,069	81,671	81,671	81,671
2000	99,148	96,811	96,811	96,811
2010	99,875	97,290	97,290	97,290
2011	100,907	99,366	99,224	98,979
2015	106,460	105,809	103,791	100,884
2020	112,964	113,420	109,888	106,905
2022	--	116,637	112,535	109,350
Average Annual Growth Rates				
1990 - 2000	1.91%	1.72%	1.72%	1.72%
2000 - 2010	0.07%	0.05%	0.05%	0.05%
2011 - 2015	1.35%	1.58%	1.13%	0.48%
2011 - 2020	1.26%	1.48%	1.14%	0.86%
2011 - 2022	--	1.47%	1.15%	0.91%
Peak (MW)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	17,647	17,647	17,647	17,647
2000	19,506	19,506	19,506	19,506
2011	23,181	21,925	21,925	21,925
2011*	23,181	21,780	21,780	21,780
2015	24,543	23,875	23,484	22,292
2020	26,267	25,907	25,054	23,721
2022	--	26,739	25,591	24,056
Average Annual Growth Rates				
1990 - 2000	1.01%	1.01%	1.01%	1.01%
2000 - 2011	1.58%	1.07%	1.07%	1.07%
2011* - 2015	1.44%	2.32%	1.90%	0.58%
2011* - 2020	1.40%	1.95%	1.57%	0.95%
2011* - 2022	--	1.88%	1.48%	0.91%
Historical values are shaded.				
*Weather-normalized: *CED 2011 Final* uses a weather-normalized peak value derived from the actual 2011 peak for calculating growth rates during the forecast period.				

Source: California Energy Commission, Demand Analysis Office, 2012

As shown in **Figure 2-1**, *CED 2011 Final* electricity consumption forecasts are lower at the beginning of the forecast period than *CED 2009* due to the recent economic downturn, causing a greater than anticipated drop in 2010 consumption. Forecast growth in the low and mid demand cases is less than *CED 2009*, while the high demand case grows at a faster rate. The low demand case continues to decline thru 2012 before increasing at a similar rate to the mid demand case.

SCE's *CED 2011 Final* forecasts were adjusted upward, in consultation with SCE staff, by nearly 400 GWh over the *CED 2011 Revised* cases by 2022 to reflect the incremental impacts of expected electrification in SCE's territory. This consideration includes electrification of rail, ports, forklifts, and other technologies distinct from electric vehicles, which are analyzed separately and described later in this chapter. These impacts are explicitly quantified by SCE's Demand Form T-1, posted electronically alongside this report (http://www.energy.ca.gov/2012_energypolicy/documents/#no-meeting).

Figure 2-1: SCE Planning Area Electricity Forecast

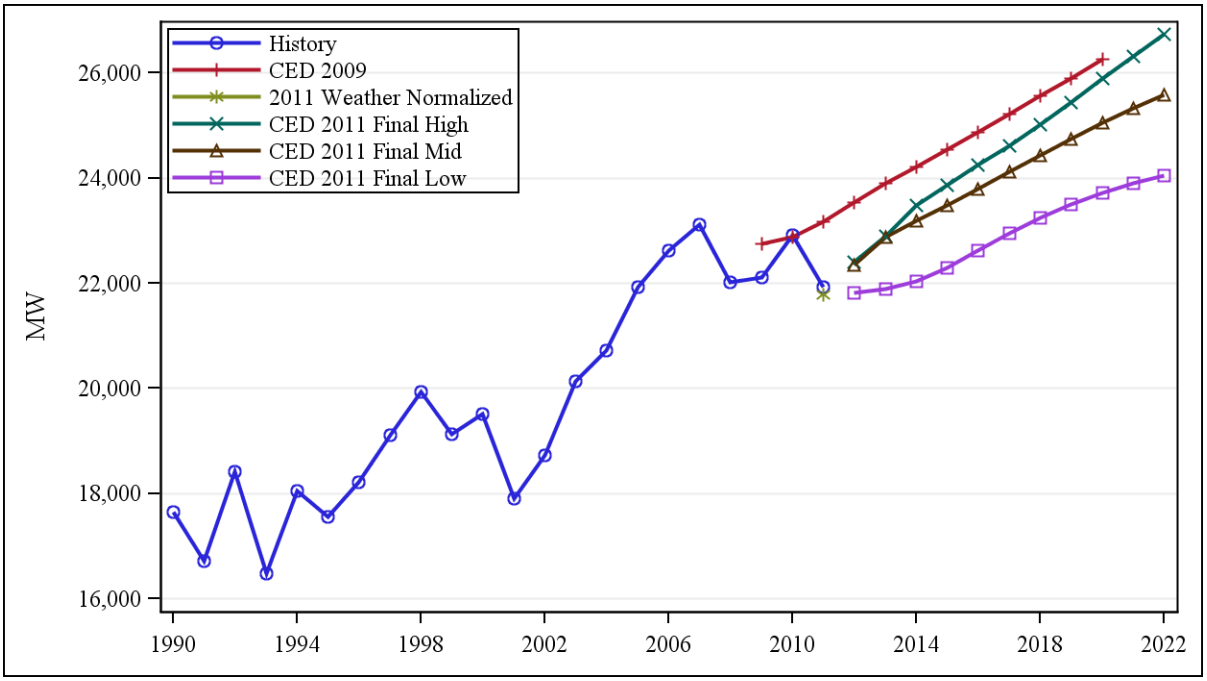


Source: California Energy Commission, Demand Analysis Office, 2012

The *CED 2011 Final* SCE planning area peak demand forecasts, shown in **Figure 2-2**, are lower than *CED 2009*, consistent with the differences seen in the consumption forecasts. The *CED 2011 Final* high demand scenario is only slightly below *CED 2009* by 2020. The 2011 SCE planning area weather-normalized peak was relatively close to the actual 2011 planning area peak (noted in **Figure 2-2**), so 2011-2012 growth is similar to that seen in the energy consumption forecasts.

SCE's projected peaks were adjusted downward slightly to reflect staff estimates of future non-event-based demand response program impacts. The adjustments were calculated as the impacts from real time pricing programs incremental to 2011 impacts, and reach around 20 MW in 2022. See Volume 1, Chapter 1 for more details.

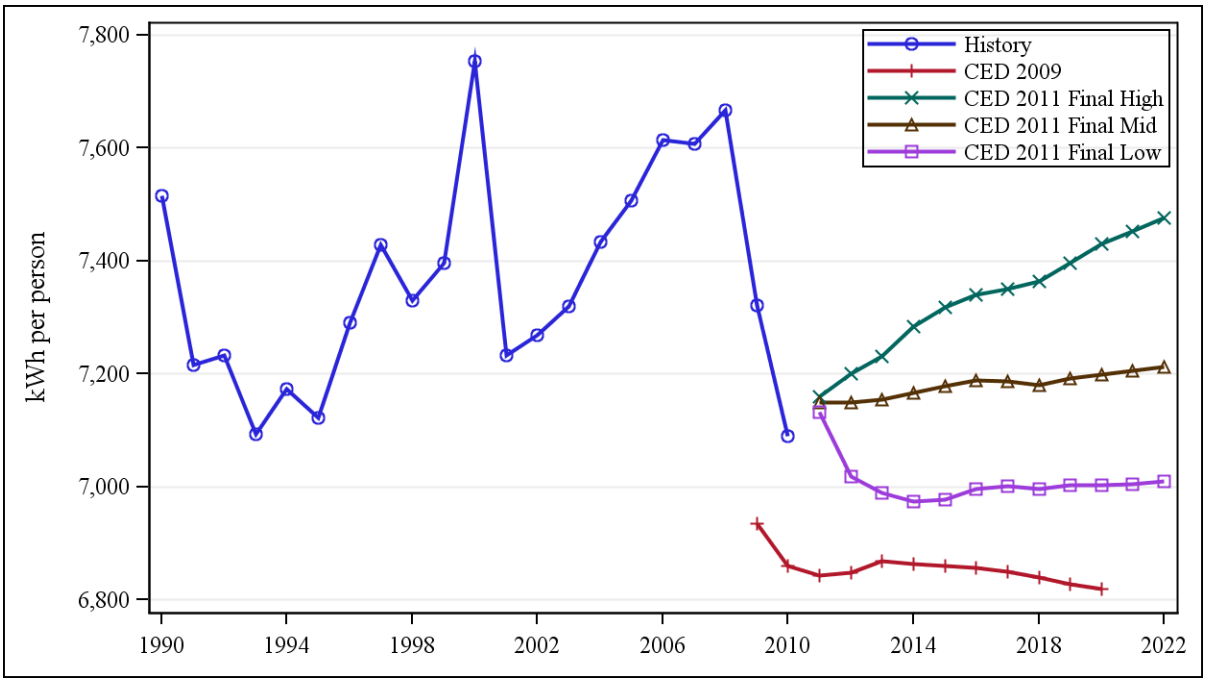
Figure 2-2: SCE Planning Area Peak



Source: California Energy Commission, Demand Analysis Office, 2012

As **Figure 2-3** shows, per capita electricity consumption is higher in all three scenarios throughout the forecast period compared to *CED 2009*. Per capita consumption is higher in recent history compared to *CED 2009* because the 2010 U.S. Census estimates of population are included. These are lower than the California Department of Finance estimates used in *CED 2009*. *CED 2011 Final* projections remain below levels witnessed in recent history in the mid and low demand cases, although they increase slightly toward the end of the forecast period due to growing electric vehicle use.

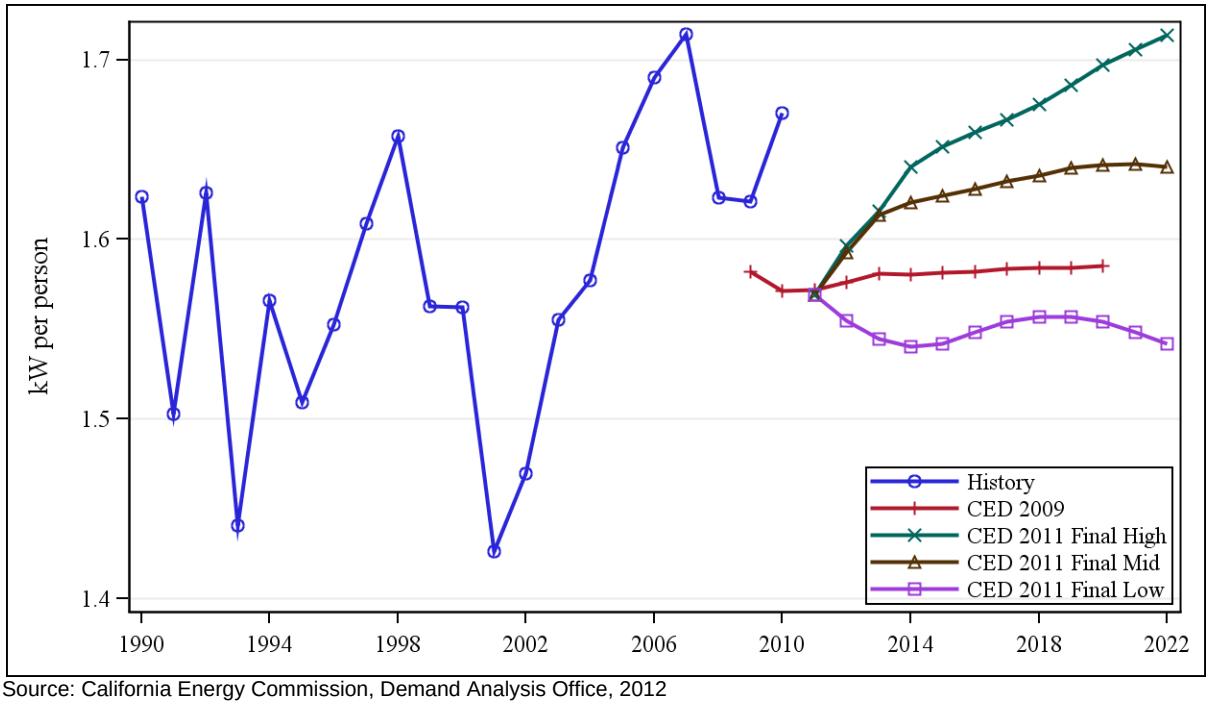
Figure 2-3: SCE Planning Area per Capita Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-4 compares per capita peak demand. *CED 2011 Final* per capita peak scenarios follow the same pattern as the per capita consumption scenarios. The per capita peak values are projected to remain in the range of recent historical levels for the mid and low demand scenarios. The high demand scenario increases to the top end of the historical range by the end of the forecast period.

Figure 2-4: SCE Planning Area per Capita Peak Demand

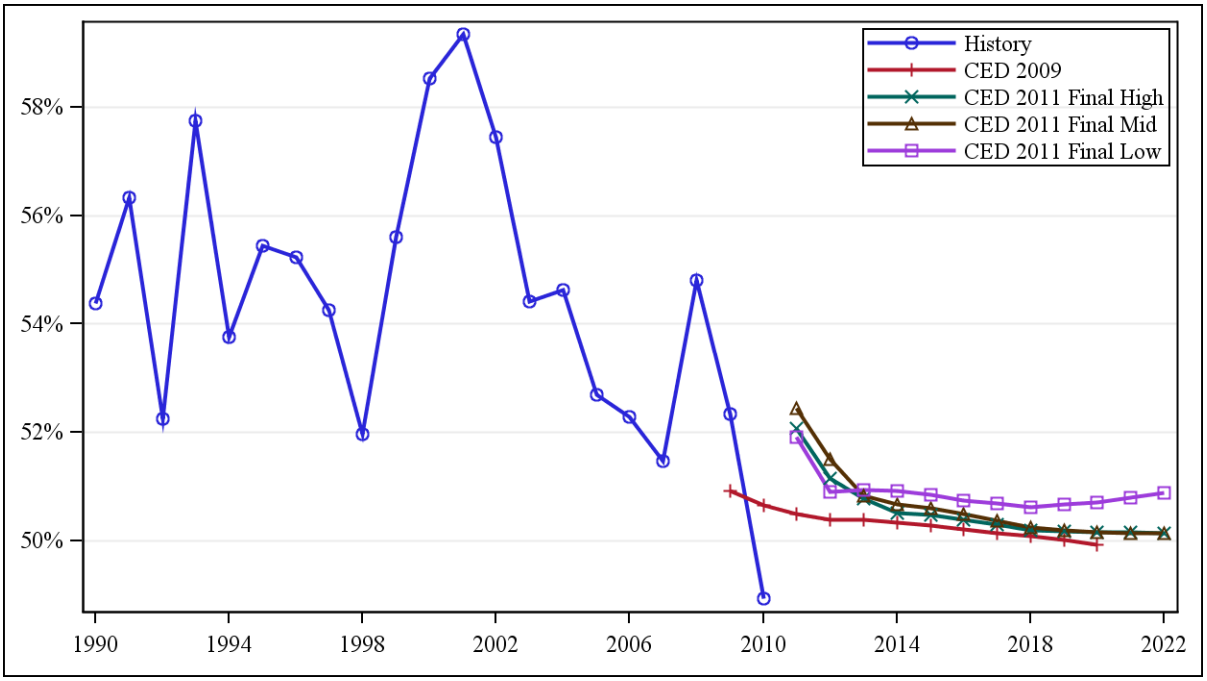


Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-5 compares the load factors for the *CED 2011 Final* and *CED 2009* forecasts. The load factor is a measure of peak demand relative to average hourly consumption. Higher load factors indicate a less variable load. Historical changes in load factors are caused by variation in annual weather patterns. In Southern California, recent peak temperatures before 2006 were lower than the 57-year median value, resulting in higher-than-expected load factors. The 2006 and 2010 load factors are low due to the higher-than-normal peak conditions experienced in those years. *CED 2011 Final* projected load factors are on the low end of the range of recent values.

Over the forecast period, the *CED 2011 Final* load factor declines slightly, which is consistent with higher weather-sensitive load growth. Consumption in the SCE planning area is shifting toward residential and commercial sectors and away from the industrial sectors. Growth is also increasingly taking place in hotter inland areas, leading to greater saturation of central air conditioning as well as more use of air-conditioning equipment in cooler coastal areas.

Figure 2-5: SCE Planning Area Load Factors



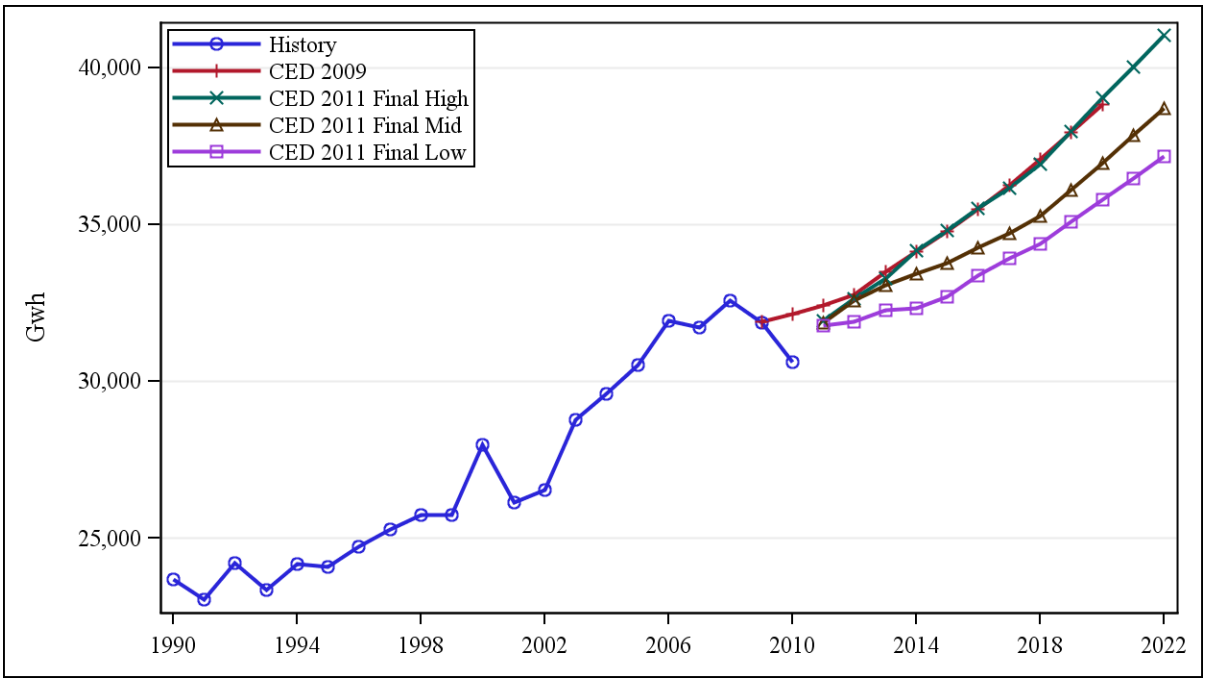
Source: California Energy Commission, Demand Analysis Office, 2012

Sector Level Results and Input Assumptions

Residential Sector

Figure 2-6 Compares *CED 2011 Final* and *CED 2009* SCE planning area residential forecasts. The mid and low scenarios are lower throughout the forecast period than *CED 2009* due to lower projected number of households.

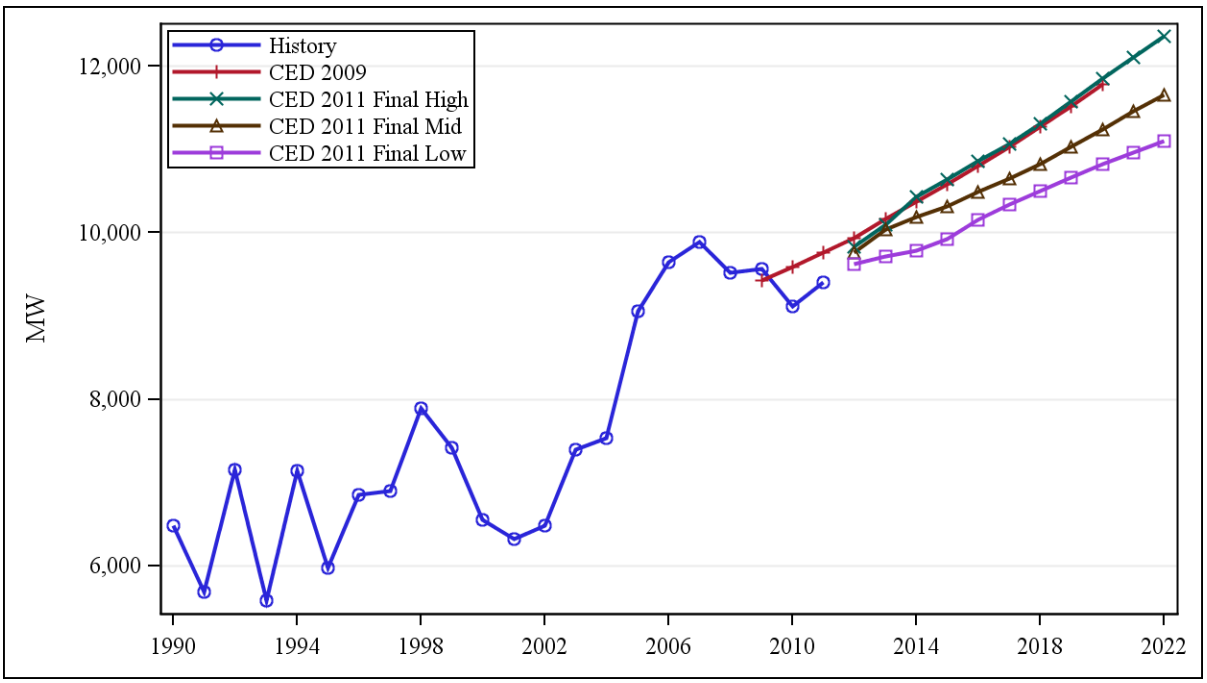
Figure 2-6: SCE Planning Area Residential Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-7 Compares *CED 2011 Final* and *CED 2009* residential peak demand forecasts. The differences between peak forecasts follow a similar pattern to differences in the consumption forecasts since the peak forecasts are driven primarily by electricity consumption.

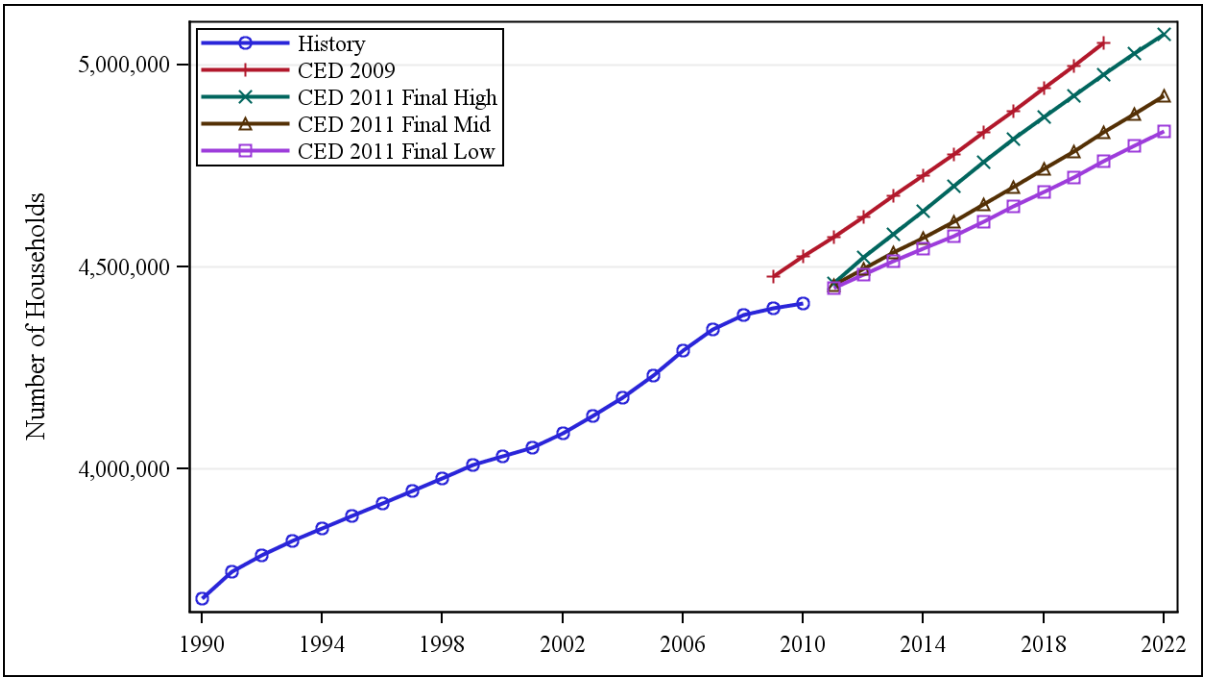
Figure 2-7: SCE Planning Area Residential Peak



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-8, **Figure 2-9**, and **Figure 2-10** compare the residential drivers used in *CED 2011 Final* with those used in *CED 2009*. **Figure 2-8** Compares total household projections. All *CED 2011 Final* scenarios are lower than the previous forecast due to a lower population and household values estimated in the 2010 census. The *CED 2011 Final* forecast includes the most recent updated county population estimates from the California Department of Finance, which incorporates information from the 2010 U.S. Census.

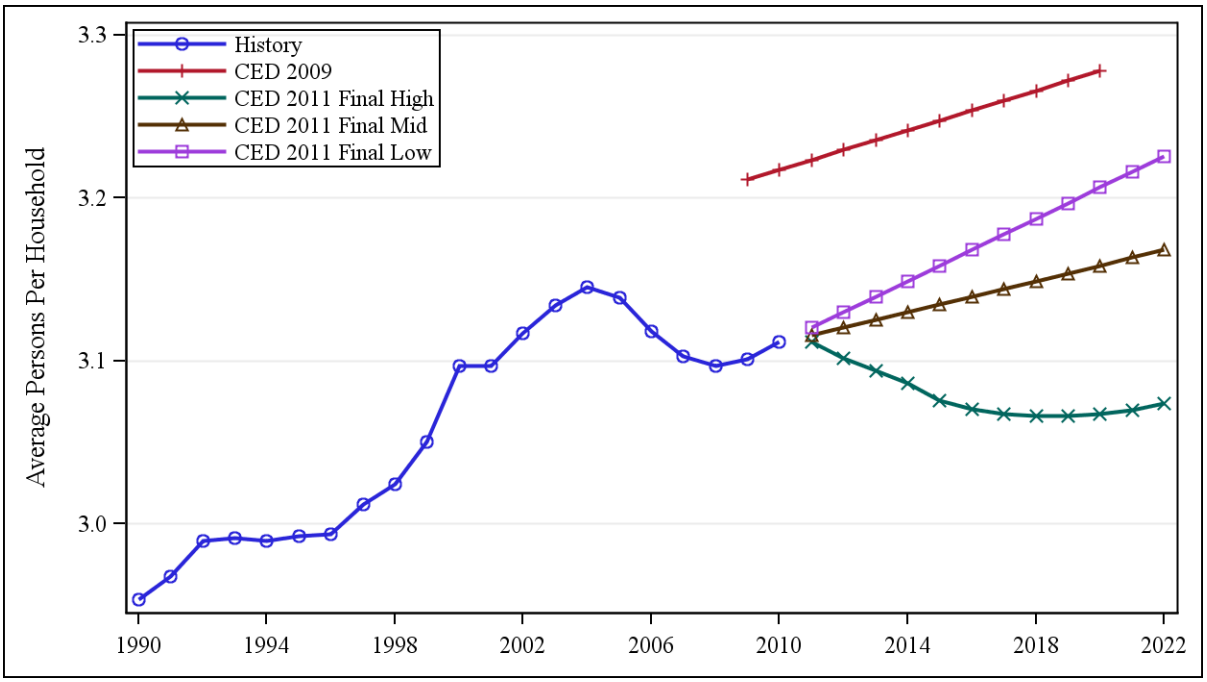
Figure 2-8: SCE Planning Area Residential Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

The household scenarios are based on persons-per-household estimates shown in **Figure 2-9** and total population. The high demand scenario uses lower persons-per-household projection (more households), and the low demand scenario uses higher persons-per-household projection (fewer households). See Volume 1, Chapter 1 for a discussion of assumptions driving these projections. The mid demand scenario assumes growth in persons per household similar to the projection used in the *CED 2009* forecast. All three scenarios use the same population forecast.

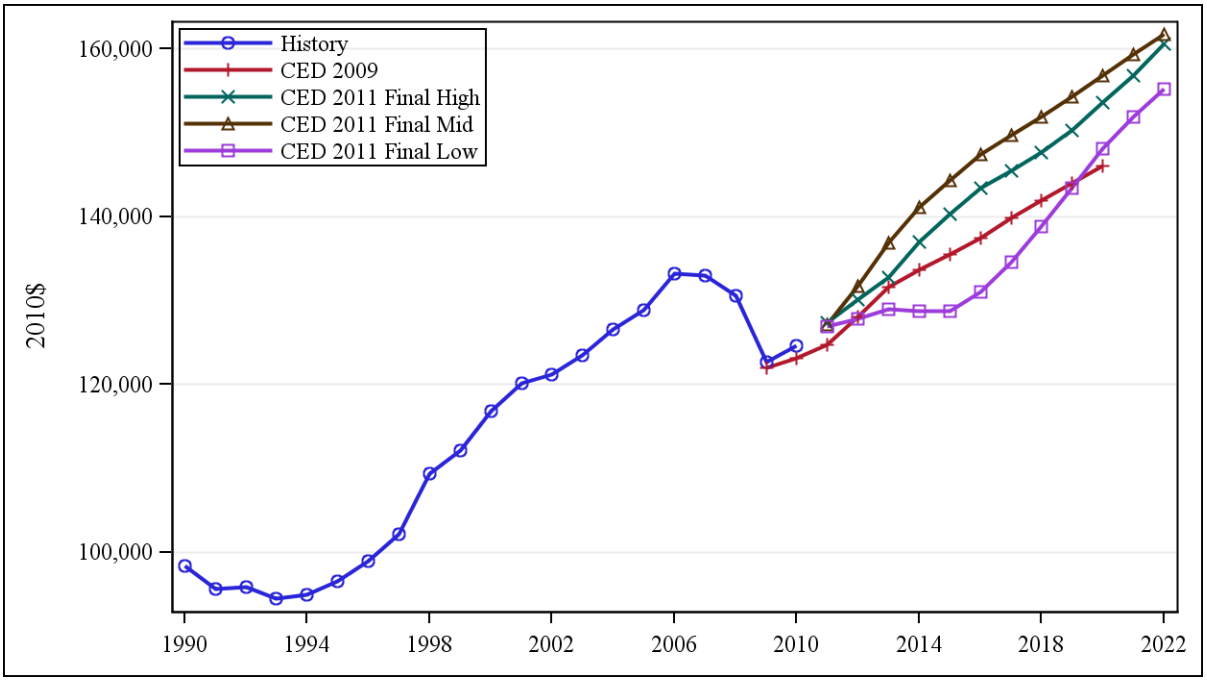
Figure 2-9: SCE Planning Area Persons per Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-10 compares average household income (per capita income multiplied by persons per household) between the two forecasts. *CED 2011 Final* estimates of household income growth are higher than the *CED 2009*. This is caused by higher growth projections of total personal income than were used in the previous forecast. The difference between scenarios is a function of the variation in per capita income and persons per household used to define the scenarios.

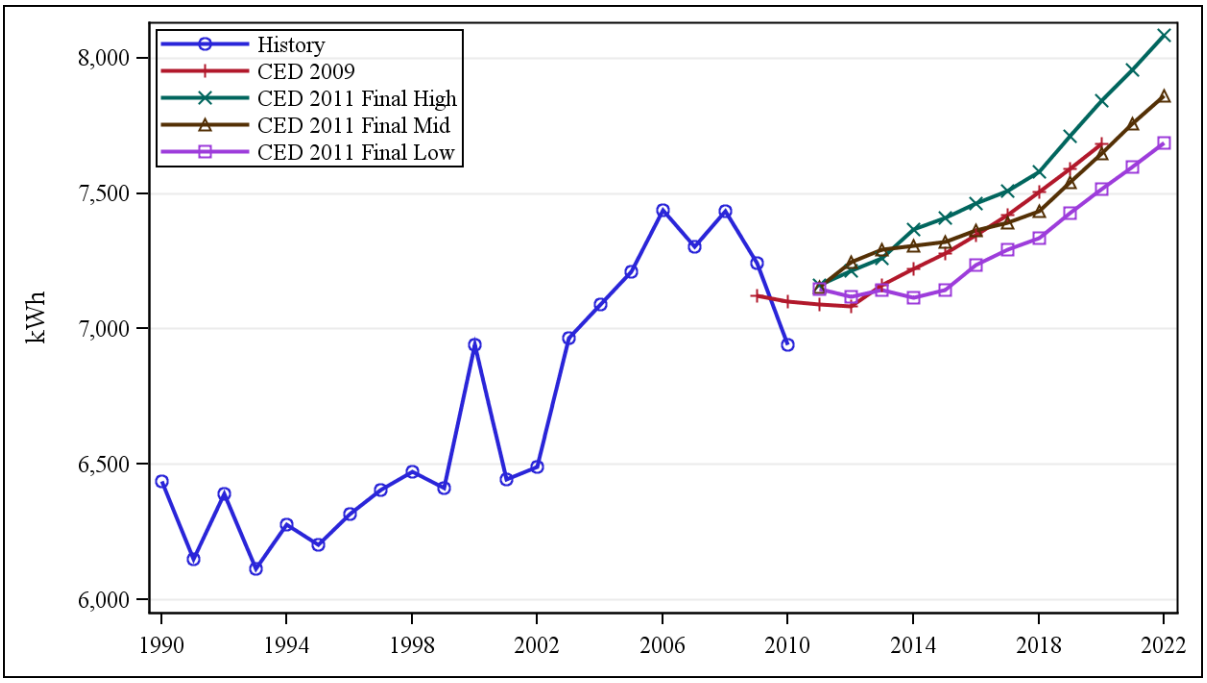
Figure 2-10: SCE Planning Area Average Household Income Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-11 shows annual electricity consumption per household. The *CED 2011 Final* forecasts are similar to *CED 2009*. *CED 2011 Final* consumption per household in the mid demand scenario is slightly higher than *CED 2009* through 2016. This is caused by differences in the underlying economic and demographic assumptions, including lower total population. Most of the growth in use per household after 2015 is caused by increasing numbers of electric vehicles in the residential sector. This adds about 310 kWh per household to the residential total by 2022 in the SCE planning area in the mid demand case. Without the inclusion of electric vehicle charging, residential use would remain relatively constant over the forecast period after the economic recovery.

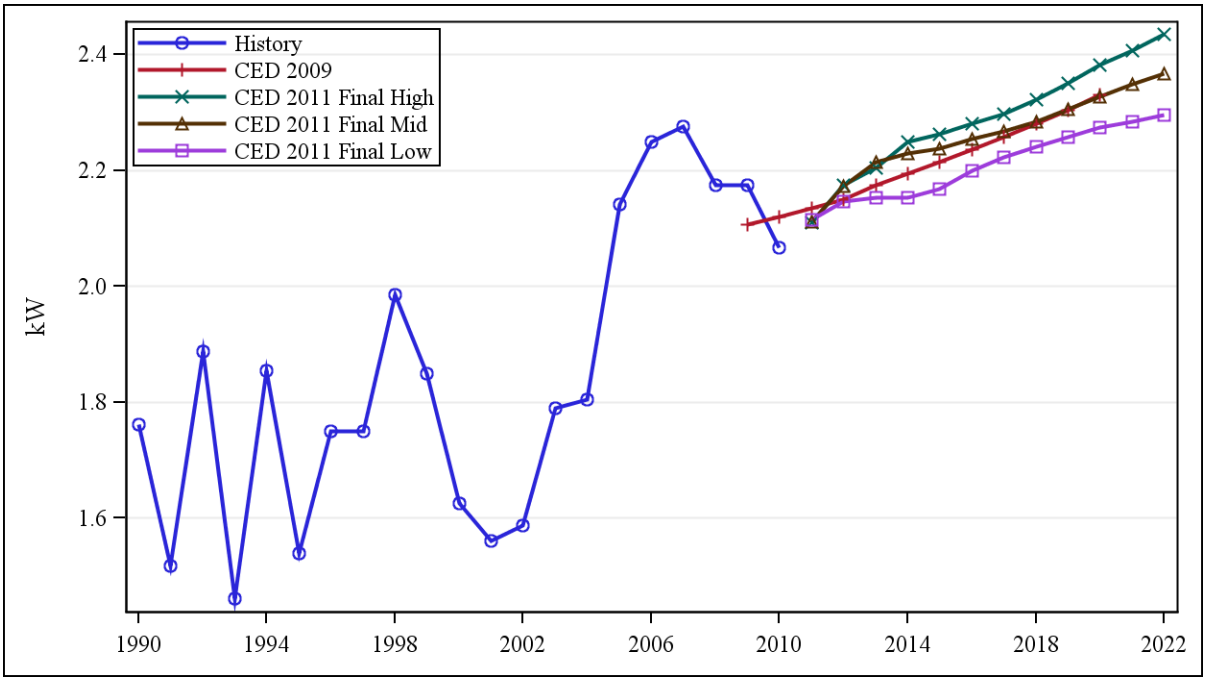
Figure 2-11: SCE Planning Area Use per Household



Source: California Energy Commission, Demand Analysis Office, 2012

CED 2011 Final peak use per household, presented in **Figure 2-12**, is also higher in the mid and high cases than projected in *CED 2009*. This is in part driven by the short-term difference in energy forecasts. The mid- to long-term growth in peak is similar to the *CED 2009* forecast. The difference in forecast level is caused mainly by the difference in the starting point.

