

CALIFORNIA ENERGY DEMAND 2010-2020 ADOPTED FORECAST

COMMISSION REPORT

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Executive Summary

Introduction

The *California Energy Demand 2010-2020 Adopted Forecast (CED 2009 Adopted)* is an Energy Commission report¹ presenting forecasts of electricity and end-user natural gas consumption and peak electricity demand for California as a whole and for each major utility planning area within the state for 2010-2020. *CED 2009 Adopted* supports the analysis and recommendations in the *2007 Integrated Energy Policy Report (2007 IEPR)* and *2008 Integrated Energy Policy Report Update (2008 IEPR Update)*, including electricity and natural gas system assessments, and the analysis of progress toward increased energy efficiency. As a result of a major effort to improve the measurement and attribution of efficiency impacts within the energy demand forecast, *CED 2009 Adopted* provides more detail on the impacts of energy efficiency programs and standards than in the past.

Summary of Changes to Forecast

The long-run forecast used in the 2007 IEPR cycle, the *California Energy Demand 2008-2018 Staff Revised Forecast*² (*CED 2007*), was based on 2006 peak demand and energy. For the current electricity and end-user natural gas consumption forecasts, staff added 2007 and 2008 energy consumption data to the historical series used for forecasting, while the peak demand forecast incorporates recent analysis of 2008 temperatures and peak demand at the planning area level.

As in the *California Energy Demand 2010-2020 Staff Draft Forecast*³ (*CED 2009 Draft* or *Draft Forecast*), residential lighting was broken out as a separate end use in the *CED 2009 Draft* to better capture the impacts of residential lighting efficiency programs. For self-generation, staff refined its methods to track various technologies and individual programs. Unlike *CED 2007* and *CED 2009 Draft*, *CED 2009 Adopted* includes a forecast of electricity use by dedicated electric and plug-in hybrid vehicles, provided by the Energy Commission's Fuels Office.

CED 2007 assumed constant electricity rates throughout the forecast period and increasing (by around 30 percent) natural gas rates. *CED 2009 Adopted* assumes rates for electricity and natural gas increase by 15 and 10 percent, respectively, between 2010 and 2020. This corresponds to the "mid-rate" scenario forecast in *CED 2009 Draft*.

¹ *California Energy Demand 2010-2020, Staff Revised Forecast, Second Edition*, November 2009, CEC-200-2009-012-SF-REV, plus errata for inclusion in Chapter 8, p. 236, before the subheading "Statewide Results," were adopted at the California Energy Commission's business meeting held December 2, 2009. *CED 2009 Adopted* combines the two into one report.

² California Energy Commission, *California Energy Demand 2008-2018 Revised Forecast*, November 2007, CEC-200-2007-015-SF2.

³ California Energy Commission, *California Energy Demand 2010-2020 Staff Draft Forecast*, June 2009, CEC-200-2009-012-SD.

The increased effort to capture the effects of energy efficiency programs, along with including the expected effects of 2010-2012 investor-owned utility (IOU) programs, results in reduced forecasted energy demand in California relative to *CED 2007*. *CED 2009 Adopted* provides details on staff work related to efficiency program measurement and attribution for this forecast.

Electricity Forecast Results

Table 1 compares *CED 2007* with *CED 2009 Adopted* and *CED 2009 Draft* forecasts for select years. For the draft forecast, the table shows results for the mid-rate case scenario, the same set of rates used in *CED 2009 Adopted*. *CED 2007* assumed constant rates throughout the forecast period. Both the energy consumption and non-coincident⁴ peak forecasts are lower in *CED 2009 Adopted* than in *CED 2007* over the entire forecast period, primarily due to worsening short-term economic conditions. Electricity consumption in *CED 2009 Adopted* is down by more than 5 percent and peak demand by almost 4 percent by 2018 compared to *CED 2007*. However, consumption and peak demand are projected to be higher in *CED 2009 Adopted* than in the draft, since predictions for economic growth are slightly more optimistic compared to a few months ago. Electricity consumption is projected to grow at a rate of 1.2 percent per year from 2010-2018, the same rate as in *CED 2007*, versus 0.7 percent per year in the draft forecast. Peak demand also grows at the same rate for 2010-2018 as in *CED 2007*, 1.3 percent annually, compared to 1.0 percent in the draft forecast.

