TURN Comments on the CEC Draft Staff Report
"Incremental Impacts of Energy Efficiency Policy Initiatives Relative to the Integrated Energy Policy Report Adopted Demand Forecast"
Number 09-IEP-1C "IEPR – Electricity Demand Forecast"

February 25, 2010

I. Introduction

TURN offers the following comments in response to CEC proceeding Number 09-IEP-1C "IEPR – Electricity Demand Forecast". TURN has participated in the DFEEQP workshops for the past many months and commends all those involved in sorting out committed and uncommitted energy efficiency (EE) savings in the load forecast in what appears to be a very satisfactory manner. TURN is very involved in the CPUC proceedings on the IOUs' EE portfolios, including ongoing and detailed review and analysis of the IOUs' forecasted EE savings in 2006-2008 and projected EE savings 2010-2012. TURN has brought that expertise to bear in a fairly detailed review and analysis of the forecasts of committed and uncommitted EE savings. TURN provided oral comments at the Joint IERP and Electricity and Natural Gas Committee Workshop February 17, 2010. TURN looks forward to continued participation in the DFEEQP workshops, and is available for discussions with CEC staff and other interested parties regarding these comments.

As noted at the workshop last week, TURN's principal recommendation is that the lower case scenario (higher forecast with lower EE savings) be adopted for purposes of the upcoming LTPP. We discuss here the evidence for shortfalls in projected EE savings and verified EE savings for the utilities' committed EE programs, and the risk that carries over into the future uncommitted period where goals exist, but utility EE program delivery strategies do not. TURN also discusses the relationship of the CPUC's EE savings goals and the CEC's forecast of incremental uncommitted EE savings relative to California's AB 32 framework of absolute reductions in consumption. Before discussing these topics TURN briefly notes how the recent CEC changes to the historic attribution of EE savings should temper any forecast of utility-EE savings.

II. Recent CEC Changes to the Historic Attribution of EE Savings

Figures 1 and 2 "CA Cumulative GWh Savings 1975-2005" and "Per Capita Electricity Use in the U.S. and CA: 1960-2004" have received worldwide attention as a putative demonstration that California is possibly "the" leader nationally and internationally in accomplishing what no other country or state has yet to achieve through governmental regulations and policies encouraging EE -- relatively flat per capita electricity consumption. [1]

Figure 1: CA Cumulative GWh Savings: 1975- 2005

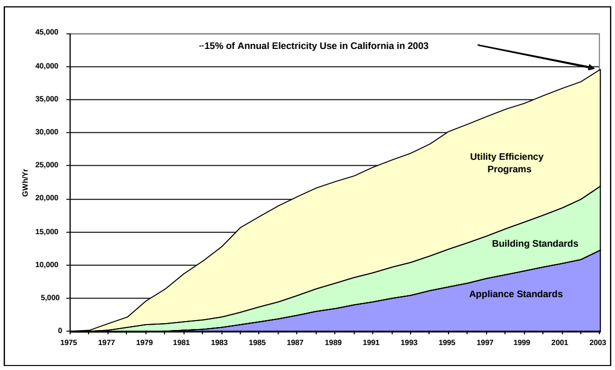
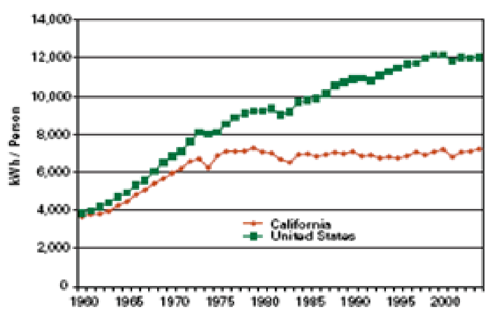


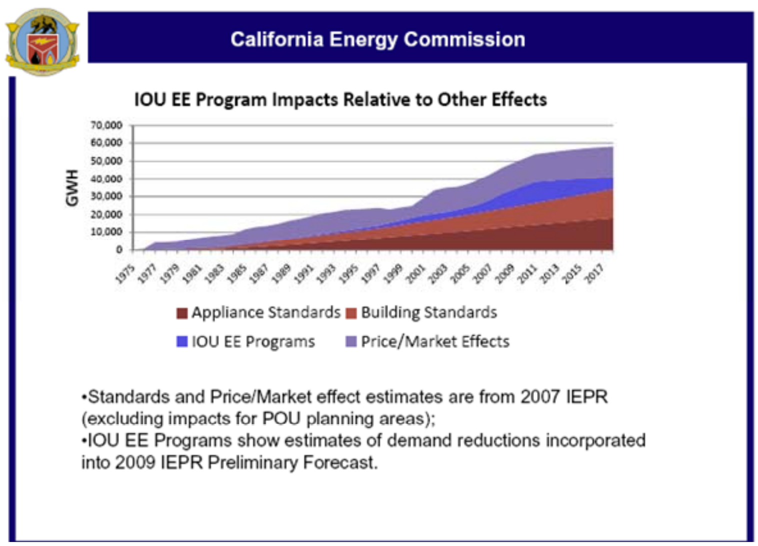
Figure 2: Per Capita Electricity Use in the U.S. and CA: 1960-2004



[1] See most notably "Our Choice: A Plan to Solve the Climate Crisis", Al Gore, 2009, Chapter 12 "How We Use Energy", "How California Leads the Way", p. 242.