Figure 2-12: SCE Planning Area Peak Use per Household

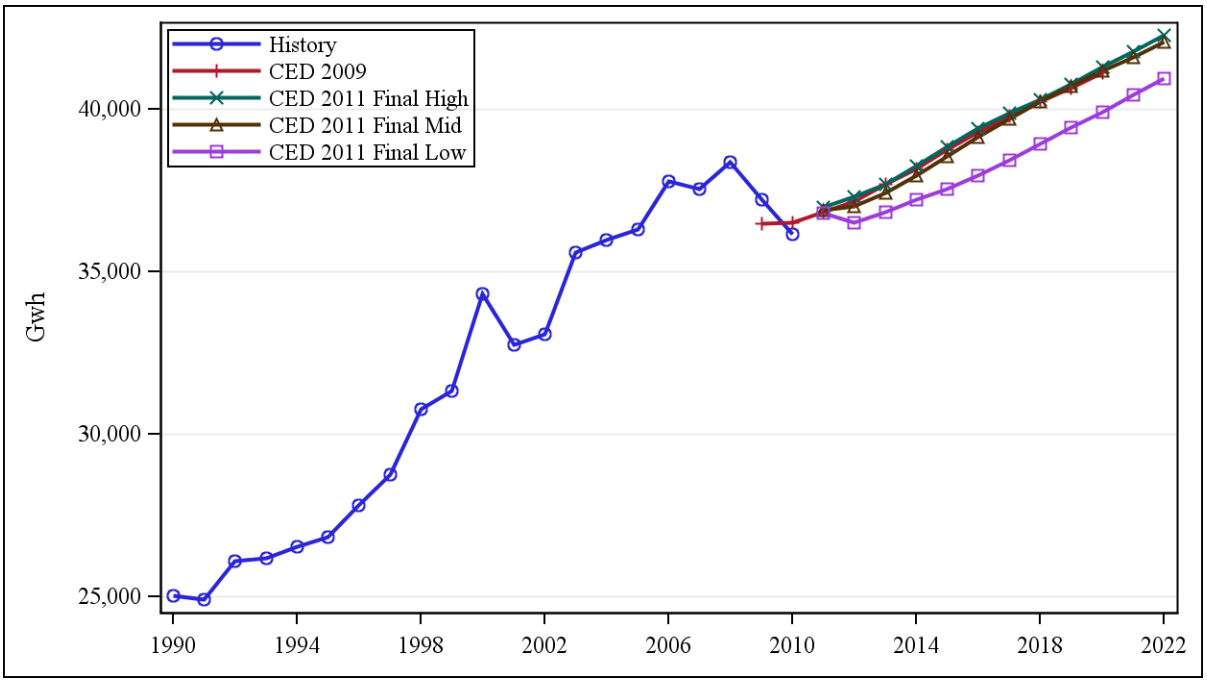


Source: California Energy Commission, Demand Analysis Office, 2012

Commercial Sector

Figure 2-13 compares the commercial building sector forecasts. *CED 2011 Final* mid and high demand scenarios are very similar to each other and to *CED 2009*. The low demand scenario is lower throughout the entire forecast period due to lower floor space projections and higher electricity rates.

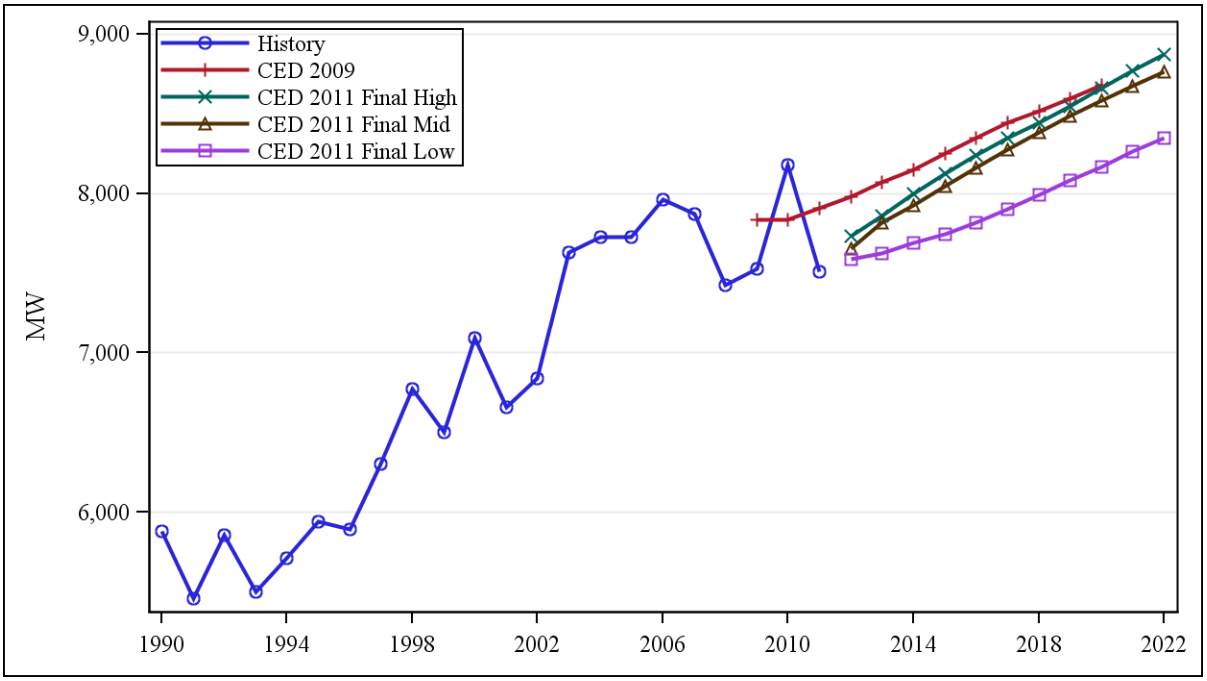
Figure 2-13: SCE Planning Area Commercial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-14 compares the commercial peak demand forecasts. Growth in the commercial peak demand forecasts is driven primarily by the underlying electricity consumption forecasts. Therefore, the consumption and peak forecasts exhibit the same patterns, although the new forecasts begin well below *CED 2009*. Growth in the mid and high cases is greater than *CED 2009* because of the adjustment for climate change. (See Volume I, Appendix A for details.)

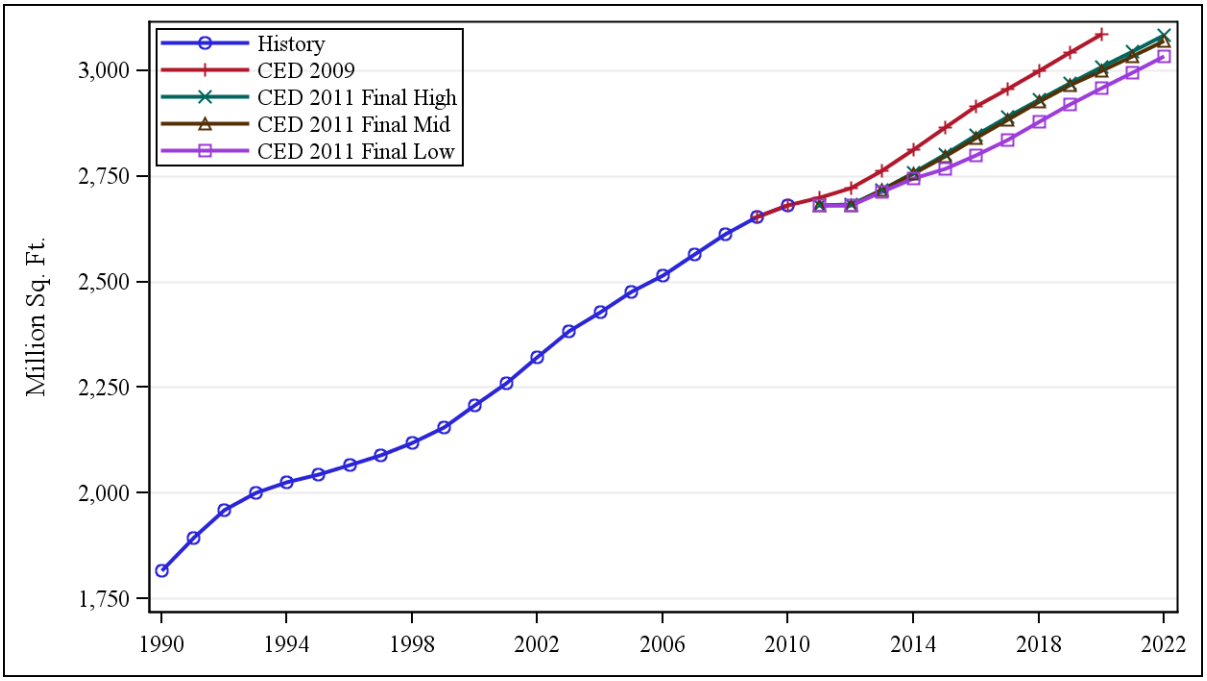
Figure 2-14: SCE Planning Area Commercial Sector Peak



Source: California Energy Commission, Demand Analysis Office, 2012

In staff's commercial building sector forecasting model, floor space by building type (for example, retail, schools, and offices) is the key driver of energy use for each specific building type. **Figure 2-15** compares total commercial floor space projections. The lower *CED 2011 Final* floor space projections compared to *CED 2009* are caused by lower estimates of floor space stock additions in the short term, driven by slow employment growth through 2012.

Figure 2-15: SCE Planning Area Commercial Floor Space



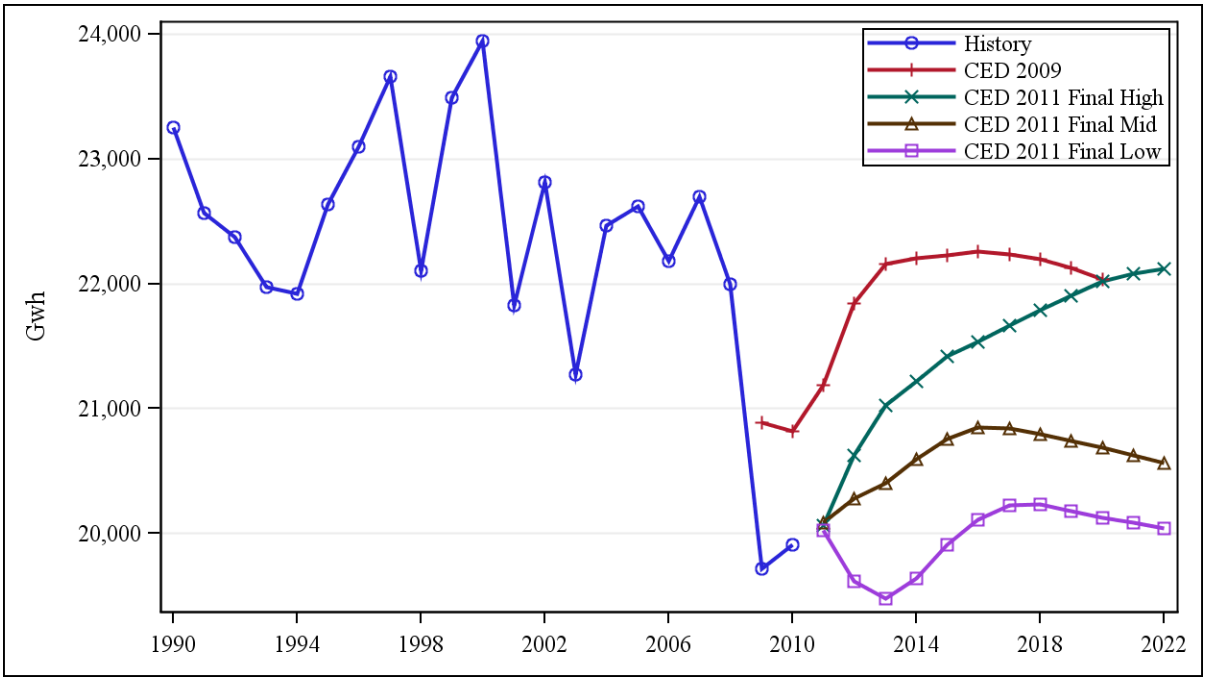
Source: California Energy Commission, Demand Analysis Office, 2012

Industrial Sector

For the final version of this forecast, staff replaced the INFORM manufacturing sector forecast used in *CED 2011 Revised* for SCE with an econometric forecast. (See Volume 1, Appendix D, for details on the econometric models.) Unlike in the other planning areas, the INFORM model predicted a significant decline in manufacturing energy use in 2011—a decline not evident in the year-to-date (through September 2011) QFER sales data. The econometric forecast predicted no such decline.

Figure 2-16 compares industrial sector electricity consumption for the SCE planning area. *CED 2011 Final* scenarios start from a lower point than *CED 2009* forecast, and the mid and low demand cases remain below *CED 2009* throughout the forecast period. Consumption in the high demand scenario is above *CED 2009* by 2020, a result of relatively high growth in manufacturing output.

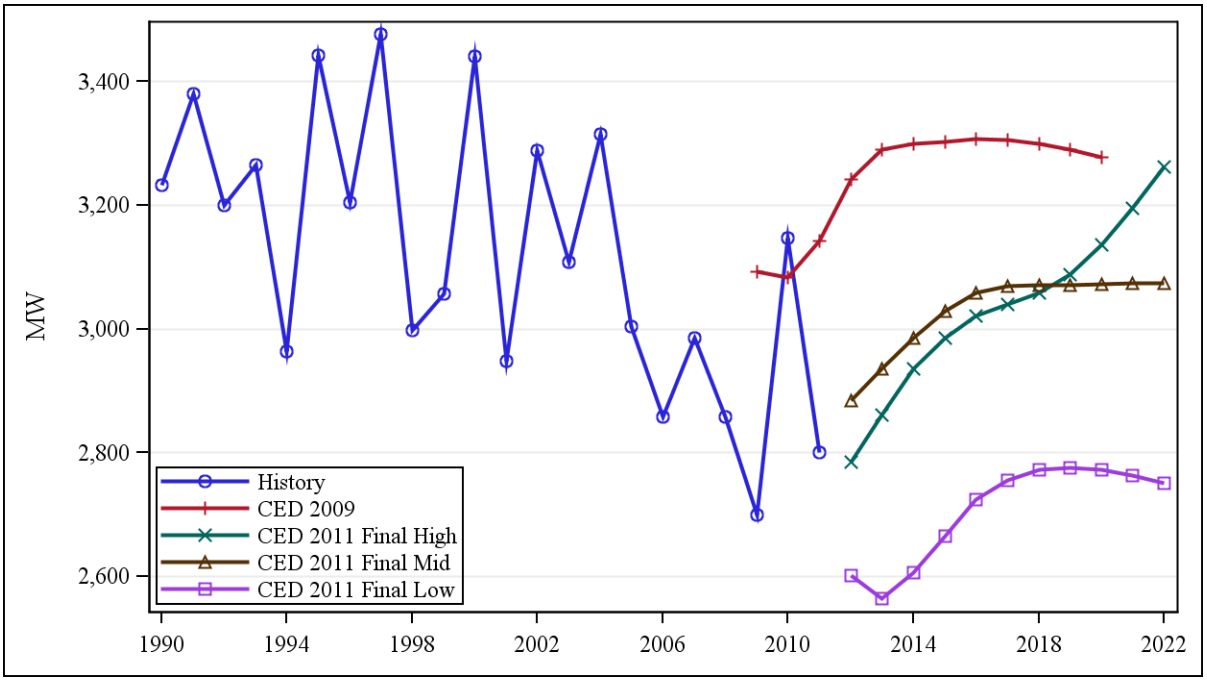
Figure 2-16: SCE Planning Area Industrial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-17 compares the industrial sector peak forecasts. Forecasted growth patterns are similar to those seen for consumption.

Figure 2-17: SCE Planning Area Industrial Sector Peak

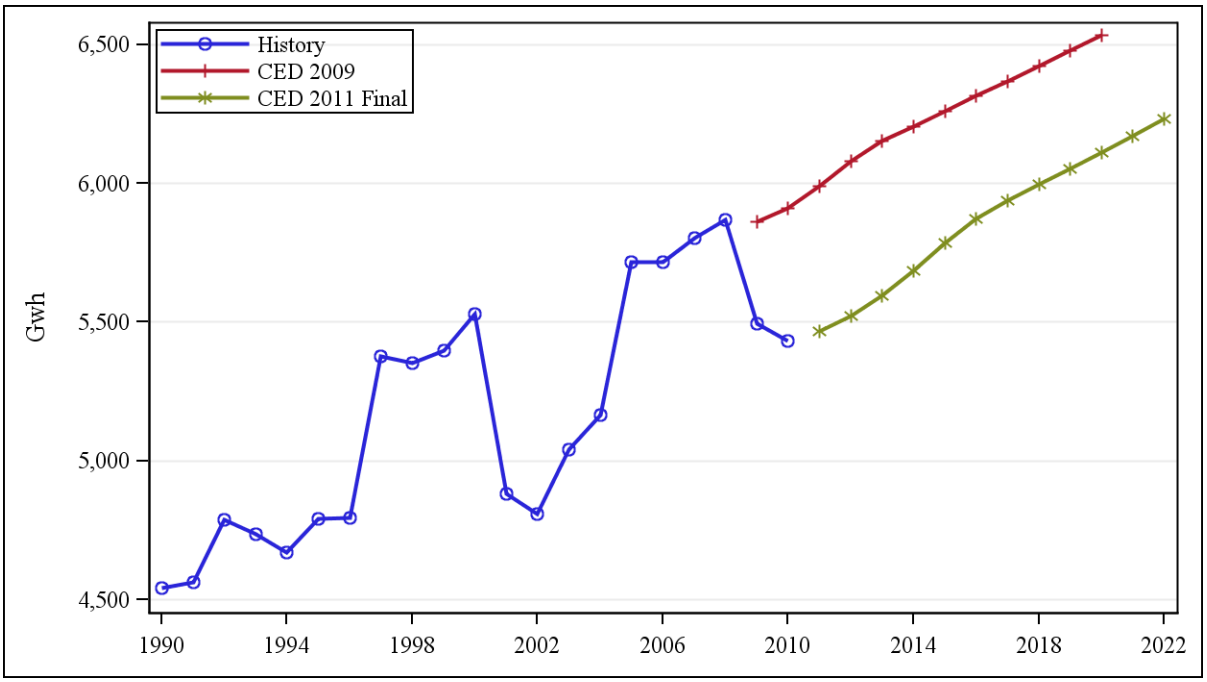


Source: California Energy Commission, Demand Analysis Office, 2012

Other Sectors

Figure 2-18 compares the electricity consumption forecasts for the TCU sector, which includes street lighting. In this case, a single scenario was run.[2] *CED 2011 Final* is lower than *CED 2009* given a lower starting point, a result of more recent sector historical consumption estimates from QFER filings.

Figure 2-18: SCE Planning Area Transportation, Communication, Utilities, and Street Lighting Sector Electricity Forecasts

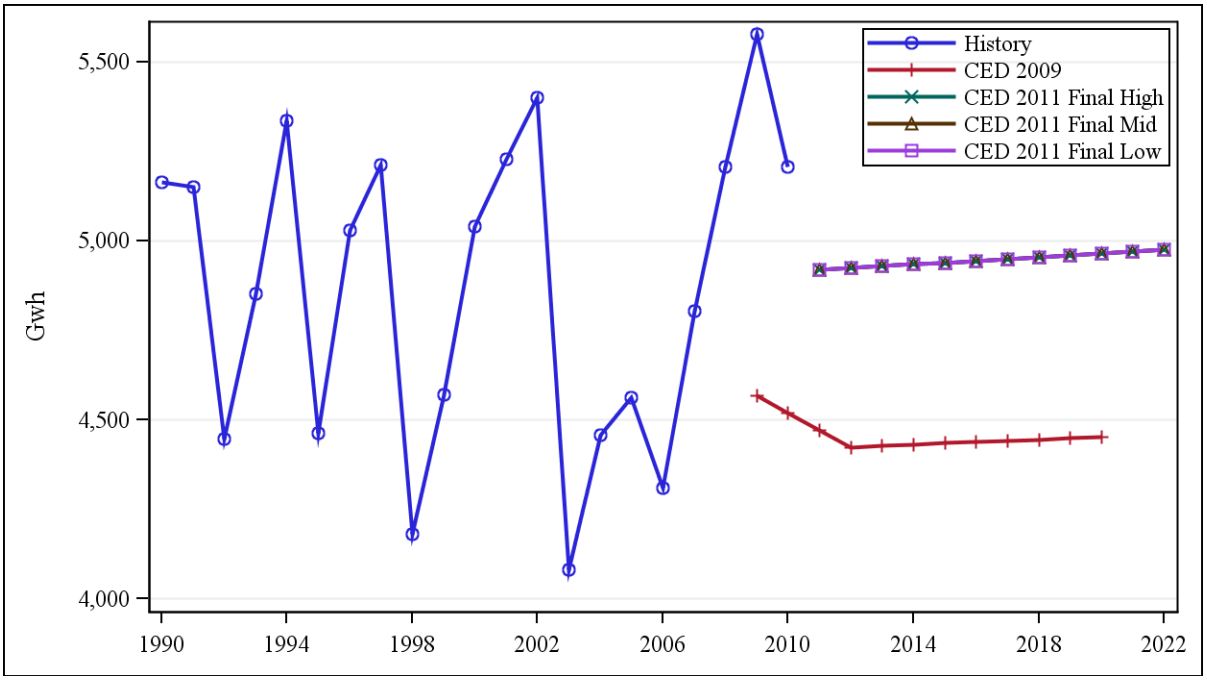


Source: California Energy Commission, Demand Analysis Office, 2012

1Growth in TCU consumption depends mainly on population, for which there is only one scenario.

Figure 2-19 compares the electricity consumption forecasts for the agriculture and water pumping sectors. The econometric estimation for SCE uses population and found no price responsiveness; thus, there is only one *CED 2011 Final* scenario. The *CED 2011 Final* agriculture and water-pumping forecast is higher in the short term than *CED 2009* due to a higher starting point based on historical consumption estimates. The *CED 2011 Final* forecast is relatively constant over the forecast period.

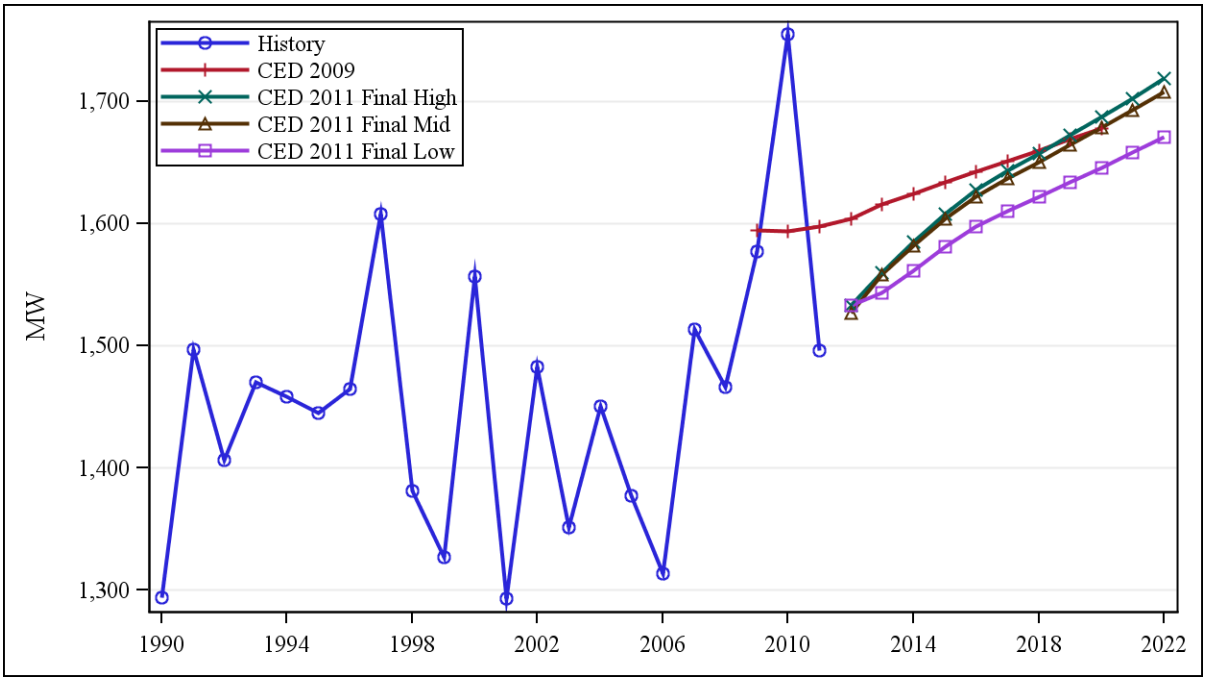
Figure 2-19: SCE Planning Area Agriculture and Water Pumping Sector Forecast



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-20 provides a comparison of the combined peak for the transportation, communication, utilities, street lighting, agriculture, and water pumping sectors. The *CED 2011 Final* peak forecast is lower than *CED 2009* until 2019 due to an estimated lower starting point. Higher growth rates in the mid and high demand scenarios bring peak demand above *CED 2009* levels by 2020.

Figure 2-20: SCE Planning Area Other Sector Peak

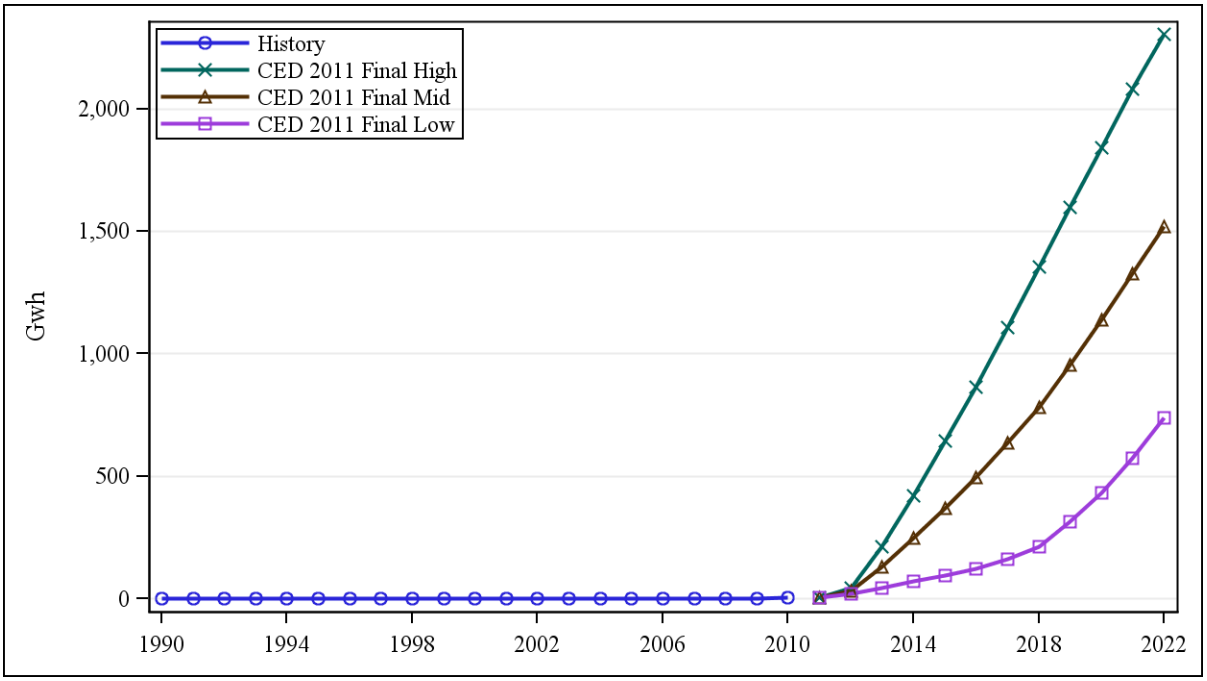


Source: California Energy Commission, Demand Analysis Office, 2012

Electric Vehicles

Electricity consumption by electric vehicles is expected to increase from around 4 GWh in 2011 to almost 750 GWh in the low demand scenario and to more than 2,300 GWh in the high case by 2022. Staff assumed most recharging would occur during off-peak hours, so peak impacts are expected to be relatively small, causing an increase of 31 MW in the low demand case and 98 MW in the high scenario by the end of the forecast period. **Figure 2-21** shows the SCE planning area electric vehicle consumption forecast for each of the demand scenarios.

Figure 2-21: SCE Electricity Consumption of Electric Vehicles



Source: California Energy Commission, Demand Analysis Office, 2012

Self-Generation

The peak demand forecast is reduced by the projected impacts of distributed PV, solar thermal, and combined heat and power systems, including the effects of SGIP, CSI, and other programs, as discussed in Volume 1, Chapter 1. The effects of these programs are forecast based on recent trends in installations and a residential predictive model. **Table 2-2** shows *CED 2011 Final* forecasts of peak impacts from PV and non-PV self-generation. Only residential PV impacts varied in the demand scenarios, based on differences in number of households and energy rates. Staff projects between 495 to 650 MW of peak reduction from PV systems in the SCE planning area by 2022. Peak reductions are based on installed system

capacities ranging from 878 MW by 2022 in the high demand case to 1,131 MW by 2022 in the low demand case.

Table 2-2: SCE Planning Area Self-Generation Peak Impacts (MW)

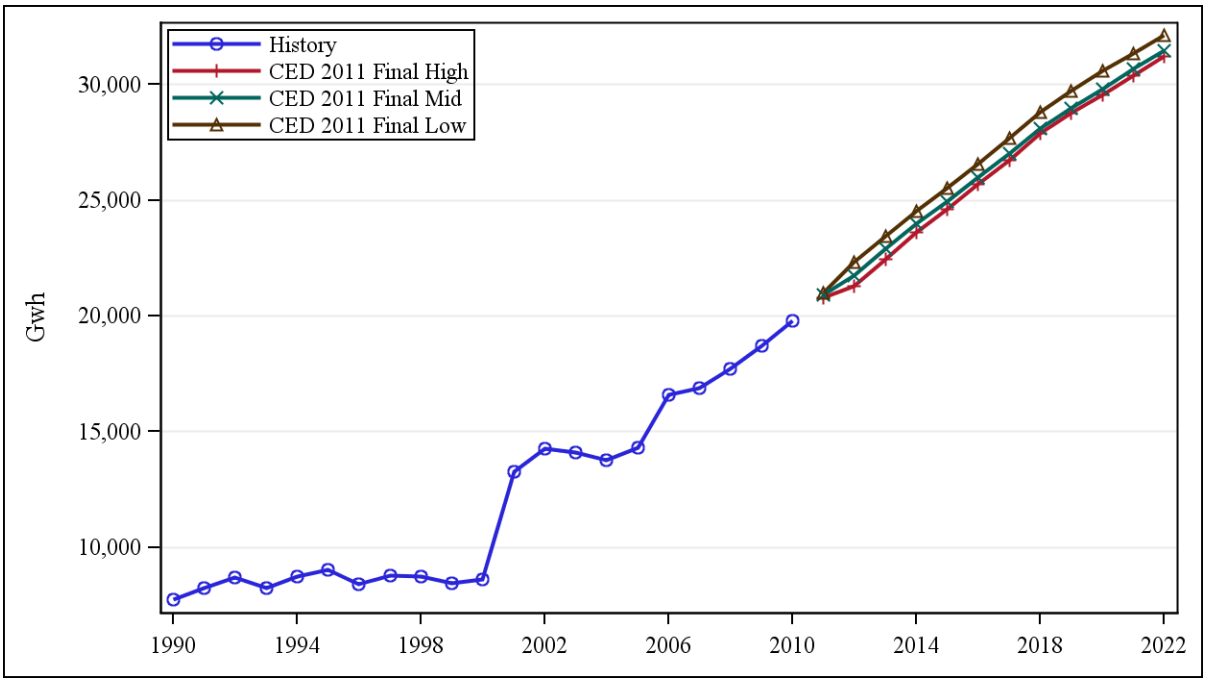
	1990	2000	2010	2015	2020	2022
Nonphotovoltaic Self-Generation	489.71	517.43	784.32	807.47	824.38	847.18
Photovoltaic, Low Demand	0.00	0.32	115.25	365.81	521.21	649.13
Photovoltaic, Mid Demand	0.00	0.32	115.25	342.21	448.75	551.92
Photovoltaic, High Demand	0.00	0.32	115.25	334.84	416.28	494.99
Total Self-Generation, Low Demand	489.71	517.75	899.58	1173.28	1345.59	1496.31
Total Self-Generation, Mid Demand	489.71	517.75	899.58	1149.68	1273.13	1399.10
Total Self-Generation, High Demand	489.71	517.75	899.58	1142.31	1240.66	1342.17

Source: California Energy Commission, Demand Analysis Office, 2012

Conservation/Efficiency Impacts

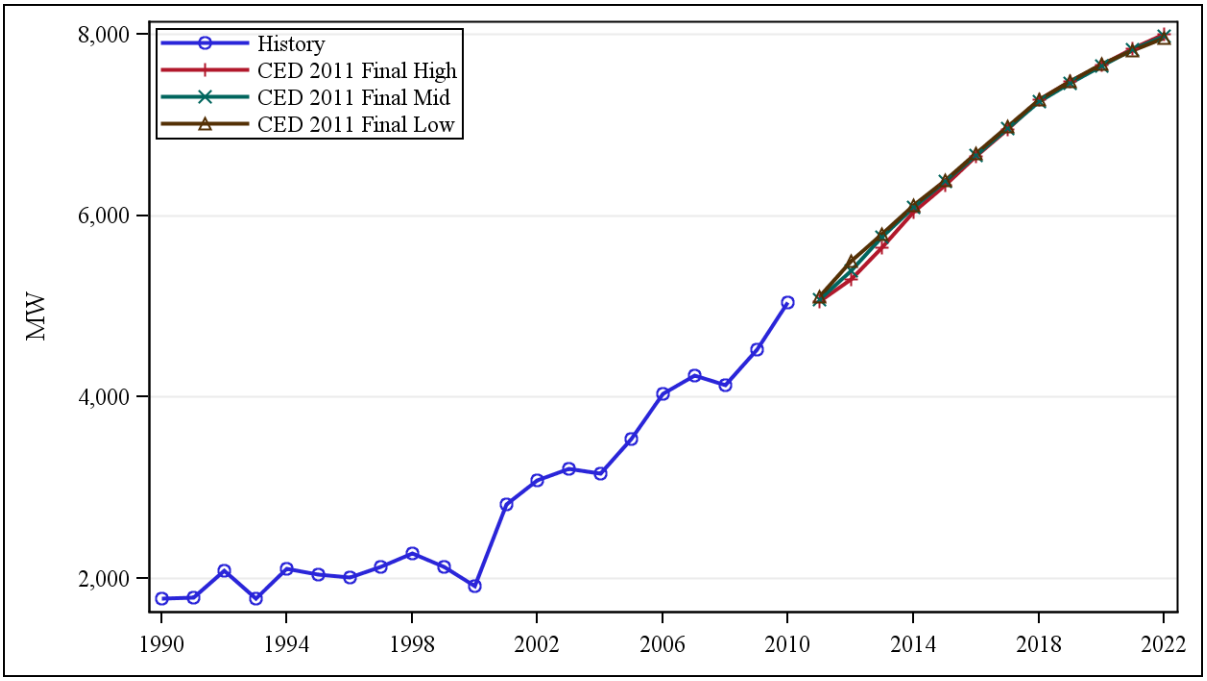
Staff has spent much time refining methods to account for energy efficiency and conservation impacts while preparing recent forecasts. **Figure 2-22** and **Figure 2-23** on the next page show committed electricity consumption and peak efficiency savings estimates from all committed sources, including building and appliance standards; utility programs implemented before 2013; and price and other effects, or savings associated with rate changes and certain market trends not directly related to programs or standards. Projected savings impacts are higher the lower the demand scenario, since price and program effects are inversely related to the demand outcome. Peak results show less difference among the scenarios, since residential consumption savings totals are very similar and the residential sector has a disproportionately large effect on peak demand.

Figure 2-22: SCE Planning Area Electricity Consumption Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2-23: SCE Planning Area Electricity Peak Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

Table 2-3 presents estimated savings for building and appliance standards in the mid demand case for selected years. Total standards impacts are higher in the high demand case by 1.5-2.0 percent due to higher home and commercial floor space construction and 1.5-2.0 percent lower in the low demand case. The standards savings estimates include the 2010 revision to Title 24 building standards as well as AB 1109 lighting and television standards savings. Savings are measured against a baseline of 1975, so they incorporate more than 30 years of impacts. Volume 1 provides more detail on staff work related to energy efficiency and conservation.

Table 2-3: SCE Planning Area Electricity Standards Savings Estimates

Electricity Consumption Savings (GWH)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	1,245	811	2,056	511	360	871	2,927
2000	1,674	2,462	4,136	1,390	1,017	2,407	6,544
2010	2,345	5,612	7,958	2,721	1,769	4,490	12,448
2015	3,013	8,211	11,224	3,373	2,251	5,624	16,848
2020	3,720	10,132	13,852	4,306	3,010	7,316	21,168
2022	3,942	10,578	14,520	4,644	3,162	7,806	22,326
Electricity Peak Demand Savings (MW)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	341	222	563	120	85	205	768
2000	389	572	961	285	208	493	1,454
2010	700	1,675	2,374	616	400	1,016	3,390
2015	936	2,551	3,487	707	472	1,179	4,667
2020	1,153	3,140	4,293	903	631	1,534	5,827
2022	1,198	3,215	4,413	974	663	1,637	6,049

Source: California Energy Commission, Demand Analysis Office, 2012

CHAPTER 3: San Diego Gas & Electric Planning Area

The San Diego Gas (SDG&E) planning area includes SDG&E bundled retail customers and customers served by various energy service providers using the SDG&E distribution system to deliver electricity to end users.

This chapter is organized similarly to those for the other planning areas. Forecasts of total consumption, per capita consumption, peak loads, and load factors give an overview of SDG&E's projected electricity demand in the coming decade. This precedes a more detailed discussion of key sector-level inputs and results. Results for self-generation, efficiency, conservation, and electric vehicles are found toward the end of this chapter.

This report presents three demand scenarios—high, mid, and low. The high case is characterized by low electricity rates, high population growth, high levels of efficiency, and low self-generation. Inversely, the low case is characterized by high electricity rates, low population, and so forth. The tables and charts presented throughout this chapter show results for all three *CED 2011 Final* forecast scenarios alongside *CED 2009* for reference.

Forecast Results

Table 3-1 presents a comparison of *CED 2011 Final* high, mid and low demand scenarios with *CED 2009* for electricity consumption and peak demand for selected years. Comprehensive results are available electronically as a set of forms posted alongside this report (http://www.energy.ca.gov/2012_energypolicy/documents/#no-meeting).

For both consumption and peak demand, growth rates starting in 2011 are shown to compare weather-normalized growth, since consumption in 2010 was reduced significantly because of a very mild weather year overall while a heat storm in September 2010 yielded a relatively high peak.

Due to a lower starting point, all three scenarios project a lower level of consumption than *CED 2009* in the short term. However, the overall annual growth rate from 2011-2020 is higher than *CED 2009* in all three scenarios.

The mid demand scenario estimates 2.1 percent average annual growth in consumption and 2.0 percent annual growth in peak demand from 2011-2022. By 2022, total consumption in the high case is projected to be 8.9 percent higher than in the low case. The spread between peak demand scenarios is slightly wider, with the high case projected to be 9.5 percent higher than the low case.

Discrepancies in historical consumption between *CED 2009* and *CED 2011 Final* result from an adjustment made to QFER filings. After the adjustment, *CED 2011 Final* consumption history more closely resembled the consumption history used as the basis for SDG&E's own demand forecast.