The revised statewide forecast of electricity consumption is lower than in *CED 2007* over the entire forecast period, beginning with a dip in 2009 (**Figure 1**). This difference reflects current economic conditions, which affect the forecast through lower personal income growth, lower employment, lower industrial output, and fewer additions to commercial floor space. Most of the remaining difference between *CED 2009 Adopted* and *CED 2007* comes from increased efficiency program impacts assumed in this forecast. Slightly more optimistic economic projections compared to those used in *CED 2009 Draft* along with the inclusion of an electric vehicle forecast lead to projected consumption by 2018 almost 5 percent higher in *CED 2009 Adopted* than in the draft.

Figure 2 compares *CED 2009 Draft* and *CED 2009 Adopted* forecasts of statewide non-coincident peak demand with *CED 2007*. As with electricity consumption, current economic conditions have a major effect in the short-term in both the draft and revised forecasts. Both forecasts show a significant reduction in peak relative to the 2007 forecast for 2010. In the longer term, beyond 2010, the growth rate in the *CED 2009 Adopted* is close to that in *CED 2007*, but levels remain around 3.7 percent lower by 2018. More optimistic recent economic

⁴ Statewide peaks are non-coincident; that is, they are the sum of the individual coincident peak demands for each planning area in California. These individual peaks often occur at different hours of the day. Peak demands provided in this report for individual planning areas are coincident peaks.

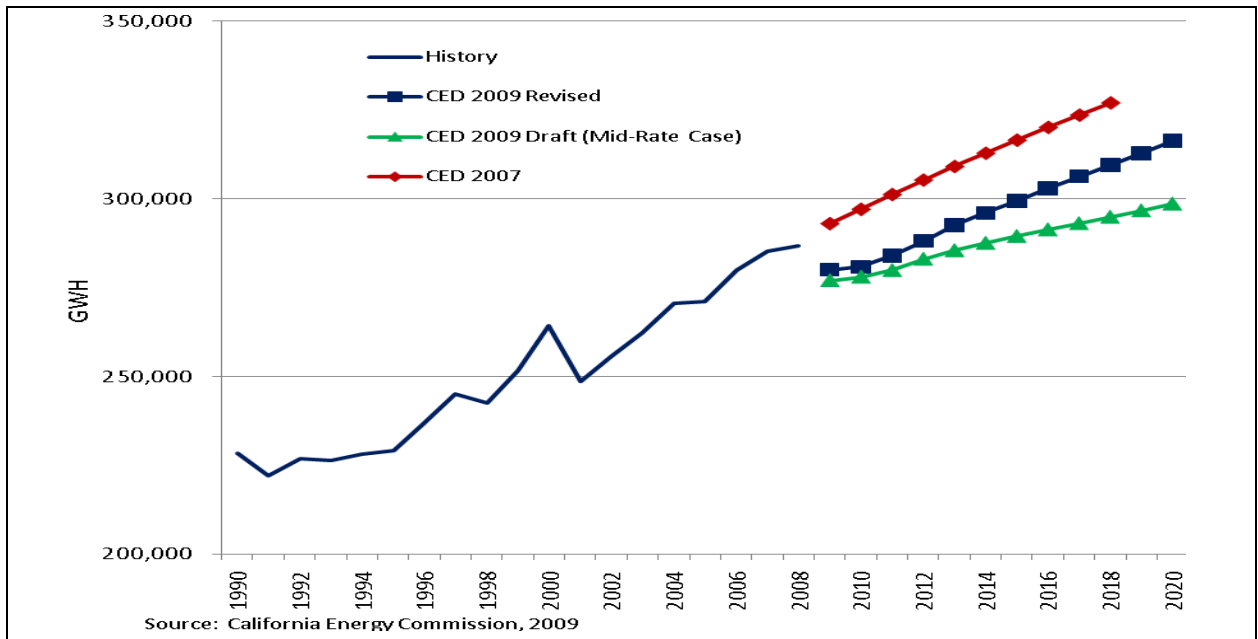
projections push the *CED 2009 Adopted* forecast peak 2.5 percent higher than in the draft by the end of the forecast period. **Figure 2** also shows the load factor for the state as a whole.