It is important to acknowledge that as part of the process of sorting out committed and uncommitted EE savings in the load forecast the CEC recently issued the following restatement of the historic attribution of EE savings. Per Figure 3, in addition to attributing EE savings to the Figure 1 categories of appliance and building standards and IOU EE programs, the CEC added a fourth attribution category of "price / market effects"[2] that in effect reassigns the majority of prior classified utility EE program savings to this new attribution category.[3]

Figure 3
CEC May 2009 Measurement of EE Program Impacts for the 2009 Preliminary Forecast



Source: Measurement of Energy Efficiency Program Impacts for the 2009 Preliminary Forecast Presentation, May 21, 2009

[2] TURN notes that at least the "price" component of "price / market effects" most likely has more to do with reductions in energy consumption via "conservation" (i.e. just using less energy) than energy efficiency per se (that is, using energy more efficiently).

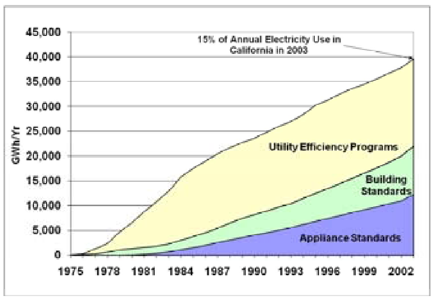
[3] This is consistent with the findings of Energy Economics Inc. published in Public Utilities Fortnightly March 2009 "Stabilizing California's Demand: The Real Reasons Behind the State's Energy Savings". The article provided here as Attachment 1 includes the results of regression analysis illustrating that there is not a strong direct "cause and effect" between energy (utility EE programs and building and appliance standards) and energy consumption (results of linear relationship less than 20%). The article also discusses the finding that there is a relatively strong correlation (about 40%) between changes in California per capita residential electricity consumption and changes in California price of residential electricity (see Figure 3).

Figure 4 below provides a side-by-side comparison of the CEC's historic attribution of EE savings per the pre-May 2009 or "old series" to the May-2009 or the "new series" 1975 - 2003. The graphs show that per the "old series", fully one-half or 20,000 of the 40,000 GWh in 2003 California cumulative EE savings were attributed to utility EE programs. Per the "new series", 2003 cumulative EE savings are adjusted downward from 40,000 to 35,000, with 20,000 attributed to building and appliance standards. Of the approximate 15,000 GWh of cumulative EE savings, at best only 3,000 GWh are attributed to utility EE programs, with the 12,000 balance attributed to the CEC's new attribution category "price / market effects".

In other words, the new approach correctly recognizes that California's historical track record in EE savings has much less to do with utility EE program savings than previously credited, and much more to do with consumers using less electricity in response to high electricity prices. This is important because the CEC's draft forecast of uncommitted incremental EE savings based on the Itron potential studies is premised on achieving significant utility program EE savings from 2012 through 2020. Table 5 below shows that of the 12,000 GHW of uncommitted incremental EE savings in 2020, over 6,000 or 50+% are attributed to IOU programs, with an additional 2,000 GWh to the CPUC's "Big Bold" Initiatives, which the utilities are integral in making happen.

Figure 4: Cumulative Savings Data: EE Programs and Other Savings

Old Series: 1975 - 2003



New Series: 1975 - 2003

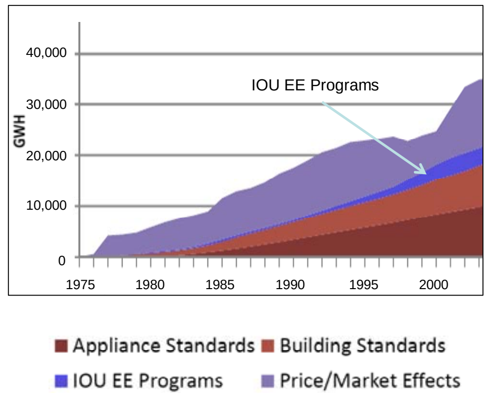
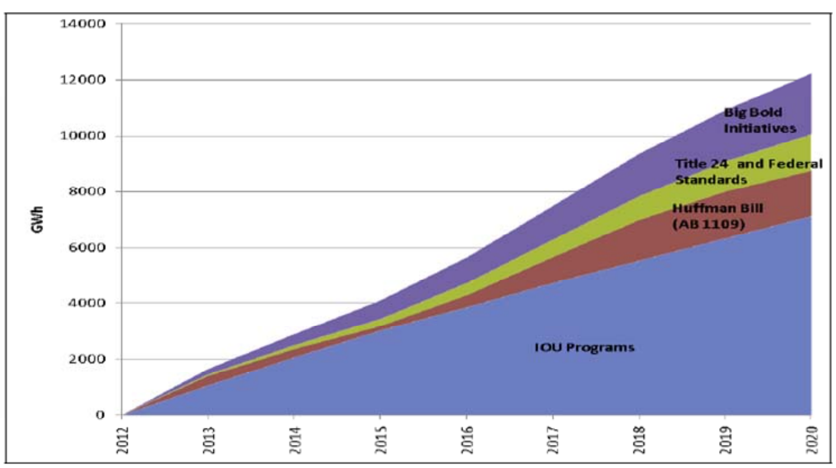


Figure 5: Uncommitted Energy Impacts Incremental to 2009 IEPR Demand Forecast for Combined IOUs, Mid Savings Scenario



Source: Itron and California Energy Commission, 2009

Source: Incremental Impacts of Energy Efficiency Policy Initiatives, CEC-200-2010-001-D, January 2010, Fig.2, p.45

III. Analytical Basis for the Using the Lower Case Scenario in the LTPP

TURN offers the following summary discussion on the analytical basis for our recommendation that the lower case scenario (higher forecast with lower EE savings) should be used in the upcoming LTPP proceedings. First, it is important to understand that the IOUs' 2010 -2012 EE program savings included in the CEC's uncommitted incremental forecast are as projected by the IOUs, that is, with no adjustments, and that the IOUs' 2010-2012 EE programs are very similar to their 2006-2009 programs. There is strong evidence via the CPUC Energy Division staff ex ante and ex post evaluation, measurement and verification (EM&V) work demonstrating rather significant shortfalls in the IOUs' projected EE savings and verified EE savings for the utilities' committed EE programs. There is a significant risk associated with ED's results as they carry over into the CEC's forecast of incremental uncommitted EE savings where EE goals exist, but utility EE program delivery strategies do not.