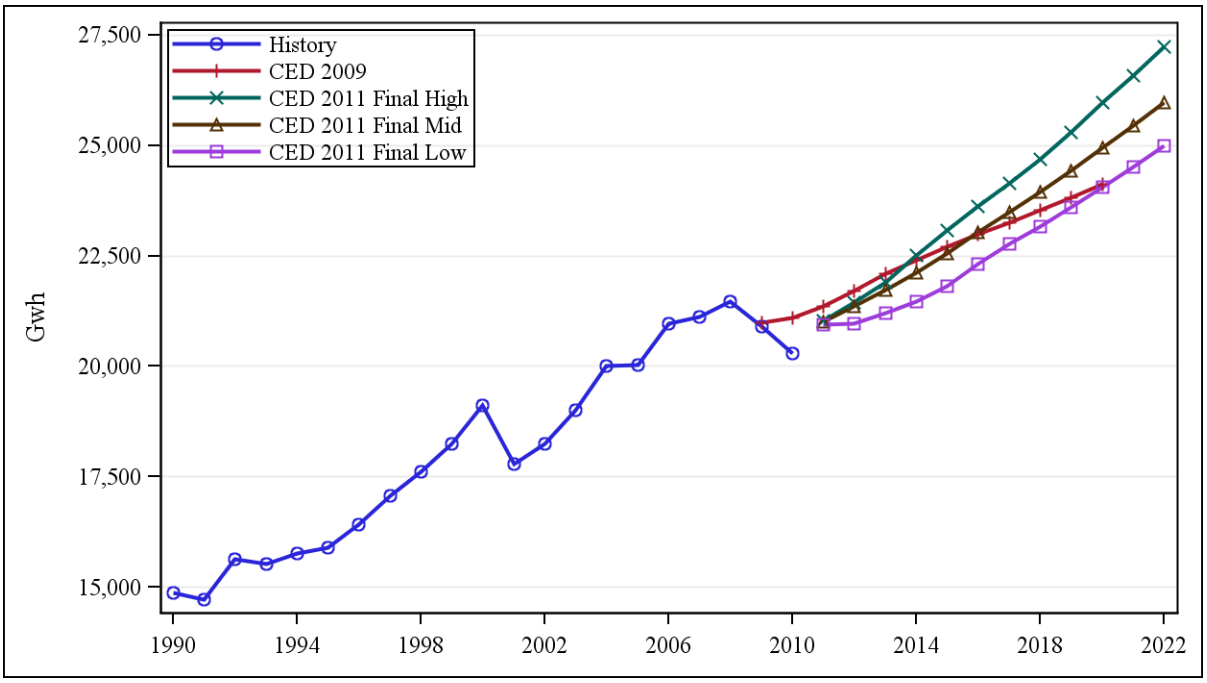
Table 3-1: SDG&E Planning Area Forecast Comparison

Consumption (GWH)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	14,926	14,863	14,863	14,863
2000	19,294	19,125	19,125	19,125
2010	21,100	20,300	20,300	20,300
2011	21,354	21,023	21,001	20,946
2015	22,707	23,071	22,550	21,820
2020	24,119	25,965	24,943	24,059
2022	--	27,228	25,967	24,992
Average Annual Growth Rates				
1990 - 2000	2.60%	2.55%	2.55%	2.55%
2000 - 2010	0.90%	0.60%	0.60%	0.60%
2011 - 2015	1.55%	2.35%	1.79%	1.03%
2011 - 2020	1.36%	2.37%	1.93%	1.71%
2011 - 2022	--	2.48%	2.07%	1.75%
Peak (MW)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	2,978	2,978	2,978	2,978
2000	3,485	3,485	3,485	3,485
2011	4,578	4,355	4,355	4,355
2011*	4,578	4,435	4,435	4,435
2015	4,856	4,915	4,865	4,618
2020	5,157	5,478	5,359	5,066
2022	--	5,699	5,536	5,202
Average Annual Growth Rates				
1990 - 2000	1.58%	1.58%	1.58%	1.58%
2000 - 2011	2.51%	2.05%	2.05%	2.05%
2011* - 2015	1.48%	2.60%	2.34%	1.02%
2011* - 2020	1.33%	2.37%	2.13%	1.49%
2011* - 2022	--	2.31%	2.04%	1.46%
Historical values are shaded.				
*Weather-normalized: CED 2011 Final uses a weather-normalized peak value derived from the actual 2011 peak for calculating growth rates during the forecast period				

Source: California Energy Commission, Demand Analysis Office, 2012

At the start of the forecast period, the *CED 2011 Final* mid case consumption forecast is 1.7 percent lower than the *CED 2009* projection. As **Figure 3-1** shows, *CED 2009* and the *CED 2011 Final* low and mid case forecasts converge to roughly the same value by 2020.

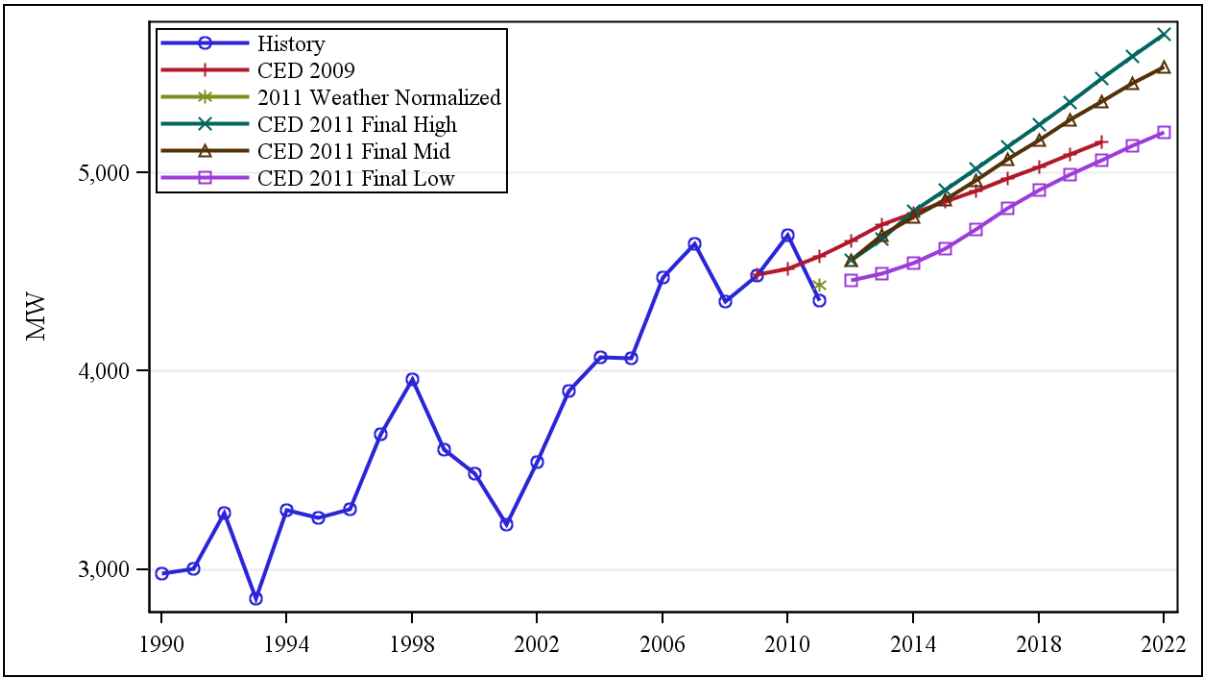
Figure 3-1: SDG&E Planning Area Electricity Forecast



Source: California Energy Commission, Demand Analysis Office, 2012

The *CED 2011 Final* peak demand forecasts are about 2.1 percent lower than the *CED 2009* forecast at the beginning of the forecast period, as shown in **Figure 3-2**. By the end of the forecast period, the *CED 2011 Final* mid forecast is 3.2 percent higher. The peak forecast assumes normal weather conditions, and the 2011 weather-normalized peak value is estimated to be higher than the actual recorded peak load for that year.

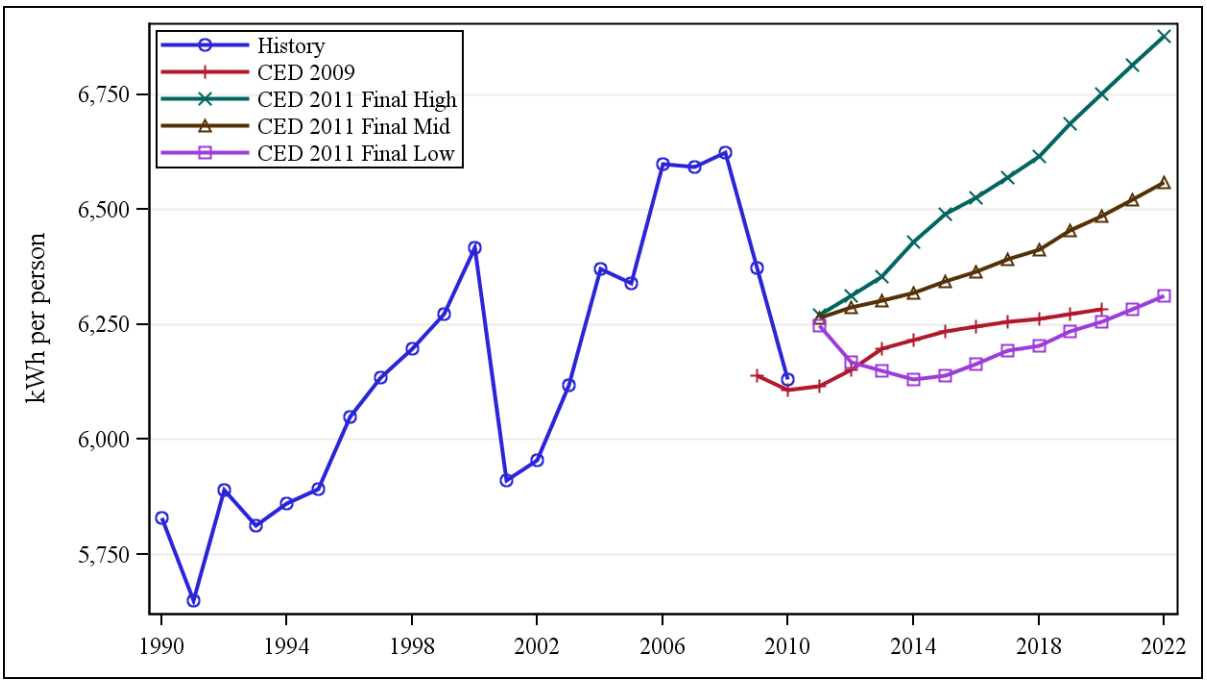
Figure 3-2: SDG&E Planning Area Peak



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-3 compares forecasts of per capita electricity consumption. Per capita consumption in *CED 2011 Final* for all demand scenarios is higher than *CED 2009* in 2011, mainly because of a reduction in population per the 2010 U.S. Census. The mid case maintains a relatively flat trajectory over the first half of the forecast period and then increases moderately toward the end. The growth toward the end of all three of the final scenarios indicates the effect of an increasing number of electric vehicles.

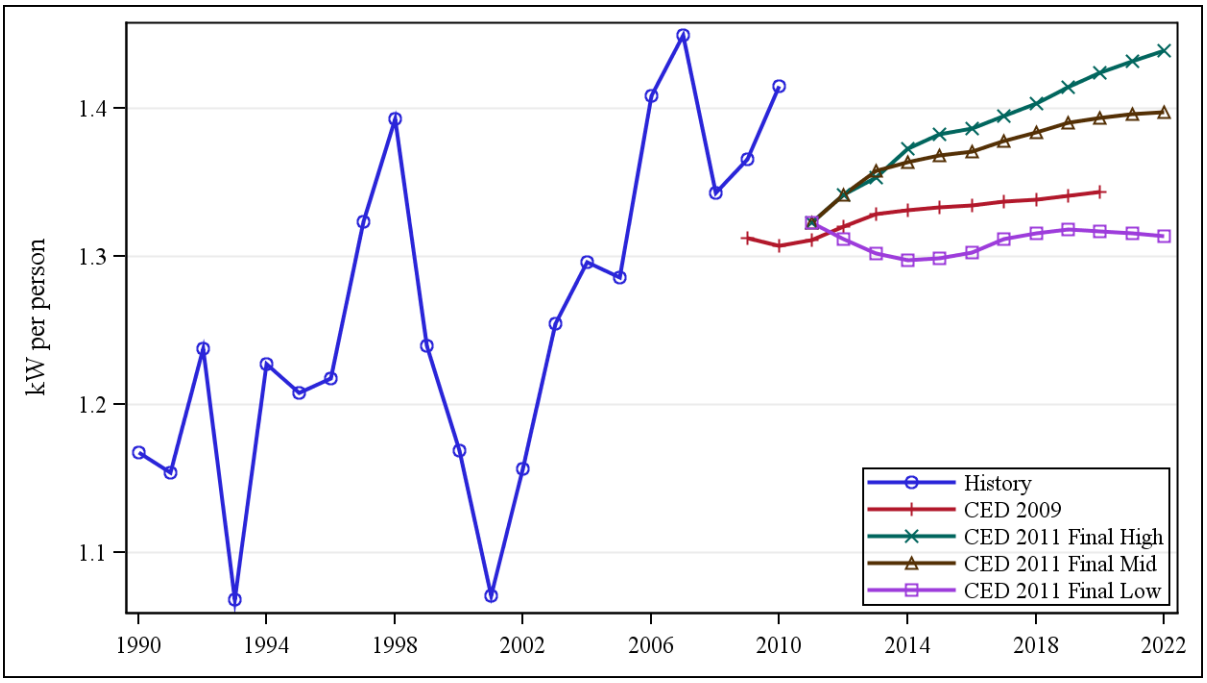
Figure 3-3: SDG&E Planning Area per Capita Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-4 compares forecasts of per capita peak demand. The *CED 2011 Final* mid demand scenario grows rapidly at the start of the forecast period as the California economy recovers and then grows at a similar rate as *CED 2009* toward the end of the forecast period.

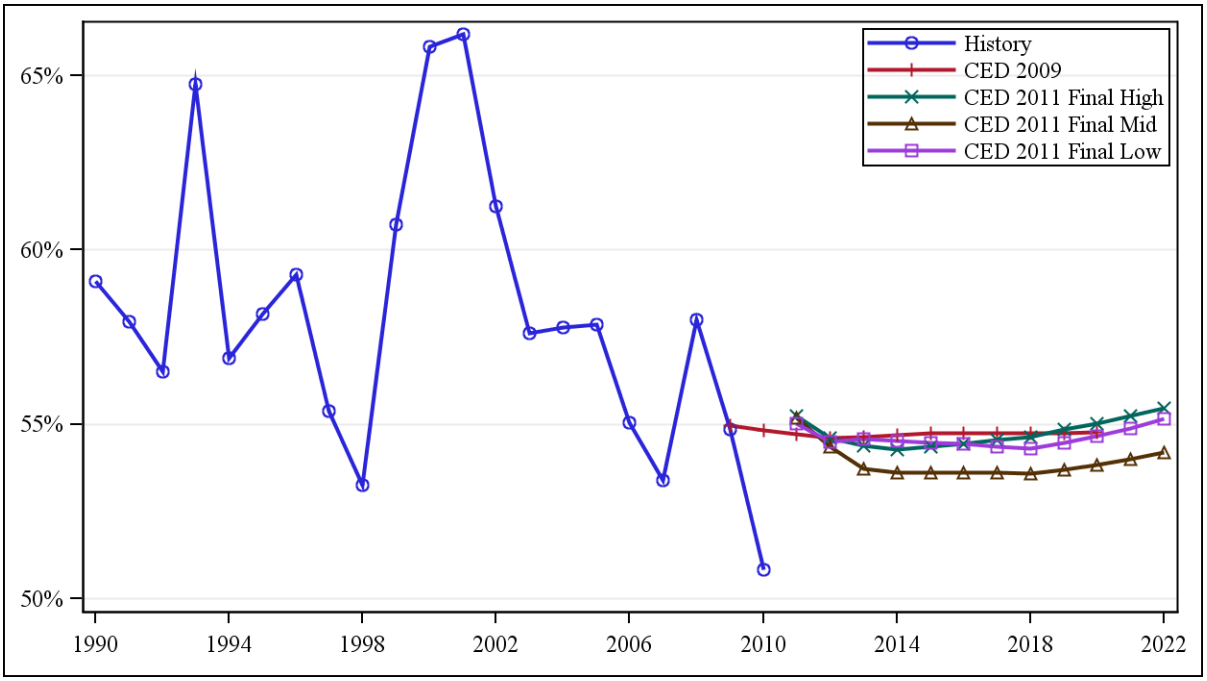
Figure 3-4: SDG&E Planning Area per Capita Peak Demand



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-5 compares the respective forecast load factors. High load factors observed from 1998-2005 are a product of lower-than-average peak temperatures as well as reaction to the energy crisis. The projected load factors, based on average temperatures and a return to normal air-conditioning use patterns, should be lower than these recent values, with the exception of 2010, when Southern California experienced an unusually severe heat storm.

Figure 3-5: SDG&E Planning Area Peak Load Factors



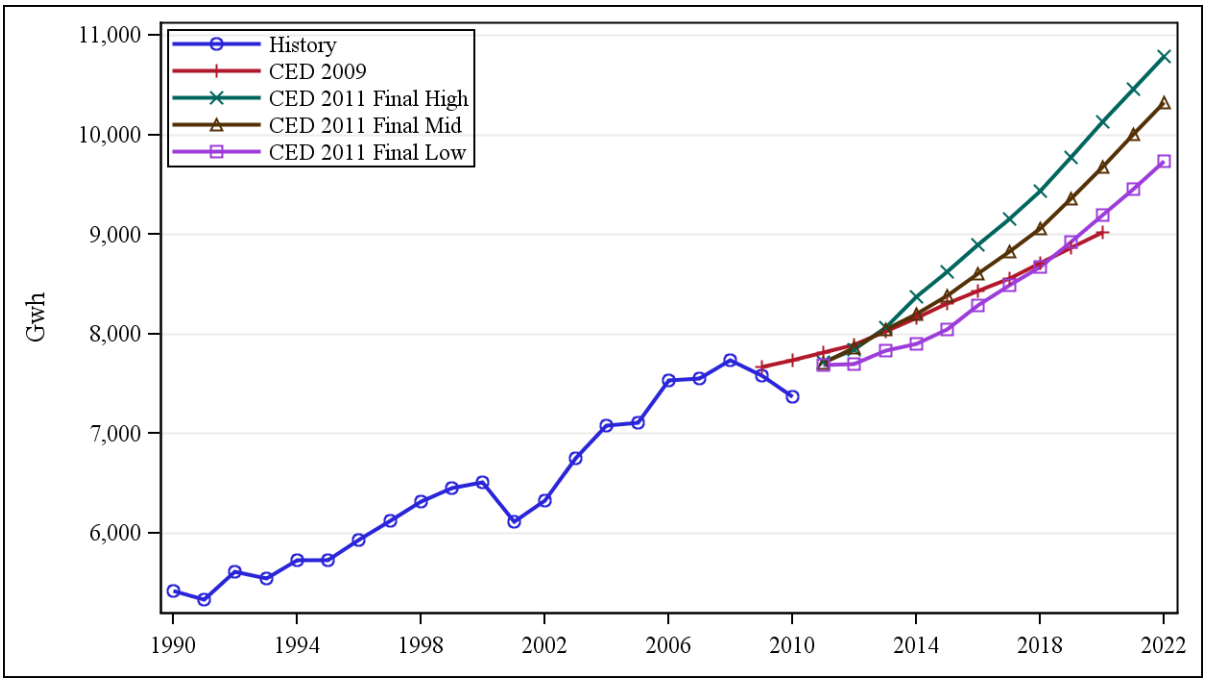
Source: California Energy Commission, Demand Analysis Office, 2012

Sector Level Results and Input Assumptions

Residential Sector

Figure 3-6 compares *CED 2011 Final* and *CED 2009* planning area residential forecasts. Due to a lower starting point, all three scenarios project a lower level of consumption than *CED 2009* in the very near term. However, for each scenario, the overall growth rate is higher than *CED 2009* due to higher growth in occupied households and higher income growth in the mid and high demand scenarios. By 2020, all three scenarios reach a higher level than *CED 2009*. This narrow range of forecasts reflects a relatively small spread in personal income between the scenarios. The mid case grows at an annual rate of 2.7 percent to reach 10,320 GWh by 2022.

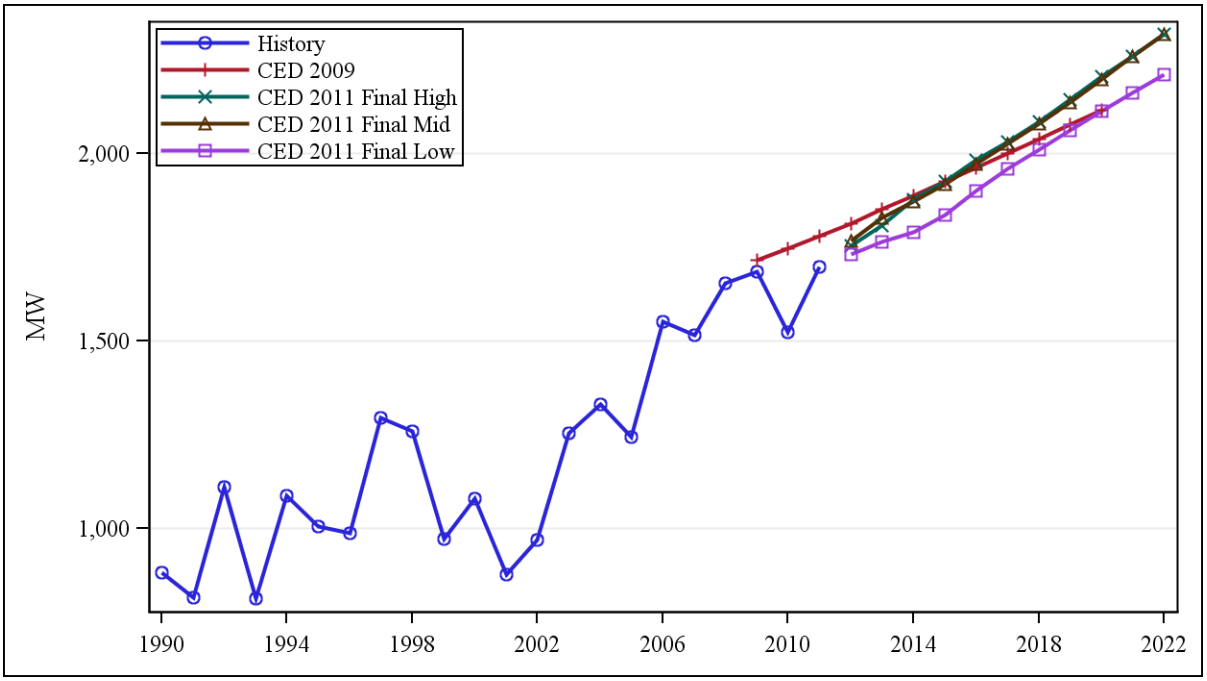
Figure 3-6: SDG&E Planning Area Residential Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-7 compares *CED 2011 Final* and *CED 2009* residential peak demand forecasts. The *CED 2011 Final* forecasts are all lower than the *CED 2009* forecast at the beginning of the forecast period but grow at a faster rate, driven by faster commercial floor space growth. The mid and high case scenarios have similar growth rates and reach more than 2,300 MW by 2022.

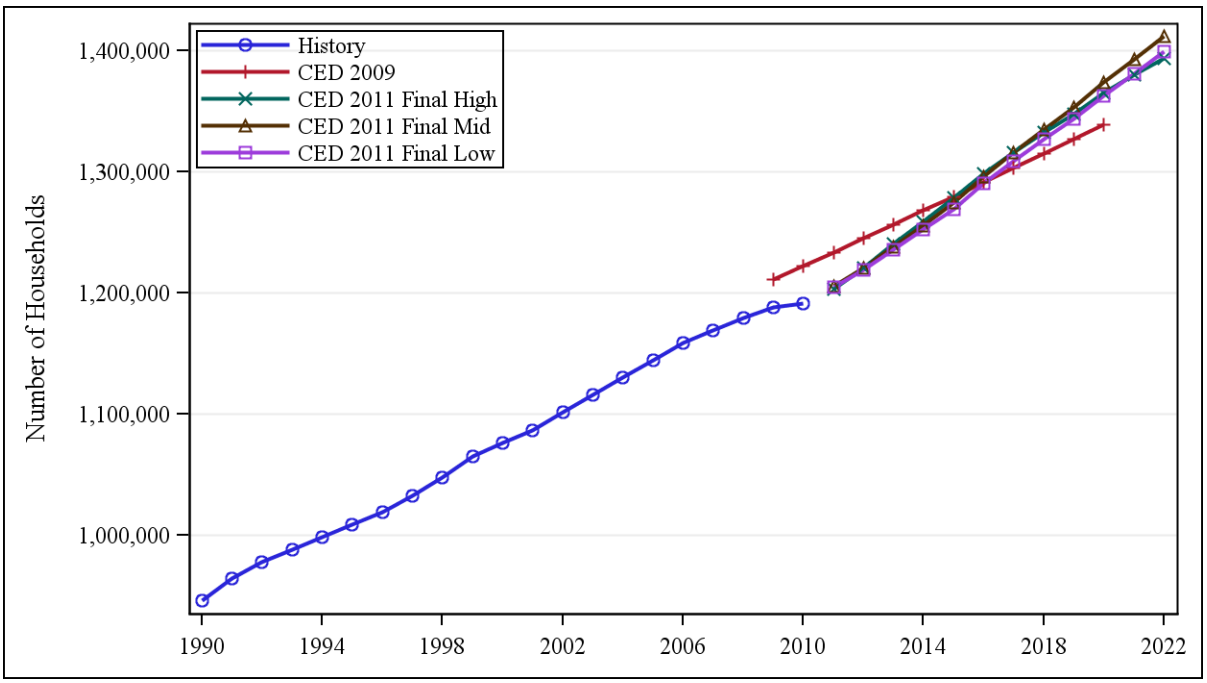
Figure 3-7: SDG&E Planning Area Residential Peak



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-8, **Figure 3-9**, and **Figure 3-10** compare the residential economic/demographic drivers used in *CED 2011 Final* with those used in *CED 2009*. **Figure 3-8** provides comparisons of total household projections. There is very little change in the year-to-year growth in the low, mid, and high demand scenarios. All three demand scenarios start lower than *CED 2009* but grow at a faster rate, such that all three scenarios are higher than *CED 2009* by the middle of the forecast period.

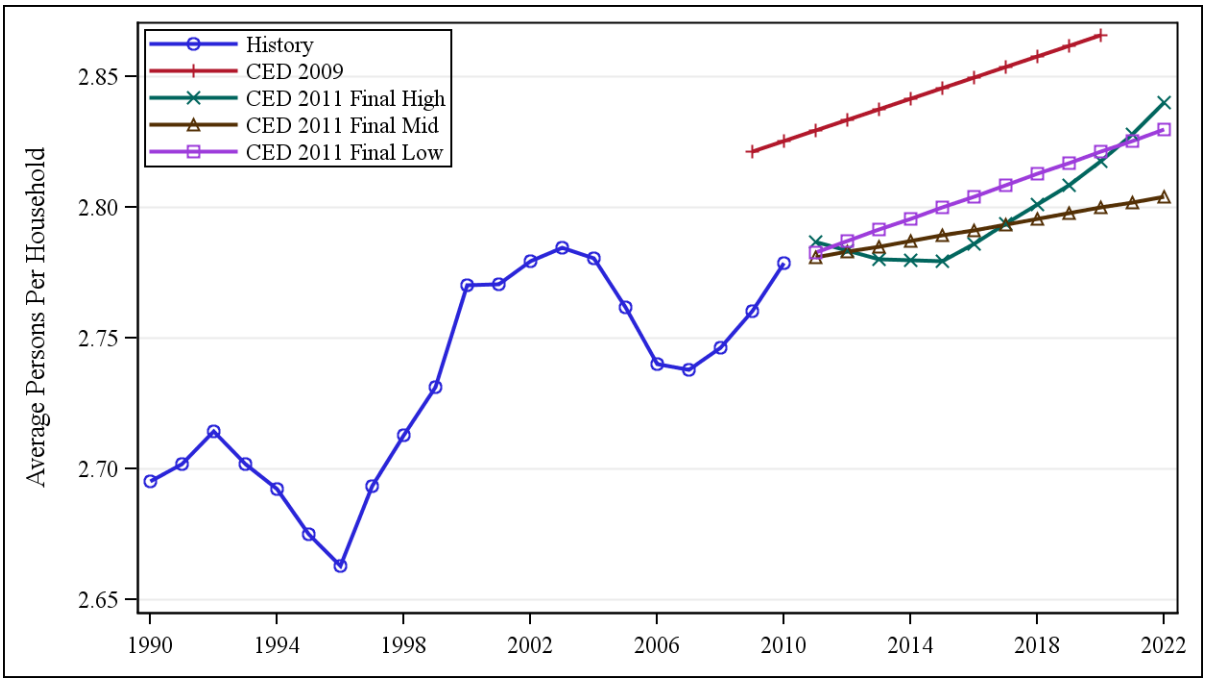
Figure 3-8: SDG&E Planning Area Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-9 compares persons per household. Population assumptions are consistent across all three scenarios, so the projections of households and persons per household are inversely related. The low and mid cases grow steadily while the high case declines in the near term before growing rapidly in the latter half of the forecast period. Due to a lower starting point for population, all three scenarios are lower than *CED 2009* throughout the forecast period.

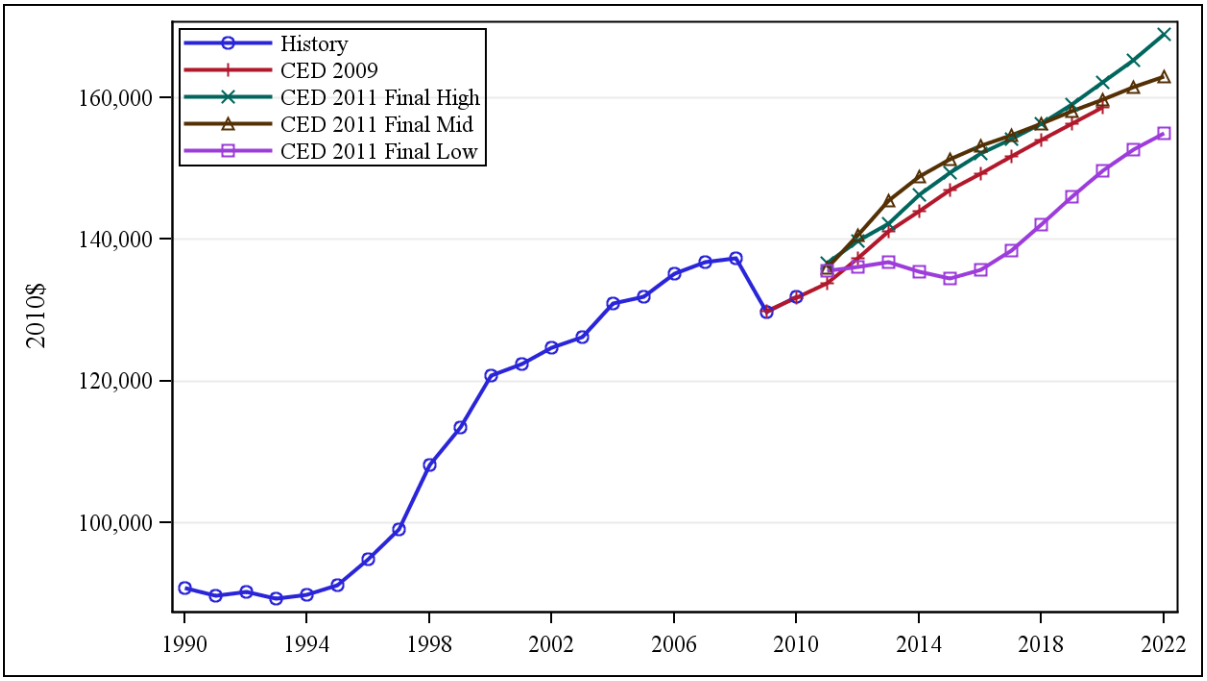
Figure 3-9: SDG&E Planning Area Persons per Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-10 provides a comparison of average household income between the forecasts and shows that the *CED 2011 Final* mid demand case tracks very closely with the *CED 2009* projection. Compared to the mid scenario, the high demand case has lower total household income in the early years of the forecast. This, combined with differences in the projected growth rate of households versus total household income, yields lower income per household in the high case than in the mid case until the later years of the forecast period.

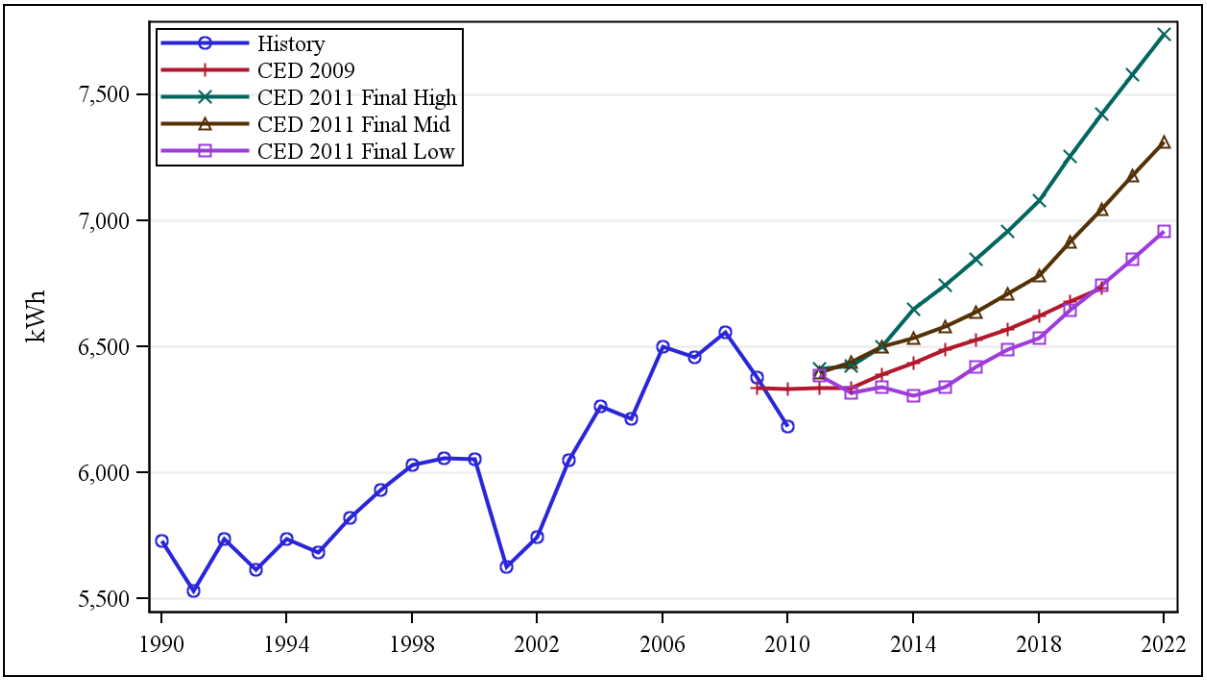
Figure 3-10: SDG&E Planning Area Average Household Income Projections



Source: California Energy Commission, Demand Analysis Office, 2012

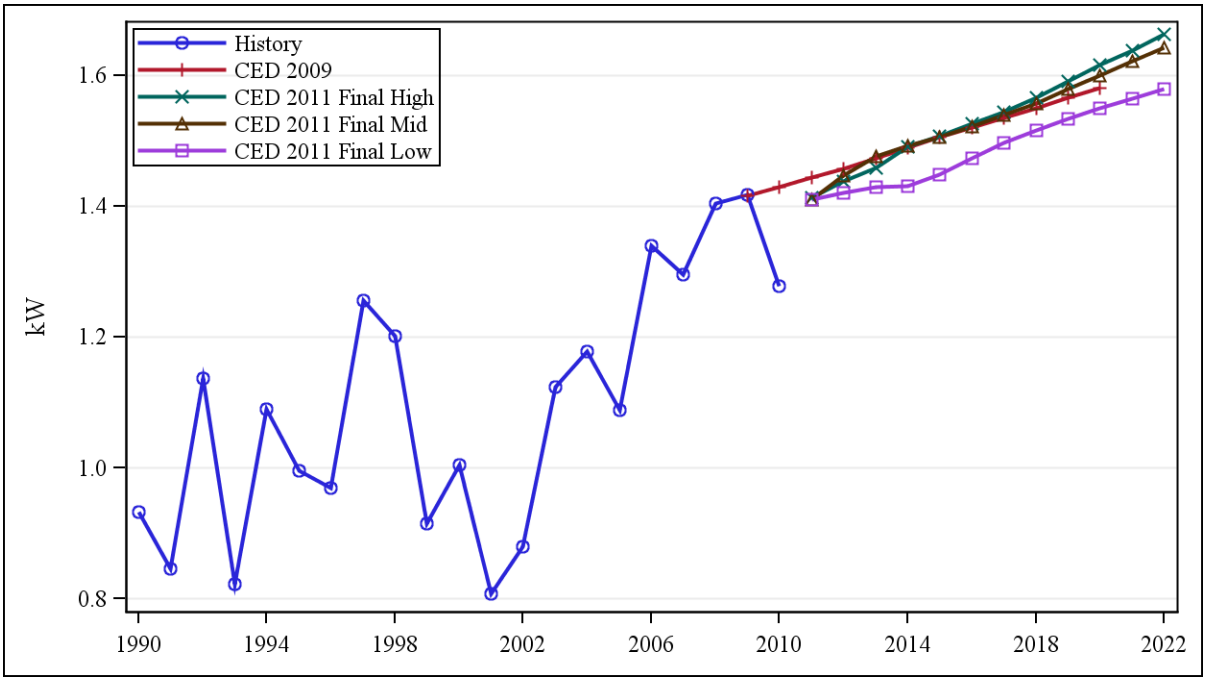
Figure 3-11 and **Figure 3-12** compare residential consumption per household and residential peak use per household, respectively. The *CED 2011 Final* forecast of consumption per household begins at a higher point and grows at a faster rate in the mid and high scenarios compared to *CED 2009* and drops below *CED 2009* in the low demand case. By the end of the forecast period, growth rates for all three of the final forecasts are higher than *CED 2009* because of the impact of electric vehicles. The *CED 2011 Final* forecast of peak use per household begins lower than that projected in *CED 2009* in the mid and high demand cases but grows at a higher rate.