Table 1: Comparison of *CED 2007*, *CED 2009 Draft*, and *CED 2009 Adopted* Statewide Electricity Forecasts

| Consumption | | | | | |
|------------------------------|--------------------------------|--|---|---|---|
| | <i>CED 2007</i> (Oct. 2007) | <i>CED 2009</i> <i>Draft</i> Mid-Rate Case (June 2009) | <i>CED 2009</i> <i>Adopted</i> (Dec. 2009) | Difference, <i>CED 2009</i> <i>Adopted</i> and <i>CED 2007</i> | Difference, <i>CED 2009</i> <i>Adopted</i> and <i>CED 2009</i> <i>Draft</i> |
| 1990 | 229,868 | 228,473 | 228,473 | -0.61% | 0.00% |
| 2000 | 265,769 | 264,233 | 264,233 | -0.58% | 0.00% |
| 2008 | 288,976 | 280,184 | 286,771 | -0.76% | 2.35% |
| 2010 | 297,062 | 278,043 | 280,843 | -5.46% | 1.01% |
| 2015 | 316,575 | 289,493 | 299,471 | -5.40% | 3.45% |
| 2018 | 327,085 | 294,895 | 309,561 | -5.36% | 4.97% |
| Average Annual Growth Rates | | | | | |
| 1990-2000 | 1.46% | 1.46% | 1.46% | | |
| 2000-2008 | 1.01% | 0.94% | 1.03% | | |
| 2008-2010 | 1.39% | -0.38% | -1.04% | | |
| 2010-2018 | 1.21% | 0.74% | 1.22% | | |
| Non-Coincident Peak | | | | | |
| | <i>CED 2007</i> (Oct. 2007) | <i>CED 2009</i> <i>Draft</i> Mid-Rate Case (June 2009) | <i>CED 2009</i> <i>Adopted</i> (Dec. 2009) | Difference, <i>CED 2009</i> <i>Adopted</i> and <i>CED 2007</i> | Difference, <i>CED 2009</i> <i>Adopted</i> and <i>CED 2009</i> <i>Draft</i> |
| 1990 | 47,308 | 47,241 | 47,530 | 0.47% | 0.61% |
| 2000 | 53,669 | 53,708 | 53,709 | 0.08% | 0.00% |
| 2008 | 62,946 | 62,948 | 61,825 | -1.78% | -1.78% |
| 2010 | 64,760 | 62,520 | 62,452 | -3.55% | -0.10% |
| 2015 | 69,302 | 65,968 | 66,772 | -3.62% | 1.25% |
| 2018 | 71,889 | 67,873 | 69,240 | -3.68% | 2.01% |
| Average Annual Growth Rates | | | | | |
| 1990-2000 | 1.27% | 1.29% | 1.23% | | |
| 2000-2008 | 2.01% | 2.00% | 1.78% | | |
| 2008-2010 | 1.43% | -0.34% | 0.51% | | |
| 2010-2018 | 1.31% | 1.03% | 1.30% | | |
| Historical values are shaded | | | | | |
| GWH = gigawatt hour | | | | | |
| MW = megawatt | | | | | |