As explained by Carmen Best of the CPUC's Energy Division (ED) at the February 17, 2010 workshop, the IOUs' 2006-2009 reported EE savings were adjusted downward by ED based on ED's October 2009 *ex ante* verification report. This worked out to about a 32% and 20% downward adjustment in the IOUs' reported GWh energy and MW demand savings respectively (Figure 6, row 7). The ED October 2009 *ex ante* evaluation is just the first step of a three step evaluation process. The second step was the public vetting in December and January of about a dozen ED measurement and verification reports on the 2006-2008 EE programs. This did <u>not</u> include an analysis of ED M&V results relative to the IOUs' reported savings. TURN conducted this additional analysis and provided high-level findings to Commissioner Grueneich via letter dated February 8, 2010 (see Attachment 2). TURN's findings are that the IOUs reported savings should be adjusted downward by 56% and 45% GWh energy and MW demand savings respectively (Figure 6, row 9). This is an additional reduction of 35% and 32% GWh energy and MW demand savings from ED's October 2009 work (Figure 6, row 8).[4] There is one

[4] Per Figure 5, row "CPUC ED ex post" the values of 4140 GWh and 866 MW are per TURN Attachment 3, Table 1, are the sum of two calculations in the columns labeled "claimed savings from programs that could be adjusted" and "evaluated savings from programs that could be adjusted". In other words, 4140 GWh is the sum of 2288 and 1852; and 866 MW is the sum of 357 and 509.

final M&V step or analysis underway now that TURN estimates will further adjust the IOUs' reported savings downward. Per Figure 6, additional ex post adjustments could further reduce the IOUs claimed savings by an additional 1,000 GWh and 233 MW, annually.[5]

Given the similarity in the IOUs' 2006-2009 and 2010-2012 EE programs and most notably the IOUs' continued use in their 2010-2012 program filings of key underlying data for the EE savings calculations that differ from the CPUC Energy Division, it is possible that assuming per Figure 5, IOU EE Program incremental savings approaching 8,000 GWh is not realistic even though the Itron work has credibly identified that level of EE potential.

Figure 6: Adjusting Reported IOU EE Savings: 2006-2008

TOTAL 4 IOUs	GWh	MW
Claimed Savings	9374	1590
CPUC ED *ex ante*	6345	1269
CPUC ED *ex post* *	4140	866
Additional *ex post*	3000	700
% Change		
Claimed to CPUC ED *ex ante*	-32%	-20%
CPUC ED ex ante to CPUC ex post	-35%	-32%
Claimed to CPUC ED ex post	-56%	-46%

Additional ex post = 1,000 GWh and 233 MW annual

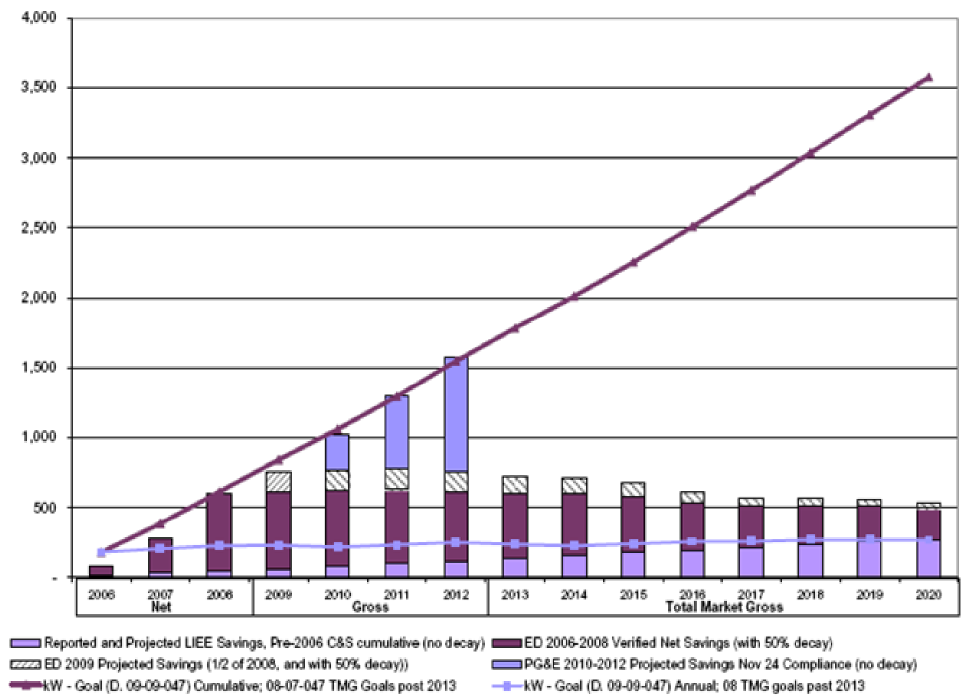
* *TURN analysis / calculations from ED consultants' Nov/Dec 2009 EM&V Reports.*

The CEC Report, beginning at Attachment B-9, shows the IOUs' 2010 – 2012 EE savings as forecasted relative to the goals. At the February 17th workshops, Carmen Best, ED, stated "that there was very little cushion in these utility projected EE savings relative to the EE goals". Figures 7 and 8 showing PG&E and SCE recorded and projected savings (2006 – 2012) and the Commission adopted goals in MW peak demand (2012- 2020) illustrate this point.