Figure 3-11: SDG&E Planning Area Consumption per Household



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-12: SDG&E Planning Area Peak Use per Household

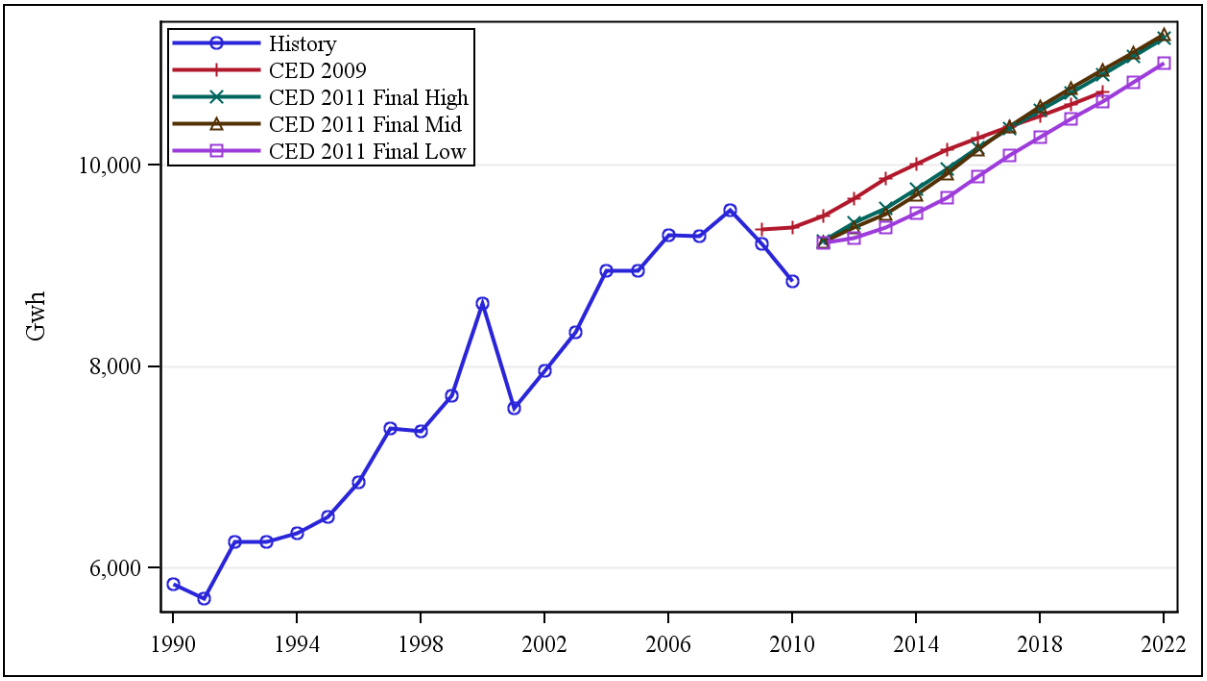


Source: California Energy Commission, Demand Analysis Office, 2012

Commercial Sector

Figure 3-13 compares the commercial sector consumption forecasts. Projected growth from 2011-2020 in commercial consumption is faster in all three scenarios compared to *CED 2009* due to faster projected growth in commercial floor space. Relatively similar projections of floor space among the scenarios (see Volume 1) lead to little difference among the scenarios. Since 2010 marked unusually cool weather in Southern California, the consumption scenarios began at a value lower than predicted by *CED 2009*. The mid case grows at an annual rate of 1.8 percent to reach 11,300 GWh by 2022.

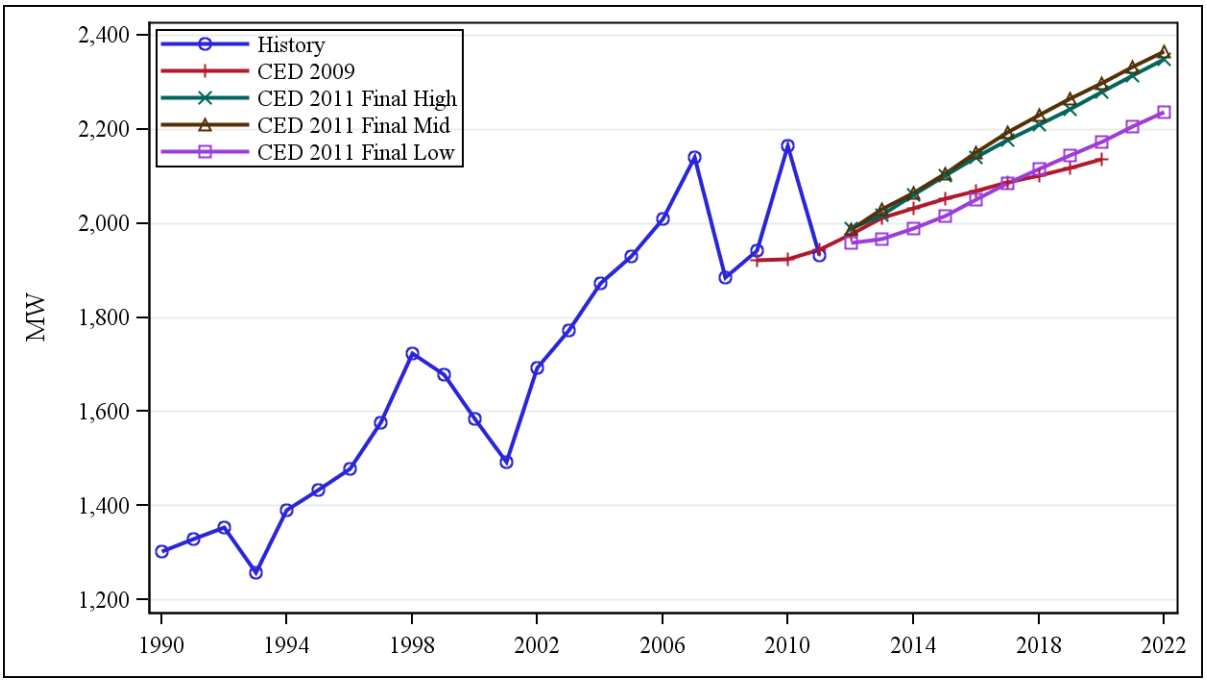
Figure 3-13: SDG&E Planning Area Commercial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-14 compares the commercial sector peak demand forecasts. Differences in the peak forecasts are similar to those in the consumption forecasts, with a higher relative (to *CED 2009*) growth rate in the mid and high cases due to the adjustment for climate change. The mid case grows at an annual rate of 1.9 percent to reach more than 2,350 MW by 2022.

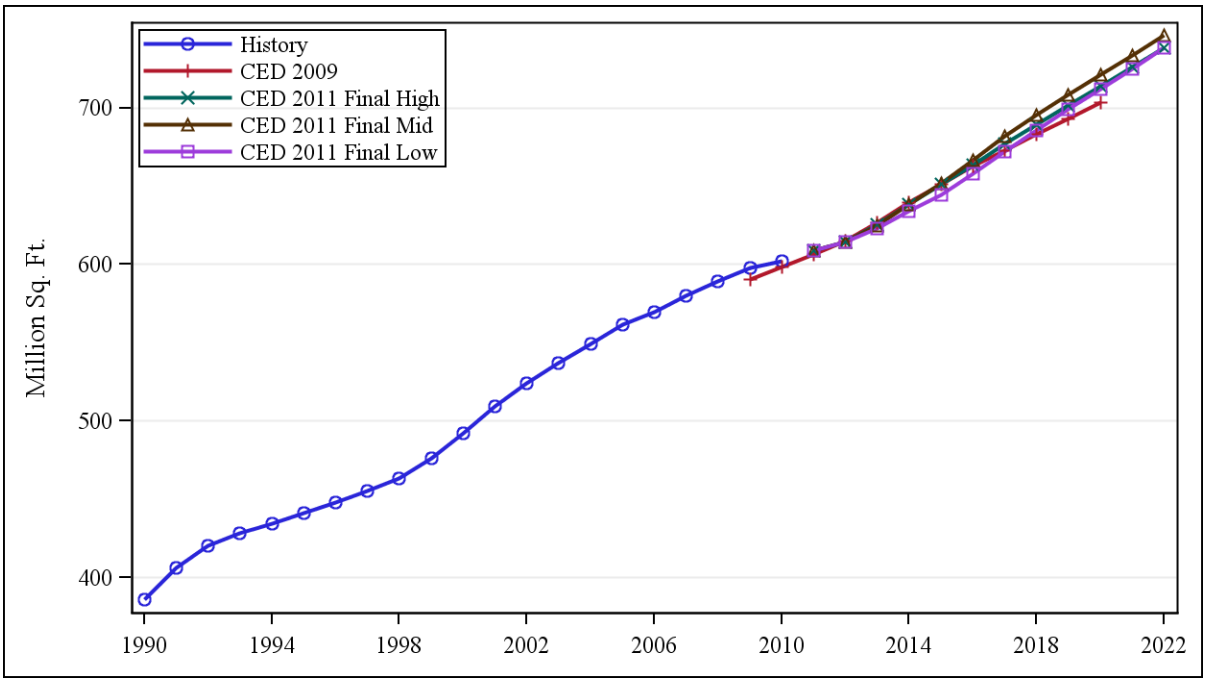
Figure 3-14: SDG&E Planning Area Commercial Sector Peak



Source: California Energy Commission, Demand Analysis Office, 2012

In staff's commercial building sector forecasting model, floor space by building type (for example, retail, schools, and offices) is the key driver of energy use for each specific building type. **Figure 3-15** compares total commercial floor space projections. Floor space projections are driven by employment forecasts in individual subsectors (retail, wholesale, restaurants, and so on). These may differ among the economic forecasts so that a subsector employment forecast may be higher in the low demand scenario than in the high case, even though total employment is lower. This can lead to the result shown in **Figure 3-15**, where mid demand floor space is higher than the high case projection. However, lower projected electricity rates and efficiency program impacts in the high demand case keep commercial consumption generally above that in the other two scenarios, as shown in **Figure 3-13**.

Figure 3-15: SDG&E Planning Area Commercial Floor Space

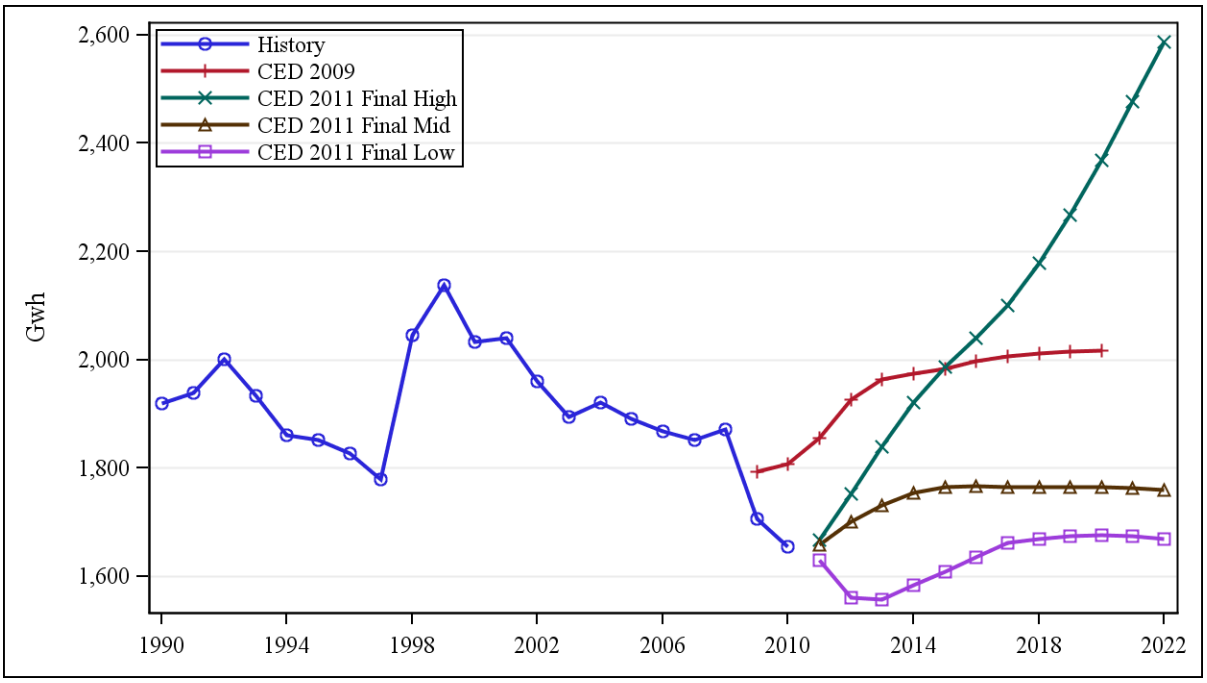


Source: California Energy Commission, Demand Analysis Office, 2012

Industrial Sector

Figure 3-16 compares the industrial sector electricity consumption forecasts for the SDG&E planning area. *CED 2011 Final* mid and low cases echo a pattern described in *CED 2009*—short-term recovery followed by a return to long-term decline. The lower starting point for *CED 2011 Final* reflects actual industrial consumption in 2010, which was lower than projected in *CED 2009*. The substantial spread between low and high cases (the high case is about 55 percent higher than the low case in 2022) reflects disparate input forecasts. Global Insight, which was used in the high case, projects very high growth in manufacturing and construction relative to Moody's, which was used in the mid and low cases.

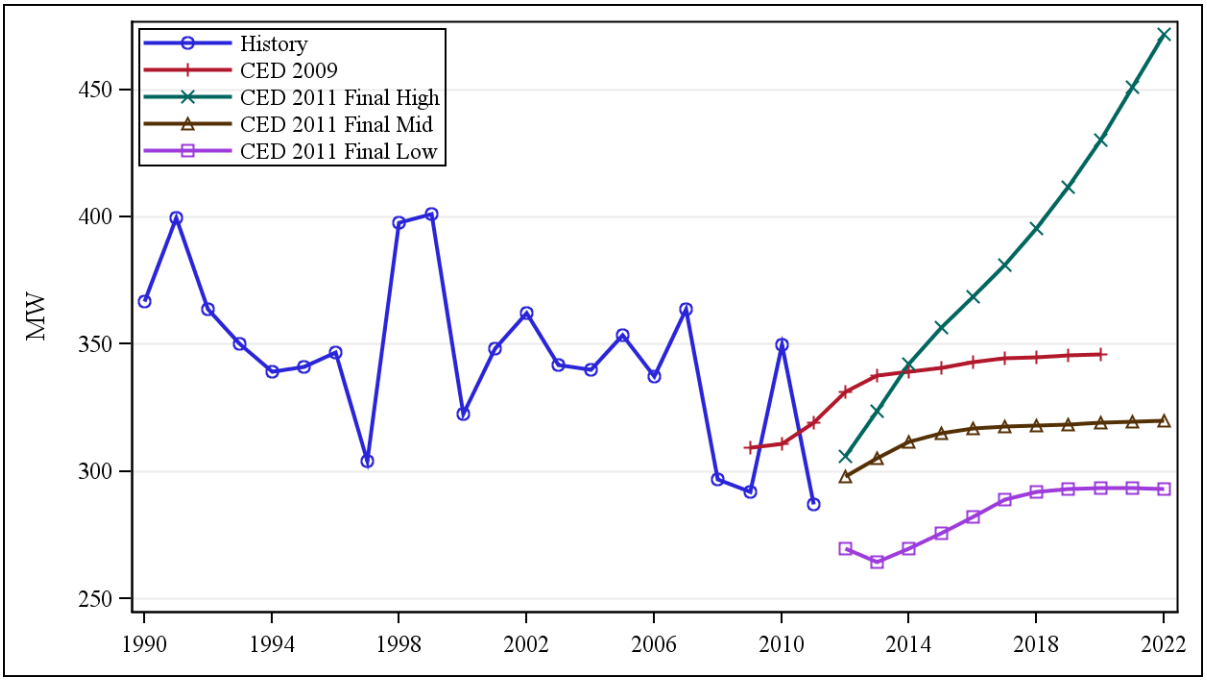
Figure 3-16: SDG&E Planning Area Industrial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-17 compares the industrial sector peak forecasts. Differences in the peak forecasts are similar to those of the consumption forecasts.

Figure 3-17: SDG&E Planning Area Industrial Sector Peak



Source: California Energy Commission, Demand Analysis Office, 2012

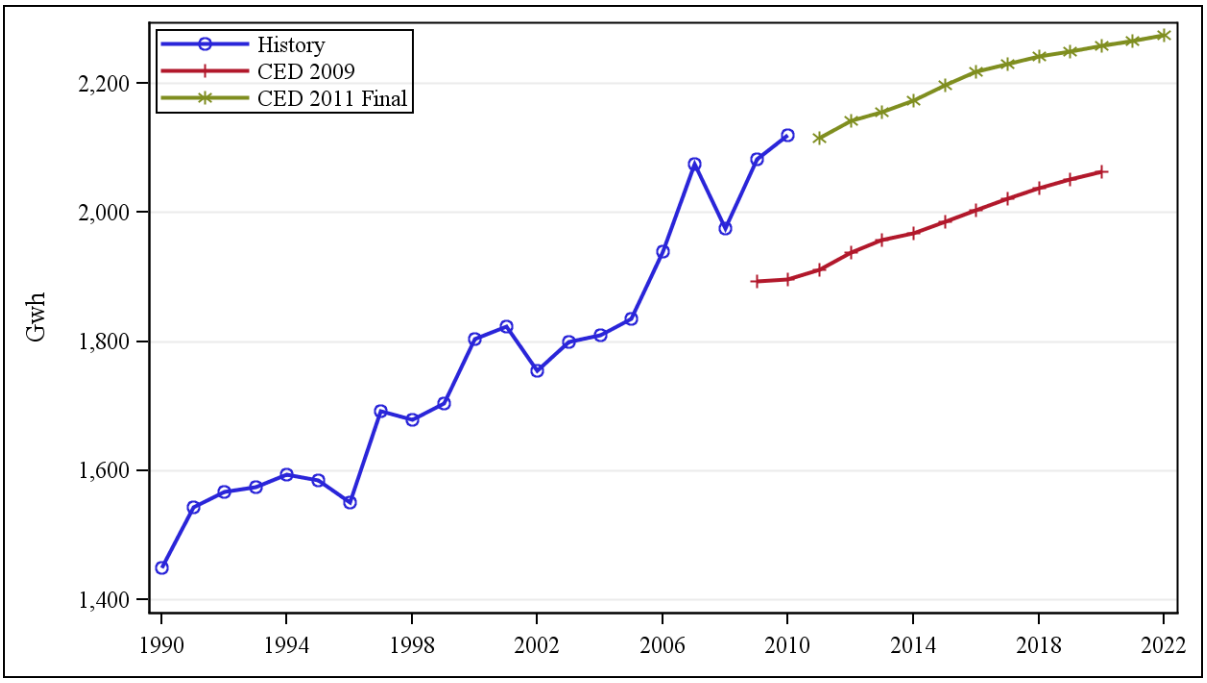
Other Sectors

Figure 3-18 and **Figure 3-19** compare the remaining sector electricity consumption forecasts. **Figure 3-18** provides a comparison of the TCU sector forecast, which includes street lighting. In this case, a single scenario was run.[3] The *CED 2011 Final* forecast is higher than the *CED 2009* forecast due to a higher historical starting point, with similar projected growth rates.

Figure 3-19 compares the agriculture and water pumping sector forecasts. The *CED 2011 Final* agriculture and water-pumping forecast does not deviate significantly from *CED 2009*, though it does have a slightly higher annual growth rate at 0.96 percent in the mid case. The slight differences between demand scenarios reflect different forecasts of occupied households.

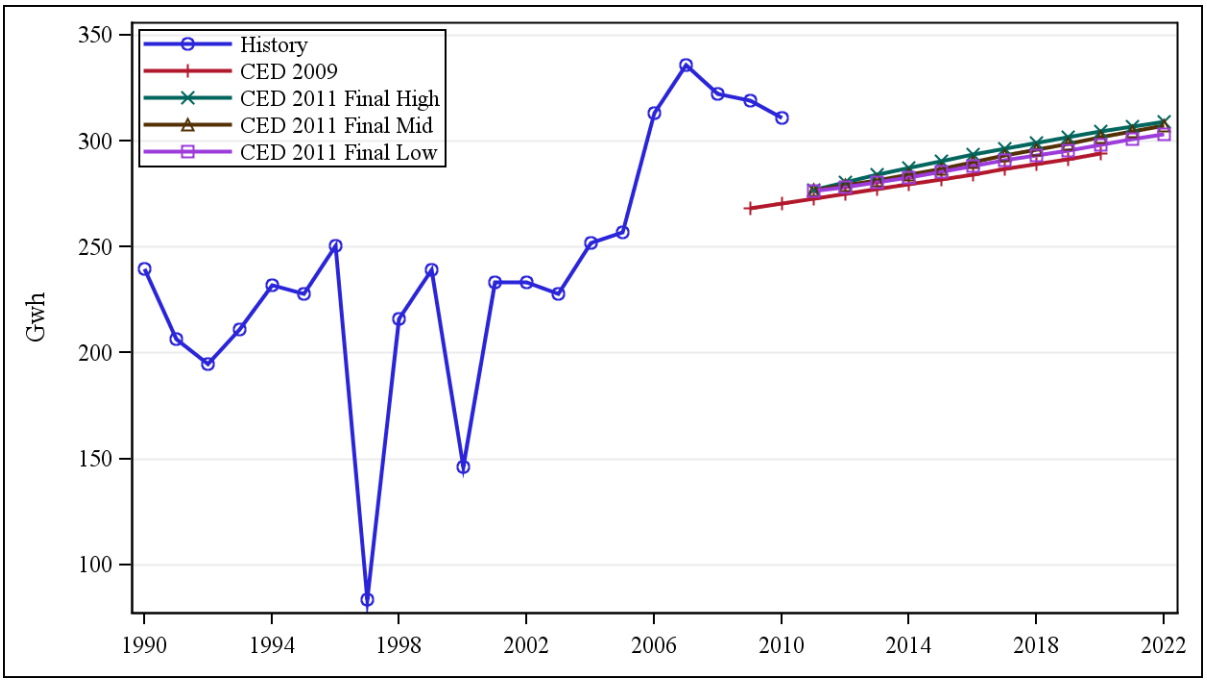
3 Growth in TCU consumption depends mainly on population, for which there is only one scenario.

Figure 3-18: SDG&E Planning Area Transportation, Communication, and Utilities Sector Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

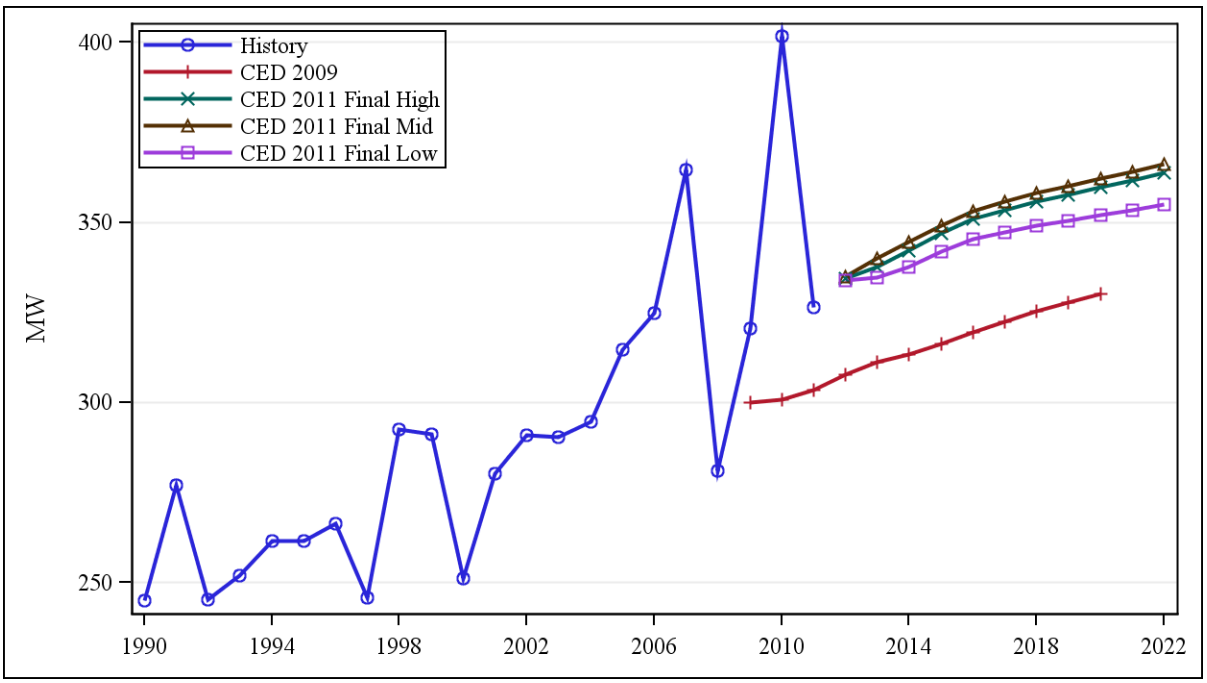
Figure 3-19: SDG&E Planning Area Agriculture and Water Pumping Forecasts



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-20 compares the combined "other" sector peak forecasts. This sector includes the combined demands of the transportation, communication, utility, street lighting, agricultural, and water pumping sectors. The *CED 2011 Final* forecast grows at an annual rate of 0.83 percent, roughly the same growth projected by *CED 2009*. Because of the significantly higher starting point, the *CED 2011* scenarios remain higher throughout the forecast period.

Figure 3-20: SDG&E Planning Area Other Sector Peak

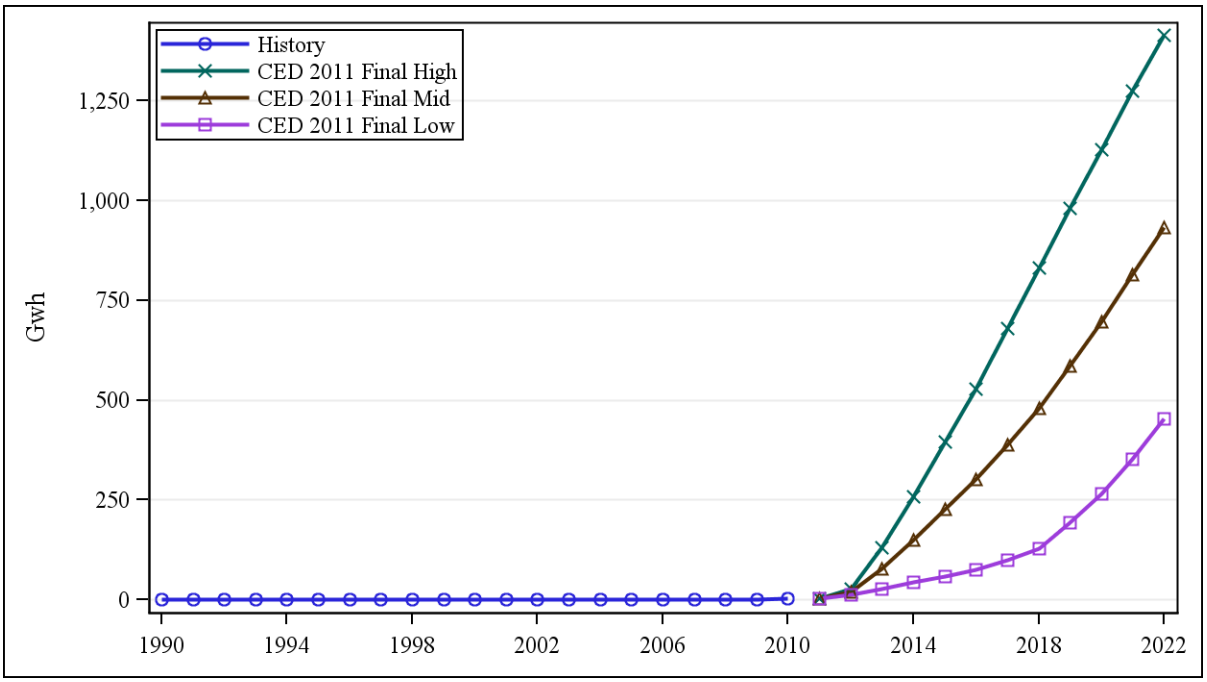


Source: California Energy Commission, Demand Analysis Office, 2012

Electric Vehicles

Figure 3-21 presents the SDG&E planning area electric vehicle consumption forecast for each of the demand scenarios. Electricity consumption by electric vehicles is expected to increase from around 2.5 GWh in 2011 to around 450 GWh in the low demand scenarios and to more than 1,400 GWh in the high case by 2022. Staff assumed most recharging would occur during off-peak hours, so peak impacts are expected to be relatively small, causing an increase of 19 MW in the low demand case and 60 MW in the high scenario by the end of the forecast period.

Figure 3-21: SDG&E Planning Area Electric Vehicle Forecast



Source: California Energy Commission, Demand Analysis Office, 2012

Self-Generation

The peak demand forecast is reduced by self-generation, including the effects of SGIP, CSI, and other programs, as discussed in Volume 1. The effects of these programs are forecast based on recent trends in installations and a residential predictive model. **Table 3-2** shows *CED 2011 Final* forecasts of peak impacts from PV and non-PV self-generation. Only residential PV impacts varied in the demand scenarios, based on differences in households and energy rates. Staff projects about 186 MW of peak reduction from PV installation in the mid case by 2022. Peak reductions are based on installed PV system capacities of 260 MW by 2022 in the high demand case and 328 MW by 2022 in the low demand case.

Table 3-22: SDG&E Planning Area Self-Generation Peak Forecasts (MW)

Year	1990	2000	2010	2015	2020	2022
Non-PV Self-Generation	78.68	59.47	115.26	134.56	134.56	134.56
PV, Low Demand	0.00	0.05	46.86	123.83	175.68	214.40
PV, Mid Demand	0.00	0.05	46.86	115.66	153.39	185.80
PV, High Demand	0.00	0.05	46.86	113.32	142.80	168.37
Total Self-Generation, Low Demand	78.68	59.53	162.11	258.39	310.25	348.96
Total Self-Generation, Mid Demand	78.68	59.53	162.11	250.22	287.95	320.37
Total Self-Generation, High Demand	78.68	59.53	162.11	247.89	277.36	302.93

Source: California Energy Commission, Demand Analysis Office, 2012

Conservation/Efficiency Impacts

Table 3-3 shows electricity consumption and peak savings estimates for building and appliance standards for the mid demand scenario for selected years. Total standards impacts are higher in the high demand case by 1.5-2.0 percent due to higher home construction and 1.5-2.0 percent lower in the low demand case. The standards savings estimates include the 2010 revision to Title 24 building standards as well as AB 1109 lighting savings and television standard savings. Savings are measured against a baseline before 1975, so they incorporate more than 30 years of impacts. Volume 1, Chapter 3 provides more detail on staff work related to energy efficiency and conservation.

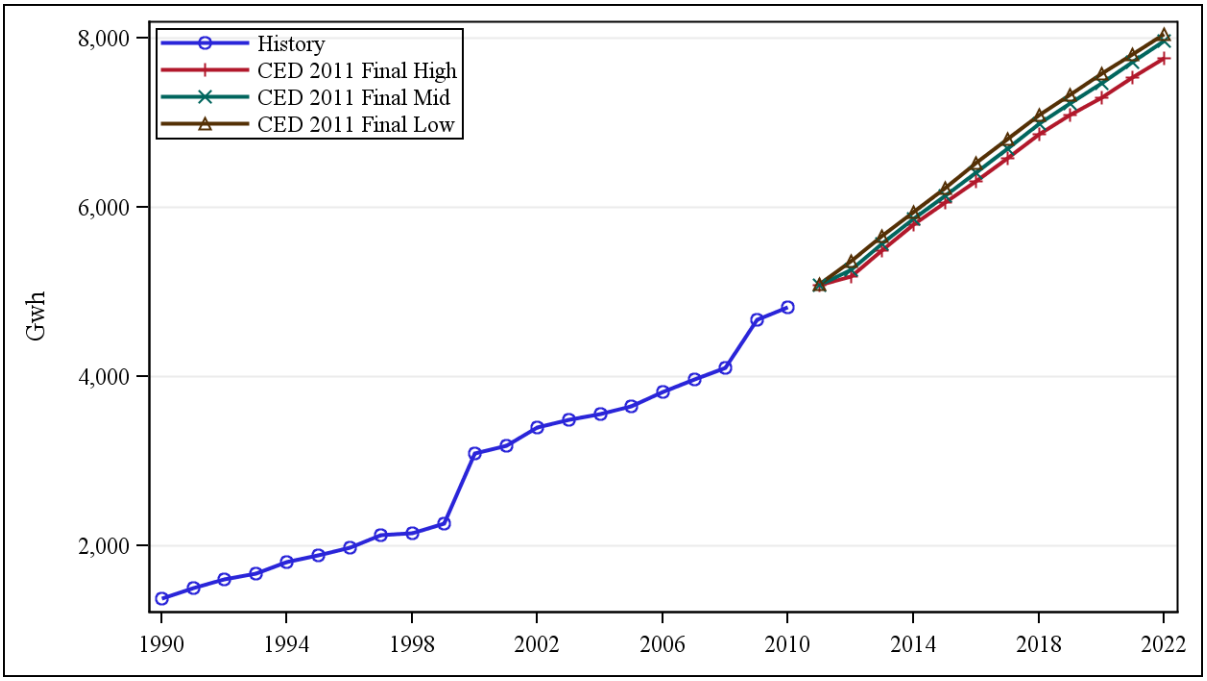
Table 3-3: SDG&E Planning Area Electricity Savings Estimates From Standards, Mid Demand Scenario

Electricity Consumption Savings (GWH)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	401	197	598	151	97	247	845
2000	443	616	1,059	406	260	666	1,725
2010	286	1,351	1,637	789	457	1,245	2,882
2015	376	2,091	2,467	1,032	594	1,626	4,092
2020	474	2,685	3,158	1,347	796	2,144	5,302
2022	503	2,830	3,333	1,464	838	2,302	5,635
Electricity Peak Demand Savings (MW)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	65	32	97	34	22	55	153
2000	72	100	171	76	48	124	295
2010	59	280	339	193	112	304	643
2015	88	488	576	218	126	344	920
2020	112	636	748	282	167	449	1,198
2022	118	662	779	306	175	482	1,261

Source: California Energy Commission, Demand Analysis Office, 2012

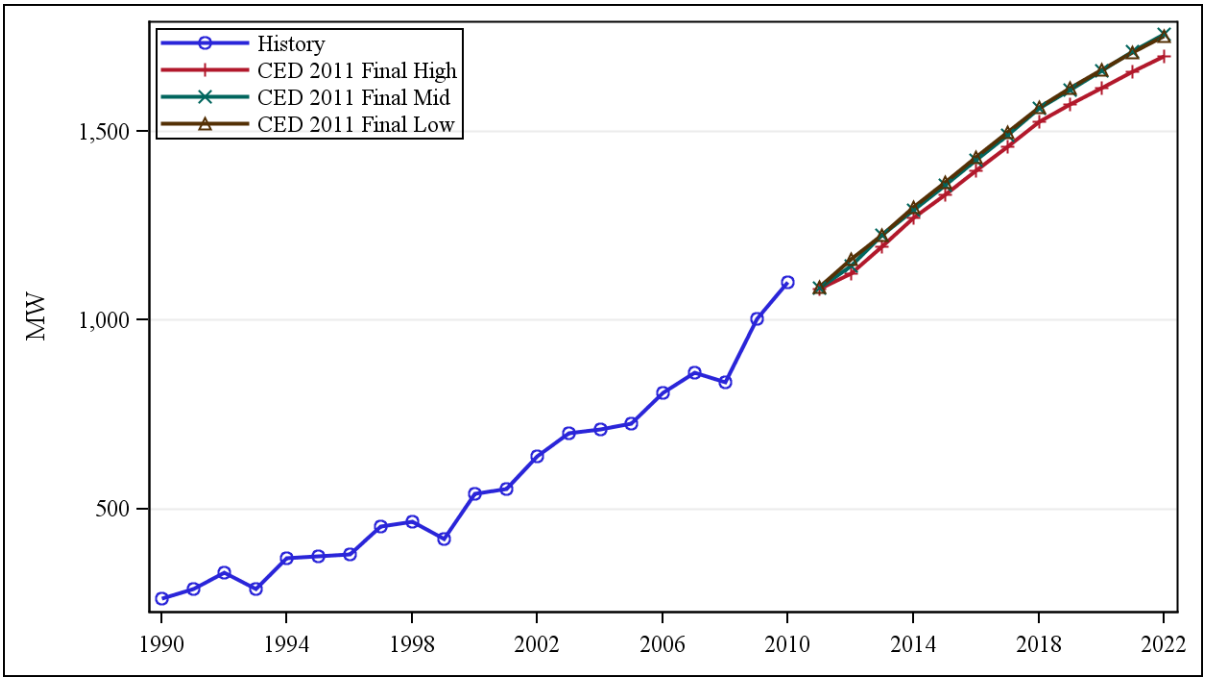
Figure 3-22 and **Figure 3-23** show estimated historical and projected total savings impacts on electricity and peak demand, respectively, from committed efficiency sources, including building and appliance standards; utility and public agency programs offered before 2013; and price and other effects, or savings associated with rate changes and certain market trends not directly related to programs or standards. Projected savings impacts are higher the lower the demand scenario, since price and program effects are inversely related to the demand outcome.

Figure 3-22: SDG&E Planning Area Electricity Consumption Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3-23: SDG&E Planning Area Electricity Peak Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

CHAPTER 4: Sacramento Municipal Utility District Planning Area

The Sacramento Municipal Utility District (SMUD) planning area includes SMUD retail customers but does not include new members of the SMUD control area, Roseville, Redding, and the WAPA. To support electricity system analysis, staff derives forecasts by control area and California Independent System Operator congestion zone from the planning area forecasts. Using historical consumption data and regional population projections, the estimated share of the PG&E forecast for WAPA, Roseville, and Redding forecasts are subtracted from the PG&E planning area and added to the SMUD control area. The results in this chapter are for the SMUD planning area only.

This chapter is organized as follows. First, forecasted consumption and peak loads for the SMUD planning area are discussed; both total and per capita values are presented. The *CED 2011 Final* values are compared to the *CED 2009* forecast, and differences between the two forecasts are explained. The forecasted load factor, jointly determined by the consumption and peak load estimates, is also discussed. Second, sector consumption and peak load forecasts are presented. The residential, commercial, industrial, and "other" sector staff draft forecasts are compared to those in *CED 2009*; again, differences between the two are discussed.

For the *CED 2011 Final* forecast, three scenarios of electricity use were developed for analysis, which include a low, mid and high electricity demand forecast. Volume 1 provides an explanation of the method and assumptions used in the scenarios.

Forecast Results

Table 4-1 presents a comparison of *CED 2011 Final* high, mid and low demand scenarios with *CED 2009* for electricity consumption and peak demand for selected years. Comprehensive results are available electronically as a set of forms posted alongside this report (http://www.energy.ca.gov/2012_energypolicy/documents/#no-meeting).

For both consumption and peak demand, growth rates starting in 2011 are shown to enable comparisons for weather-normalized growth. Discrepancies in historical consumption between *CED 2009* and *CED 2011 Final* result from an adjustment made to QFER filings. After the adjustment, *CED 2011 Final* consumption history more closely resembled the consumption history used as the basis for SMUD's own demand forecast.