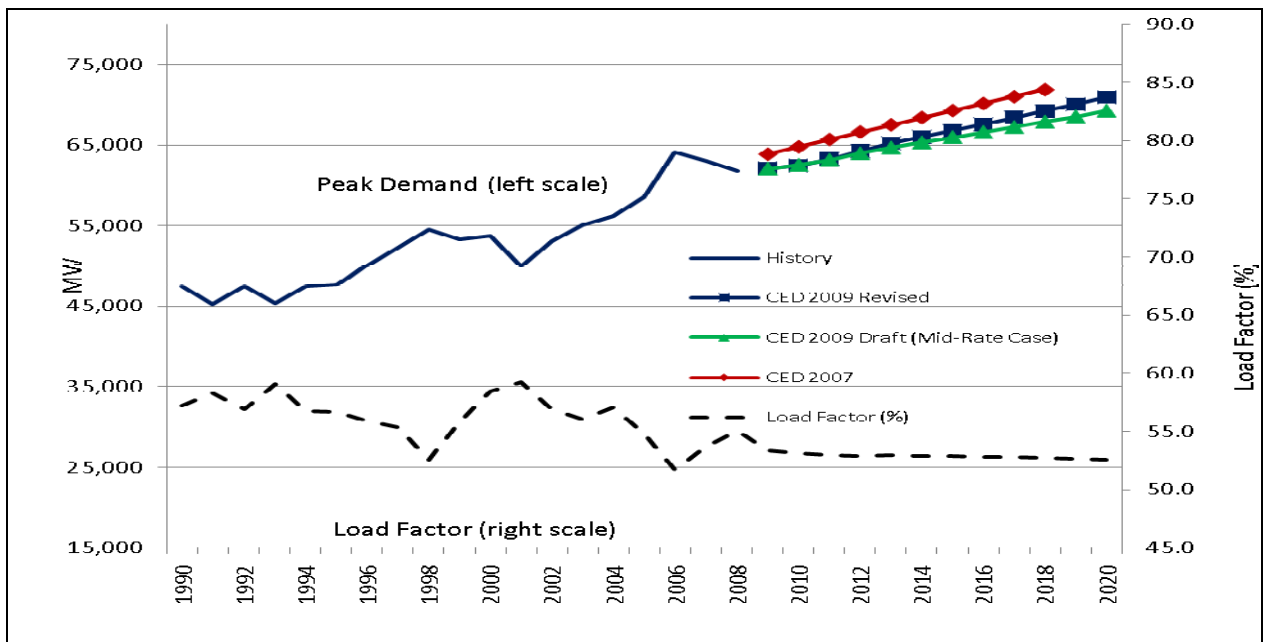
Source: California Energy Commission, 2009

Figure 1: Statewide Electricity Consumption



Source: California Energy Commission, 2009

Figure 2: Statewide Non-Coincident Peak Demand



Source: California Energy Commission, 2009

The load factor represents the relationship between average energy demand and peak: the smaller the load factor, the greater the difference between peak and average hourly demand. The load factor varies with temperature; in extremely hot years (for example, 1998 and 2006) demand is *peakier*. The general decline in the load factor over the last 20 years indicates a greater proportion of homes and businesses with central air conditioning. This trend is projected to continue over the forecast period. Energy efficiency measures, such as more efficient lighting, can also contribute to the declining load factor by reducing overall energy use while having an insignificant effect on peak demand.

End-User Natural Gas Forecast Results

CED 2009 Adopted and *CED 2009 Draft* natural gas forecasts are compared with *CED 2007* for selected years (**Table 2**). These forecasts do not include natural gas used for generating electricity. As in the case of electricity, the set of rates used in the *CED 2009 Adopted* forecast corresponds to the mid-rate scenario in the draft forecast; thus the comparison is made to the draft mid-rate case. *CED 2007* used slightly higher rates, roughly equivalent to those in the draft high-rate scenario.

Reported 2008 natural gas consumption for the *CED 2009 Adopted* forecast is below that predicted in the draft forecast and *CED 2007*. This difference, along with a projected consumption reduction from 2008-2010 in the industrial and mining sectors, leads to a lower forecast through 2020. However, as the economy recovers beyond 2010, the growth rate exceeds those of the two previous forecasts.