[5] Attachment 3 provides preliminary TURN discussion and analysis of additional adjustments to the CPUC ED's ex post adjustments of the IOUs' 2006-2008 reported EE savings.

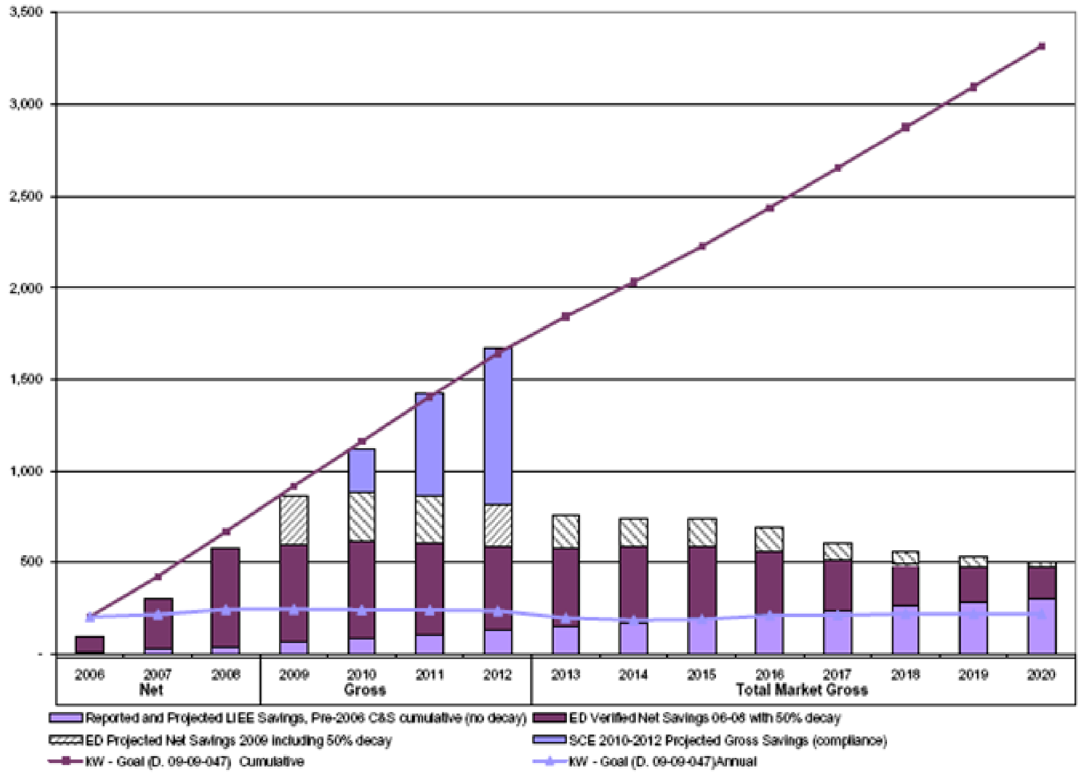
Similar data for SDG&E in Figure 9 shows that SDG&E's forecasted 2010-2012 savings provide for a modest cushion of savings shortfall relative to the 2013-2020 EE goals. As noted above in discussing Figure 6, if the 2006-2009 EE savings are per Figures 7 through 9 adjusted downward even further, and if adjustments are made to the IOUs projected /unadjusted 2010 – 2012 EE savings to more reasonably reflect similarity of program design and CPUC Energy Division measured and verified results, Figures 7 and 8 for PG&E and SCE would reflect a shortfall or gap between committed (2006-2012) and uncommitted (2013-2020) savings. Figure 9 for SDG&E would most likely indicate elimination of the current modest cushion if not shortfalls similar to PG&E and SCE.

Figure 7: PG&E Recorded and Projected Savings v. Commission Adopted Goals MW



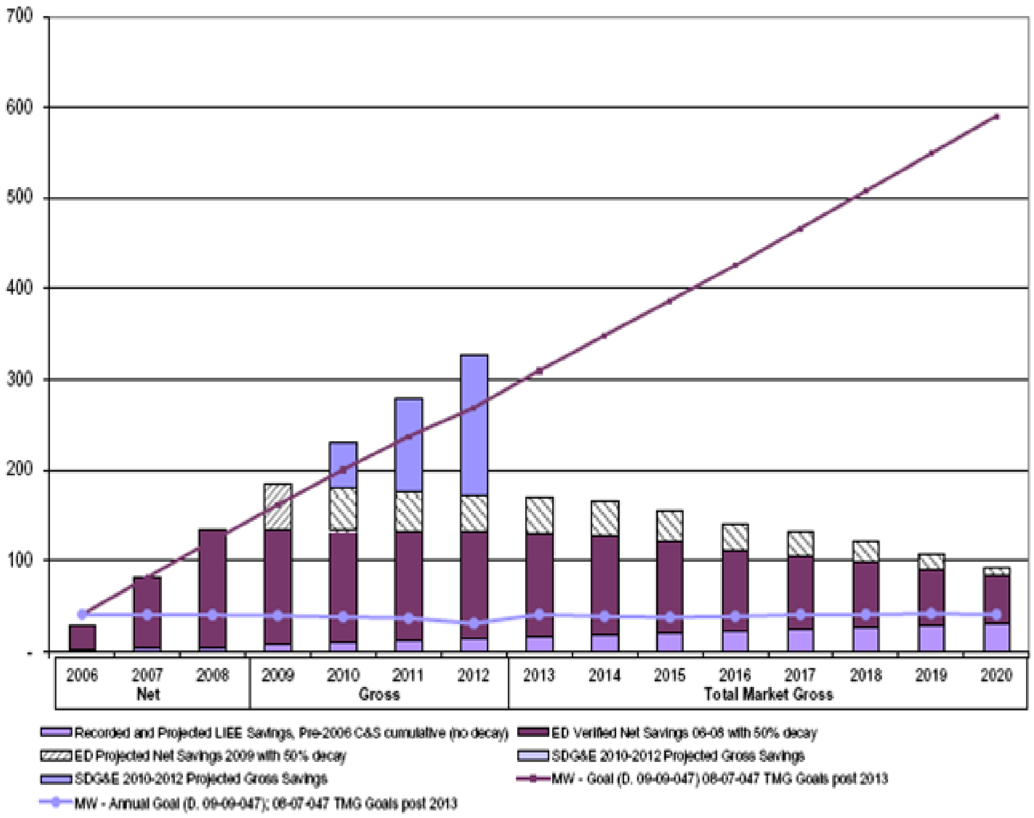
Source: Incremental Impacts of Energy Efficiency Policy Initiatives, Appendix B, CEC-200-2010-001-D, January 2010, B-9