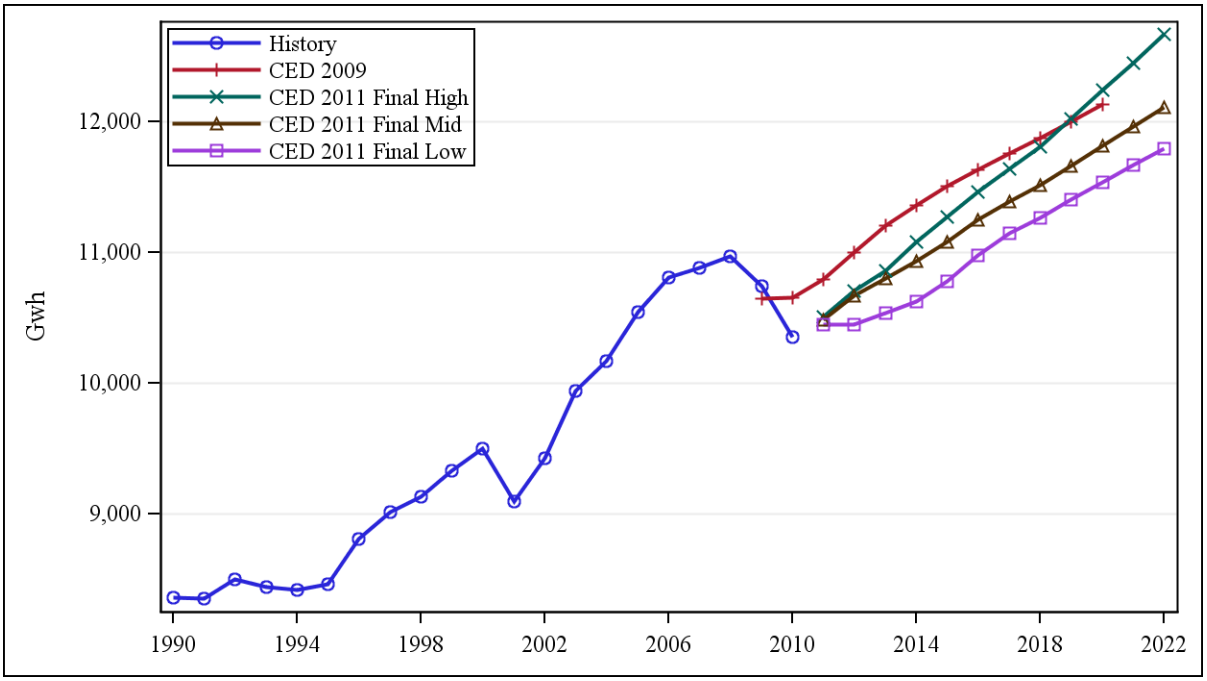
Table 4-1: SMUD Planning Area Forecast Comparison

Consumption (GWH)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	8,358	8,361	8,361	8,361
2000	9,494	9,502	9,502	9,502
2010	10,656	10,354	10,354	10,354
2011	10,793	10,504	10,486	10,448
2015	11,504	11,271	11,082	10,776
2020	12,131	12,237	11,812	11,536
2022	--	12,666	12,109	11,794
Average Annual Growth Rates				
1990 - 2000	1.28%	1.29%	1.29%	1.29%
2000 - 2010	1.16%	0.86%	0.86%	0.86%
2011 - 2015	1.61%	1.78%	1.39%	0.78%
2011 - 2020	1.31%	1.71%	1.33%	1.09%
2011 - 2022	--	1.69%	1.31%	1.09%
Peak (MW)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	2,167	2,193	2,193	2,193
2000	2,687	2,686	2,686	2,686
2011	3,088	2,840	2,840	2,840
2011*	3,088	3,024	3,024	3,024
2015	3,270	3,301	3,255	3,088
2020	3,438	3,581	3,467	3,295
2022	--	3,691	3,540	3,343
Average Annual Growth Rates				
1990 - 2000	2.17%	2.05%	2.05%	2.05%
2000 - 2011	1.27%	0.51%	0.51%	0.51%
2011* - 2015	1.44%	2.21%	1.86%	0.53%
2011* - 2020	1.20%	1.90%	1.53%	0.96%
2011* - 2022	--	1.83%	1.44%	0.92%
Historical values are shaded.				
*Weather-normalized: CED 2011 Final uses a weather-normalized peak value derived from the actual 2011 peak for calculating growth rates during the forecast period.				

Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-1 and **Figure 4-2** present a graphical comparison of *CED 2011* with *CED 2009*. Annual SMUD electricity consumption grows at a rate of 1.33 percent from 2011-2020 in the mid case, compared to 1.31 percent in the *CED 2009* forecast. Total historical electricity consumption dropped 5.5 percent between 2008 and 2010. For the mid case, the *CED 2011 Preliminary* forecast is 2.6 percent lower than the *CED 2009* forecast in 2020. Electricity consumption for the high case scenario reaches the *CED 2009* forecast by the end of the forecast period.

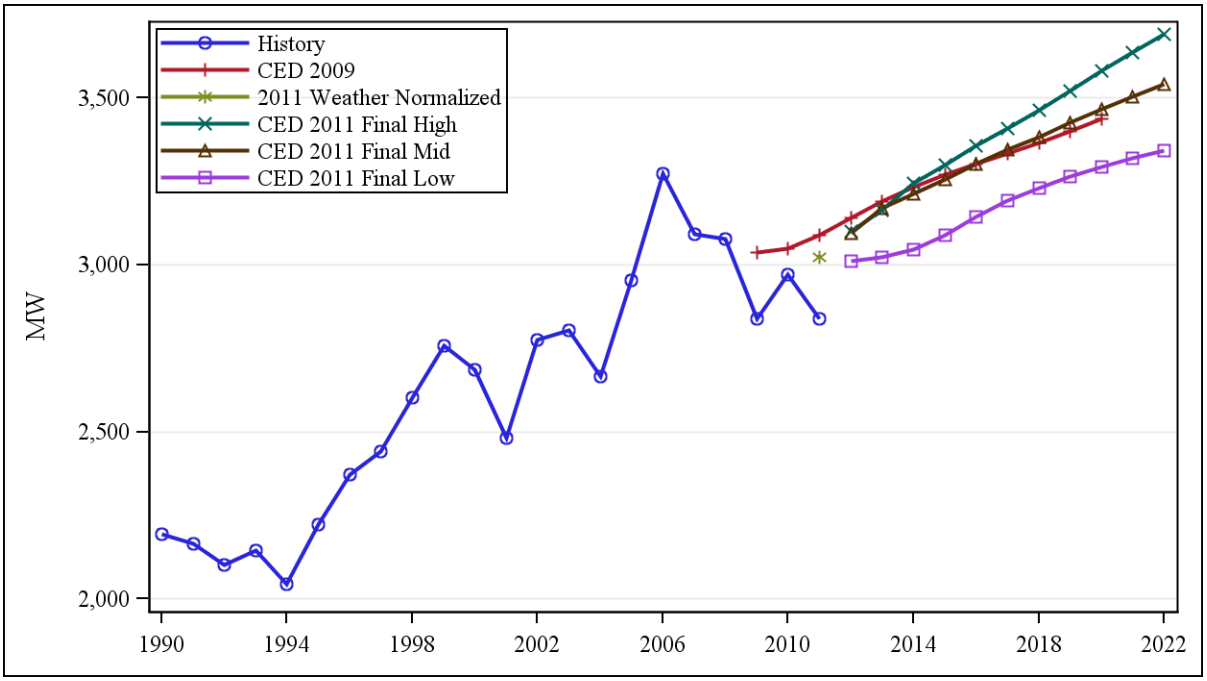
Figure 4-1: SMUD Planning Area Electricity Consumption Forecast



Source: California Energy Commission, Demand Analysis Office, 2012

The *CED 2011 Final* SMUD planning area peak demand forecast for the low case scenario, shown in **Figure 4-2**, is lower through 2020 compared to the *CED 2009* forecast. The mid case is very similar to what was predicted in *CED 2009*. By 2017, the mid demand scenario is higher than *CED 2009* and by 2020 reaches a difference of 0.9 percent. From 2011 through 2020, peak electricity demand grows at a rate of 1.5 percent for the new forecast compared to 1.2 percent in *CED 2009*. Historical peak demand dropped 135 MW from 2010 to 2011 as the SMUD service area experienced a mild summer. Staff calculated a weather-normalized peak of 3,024 MW for 2011.

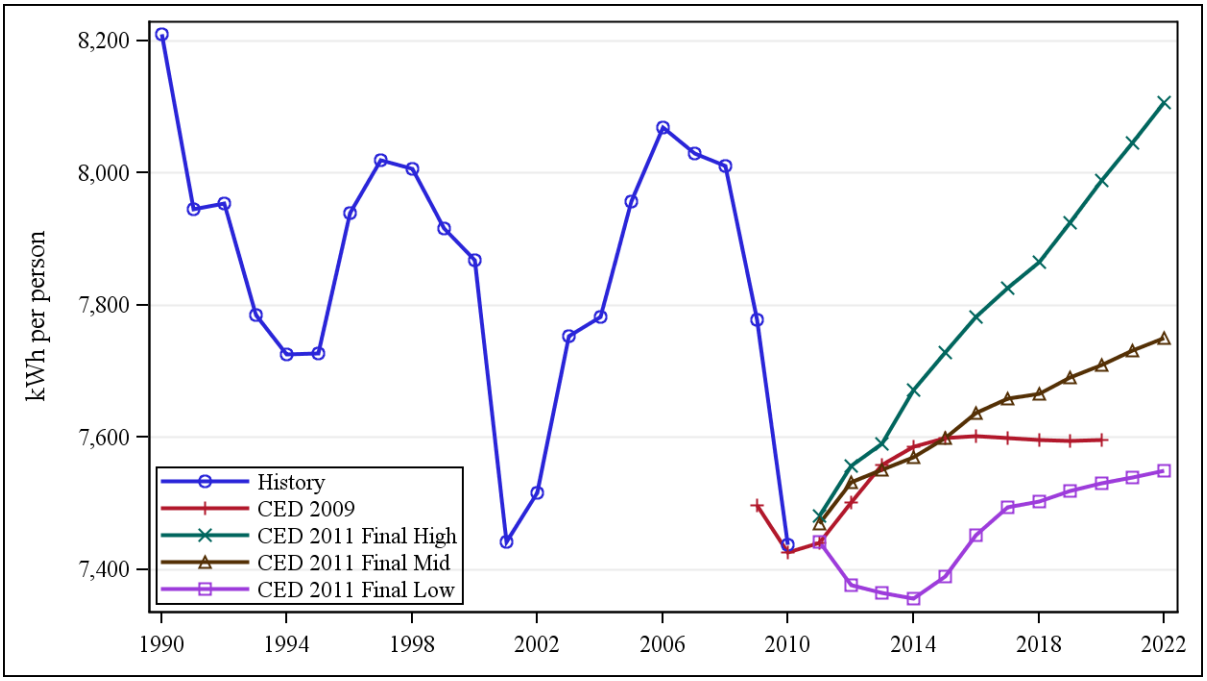
Figure 4-2: SMUD Planning Area Peak



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-3 compares *CED 2011 Final* and *CED 2009* per capita electricity consumption forecasts. The historical trend from 1990 through 2010 has been generally decreasing; by 2010 per capita consumption dipped below the 2001 historical low of 7,500 kWh per person. Both the *CED 2011 Final* and *CED 2009* forecasts are similar through 2015, but begin to separate as the mid case continues to grow while the *CED 2009* forecast flattens out during the second half of the forecast horizon. The per capita consumption growth rate accelerates toward the end of the forecast period for all three scenarios due to increasing numbers of electric vehicles. In 2015, projected per capita consumption in the mid case is roughly that projected by *CED 2009*—around 7,600 kWh per person. However, unlike the CED 2009 projection, which leveled off after 2015, the mid scenario increases and reaches 7,750 GWh by the end of the forecast period. The high scenario surpasses recent historical highs and reaches roughly 8,100 kWh per person by 2022.

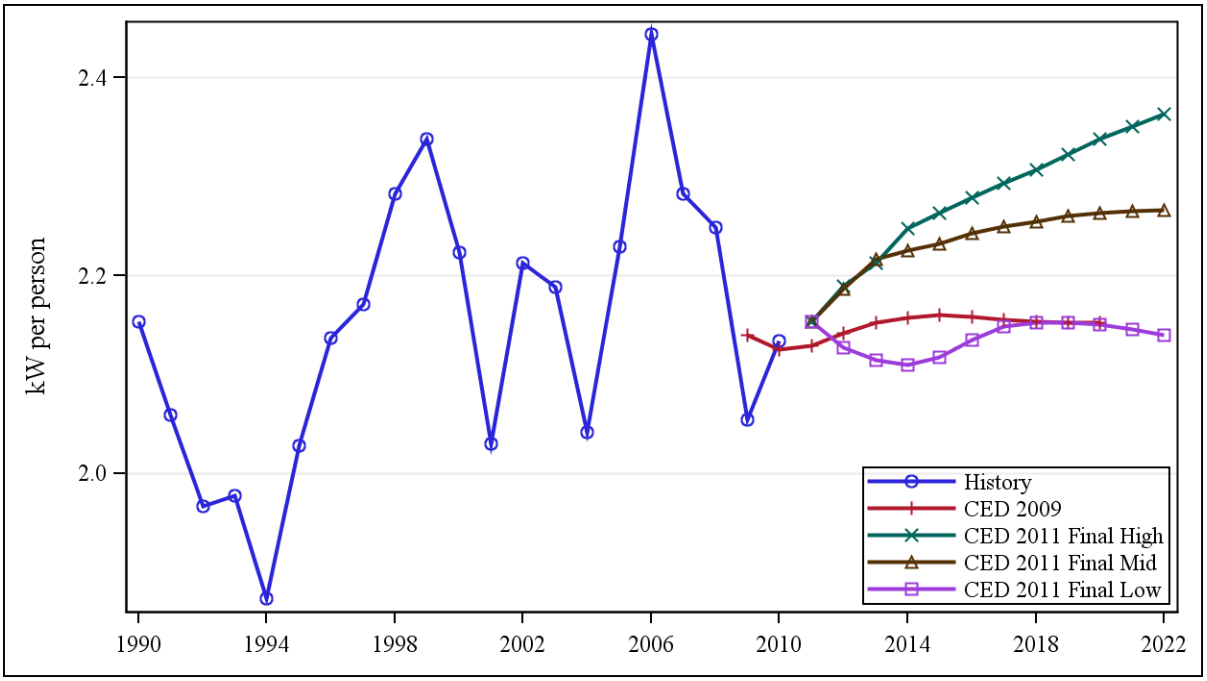
Figure 4-3: SMUD Planning Area per Capita Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Per capita peak demand is shown in **Figure 4-4**. The *CED 2009* forecast most closely resembles the low scenario. The mid case grows rapidly in the near term and slower in the second half of the forecast period, reflecting a projected economic recovery and then a return to the longer-term historical trend. By 2022, the high case projects a per capita peak exceeded only once in recent history.

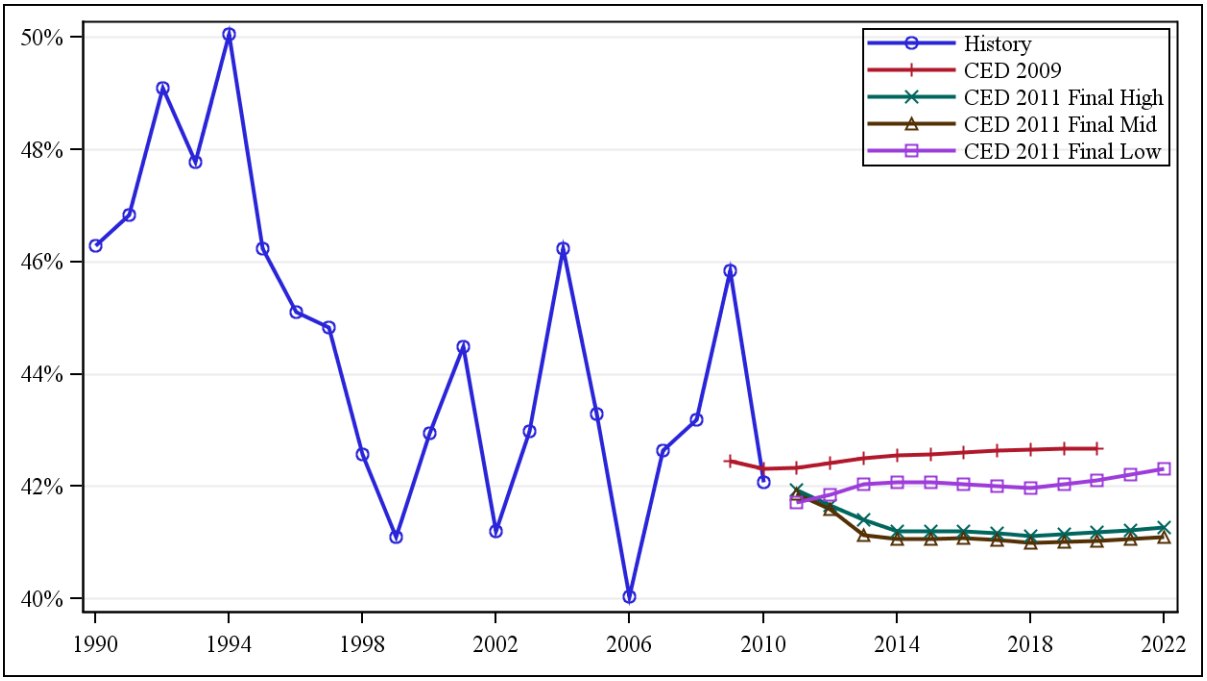
Figure 4-4: SMUD Planning Area per Capita Peak Demand



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-5 compares *CED 2011 Final* and *CED 2009* load factors. The load factor represents the relationship between average energy demand and system peak. The smaller the load factor, the greater is the difference between peak and average hourly demand. Variation in historical load factors is caused in part by annual weather patterns. In years with extreme heat, demand peaks at higher levels and results in lower system load factors. Higher load factors indicate demand is more stable. The SMUD load factor has been declining since the mid-1990s, as the residential sector—with a continually increasing presence of air conditioning—grew faster than other sectors. The forecasted load factors are fairly level as air conditioning in the SMUD planning area nears full saturation. The load factors in the mid and high scenarios decrease quickly in the near term, reflecting higher projected peak growth versus consumption growth coming out of the recession.

Figure 4-5: SMUD Planning Area Load Factors



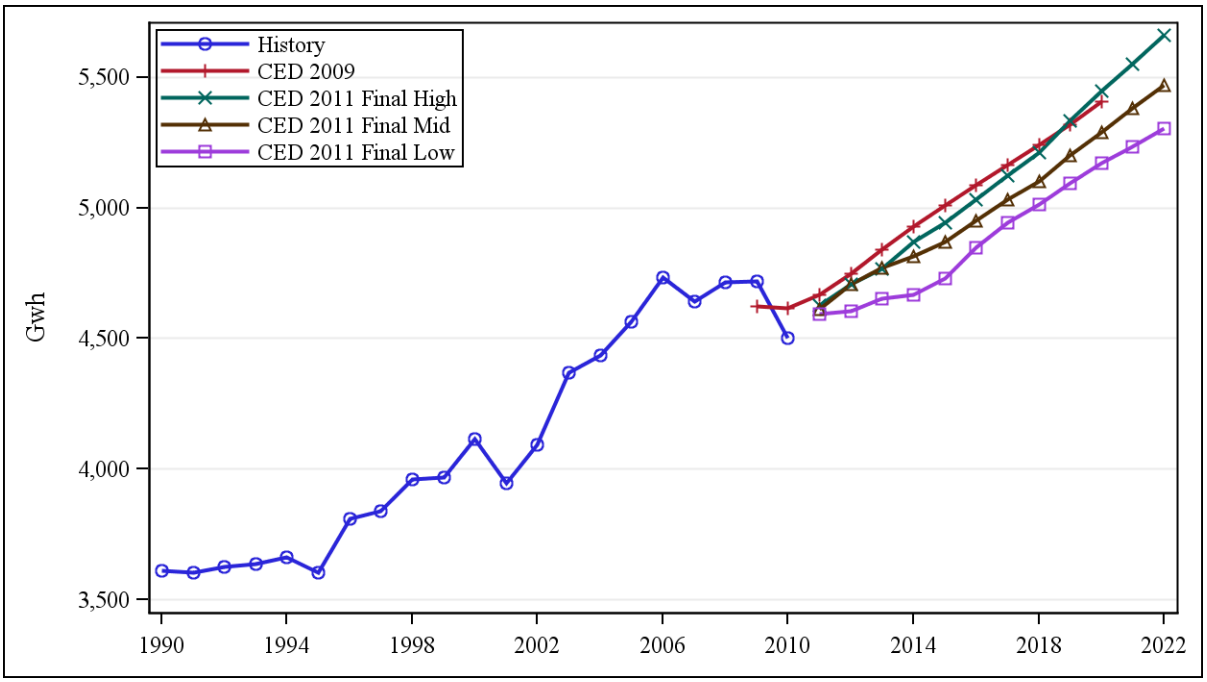
Source: California Energy Commission, Demand Analysis Office, 2012

Sector Level Results and Input Assumptions

Residential Sector

Figure 4-6 compares *CED 2011 Final* and *CED 2009* SMUD residential forecasts. The growth rate for residential consumption over the entire forecast period is higher in all three scenarios compared to *CED 2009* mainly because of higher income growth in the new forecast. For *CED 2011 Final*, the low case grows at 1.32 percent per year from 2011-2020 while the high case grows at 1.85 percent, compared to 1.65 percent in *CED 2009*. Rates of growth between the three scenarios were relatively similar since differences in personal income estimates among the scenarios were small. Due to a drop in recorded consumption of 219 GWh from 2009 to 2010, the *CED 2011 Final* forecast starts somewhat lower than the projection made in 2009.

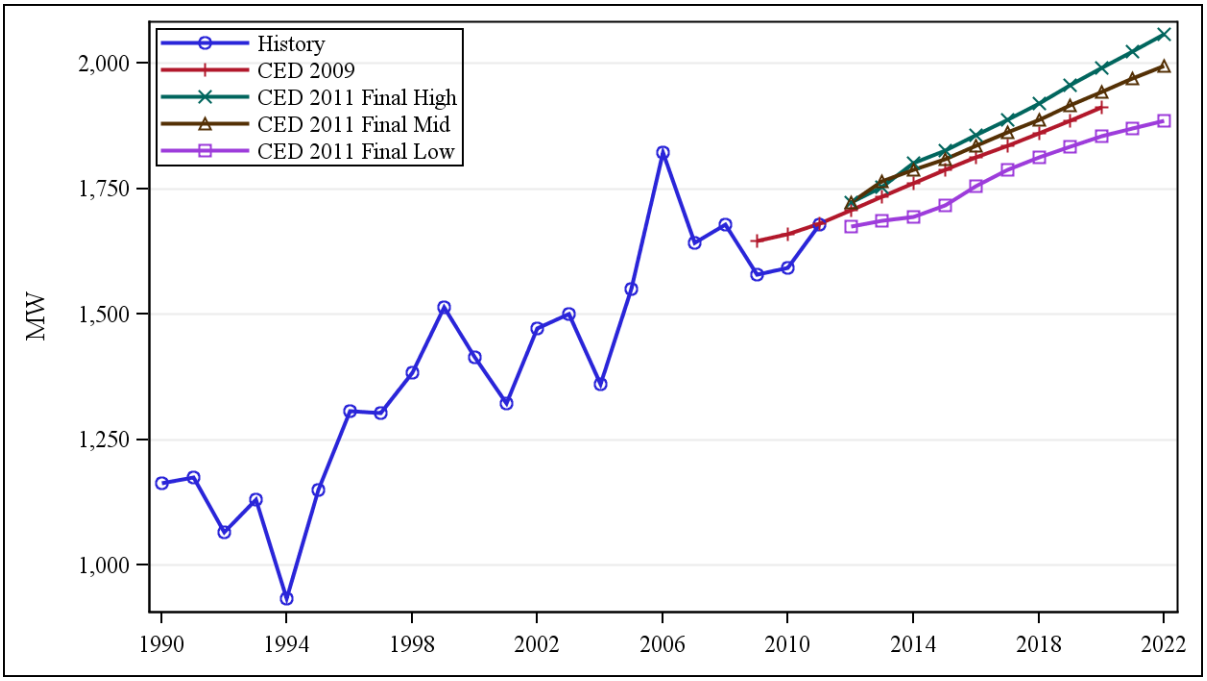
Figure 4-6: SMUD Planning Area Residential Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-7 compares the *CED 2011 Final* and *CED 2009* residential peak demand forecasts. Historical residential peak for 2011 was 1,675 MW, which was near the value predicted in *CED 2009*. The *CED 2009* forecast grows at an annual rate from 2012 through 2020 of 1.43 percent. From 2011 through 2022, the low case grows at an annual rate of 1.07 percent, the mid case at 1.58, percent and the high case at 1.87 percent.

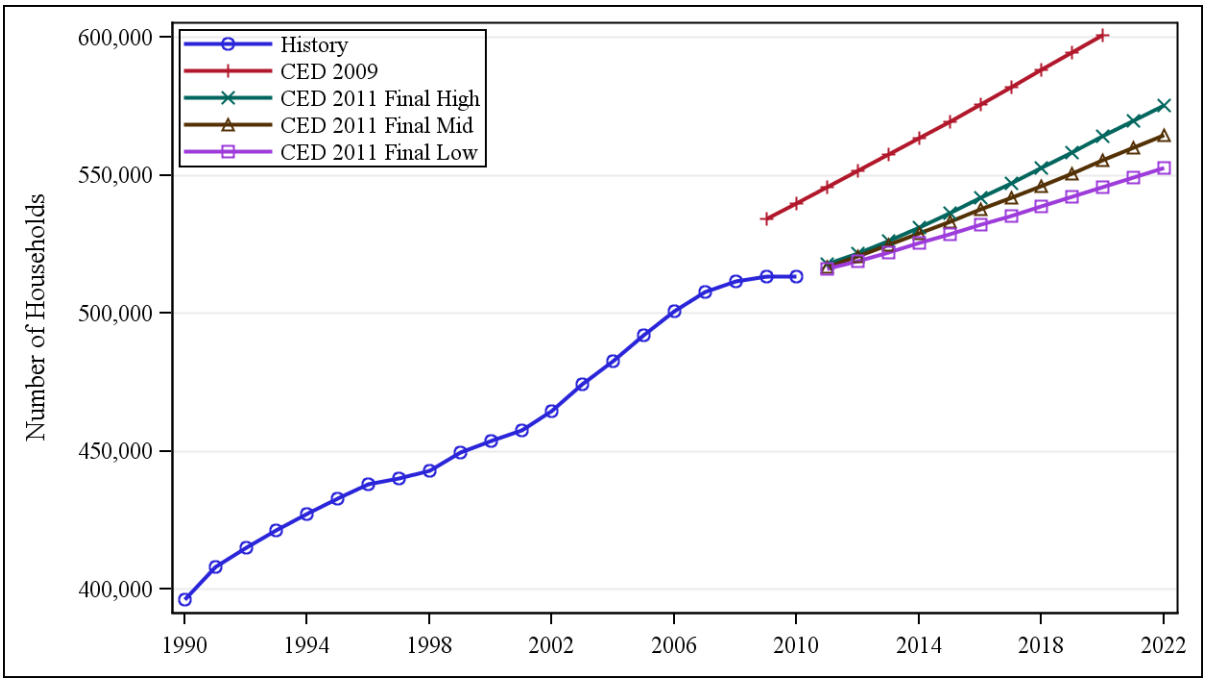
Figure 4-7: SMUD Planning Area Residential Peak



Source: California Energy Commission, Demand Analysis Office, 2012

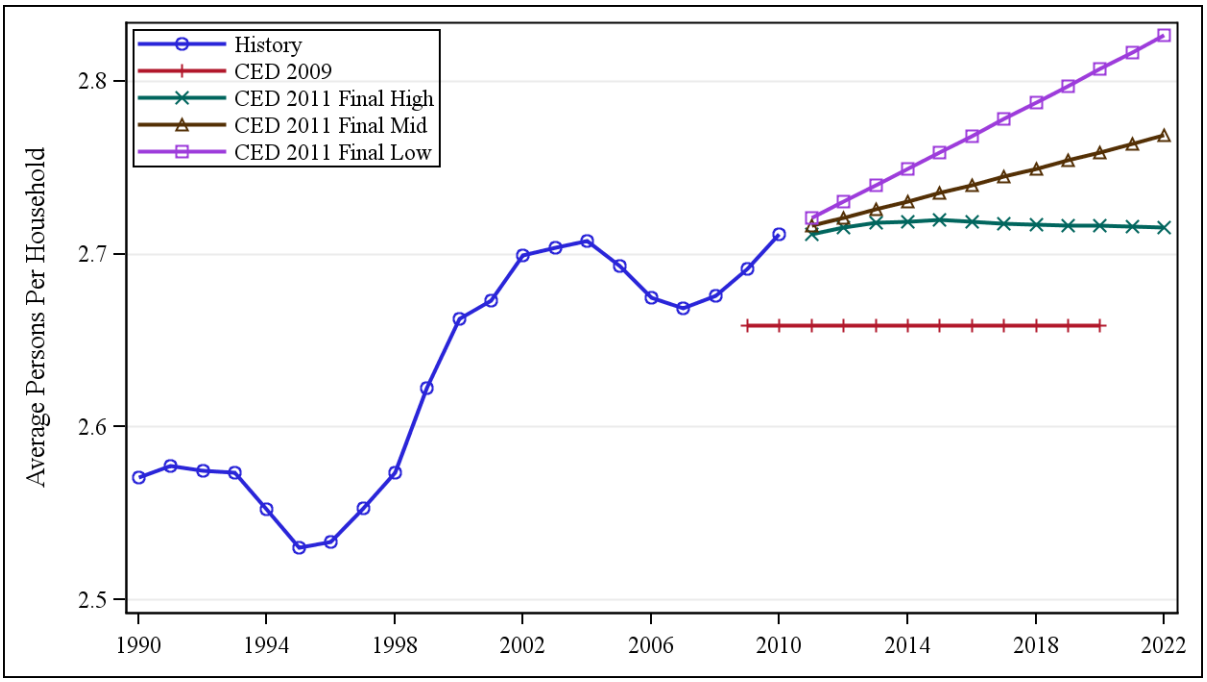
Figure 4-8 and **Figure 4-9** compare the residential economic/demographic drivers used in the *CED 2011 Final* forecast with drivers used in *CED 2009*. **Figure 4-8** compares total households, and **Figure 4-9** compares persons per household projections. The *CED 2011 Final* forecast of households is lower in all cases than *CED 2009* due to lower population levels in the current forecast. By 2020, *CED 2011 Final* predicts around 555,000 households versus 600,000 in *CED 2009*. For the *CED 2011 Final* mid case, persons per household reach just over 2.76 in 2020, compared to a projection of 2.66 for *CED 2009*.

Figure 4-8: SMUD Planning Area Residential Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

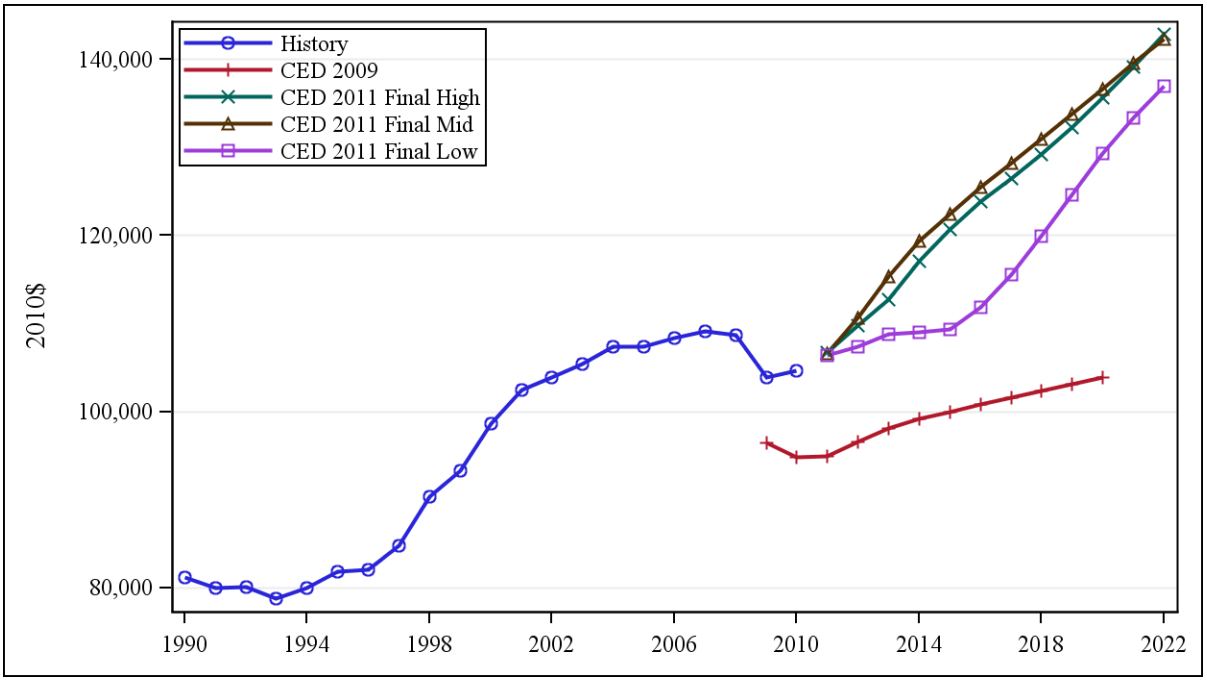
Figure 4-9: SMUD Planning Area Persons per Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-10 compares average household income in the two forecasts. The growth rate of income between 2010 and 2020 is higher in all three scenarios compared to *CED 2009*, as both Global Insight and Moody's project faster total personal income growth. Income per household in the high demand case is slightly lower than in the mid case until the end of the forecast period where the two scenarios are nearly identical. This is due to lower total household income at the beginning of the forecast period in the high scenario compared to the mid case, as well as differences in the projected growth rate of households compared to total household income. The *CED 2009* projection declines in the short term as a result of the economic downturn and then grows at a much slower rate than in the *CED 2011 Final* scenarios in the mid-to long term.

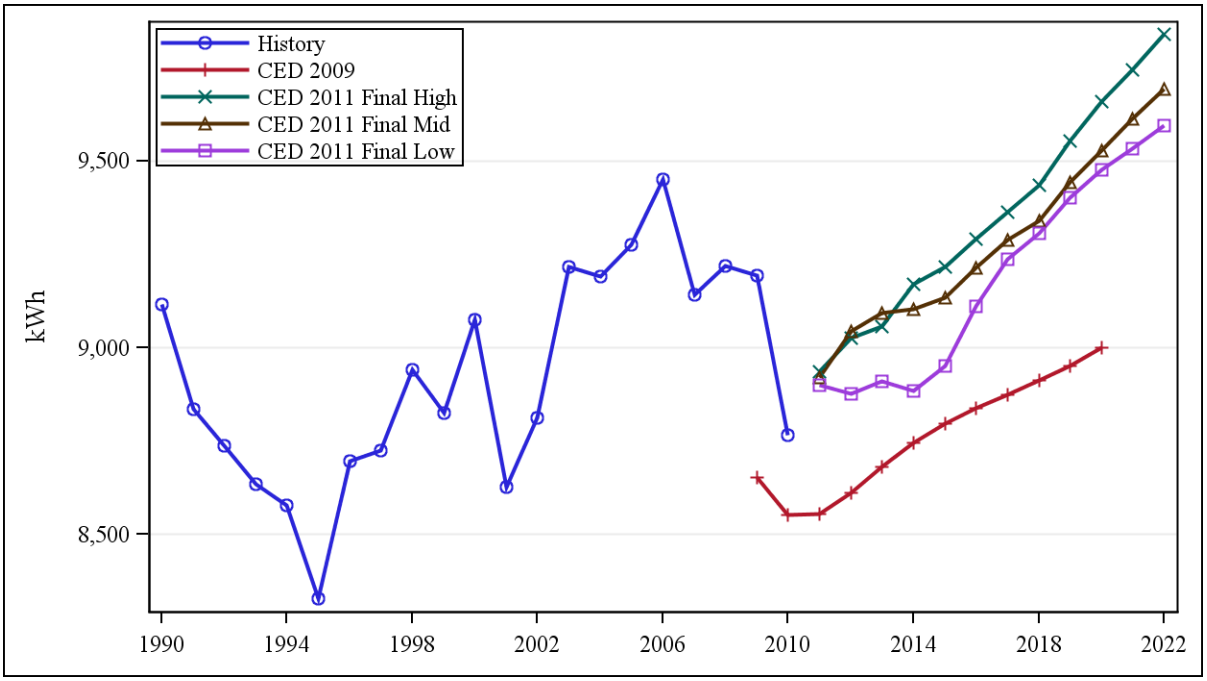
Figure 4-10: SMUD Planning Area Average Household Income Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-11 compares electricity consumption per household in the two forecasts and shows the 1990–2010 historical series. Consumption per household starts near the middle of the historical series but significantly surpasses historical highs by the end of the forecast period. *CED 2011 Final* use per household is expected to rise to 9,690 kWh per household in 2020 in the mid case, growing at 0.76 percent compared to 9,000 kWh per household predicted in the *CED 2009* forecast. As in the case of per capita electricity consumption, higher growth in consumption per household results from faster income growth and increased numbers of electric vehicles. The use per household for all three scenarios has increased relative to *CED 2009* since the number of households has been revised downward per the 2010 U.S. Census.

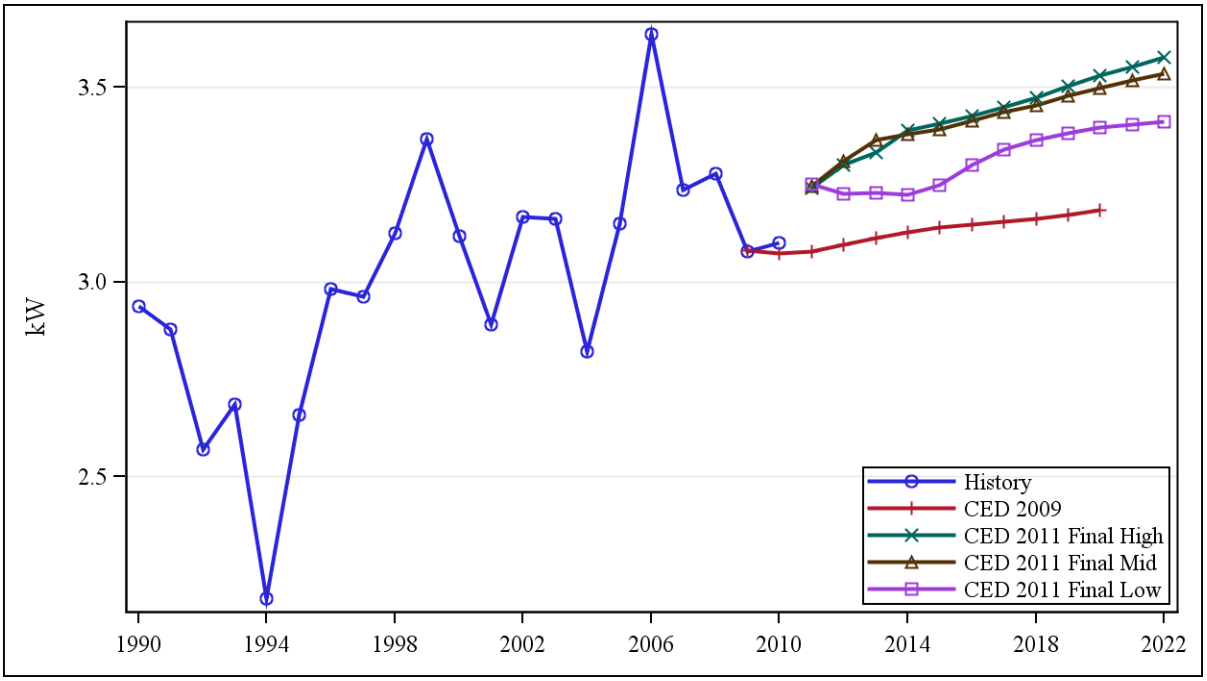
Figure 4-11: SMUD Planning Area Electricity Use per Household



Source: California Energy Commission, Demand Analysis Office, 2012

The increases in peak use per household for all three new scenarios shown in **Figure 4-12** are less than those predicted for energy use per household, since charging electric vehicles has little effect on peak compared to consumption. For the mid case, the average growth rate for peak use per household is 0.8 percent per year over the forecast period. Peak use per household rises to 3.53 kW in 2020 in the mid case compared to 3.18 kW predicted in the *CED 2009* forecast.