Table 2: Statewide End-User Natural Gas Consumption

| End-User Consumption (MM Therms) | | | | | |
|--|--------------------------------|---|--|---|---|
| | <i>CED 2007</i> (Oct. 2007) | <i>CED 2009</i> <i>Draft</i> Mid-Rate Case (June 2009) | <i>CED 2009</i> <i>Adopted</i> (Dec. 2009) | Difference, <i>CED 2009</i> <i>Adopted</i> and <i>CED 2007</i> | Difference, <i>CED 2009</i> <i>Adopted</i> and <i>CED 2009</i> <i>Draft</i> |
| 1990 | 12,893 | 12,893 | 12,893 | 0.00% | 0.00% |
| 2000 | 13,913 | 13,913 | 13,913 | 0.00% | 0.00% |
| 2008 | 13,445 | 12,941 | 12,494 | -7.07% | -3.46% |
| 2010 | 13,616 | 12,992 | 12,162 | -10.68% | -6.48% |
| 2015 | 13,932 | 13,218 | 12,751 | -8.48% | -3.54% |
| 2018 | 14,058 | 13,319 | 12,894 | -8.28% | -3.20% |
| Average Annual Growth Rates | | | | | |
| 1990-2000 | 0.76% | 0.76% | 0.76% | | |
| 2000-2008 | -0.55% | -0.73% | -1.11% | | |
| 2008-2010 | 0.63% | 0.19% | -1.34% | | |
| 2010-2018 | 0.40% | 0.31% | 0.73% | | |
| Historical values are shaded | | | | | |
| End-user consumption excludes natural gas used to generate electricity | | | | | |

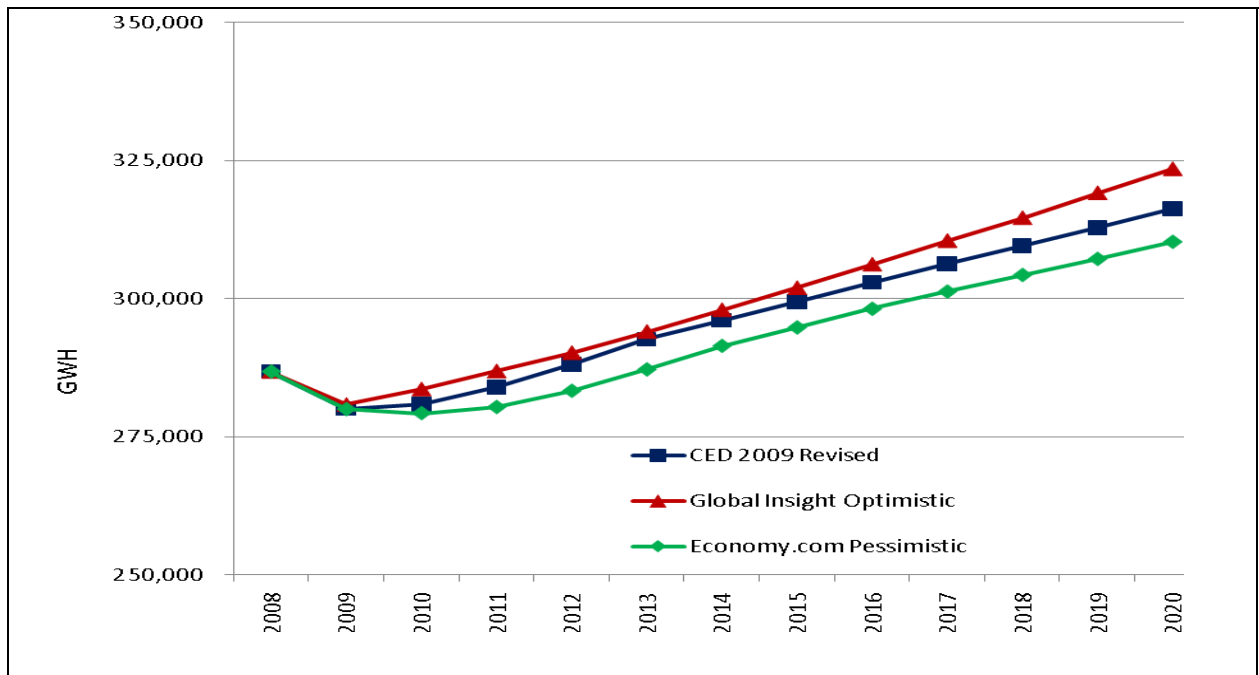
Source: California Energy Commission, 2009