Figure 8: SCE Recorded and Projected Savings v. Commission Adopted Goals MW



Source: Incremental Impacts of Energy Efficiency Policy Initiatives, Appendix B, CEC-200-2010-001-D, January 2010, B-11

Figure 9: SDG&E Recorded and Projected Savings v. Commission Adopted Goals MW

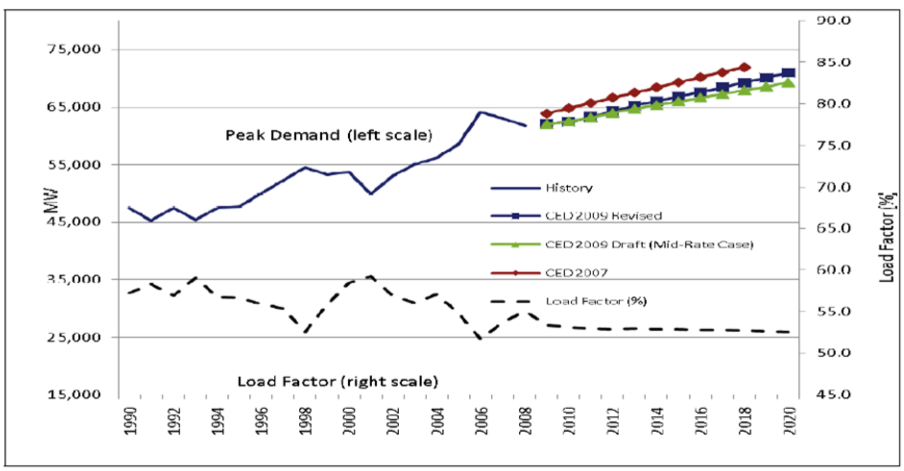


Source: Incremental Impacts of Energy Efficiency Policy Initiatives, Appendix B, CEC-200-2010-001-D, January 2010, B-12

As stated earlier, the IOUs' 2010 -2012 EE programs are very similar to the 2006 -2009, with the forecast of IOU EE peak demand MW savings highly dependent on the (1) IOUs' core program space cooling and the CPUC Big Bold Initiatives – (2) zero net energy construction residential and non-residential, and (3) Heating, Ventilation, and Air Conditioning. Without going into details here, California is not where it wants or needs to be in achieving space cooling savings via the IOUs' EE Programs, and the Big Bold Initiatives are just in the earliest stages of roll-out. Suffice to state that the CPUC ED 2006-2008 EM&V ex post results on residential and small commercial HVAC came in with realization rates (measured and verified savings relative to utility reported) of 28-45%. And even that level of performance assumes the utilities go forward with their programs; so far in 2010, SCE has suspended the quality installation and quality maintenance component of its residential and small commercial HVAC program, while PG&E has slashed its residential HVAC budget.

Figure 10 illustrates how California's steady increase in non-coincident peak demand relative to GWh energy requirements has resulted in a steadily eroding system load factor.

Figure 10: Statewide Non-Coincident Peak Demand 1990-2020



Source: California Energy Commission, 2009

Source: California Energy Demand 2010-2020 Adopted Forecast, CEC 200-2009-012-CMF, December 2009, Fig. 2, p.4

Figures 11 and 12 provide the historic load factors for PG&E and SCE 1970 – 2004 with tracking of growth of the residential central air conditioning saturation over time.[6] The data shows that as utility system load factors have deteriorated over time (about 65 to 60% 1970 to

[6] Memo to CEC Commissioner John L. Geesman and Commissioner James D. Boyd, from Tom Gorin, Demand Analysis Office, dated October 4, 2005, regarding Supplementary Information on Historic Load Factors.

2002 PG&E and SCE) residential central air conditioning has increased from 7% to 30% (for PG&E) and 40% (for SCE). For the reasons detailed in this section and our discussion in the prior section of how the recent CEC changes to the historic attribution of EE savings should temper any forecast of utility-EE savings, TURN recommends that it is more prudent to go forward in the LTPP with the lower case scenario (that is higher forecast, lower EE savings).