Figure 4-12: SMUD Planning Area Peak Use per Household

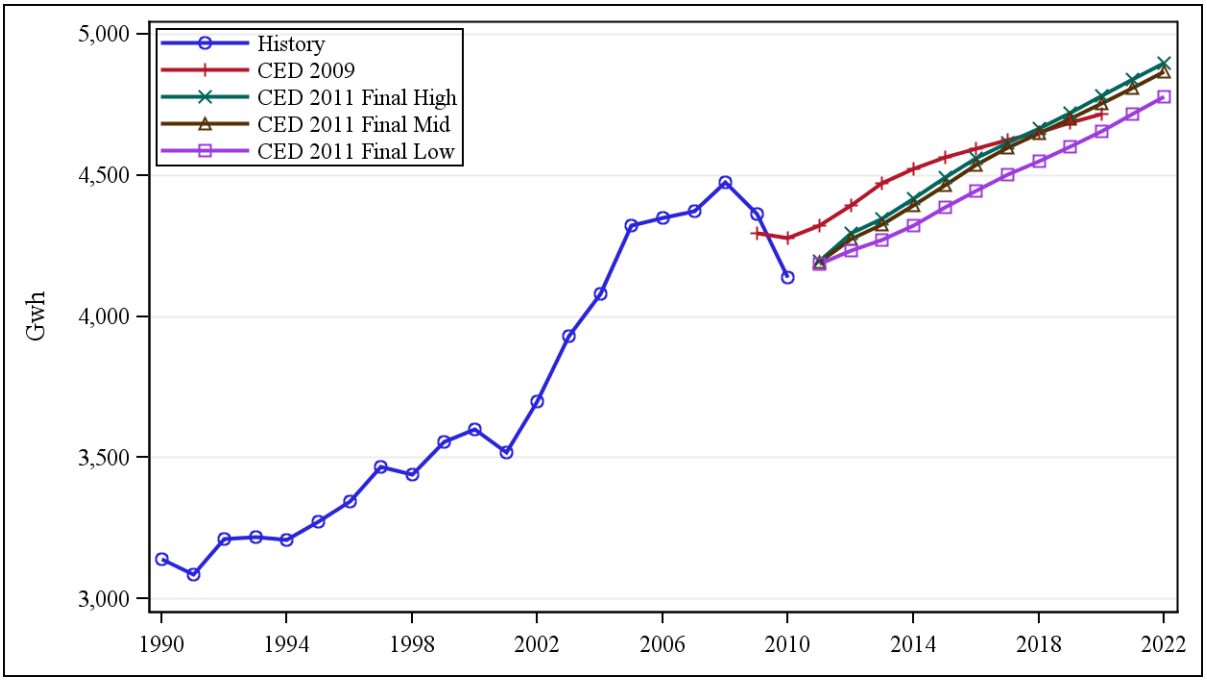


Source: California Energy Commission, Demand Analysis Office, 2012

Commercial Sector

Figure 4-13 compares the commercial sector forecasts. *CED 2011 Final* begins slightly below the *CED 2009* forecast. Actual consumption in 2010 was lower than the projection from *CED 2009* since the effect of the recession in Sacramento was more severe than assumed in 2009. The *CED 2011 Final* forecast grows at a faster rate from 2010-2020 in all three scenarios compared to *CED 2009* because of faster projected growth in floor space. The growth rate of the *CED 2011 Final* commercial forecast is 1.36 percent over the forecast period in the mid case.

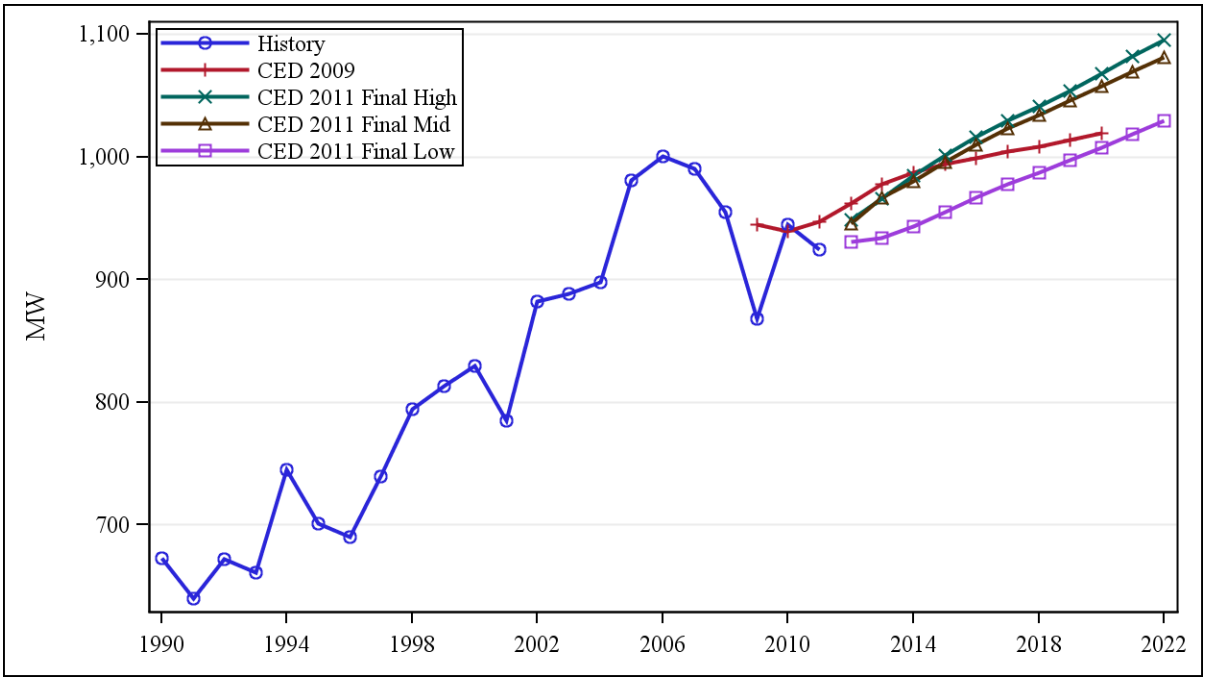
Figure 4-13: SMUD Planning Area Commercial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-14 compares the commercial peak demand forecasts. The *CED 2011 Final* mid demand peak forecast is lower than *CED 2009* until 2015, and is higher for the remainder of the forecast period. Commercial peak grows at a rate of 1.4 percent per year in the mid case, from 927 MW in 2011 to 1,081 MW in 2022. The *CED 2009* forecast grew at an annual rate of 0.7 percent from 2011 through 2020. Differences in peak forecasts are driven primarily by the differences in electricity forecasts.

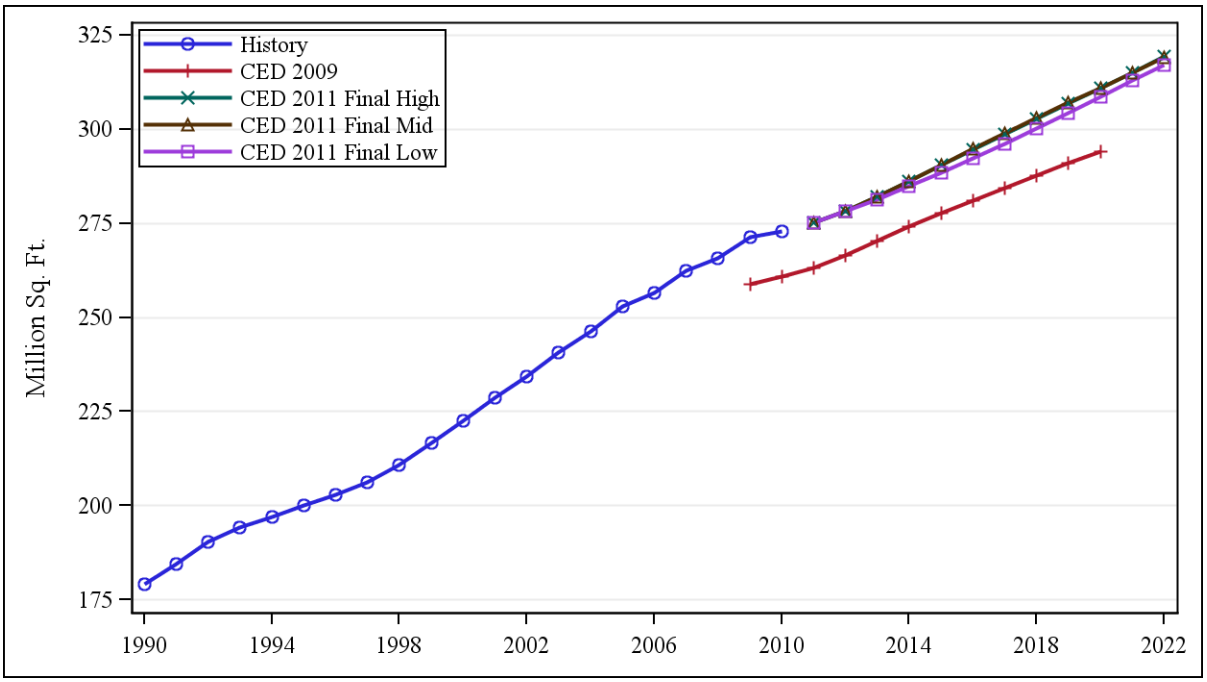
Figure 4-14: SMUD Planning Area Commercial Building Sector Peak



Source: California Energy Commission, Demand Analysis Office, 2012

In staff's commercial building sector forecasting model, floor space by building type (for example, retail, offices, schools, and hospitals) is the key driver of electricity growth. **Figure 4-15** compares total commercial floor space projections. Commercial floor space grows from 273 million square feet in 2010 to 319 million square feet in 2022. The *CED 2011 Final* floor space projections are higher than those used in *CED 2009* primarily because estimated 2010 floor space for Sacramento is higher than predicted in 2009. From 2010 through 2020, the *CED 2011* mid case floor space forecast grew at an annual rate of 1.32 percent compared to 1.21 percent for *CED 2009*. The three floor space scenarios do not vary significantly, reflecting the importance of population in the floor space econometric model, which is held constant across the scenarios.

Figure 4-15: SMUD Planning Area Commercial Floor Space

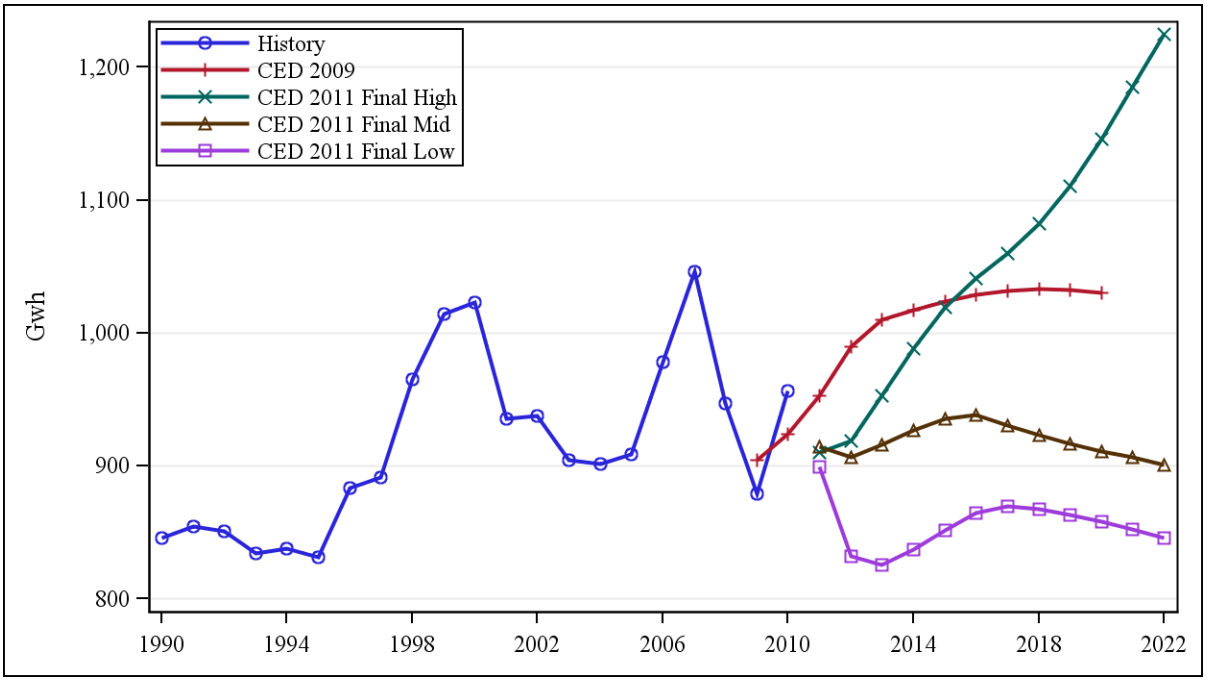


Source: California Energy Commission, Demand Analysis Office, 2012

Industrial Sector

Figure 4-16 compares the SMUD planning area industrial sector electricity consumption forecasts. *CED 2011 Final* industrial electricity consumption starts slightly lower than was predicted in 2009. Consumption in the low and mid cases initially declines, starts to recover, and then slips back into decline by the end of the forecast period. Growth in manufacturing and construction is projected to be much stronger in the (Global Insight) high demand scenario, with consumption increasing at 2.7 percent per year on average over the forecast period.

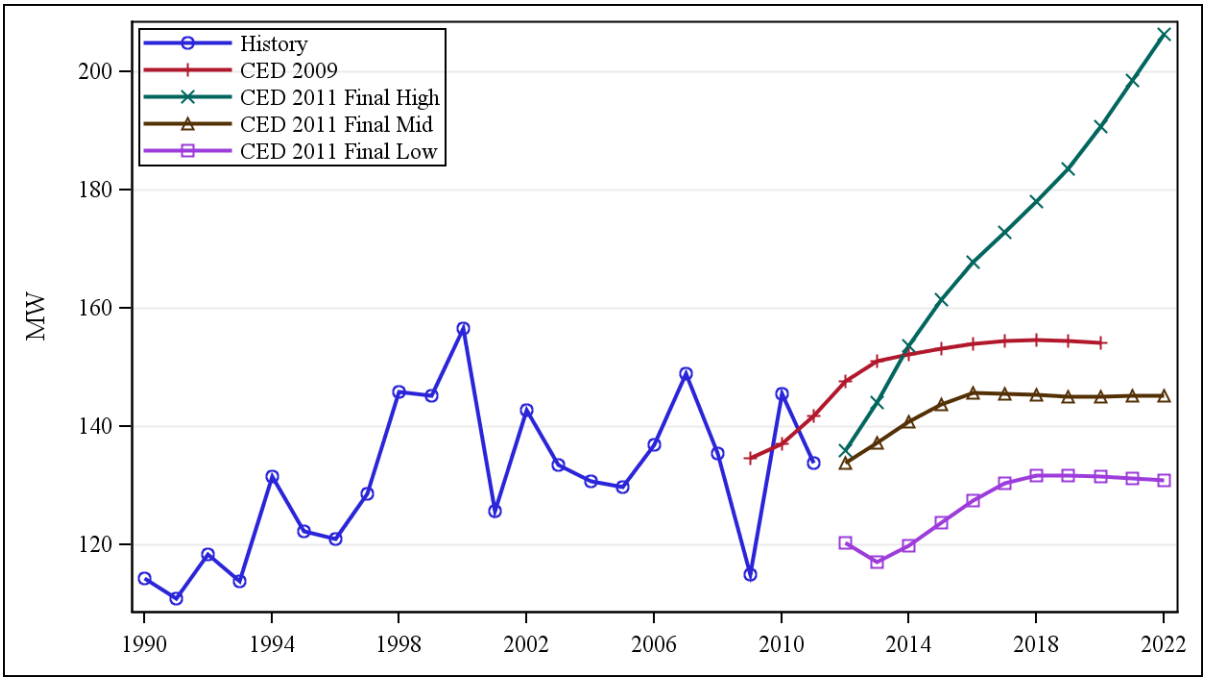
Figure 4-16: SMUD Planning Area Industrial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-17 compares the industrial sector peak forecasts, which are very similar to the energy forecasts. The *CED 2011 Final* peak forecast in the mid case increases from 134 MW in 2011 to 144 MW in 2015, at which point it remains flat through the end of the forecast period.

Figure 4-17: SMUD Planning Area Industrial Sector Peak

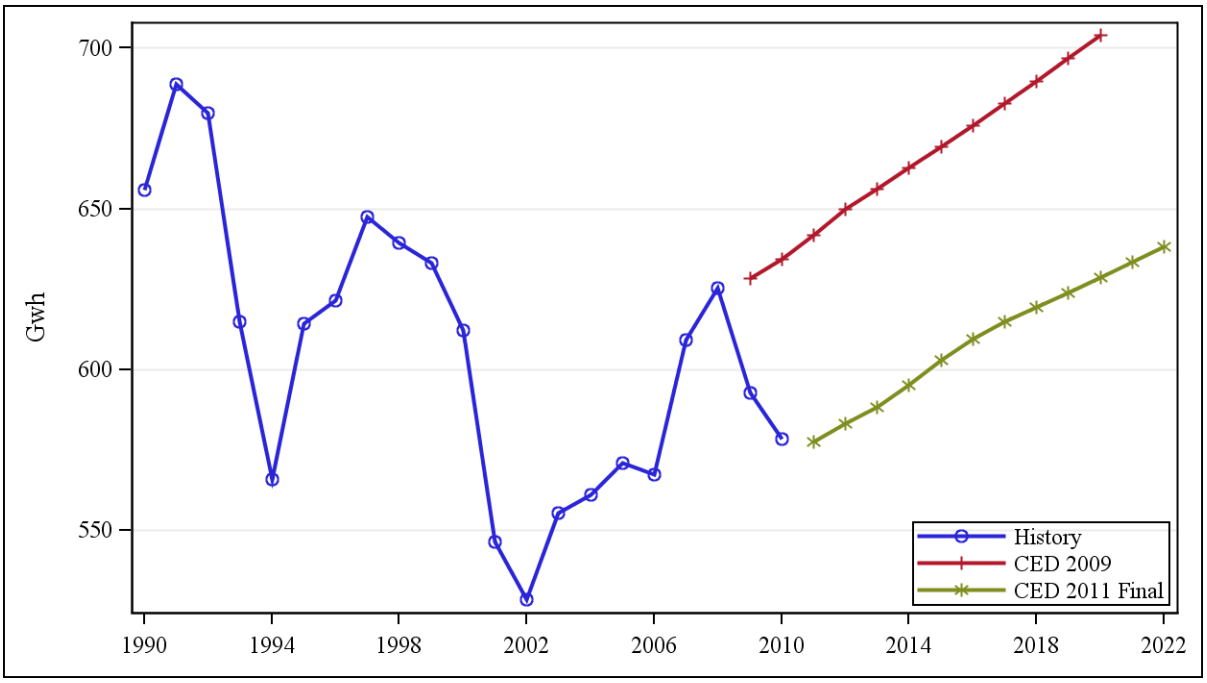


Source: California Energy Commission, Demand Analysis Office, 2012

Other Sectors

Figure 4-18 and **Figure 4-19** compare the remaining sector electricity consumption forecasts. **Figure 4-18** compares the transportation communications, and utilities (TCU) sector forecasts, which include street lighting. In this case, a single scenario was run.[4] The *CED 2011 Final* forecast is lower than the *CED 2009* forecast primarily due to a lower historical starting point. The *CED 2009* forecast grows at about 1 percent over the forecast period, while the *CED 2011 Final* forecast grows at 0.82 percent. The historical decline of TCU electricity consumption from 1990 through 2001 is a result of military base closures. However, since 2002, the sector experienced steady growth until the recession in 2008.

Figure 4-18: SMUD Planning Area Transportation, Communications, and Utilities Sector Electricity Consumption

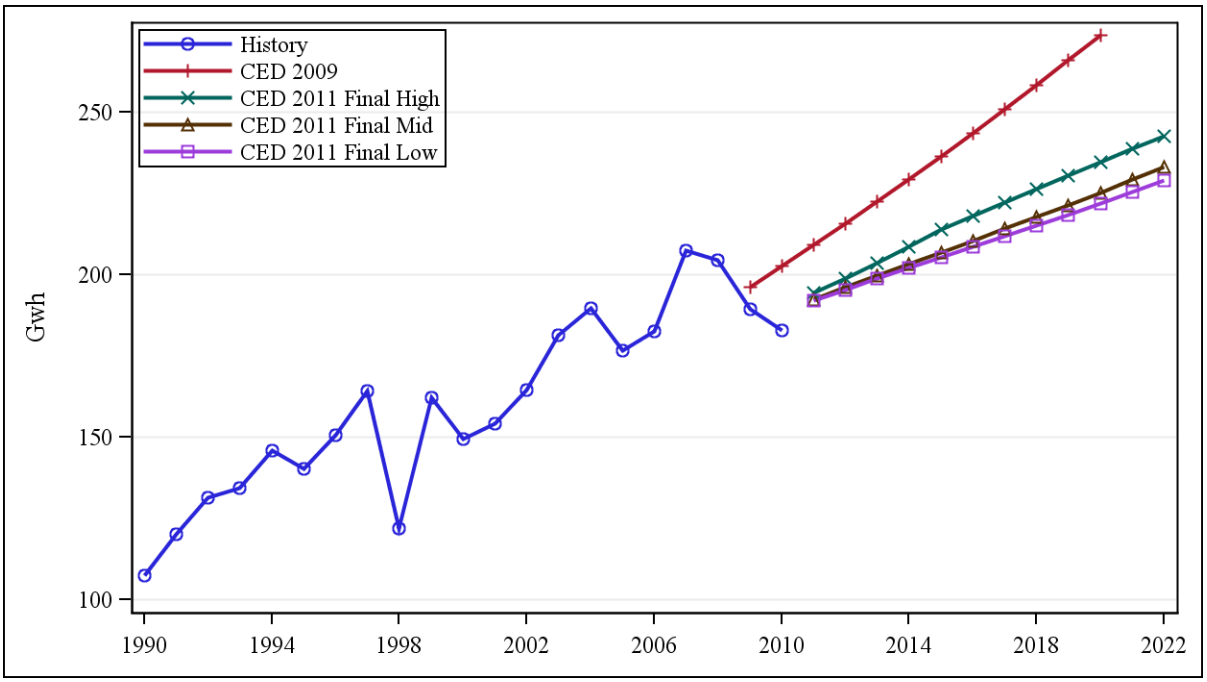


Source: California Energy Commission, Demand Analysis Office, 2012

4 Growth in TCU consumption depends mainly on population, for which there is only one scenario.

Figure 4-19 compares the agriculture and water pumping sector forecasts. Historical electricity use has been dropping for three straight years but was expected to recover starting in 2011 for all three scenarios. Average annual growth rates from 2011-2022 range from 1.6 percent in the low case to 2.0 percent in the high case. By 2022, the high case is 6.0 percent above the low case. The *CED 2011 Final* agriculture and water pumping forecast grows at an annual rate of 1.8 percent in the mid case from 2011-2020 compared to 3.0 percent for *CED 2009*. Slower growth in the number of households in the *CED 2011 Final* forecast compared to *CED 2009* drive the results and keep consumption growth below that in the 2009 forecast.

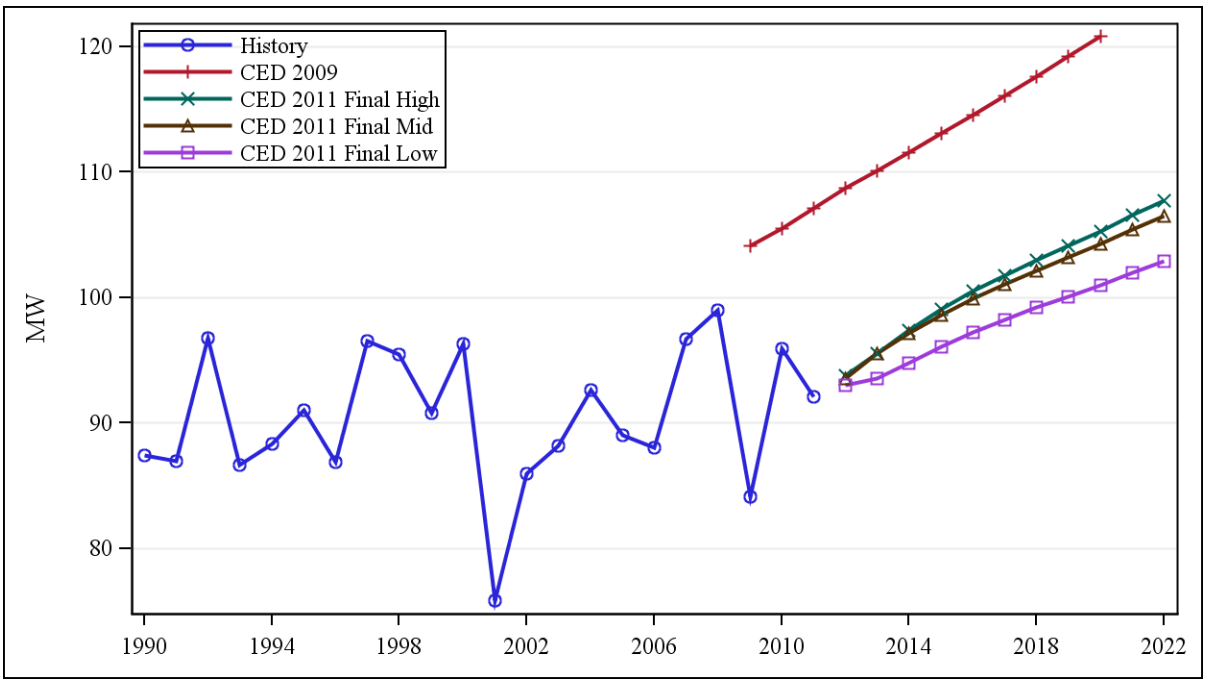
Figure 4-19: SMUD Planning Area Agriculture and Water Pumping Electricity Consumption Forecasts



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-20 compares the combined "other" sector peaks for the *CED 2011 Final* and *CED 2009* forecasts, which includes the TCU sector, the street lighting sector, and the agriculture and water pumping sector. The *CED 2011 Final* forecasts are lower over the entire forecast period than the *CED 2009*, given a lower assumed starting point resulting from a reclassification of historical consumption. The 1.33 percent annual growth rate of the *CED 2011 Final* forecast is identical to the *CED 2009* forecast from 2012 through 2020.

Figure 4-20: SMUD Planning Area Other Sector Peak

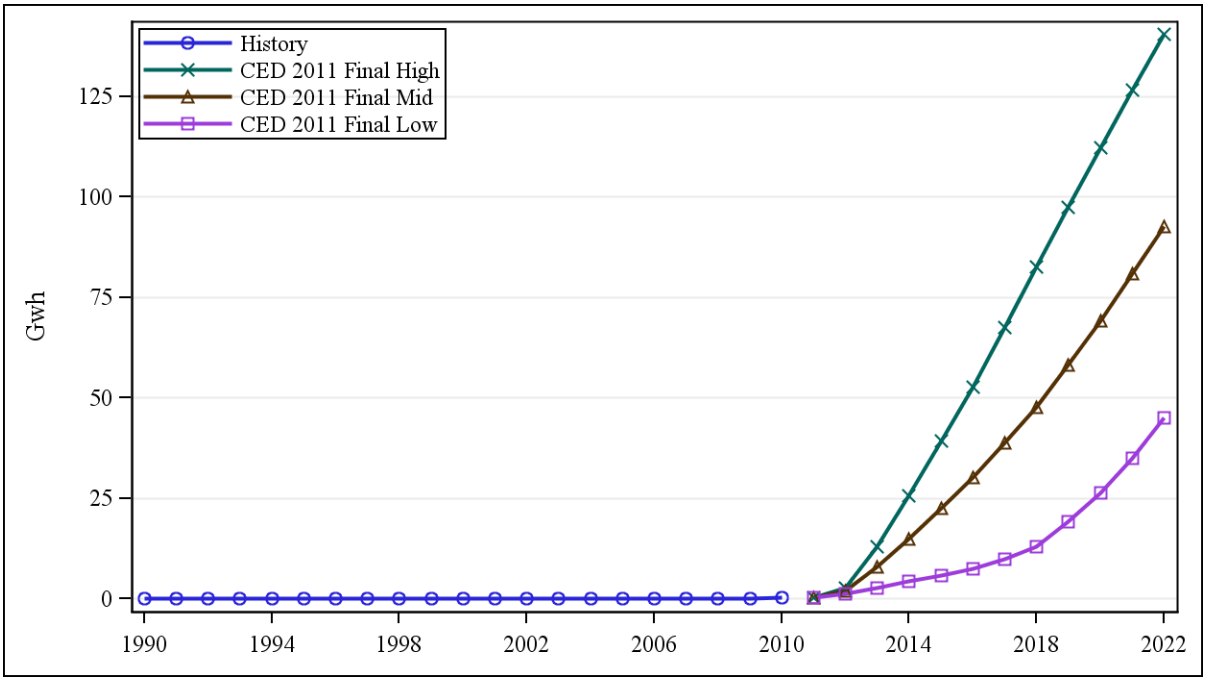


Source: California Energy Commission, Demand Analysis Office, 2012

Electric Vehicles

Consumption by electric vehicles in 2010 was less than 1 GWh and is expected to rise to 30 GWh by 2016 in the mid demand case, as shown in **Figure 4-21**. By the end of the forecast period, total electricity used by electric vehicles is projected to be 92 GWh in the mid case. Staff assumed that most recharging would occur during off-peak hours, so that peak impacts are relatively small, reaching only 4 MW by 2022 in the mid case.

Figure 4-21: SMUD Electricity Consumption of Electric Vehicles



Source: California Energy Commission, Demand Analysis Office, 2012

Self-Generation

As shown in **Table 4-2**, the peak demand forecast is reduced by the projected impacts of distributed PV, solar thermal, and combined heat and power systems, including the effects of SGIP, CSI, and other programs, as discussed in Volume 1, Chapter 1. The effects of these programs are forecast based on recent trends in installations and a predictive model for the residential sector. Staff projects about 38 MW of peak reduction from PV systems by 2022 in the mid demand case. Peak reductions are based on installed system capacities ranging from 72 MW by 2022 in the high demand case to 83 MW by 2022 in the low demand case.

Table 4-2: SMUD Peak Demand Reductions From Self-Generation (MW)

	1990	2000	2010	2015	2020	2022
Non-Photovoltaic Self-Generation	0.00	0.00	1.74	1.74	1.74	1.74
Photovoltaic, Low Demand	1.05	2.39	16.94	22.01	32.03	42.06
Photovoltaic, Mid Demand	1.05	2.39	16.94	20.69	28.31	37.90
Photovoltaic, High Demand	1.05	2.39	16.94	20.51	27.59	36.63
Total Self-Generation, Low Demand	1.05	2.39	18.68	23.75	33.78	43.80
Total Self-Generation, Mid Demand	1.05	2.39	18.68	22.43	30.05	39.64
Total Self-Generation, High Demand	1.05	2.39	18.68	22.25	29.34	38.37

Source: California Energy Commission, Demand Analysis Office, 2012

Conservation/Efficiency Impacts

Table 4-3 and **Table 4-4** show electricity consumption and peak savings estimates for building and appliance standards for the mid demand scenario. Total standards impacts are higher in the high demand case by 1.5-2.0 percent because of more floor space and home construction and 1.5-2.0 percent lower in the low demand case. The standards savings estimates include the 2010 revision to Title 24 building standards as well as AB 1109 lighting savings and television standard savings. Savings are measured against a baseline before 1975, so they incorporate more than 30 years of impacts. Volume 1, Chapter 3 provides more detail on staff work related to energy efficiency and conservation.

Table 4-3: SMUD Planning Area Electricity Consumption Savings Estimates From Standards, Mid Demand Scenario

Electricity Consumption Savings (GWH)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	488	148	636	73	40	112	748
2000	774	399	1,173	186	107	293	1,466
2010	937	714	1,651	357	183	540	2,191
2015	1,056	1,078	2,133	443	235	678	2,812
2020	1,173	1,335	2,507	542	311	853	3,360
2022	1,211	1,381	2,592	584	325	909	3,501

Source: California Energy Commission, Demand Analysis Office, 2012

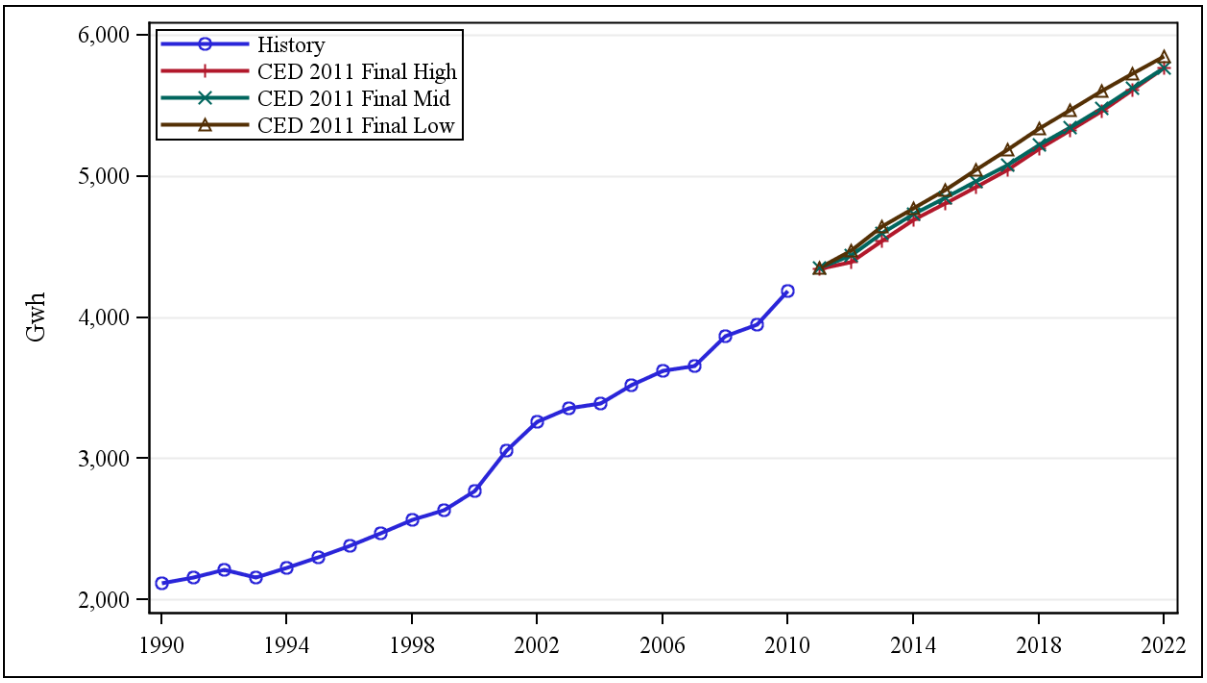
Table 4-4: SMUD Planning Area Electricity Peak Savings Estimates From Standards, Mid Demand Scenario

Electricity Peak Demand Savings (MW)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	157	48	205	16	9	24	229
2000	266	138	404	43	24	67	471
2010	331	252	583	82	42	124	707
2015	392	400	792	99	52	151	943
2020	429	489	918	121	69	190	1,108
2022	437	498	934	130	72	202	1,136

Source: California Energy Commission, Demand Analysis Office, 2012

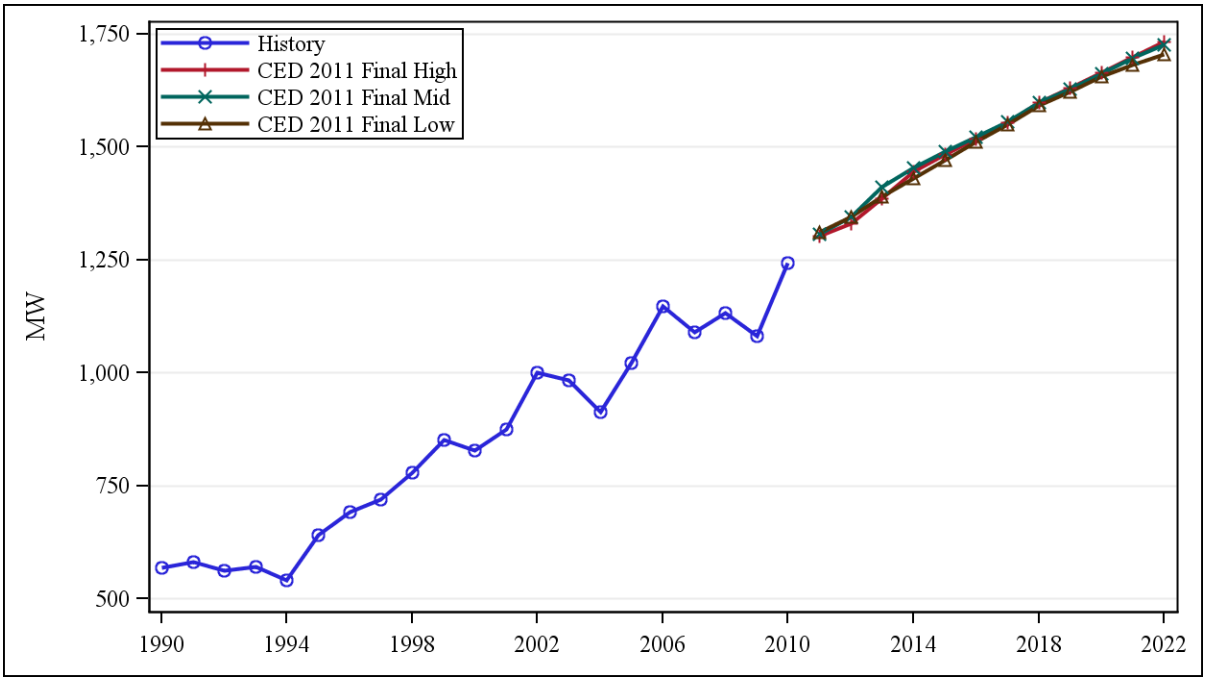
Figure 4-22 and **Figure 4-23** show estimated historical and projected total savings impacts on electricity and peak demand from all committed efficiency sources, including building and appliance standards; utility and public agency programs implemented before 2013; and price and other effects, or savings associated with rate changes and certain market trends not directly related to programs or standards. Projected savings impacts are higher the lower the demand scenario, since price and program effects are inversely related to the demand outcome.

Figure 4-22: SMUD Efficiency GWh



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 4-23: SMUD Efficiency MW



Source: California Energy Commission, Demand Analysis Office, 2012

CHAPTER 5: Los Angeles Department of Water and Power

The Los Angeles Department of Water and Power (LADWP) planning area includes LADWP bundled retail customers and customers served by energy service providers using the LADWP distribution system to deliver electricity to end users.