Economic Scenarios

The results presented above rely on economic inputs from a *base case* economic scenario provided by Moody's Economy.com (Economy.com). Staff also examined the effects of two alternative economic scenarios for California electricity demand: an *optimistic* case provided by IHS Global Insight and an Economy.com *pessimistic* case. For this analysis, staff developed econometric models for the three largest sectors (residential, commercial, and industrial plus mining) at the planning area level, using historical data for electricity consumption, electricity rates, weather, and various economic and demographic variables. Electricity consumption for the remaining sectors was held constant (*CED 2009 Adopted* levels) in the alternative scenarios. **Figure 3** shows the projected impacts of the optimistic and pessimistic scenarios on statewide consumption. Peak demand was developed by applying projected load factors from the *CED 2009 Adopted* forecast at the planning area and sector level to the consumption results for each scenario. Projected peak impacts are shown in **Figure 4**.

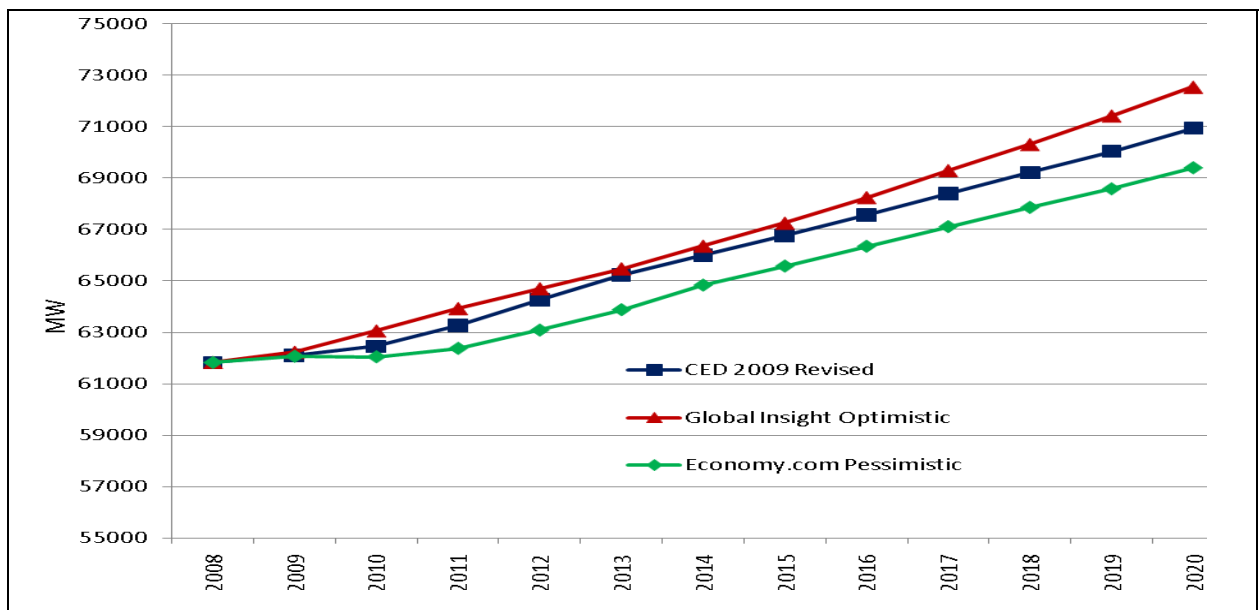
Electricity consumption is projected to be 2.3 percent higher in the optimistic economic case than in the *CED 2009 Adopted* forecast by 2020 and 1.9 percent lower in the pessimistic scenario. The peak demand forecast increases by 2.3 percent under the optimistic scenario by 2020 and falls by 2.2 percent in the pessimistic case. The percentage of peak reduction is more than consumption in the pessimistic case because the relative decrease in consumption is projected to be higher for the residential and commercial sectors than for the industrial, which has a higher load factor (is less *peaky*). Annual growth rates from 2010-2020 for electricity consumption and peak demand increase from 1.2 percent and 1.3 percent, respectively, to 1.3 percent and 1.4 percent in the optimistic case, and fall to 1.1 percent each under the pessimistic scenario.