Figure 11: PG&E Historic Load Factors 1970-2004

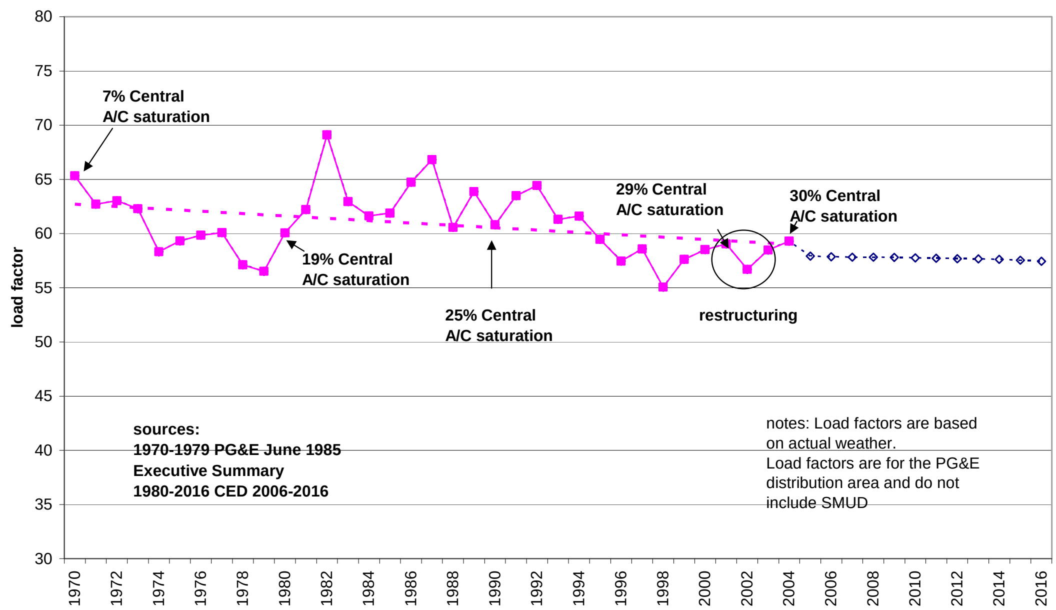
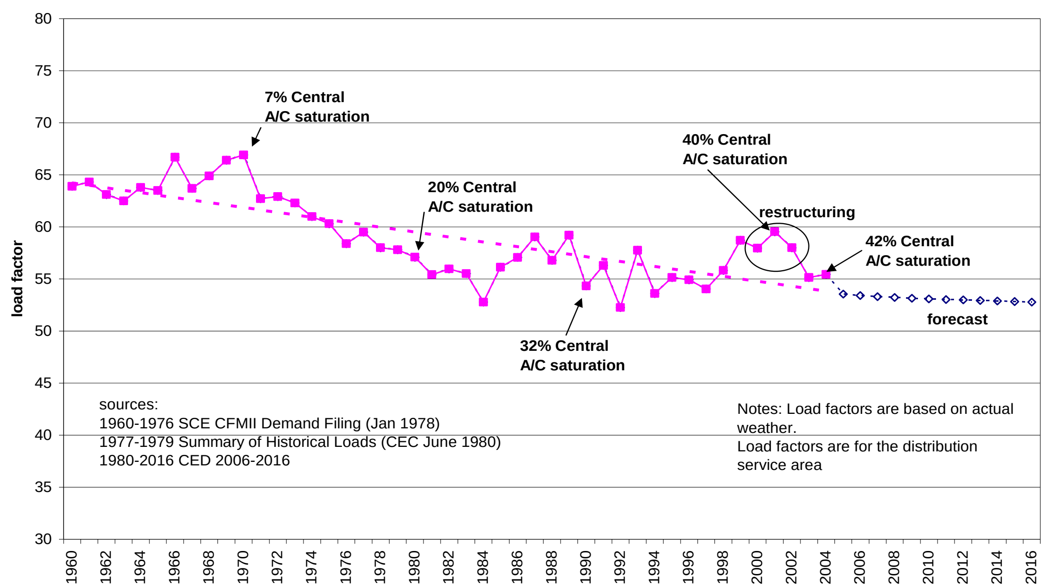


Figure 12: SCE Historic Load Factors 1960-2004



IV. Reconciling Energy Efficiency Savings and AB 32 Absolute Consumption Reduction Goals

TURN further offers the following additional comments regarding the relationship of the CPUC's EE savings goals and the CEC's forecast of incremental uncommitted EE savings relative to California's AB 32 framework of absolute reductions in consumption.

To pursue AB 32 climate change policy goals and gauge progress toward achieving them it is necessary not only to understand the difference between energy savings and consumption reductions, but to recognize how limited and limiting the savings framework is in the context of climate change legislation and targets.

The terminology used to measure progress saving energy via energy efficiency -- *energy savings*, *energy intensity*, *increased energy efficiency*, etc. -- all refer to changes with no direct bearing on absolute consumption. Treating the efforts that are evaluated according to these scales as helpful in the pursuit of GHG reductions obstructs progress toward these goals by mixing relative with absolute scales and obscuring the difference between energy consumed (as metered) and energy saved (generally a ratio of program effects divided by a hypothetical energy growth trajectory).