This chapter is organized as follows. First, forecasted consumption and peak loads for the LADWP planning area are discussed; both total and per capita values are presented. The *CED 2011 Final* values are compared to the *CED 2009* forecast; significant differences between the two forecasts are explained. The forecasted load factor, jointly determined by the consumption and peak load estimates, is also discussed. Second, sector consumption and peak load forecasts are presented. The residential, commercial, industrial, and "other" sector forecasts are compared to those in *CED 2009*. Finally, results for electric vehicles, self-generation, and efficiency are discussed.

Forecast Results

Table 5-1 presents a comparison of *CED 2011 Final* high, mid and low demand scenarios with *CED 2009* for electricity consumption and peak demand for selected years. Comprehensive results are available electronically as a set of forms posted alongside this report (http://www.energy.ca.gov/2012_energypolicy/documents/#no-meeting).

Figure 5-1 and **Figure 5-2** in the following pages compare the *CED 2011 Final* forecast with the *CED 2009* forecast.

For both consumption and peak demand, growth rates starting in 2011 are shown to compare weather-normalized growth rates. Consumption in 2010 was reduced significantly due to a very mild weather year overall, while peak demand was historically high as a result of a heat storm in September 2010. A weather-normalized comparison (2011-2020) shows faster growth in the mid and high demand cases for consumption and in all three cases for peak demand compared to *CED 2009*. These differences result from faster income growth in the mid and high cases and faster household growth in all three scenarios versus *CED 2009*. In addition, peak demand is increased in the mid and high cases due to an adjustment to reflect potential climate change. (See Chapter 1 of Volume 1.)

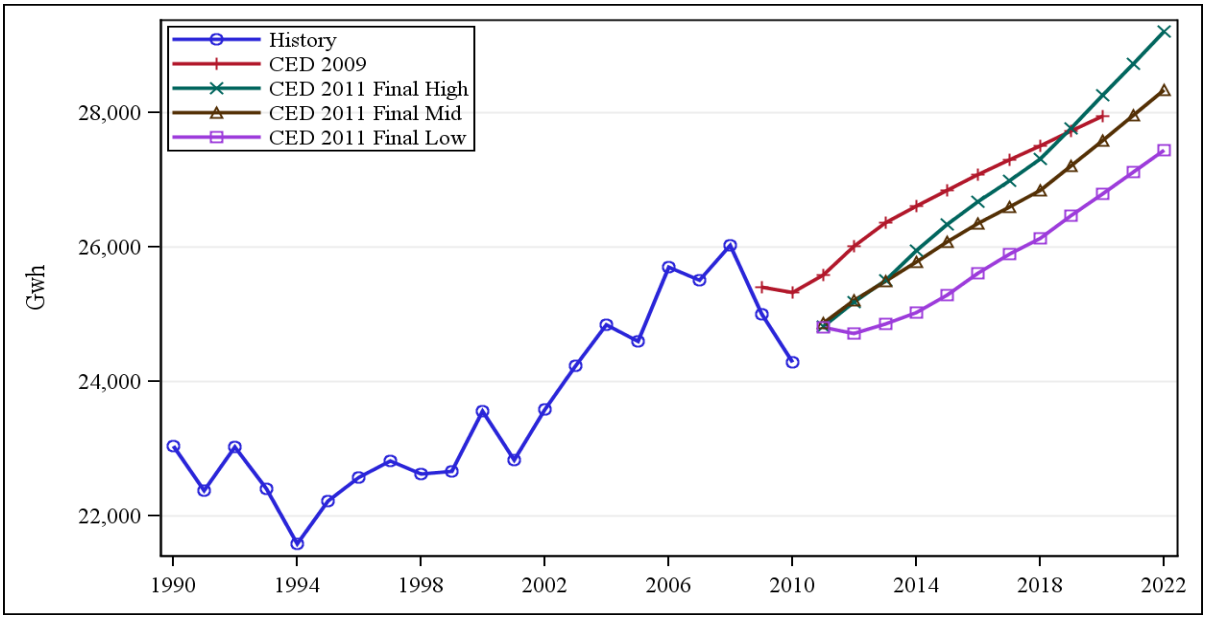
Discrepancies in historical consumption between *CED 2009* and *CED 2011 Final* result from an adjustment made to QFER filings. After the adjustment, *CED 2011 Final* consumption history more closely resembled the consumption history used as the basis for LADWP's own demand forecast.

Table 5-1: LADWP Planning Area Forecast Comparison

Consumption (GWH)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	23,263	23,038	23,038	23,038
2000	23,438	23,562	23,562	23,562
2010	25,326	24,294	24,294	24,294
2011	25,589	24,819	24,867	24,808
2015	26,841	26,338	26,074	25,291
2020	27,943	28,260	27,587	26,798
2022	--	29,207	28,333	27,447
Average Annual Growth Rates				
1990 - 2000	0.07%	0.23%	0.23%	0.23%
2000 - 2010	0.78%	0.31%	0.31%	0.31%
2011 - 2015	1.20%	1.50%	1.19%	0.48%
2011 - 2020	0.98%	1.45%	1.16%	0.86%
2011 - 2022	--	1.49%	1.19%	0.92%
Peak (MW)				
	CED 2009 (Dec. 2009)	*CED 2011 Final* - High	*CED 2011 Final* - Mid	*CED 2011 Final* - Low
1990	5,341	5,341	5,341	5,341
2000	5,344	5,344	5,344	5,344
2011	5,846	5,907	5,907	5,907
2011*	5,846	5,946	5,946	5,946
2015	6,060	6,479	6,386	6,072
2020	6,247	6,972	6,774	6,432
2022	--	7,194	6,937	6,550
Average Annual Growth Rates				
1990 - 2000	0.01%	0.01%	0.01%	0.01%
2000 - 2011	0.82%	0.91%	0.91%	0.91%
2011* - 2015	0.91%	2.17%	1.80%	0.53%
2011* - 2020	0.74%	1.78%	1.46%	0.88%
2011* - 2022	--	1.75%	1.41%	0.88%
Historical values are shaded.				
*Weather-normalized: CED 2011 Final uses a weather-normalized peak value derived from the actual 2011 peak for calculating growth rates during the forecast period.				

Source: California Energy Commission, Demand Analysis Office, 2012

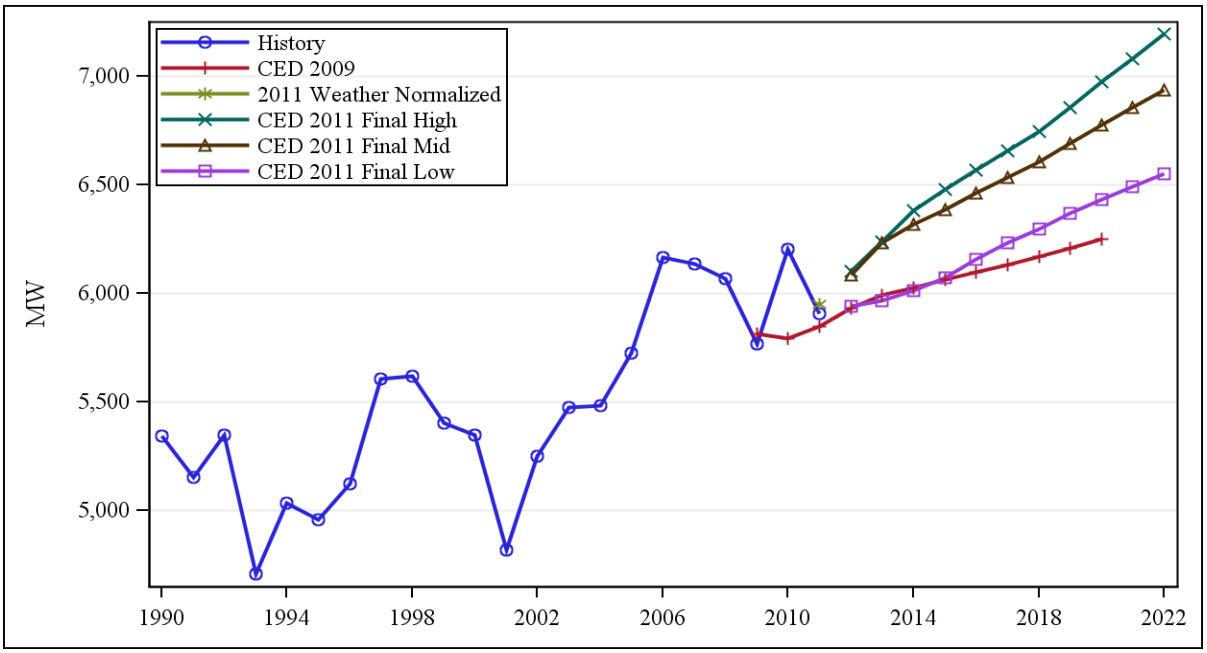
Figure 5-1: LADWP Planning Area Electricity Forecast



Source: California Energy Commission, Demand Analysis Office, 2012

The *CED 2011 Final* LADWP planning area peak demand forecast, shown in **Figure 5-2**, has higher growth rates than *CED 2009* for each of the three scenarios, although the low scenario dips down to the 2009 forecast in the short term. By 2015, the low scenario is also higher than the *CED 2009* forecast.

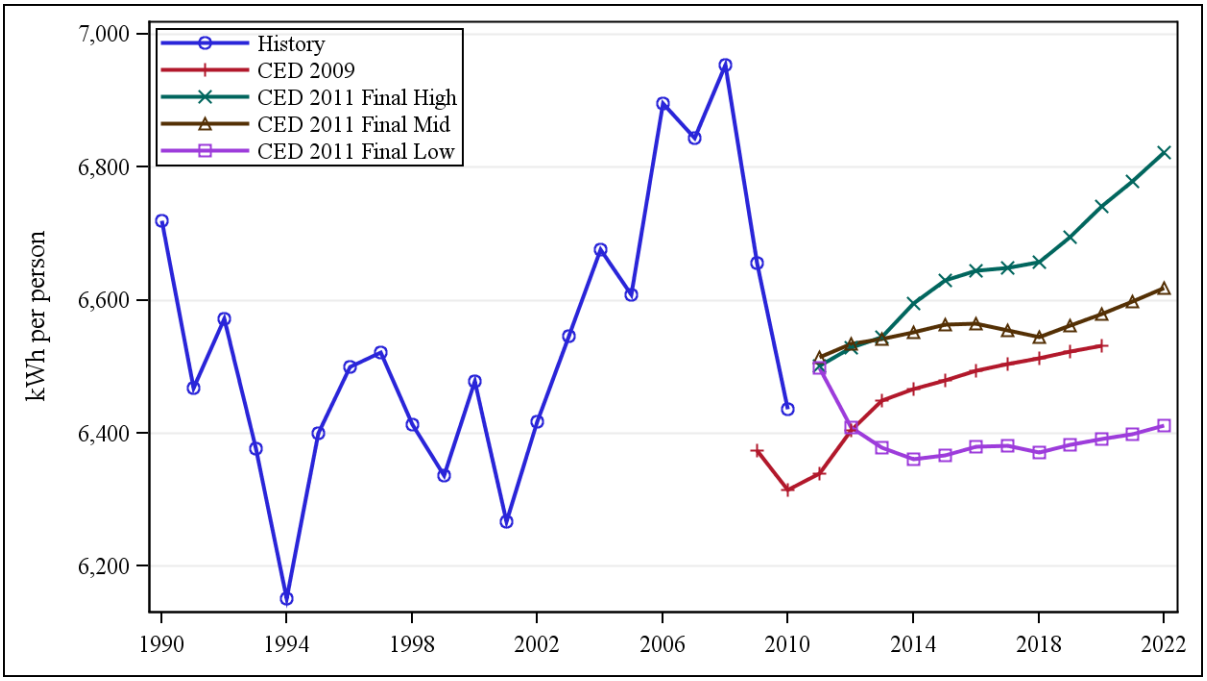
Figure 5-2: LADWP Planning Area Peak



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-3 compares *CED 2011 Final* and *CED 2009* per capita electricity consumption forecasts for the LADWP planning area. Projected per capita consumption in *CED 2011 Final* begins higher than *CED 2009* in all three scenarios, with the low scenario then falling below the *CED 2009* level for the rest of the forecast period. *CED 2011 Final* per capita electricity consumption is projected to be lower than pre-energy crisis levels. Per capita consumption rises slightly toward the end of the forecast period in all three scenarios, reflecting increasing numbers of electric vehicles.

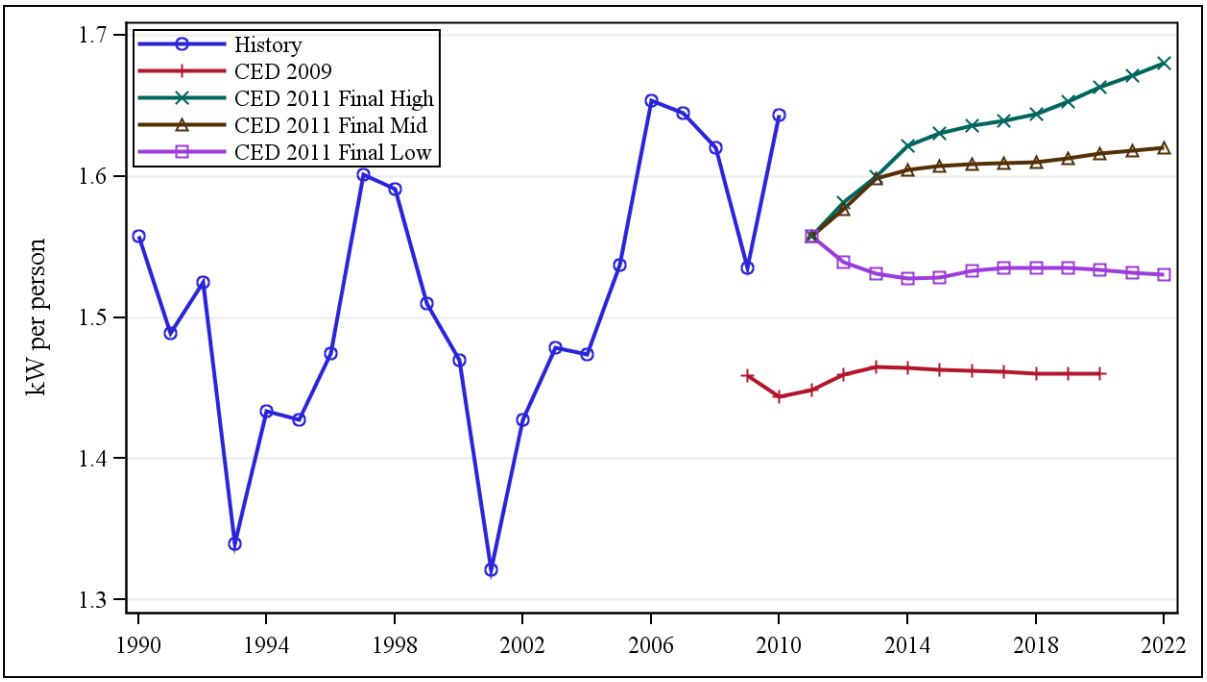
Figure 5-3: LADWP Planning Area per Capita Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

CED 2011 Final per capita peak demand, shown in **Figure 5-4**, is higher than the *CED 2009* projection throughout the forecast for all three scenarios. The low and mid scenarios have a relatively flat growth rate, similar to *CED 2009*. Faster economic growth in the high demand case keeps per capita peak growing throughout the forecast period.

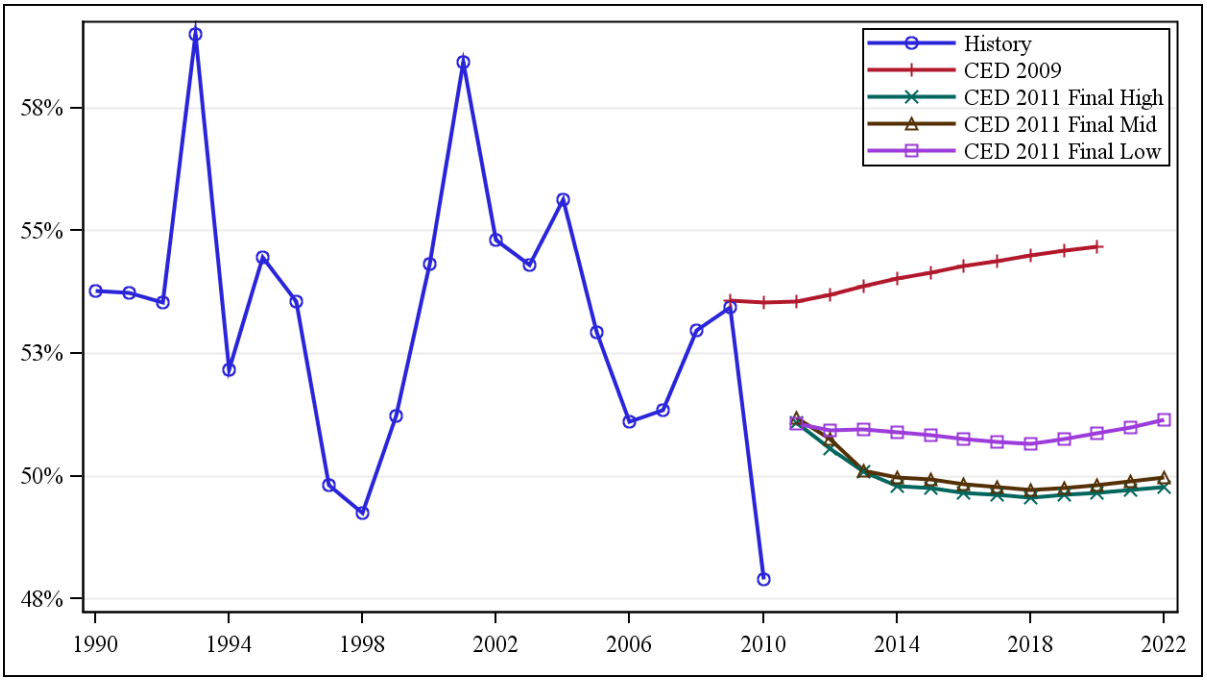
Figure 5-4: LADWP Planning Area per Capita Peak Demand



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-5 compares the load factors of the two forecasts. The load factor represents the relationship between average energy demand and system peak. The smaller the load factor, the greater is the difference between peak and average hourly demand. Variation in historical load factors is caused in part by annual weather patterns. In years with extreme heat, demand peaks at higher levels and results in lower system load factors. Higher load factors indicate demand is more stable. The LADWP load factor has been declining since the mid-1990s, as the residential sector—with a continually increasing presence of air conditioning—grew faster than other sectors. The forecasted load factor continues to decline in the early years of the forecast, especially in the mid and high scenarios, as residential consumption increases as a proportion of total, thereby reducing the system load factor. The forecasted load factors increase in later years due to increasing electric vehicle usage, which affects consumption much more than peak.

Figure 5-5: LADWP Planning Area Load Factors



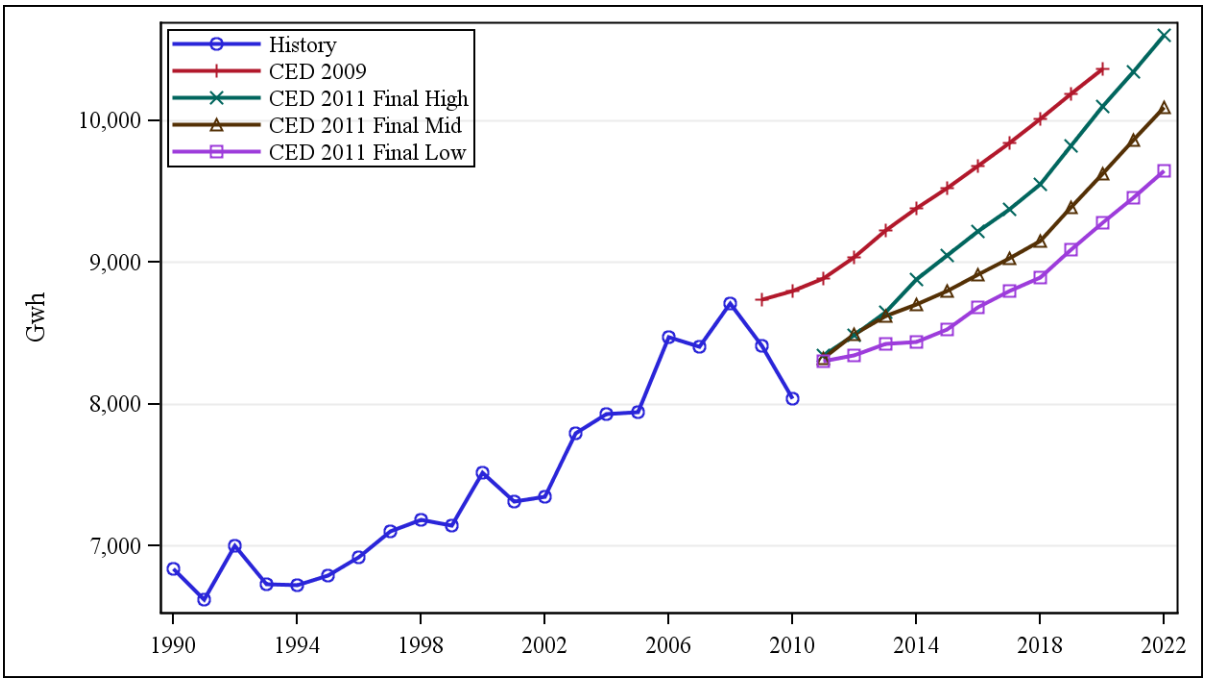
Source: California Energy Commission, Demand Analysis Office, 2012

Sector Level Results and Input Assumptions

Residential Sector

Figure 5-6 compares the *CED 2011 Final* and *CED 2009* LADWP planning area residential forecasts. *CED 2011 Final* is lower than *CED 2009* over the entire forecast period for all scenarios due to the recent economic decline, although the growth rates for the mid and high demand scenarios are higher. The higher growth rates are due to a higher projected growth rate in the number of households and higher income growth in the mid and high cases compared to *CED 2009*. Lower levels in *CED 2011 Final* reflect primarily the lower starting value in 2010.

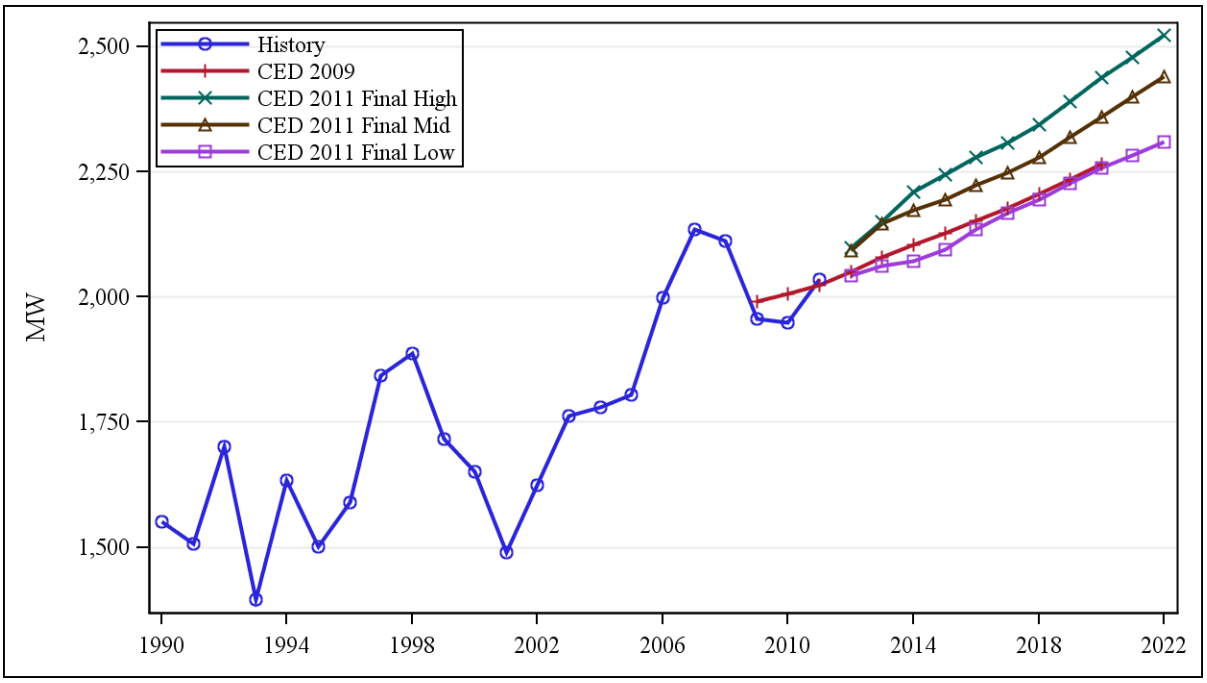
Figure 5-6: LADWP Planning Area Residential Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-7 compares *CED 2011 Final* and *CED 2009* residential peak demand forecasts. Growth in peak demand is higher in the mid and high case scenarios throughout the forecast period. The higher growth rates compared to *CED 2009* happen for the same reasons as consumption, in addition to the adjustment for climate change, not included in *CED 2009*.

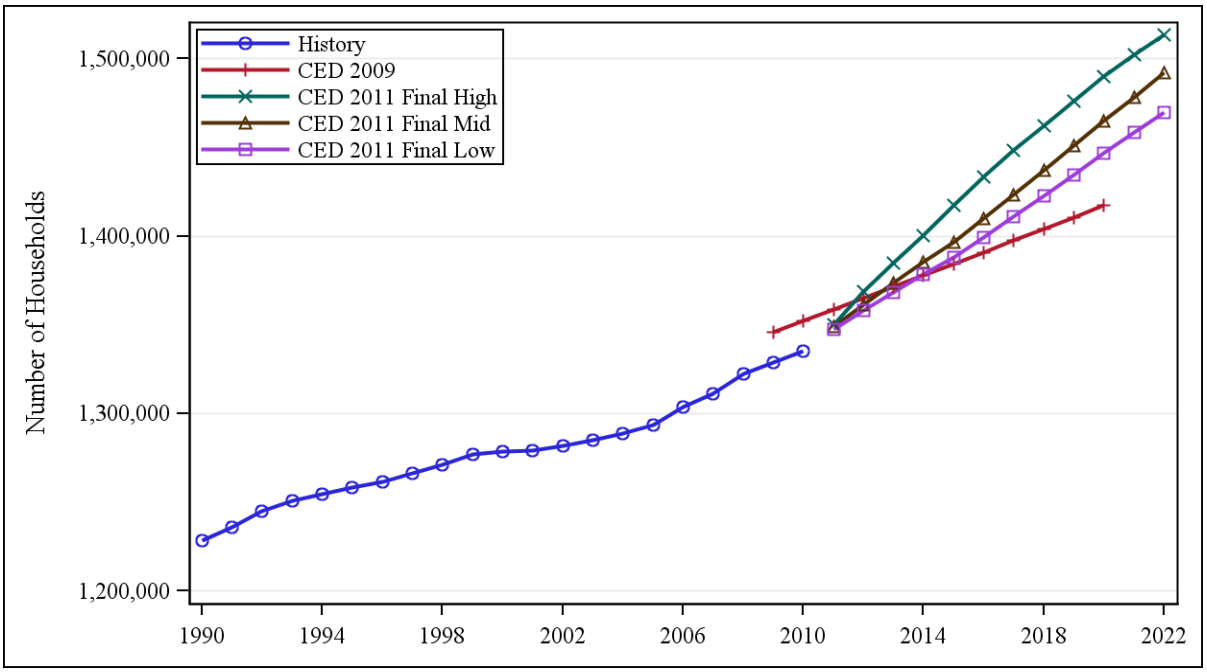
Figure 5-7: LADWP Planning Area Residential Peak



Source: California Energy Commission, Demand Analysis Office, 2012

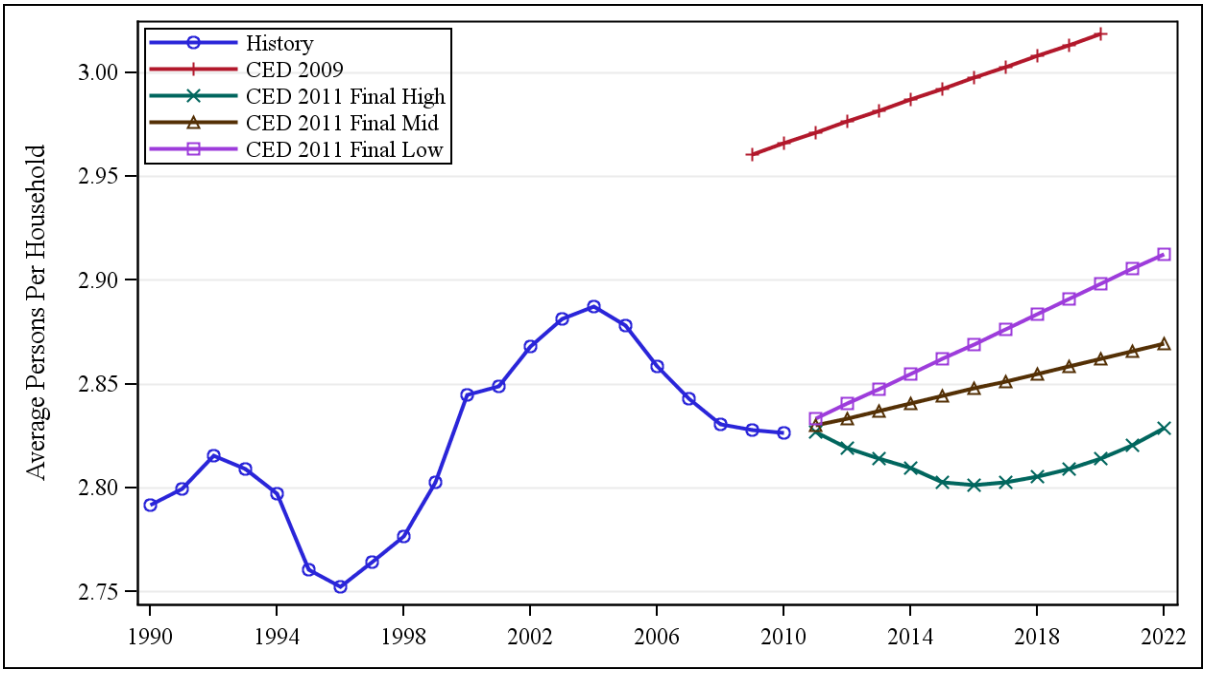
Figure 5-8 and **Figure 5-9** compare the residential economic/demographic drivers used in *CED 2011 Final* with drivers used in *CED 2009*. **Figure 5-8** compares total households while **Figure 5-9** compares persons per household projections. *CED 2011 Final* projected number of households is higher than *CED 2009* in all three scenarios after 2015, although beginning at a lower level in 2011. See Chapter 1 of Volume 1 for a description of the scenarios for persons per household.

Figure 5-8: LADWP Planning Area Residential Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

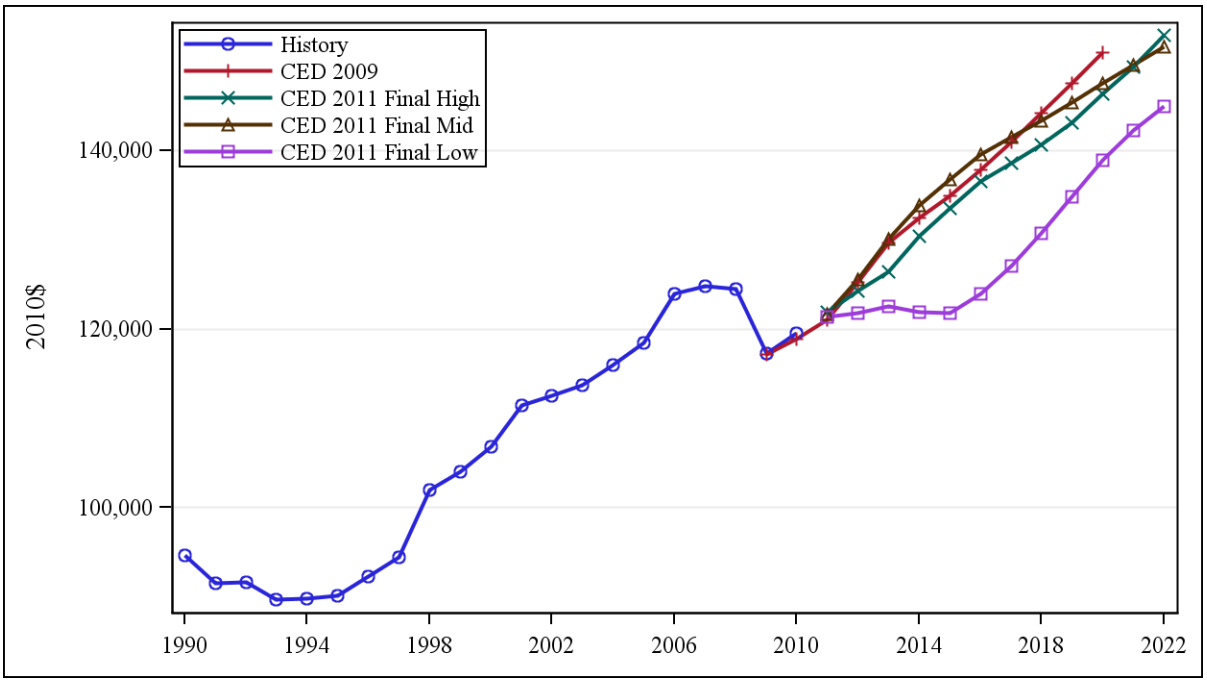
Figure 5-9: LADWP Planning Area Persons per Household Projections



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-10 compares average household income in the two forecasts. The low demand scenario is lower than the *CED 2009* forecast throughout the forecast period, although the gap becomes smaller after 2015. The mid and high scenarios of *CED 2011 Final* are similar to the *CED 2009* forecast though the growth rates for both scenarios fall below *CED 2009* toward the end of the forecast period.

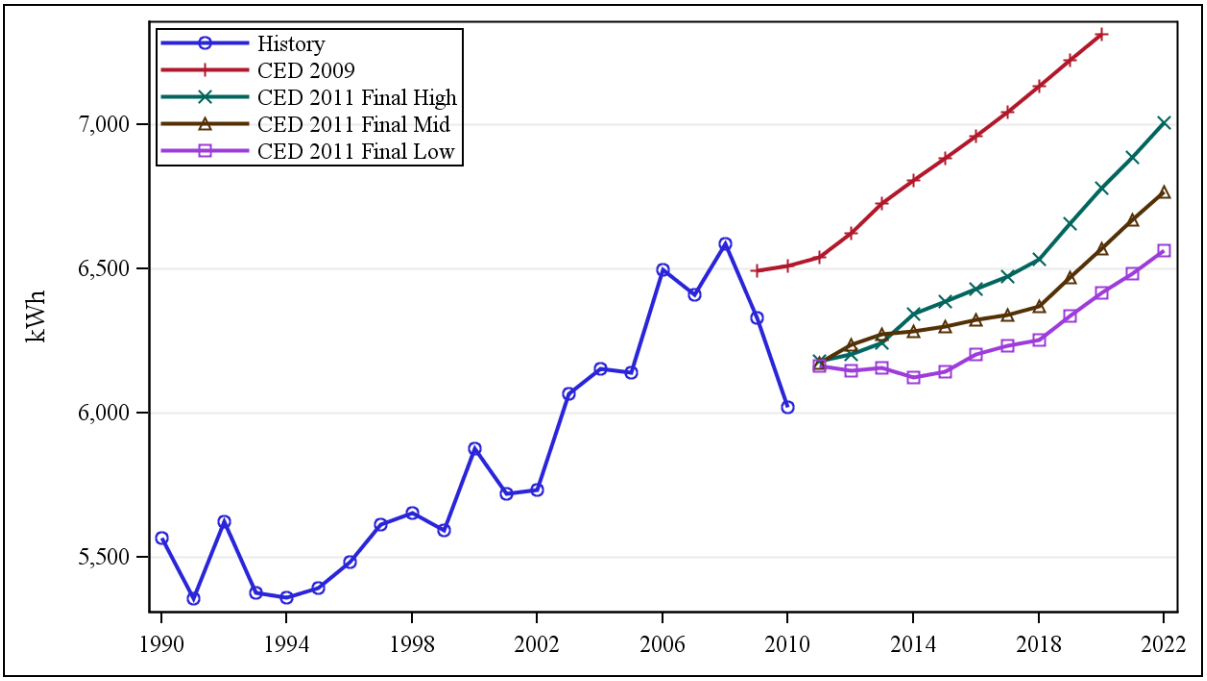
Figure 5-10: LADWP Planning Area Average Household Income Projections



Source: California Energy Commission, Demand Analysis Office, 2012

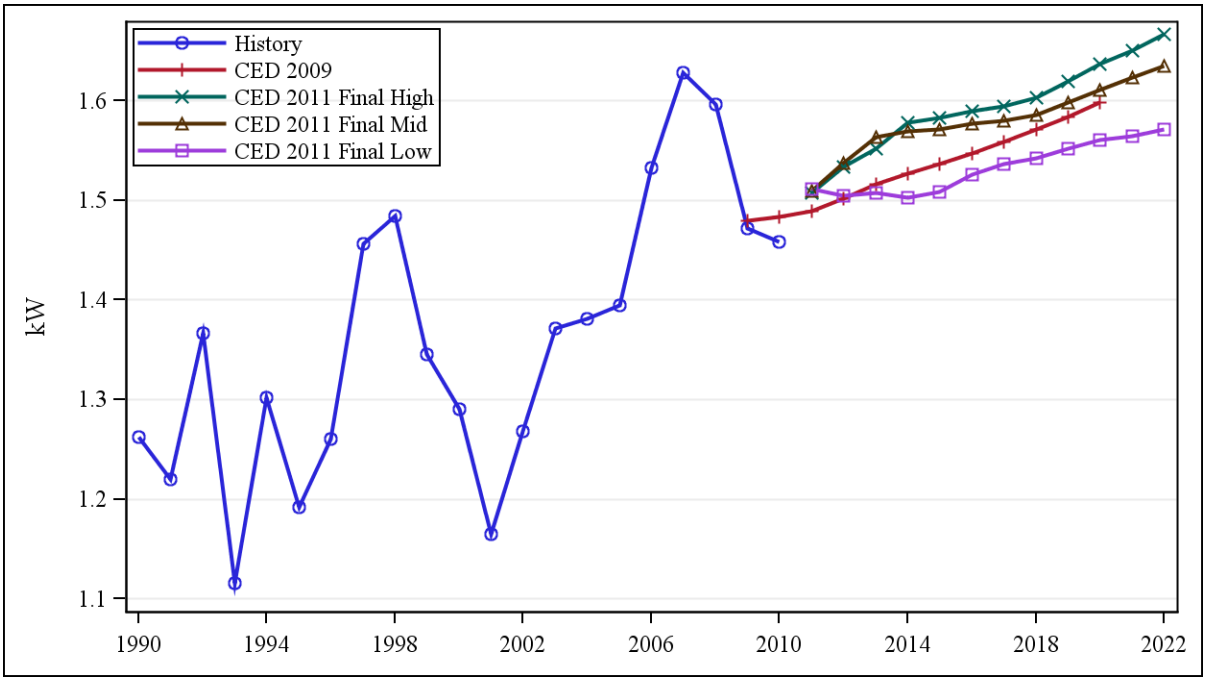
Figure 5-11 compares electricity consumption per household in the two forecasts and shows the 1990–2010 historical series. *CED 2011 Final* use per household grows similarly to the *CED 2009* forecast in the later forecast years, although it begins from a lower level due to the lower consumption forecast. Peak use per household begins at a slightly higher point than *CED 2009*, as seen in **Figure 5-12**, but the low case scenario declines to below the *CED 2009* level and has a slower growth rate throughout the forecast period. The mid and high case scenarios have higher growth rates in the early forecast years but these eventually decrease to below *CED 2009* rates.