Figure 3: Projected Statewide Electricity Consumption, *CED 2009 Adopted* and Alternative Economic Scenarios



Source: California Energy Commission, 2009

Figure 4: Projected Statewide Peak Demand, *CED 2009 Adopted* and Alternative Economic Scenarios



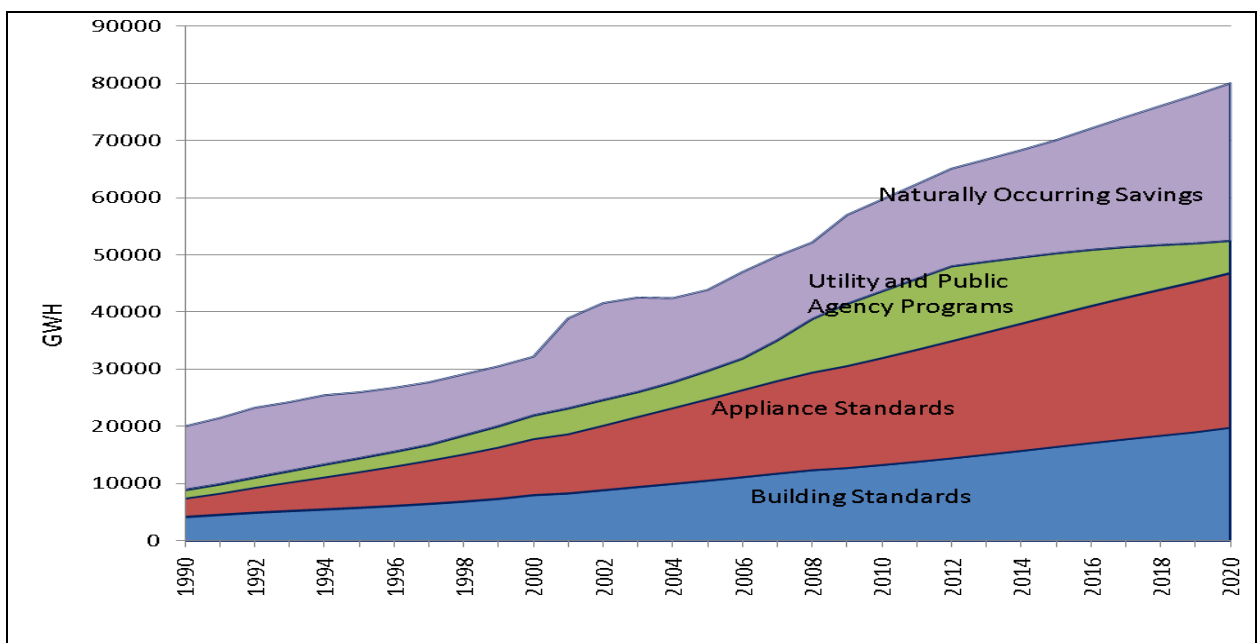
Source: California Energy Commission, 2009

Conservation/Efficiency

With the state's adoption of the first *Energy Action Plan (EAP)* in 2003, energy efficiency became the resource of first choice for meeting the state's future energy needs. Assembly Bill 2021 (Levine, Chapter 734, Statutes of 2006) set a statewide goal of reducing total forecasted electricity consumption by 10 percent over the next 10 years. Under AB 2021, the Energy Commission, in consultation with the California Public Utilities Commission (CPUC), is responsible for setting annual statewide efficiency targets in a public process using the most recent investor-owned and publicly owned utility targets. These targets, combined with California's greenhouse gas emission reduction goals, make it essential for the Energy Commission to properly account for energy efficiency impacts when forecasting future electricity and natural gas demand.

Much time and effort was put into refining the staff's forecasting methods to account for energy efficiency and conservation impacts while preparing this forecast, particularly for utility efficiency programs. **Figure 5** shows electricity consumption savings estimates incorporated in *CED 2009 Adopted* for building and appliance standards, utility and public agency programs, and *naturally occurring* savings, or savings associated with rate changes and market trends not directly related to programs or standards.

Figure 5: Efficiency/Conservation Consumption Savings by Source



Source: California Energy Commission, 2009