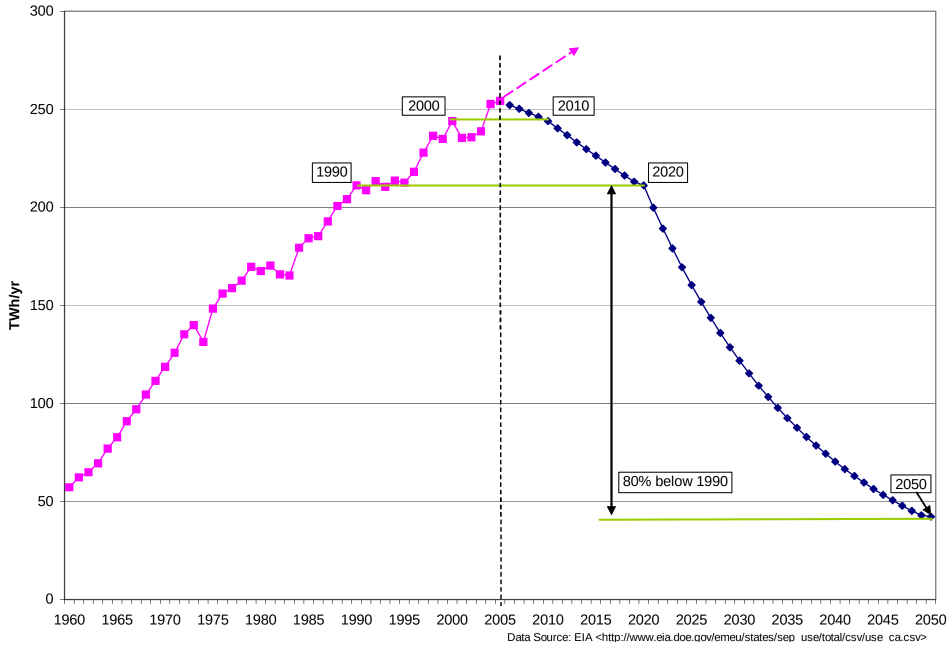
Energy consumption is a *first order* concept that bears on climate change, GHG emissions, and future reduction targets and dates. Energy efficiency, the more common phrase in use today, is, by contrast, a *second order* concept, a ratio (kWh/cubic foot, miles per gallon, BTU output/BTU input, etc). Changes in this second order concept may correspond to absolute reductions in energy consumption—as is often assumed or asserted—or they may not. As a ratio of two numbers, both of which are subject to change, an increase in efficiency only requires that the numerator increase *relative to the denominator.* Because of this fundamental uncertainty, the complexity of the circumstances in which energy consumption occurs, the number of technical, cultural, behavioral, and economic drivers involved, energy efficiency and the associated energy savings is an uncomplete framework or method for measuring progress toward reductions in GHG emissions.

For instance, absolute increases in energy consumption can occur even with energy (efficiency) savings. California electricity consumption has continued to increase between 2005 & '08 (+1.7%); with only a slight decline per capita (-0.8%). California natural gas consumption has increased 6.5% between 2005 & '07; with a marked increase in +5.1% per capita.

Figure 13[7] illustrates the magnitude of the task ahead of California in complying with AB 32.

[7] http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html &
http://quickfacts.census.gov/qfd/states/06000lk.html
http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_a_EPG0_VC0_mmcf_a.htm Deumling, Reuben. 2007. CPUC Energy Division White Paper. *"Separating Means and Ends: Reorienting Energy Efficiency Programs and Policy toward Reducing Energy Consumption in California"* http://www.cpuc.ca.gov/NR/rdonlyres/D5CFAD3F-A4EC-4721-BD79-D4BD6AC72257/0/EDWhitePaper_MeansAndEnds_090402.pdf

Figure 13: Total CA electricity consumption 1960-2005 & an AB32-derived trajectory through 2050



Source: Reuben Deumling, Separating Means and End: Reorienting Energy Efficiency Programs and 1

Stabilizing California's Demand

The real reasons behind the state's energy savings.

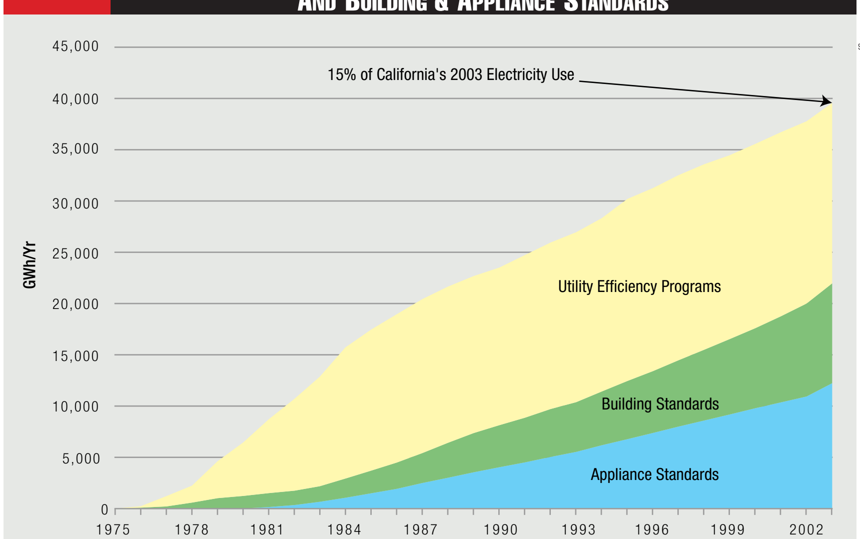
BY CYNTHIA MITCHELL, *ET AL.*

In 2005, California's energy policymakers and regulators established energy efficiency (EE) as California's highest priority resource for meeting future needs in a clean, reliable, and low-cost manner.[1] In 2006, the California legislature and governor positioned energy conservation and efficiency as the cornerstone of the state's Global Warming Solutions Act. The Act mandates a 2020 statewide limit on greenhouse gas (GHG) emissions to 1990 levels. Compliance will be nothing short of Herculean: California will have to reduce per capita energy usage in a manner that accommodates continued brisk population growth and protects the state's economy from economic dislocations and recessionary pressures.

The California Energy Commission (CEC) and California Public Utilities Commission (CPUC) point to California's historical record in saving energy (*see Figure 1*), coupled with its current stable per capita electricity use relative to the balance of the United States (*see Figure 2*), as proof that it is up to this formidable challenge:"Because of its energy efficiency standards and program investments, electricity use per person in California has remained relatively stable over the past 30 years, while nationwide electricity use has increased by almost 50 percent."[2]

The CEC and CPUC take credit for saving, on a cumulative statewide basis from 1975 to 2003, about 40,000 GWh, or the equivalent of 15 percent of annual electricity use, through a combination of utility EE programs and appliance and building standards (*see Figure 2*).[3] Figure 2 illustrates the trend in average per capita total consumption in California and the U.S. between 1960 and 2005.[4] Until the mid-1970s, total electricity use in California and the United States increased at about the same rate. After that, California's usage leveled off, while usage in the United States as a whole continued to increase. [5]

FIG. 1 CALIFORNIA CUMULATIVE GWH SAVINGS: UTILITY EE PROGRAMS AND BUILDING & APPLIANCE STANDARDS



Source: California Energy Commission

California is Different

California's GHG-reduction policy appears in large part premised on the state already having achieved a strong and direct "cause and effect" between energy savings (utility EE programs and building and appliance standards) and energy consumption. As noted above, several documents highlight the role of EE savings in accounting for the different consumption trends evident in California and the rest of the United States.