Figure 5-11: LADWP Planning Area Electricity Consumption per Household



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-12: LADWP Planning Area Peak Use per Household

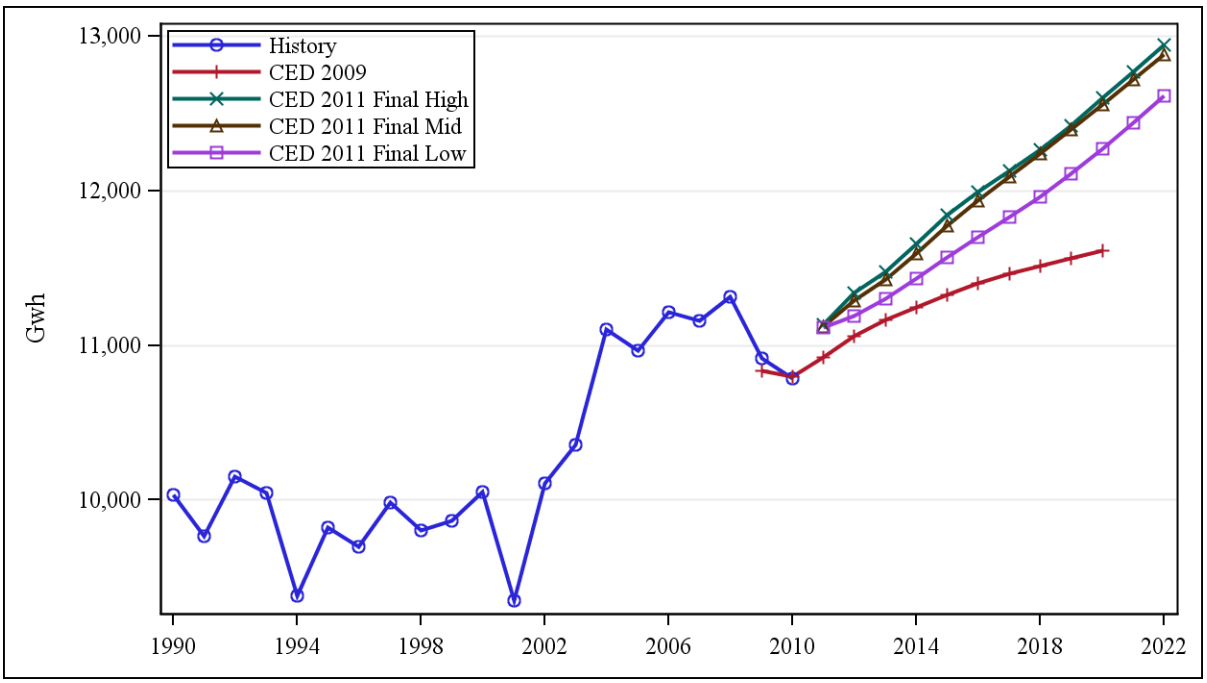


Source: California Energy Commission, Demand Analysis Office, 2012

Commercial Sector

Figure 5-13 compares the commercial sector forecasts. *CED 2011 Final* begins slightly above the *CED 2009* forecast and grows at a faster rate in all three scenarios. This is due to higher projected population growth, which directly affects commercial floor space. *CED 2011 Final* commercial consumption growth from 2010 to 2011 is very high, the result of the historically cool weather in Southern California in 2010, which led to low consumption for the year.

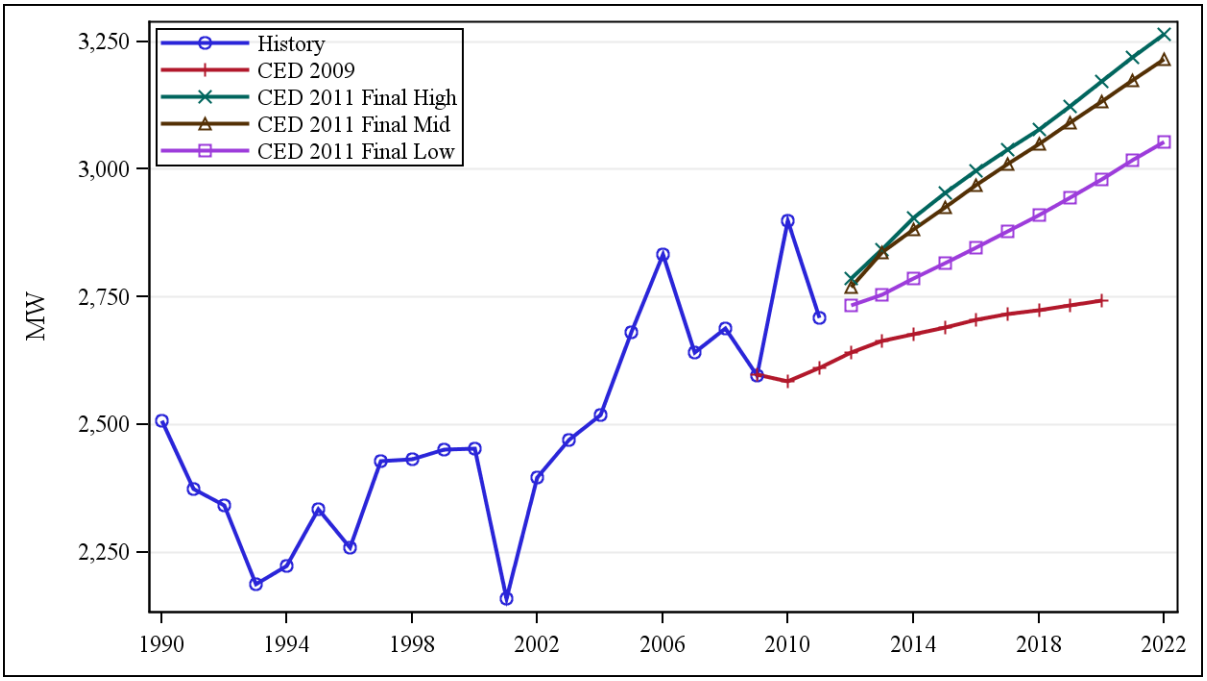
Figure 5-13: LADWP Planning Area Commercial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-14 compares the commercial peak demand forecasts. As with consumption, *CED 2011 Final* forecasted peak grows at a faster rate than *CED 2009* for all three scenarios, for the same reasons, in addition to the climate change adjustment.

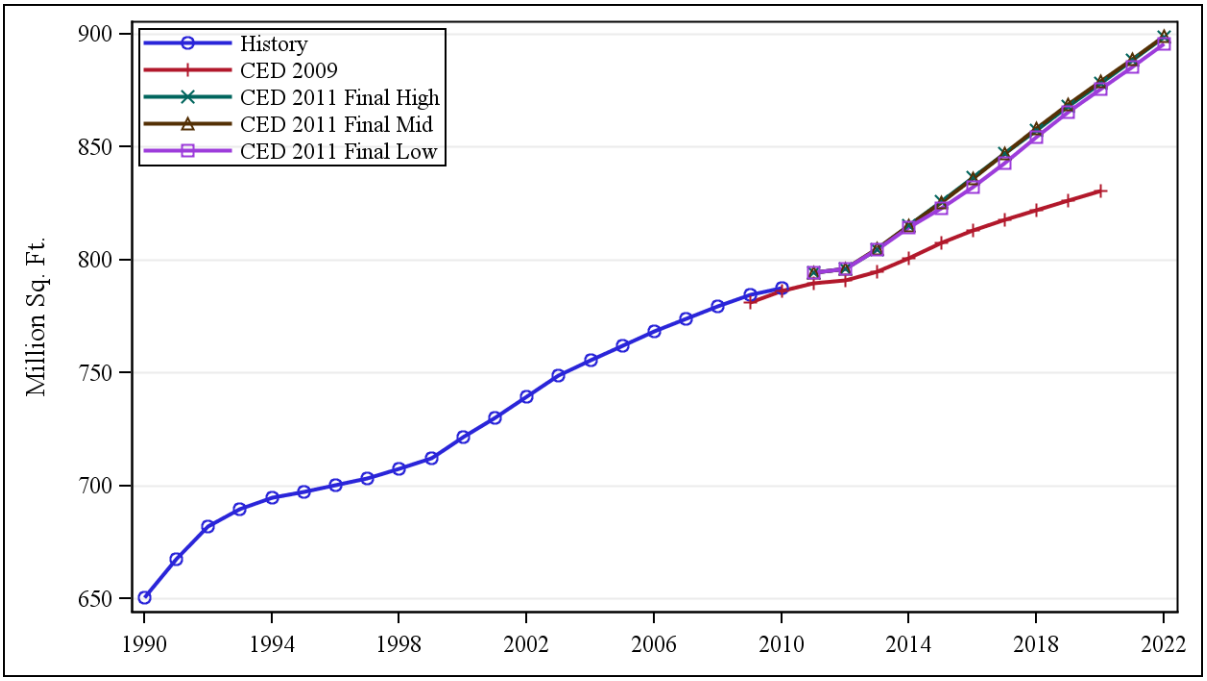
Figure 5-14: LADWP Planning Area Commercial Sector Peak



Source: California Energy Commission, Demand Analysis Office, 2012

In staff's commercial building sector forecasting model, floor space by building type (for example, retail, offices, schools, and hospitals) is the key driver of electricity consumption growth. **Figure 5-15** compares total commercial floor space projections. The *CED 2011 Final* floor space projections are higher than those used in *CED 2009.* The three floor space scenarios do not vary significantly, reflecting the importance of population, which does not vary across the scenarios, in the floor space model.

Figure 5-15: LADWP Planning Area Projected Commercial Floor Space

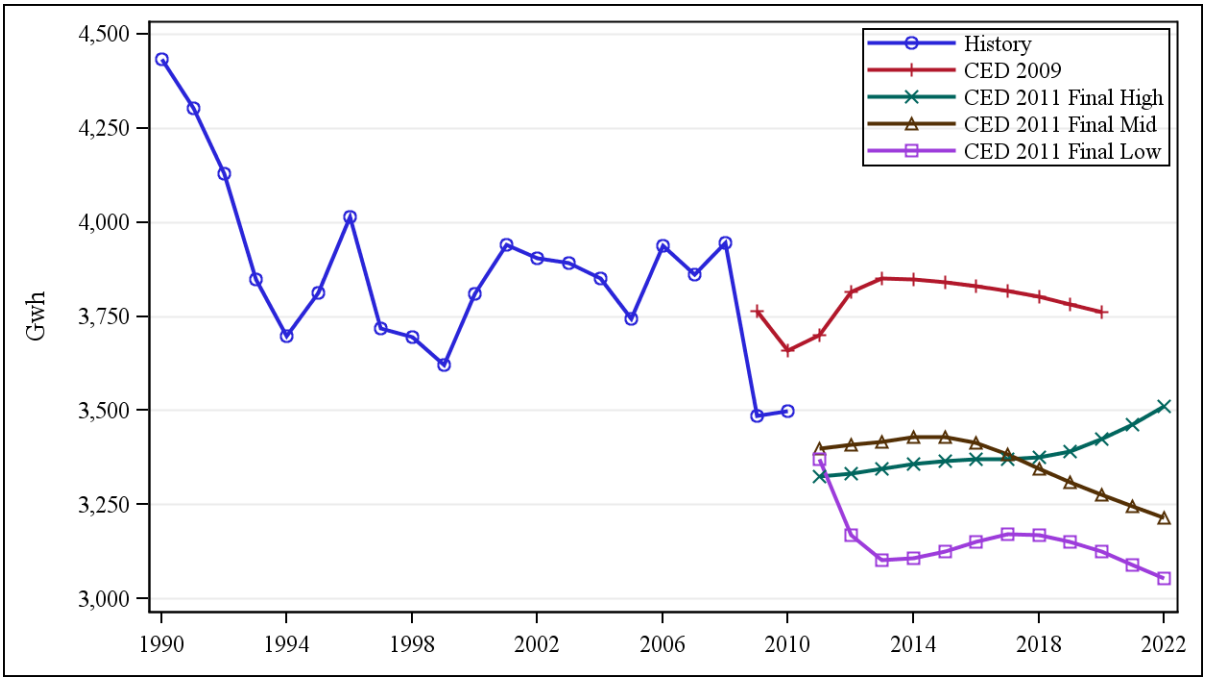


Source: California Energy Commission, Demand Analysis Office, 2012

Industrial Sector

Figure 5-16 compares the LADWP planning area industrial sector electricity consumption forecasts. The *CED 2011 Final* industrial electricity consumption forecast begins at a lower level than the *CED 2009* forecast, due to consumption in 2009 and 2010 being lower than was previously forecast. The low and mid scenarios reflect a long-term decline with a similar growth rate to that of *CED 2009*, but growth in projected manufacturing output in the high scenario pushes industrial consumption up toward the end of the forecast period.

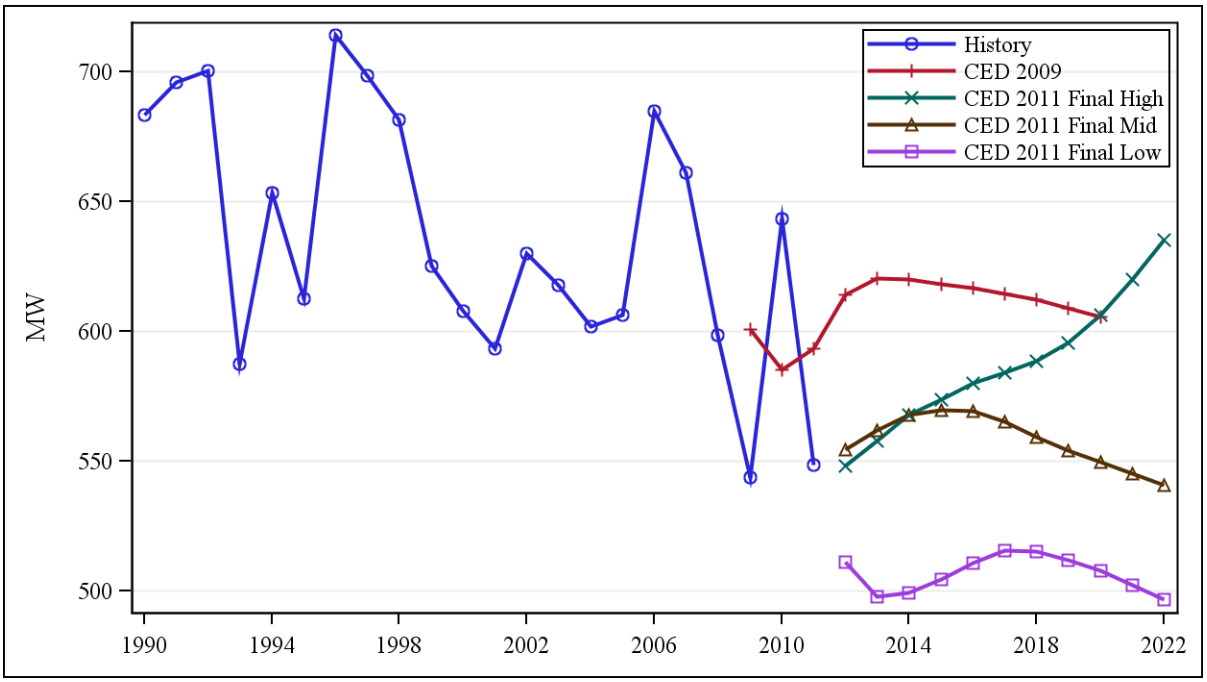
Figure 5-16: LADWP Planning Area Industrial Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-17 compares the industrial sector peak forecasts. All three peak scenarios in *CED 2011 Final* begin at a lower level than the *CED 2009* forecast for the same reason as described for consumption. The patterns for the three scenarios mirror those for consumption, with growth in the high case due to the rapid increase in projected manufacturing output in this scenario.

Figure 5-17: LADWP Planning Area Industrial Sector Peak



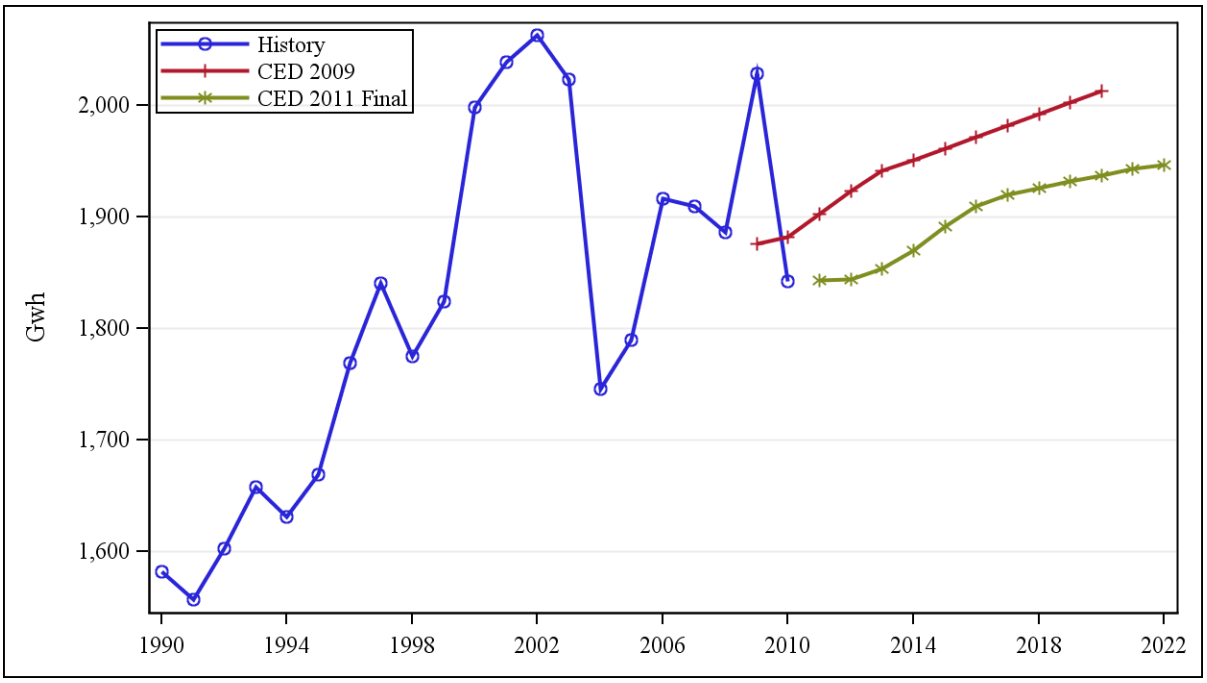
Source: California Energy Commission, Demand Analysis Office, 2012

Other Sectors

Figure 5-18 and **Figure 5-19** compare the remaining sector electricity consumption forecasts. **Figure 5-18** compares the transportation, communications, and utility (TCU) and street lighting sector forecasts. The *CED 2011 Final* forecast starts from a lower point than the *CED 2009* forecast due to lower-than-expected consumption beginning in 2010, but its annual growth rate is similar to the previous forecast. The main driver of the TCU forecast is population, which does not vary by scenario, so only one demand case was developed for this sector.

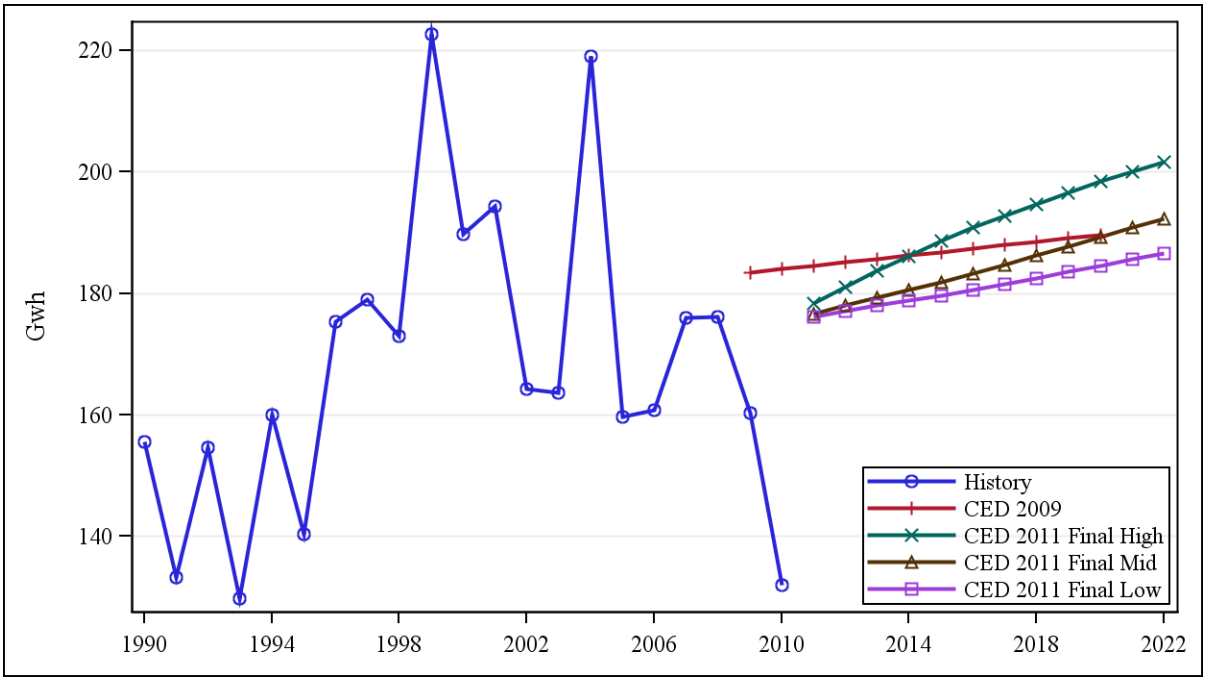
Figure 5-19 compares the agriculture and water pumping sector forecasts. *CED 2011 Final* has a faster growth rate than the *CED 2009* forecast in all three scenarios, with consumption in the high case exceeding *CED 2009* by 2016. The high scenario projection is 8 percent higher than the low scenario forecast by 2022. The large decrease in historical consumption for 2009 and 2010 may be the result of a QFER reporting problem, which staff will attempt to address in future forecasts.

Figure 5-18: LADWP Planning Area Transportation, Communication, and Utilities Sector Electricity Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

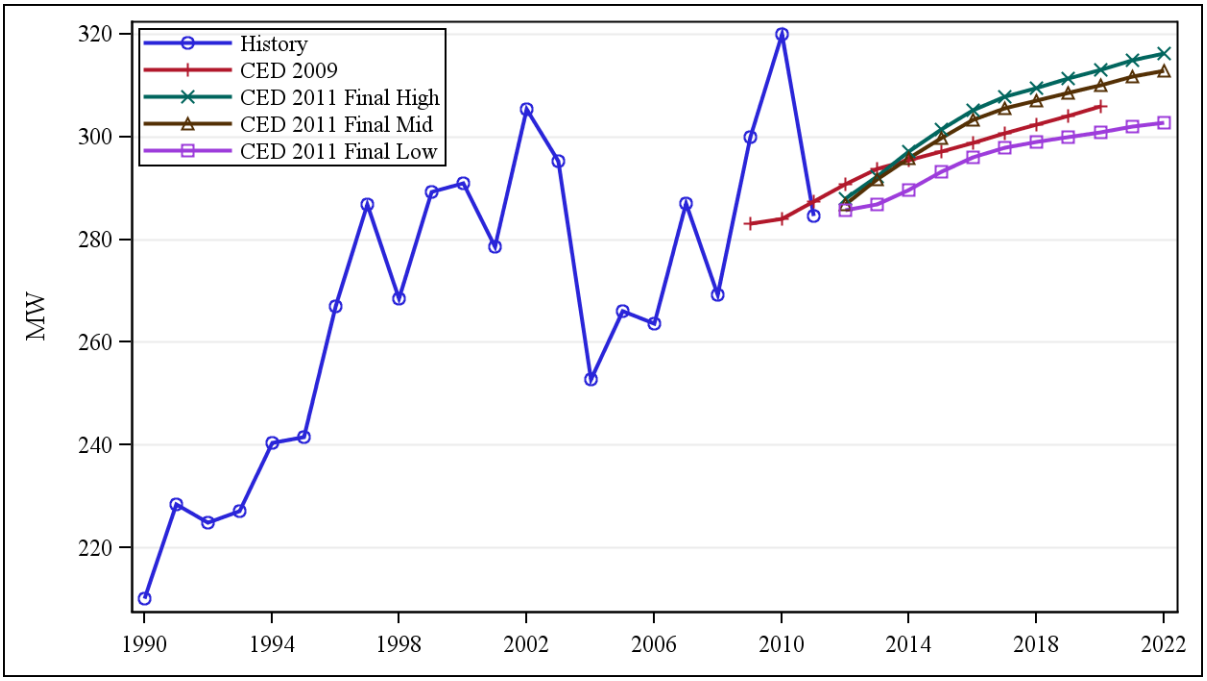
Figure 5-19: LADWP Planning Area Agriculture and Water Pumping Electricity Consumption Forecasts



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5-20 compares the combined peak for the transportation, communication, utilities, street lighting, agriculture, and water pumping sectors. *CED 2011 Final* grows at a slightly higher rate than *CED 2009* in all three scenarios but begins at a lower point due to a lower-than-expected peak in 2010.

Figure 5-20: LADWP Planning Area Other Sector Peak

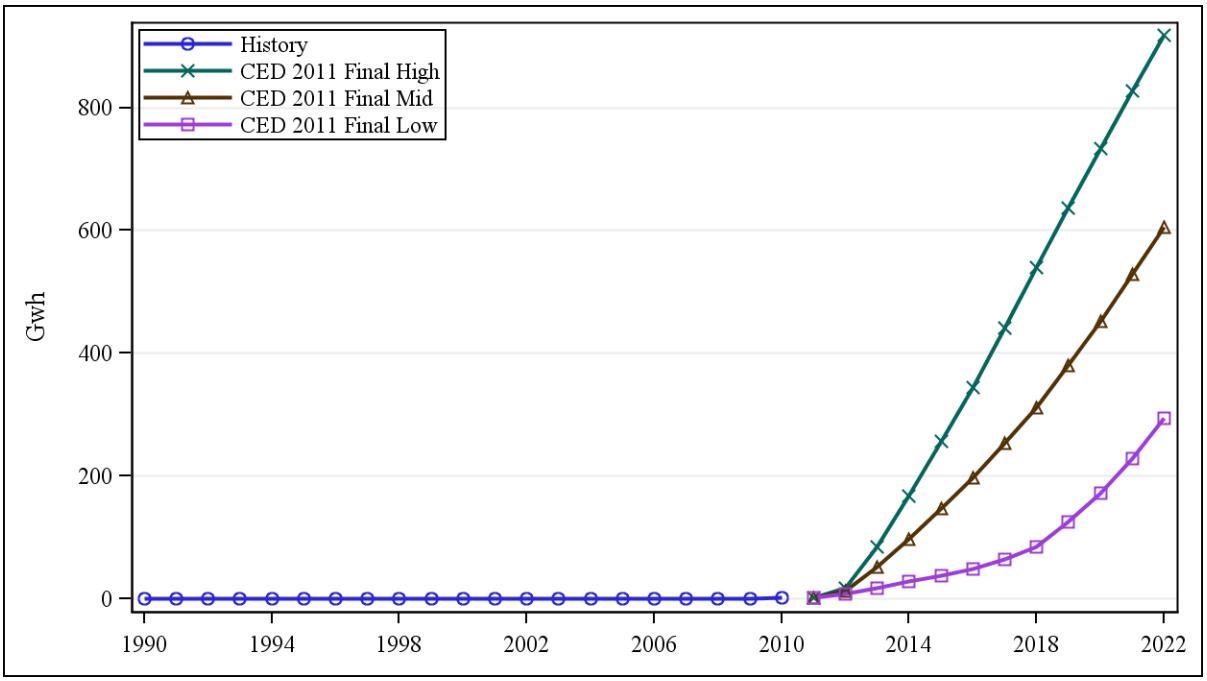


Source: California Energy Commission, Demand Analysis Office, 2012

Electric Vehicles

Figure 5-21 shows projected electricity consumption from electric vehicles. Since existing electric vehicle use is included in QFER consumption data, projected consumption and peak demand incremental to 2010 usage was added to the sector model results. For the LADWP planning area, consumption by electric vehicles is expected to grow from around 2 GWh in 2011 to more than 600 GWh in the mid case by 2022. Recharging is assumed to occur mainly during off-peak hours, resulting in relatively low peak impacts. By 2022, electric vehicles are expected to contribute an additional 12 MW of peak demand in the low demand scenario and 39 MW in the high scenario.

Figure 5-21: LADWP Planning Area Electric Vehicle Consumption



Source: California Energy Commission, Demand Analysis Office, 2012

Self-Generation

As shown in **Table 5-2,** the peak demand forecast is reduced by the projected impacts of distributed PV, solar thermal, and combined heat and power systems, including the effects of SGIP, CSI, and other programs, as discussed in Volume 1, Chapter 1. The effects of these programs are forecast based on recent trends in installations and a predictive model for the residential sector. Staff projects about 55 MW of peak reduction from PV installation in the mid case by 2022. Peak reductions are based on installed PV system capacities of 138 MW by 2022 in the high demand case and 146 MW by 2022 in the low demand case.

Table 5-2: LADWP Planning Area Self-Generation Peak Forecasts

	1990	2000	2010	2015	2020	2022
Non-PV Self-Generation	148.50	196.70	215.57	215.62	215.68	215.73
PV, Low Demand	0.00	0.22	14.90	31.41	46.57	56.83
PV, Mid Demand	0.00	0.22	14.90	31.07	45.12	54.63
PV, High Demand	0.00	0.22	14.90	30.80	44.35	53.59
Total Self-Generation, Low Demand	148.50	196.91	230.47	247.03	262.25	272.56
Total Self-Generation, Mid Demand	148.50	196.91	230.47	246.69	260.79	270.37
Total Self-Generation, High Demand	148.50	196.91	230.47	246.42	260.03	269.32

Source: California Energy Commission, Demand Analysis Office, 2012

Conservation/Efficiency Impacts

Table 5-3 shows electricity consumption and peak savings estimates for building and appliance standards for the mid demand scenario. Total standards impacts are higher in the high demand case by 1.5-2.0 percent because of more home construction and commercial floor space, and 1.5-2.0 percent lower in the low demand case. Chapter 3 of Volume 1 provides more detail on staff work related to energy efficiency and conservation.

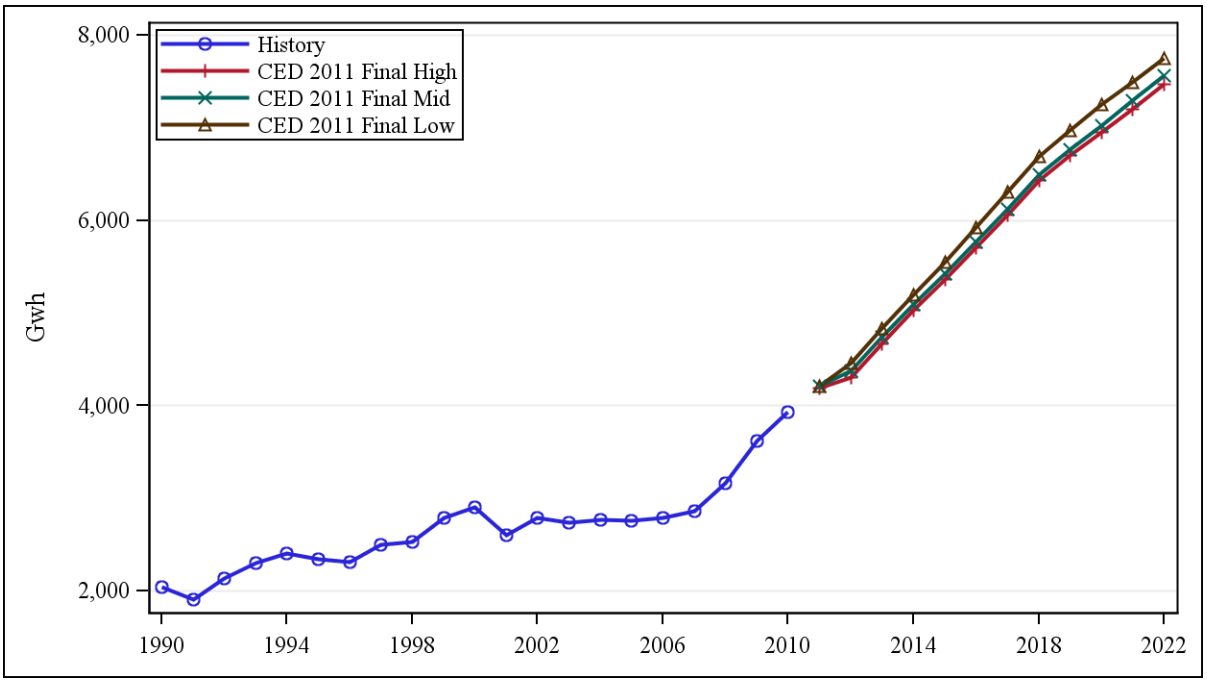
Table 5-3: LADWP Planning Area Electricity Savings Estimates From Standards, Mid Demand Scenario

Electricity Consumption Savings (GWH)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	318	220	538	128	87	215	754
2000	414	683	1,097	267	187	454	1,552
2010	278	1,346	1,624	504	324	829	2,453
2015	371	2,227	2,598	722	475	1,196	3,794
2020	467	2,873	3,340	997	699	1,696	5,036
2022	497	3,005	3,502	1,104	743	1,847	5,349
Electricity Peak Demand Savings (MW)							
	Residential			Commercial			
	Building Standards	Appliance Standards	Total	Building Standards	Appliance Standards	Total	Total Standards
1990	72	50	122	32	22	54	176
2000	93	154	247	64	45	109	356
2010	67	324	391	136	87	223	615
2015	93	560	653	180	118	298	951
2020	117	719	835	250	175	425	1,260
2022	122	736	858	277	186	463	1,321

Source: California Energy Commission, Demand Analysis Office, 2012

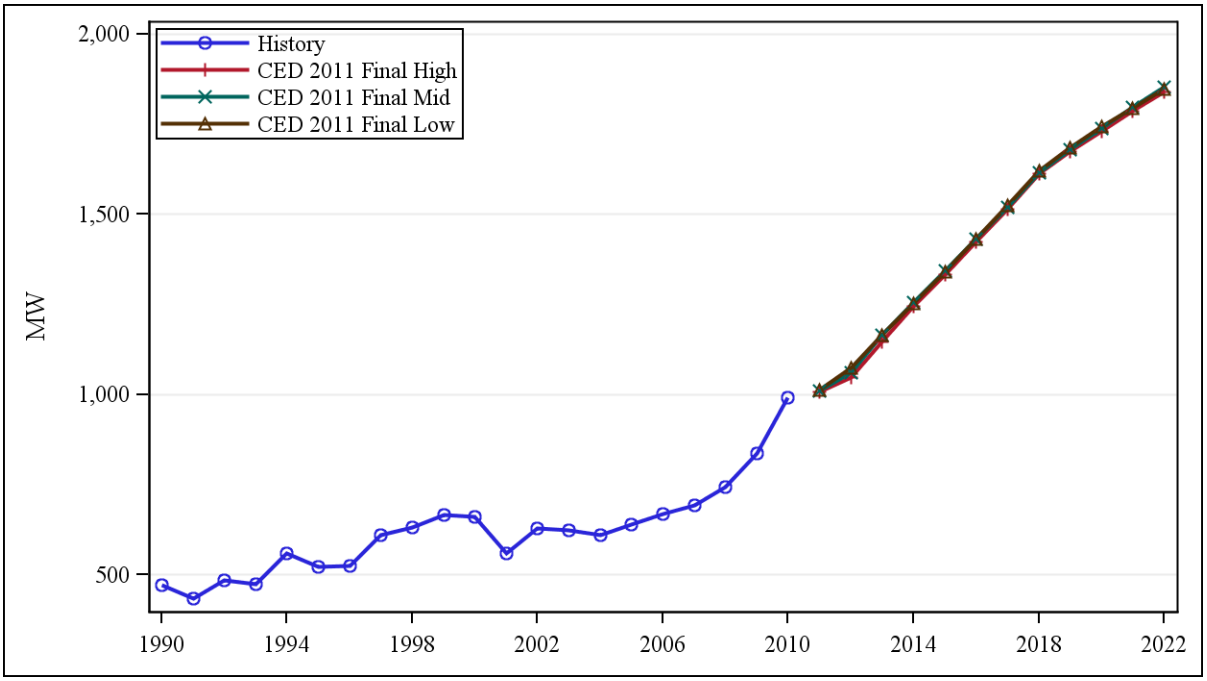
Figure 5-22 and **Figure 5-23,** both depicted on the next page, show forecasts of total savings impacts on electricity and peak demand, from all committed sources, including building and appliance standards; utility and public agency programs implemented before 2013; and price and other effects, or savings associated with rate changes and certain market trends not directly related to programs or standards. Savings are measured against a 1975 baseline, so they incorporate more than 30 years of impacts from rate changes and standards. Projected savings impacts are higher the lower the demand scenario, since price and program effects are inversely related to the demand outcome. Peak results show less difference among the scenarios, since residential consumption savings totals are very similar and the residential sector has a disproportionately large effect on peak demand.

Figure 5- 22: LADWP Planning Area Electricity Consumption Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 5- 23: LADWP Planning Area Electricity Peak Savings Estimates



Source: California Energy Commission, Demand Analysis Office, 2012

GLOSSARY

Acronym	Definition
CED	California Energy Demand
CPUC	California Public Utilities Commission
CSI	California Solar Initiative
Energy Commission	California Energy Commission
ESP	Energy service provider
GW/GWh	Gigawatt/gigawatt hours
IEPR	*Integrated Energy Policy Report*
KW/KWh	Kilowatt/Kilowatt hours
LADWP	Los Angeles Department of Water and Power
MW/MWH	Megawatt/megawatt hours
PG&E	Pacific Gas and Electric Company
PV	Photovoltaic
QFER	Quarterly Fuel Energy Report
SCE	Southern California Edison Company
SDG&E	San Diego Gas & Electric Company
SGIP	Self-Generation Incentive Program
SMUD	Sacramento Municipal Utility District
TCU	Transportation, communications, and utility
WAPA	Western Area Power Administration