When we started this project two years ago, we could find no studies that demonstrated the strength of the relationship between EE savings and consumption in California. Since then, some analyses have been undertaken, but, as yet, there has been no analysis that models consumption in California by looking at the specific contribution of changes in the level of EE savings to changes in consumption via multiple regression. Our own attempts to undertake such an analysis, while preliminary (and the best we felt it worthwhile to do given the limitations of the available data) showed that annual changes in the level of EE savings were not associated highly with changes in per capita electricity consumption. Even when many outliers were excluded, simple linear regression showed that the relationship

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between these two variables was less than 20 percent. In addition, the EE savings variable was not significant within any of the multiple regression models. A major issue we encountered was that on a per capita basis, annual changes in the level of EE savings, were small in relation to the changes in annual electricity consumption. While fully controlling for all other factors that contribute to annual fluctuations in the level of electricity consumption may have allowed us to identify the role of EE savings, we were able to control only for about half of the annual variation in consumption and did not succeed in specifying the role of EE savings.[6]

While we have no doubt that EE programs have contributed to the relatively stable[7] pattern of per capita electricity consumption in California, we were interested to see whether there were other factors that distinguish California from the rest of the country that also should be taken into account when explaining the divergence in consumption. We found that California is different from the rest of the United States in several other aspects (*i.e.,* in addition to the scope of its EE programs) that could help account for some of the difference in consumption trends. These are: the price of residential electricity; climate; household size; housing mix; conservation ethic; and the structure of the economy.

In addition to savings from EE programs, building codes and appliance standards could help account for the different consumption trends evident in California and the rest of the United States over the past 30 years.

Fig. 2 Per Capita Electricity Use in the United States and California: 1960-2005

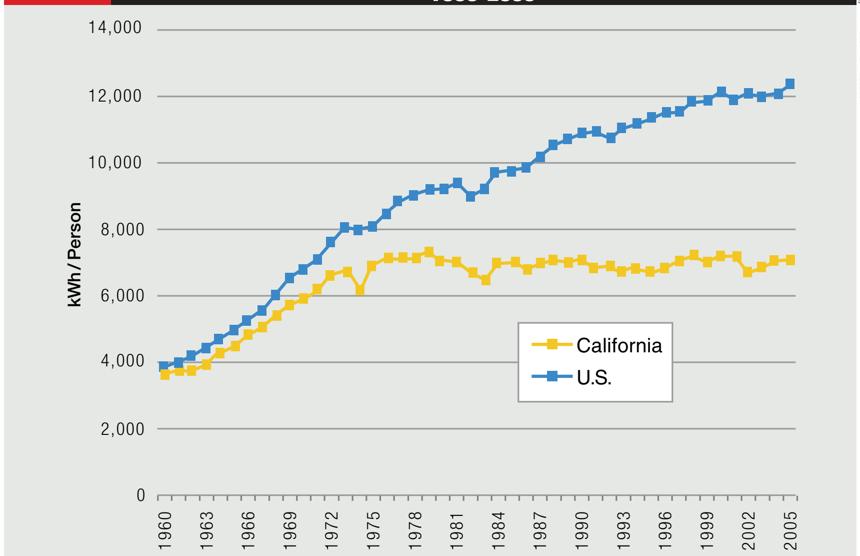
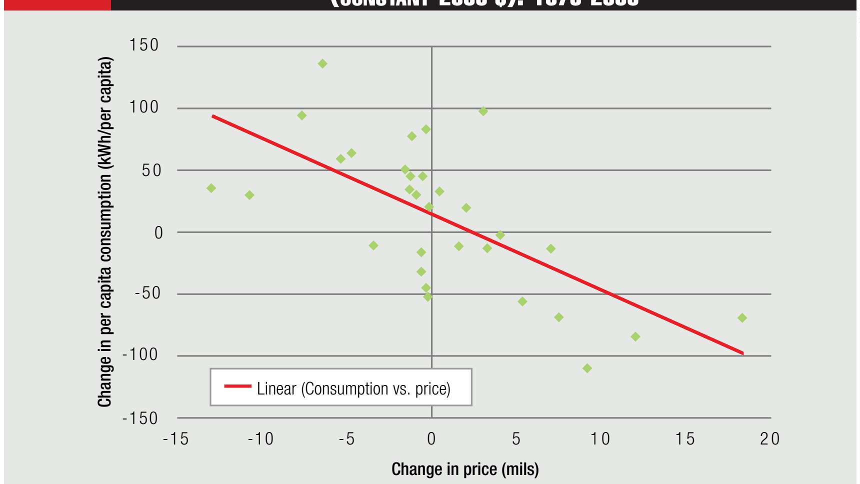


Fig. 3 Change in California Per Capita Residential Electricity Consumption vs. Change in California Price of Residential Electricity (constant 2000 $): 1970-2005



■ **Electricity Prices:** In California, as elsewhere, there is a predictable relationship between electricity prices and the annual variation in residential per capita electricity consumption. On an annual basis, increases in the price of residential electricity are associated with decreases in consumption (*see Figure 3*). For every one mil increase in the price of residential electricity in California, per capita consumption declines by about 6 kWh per capita.[8] The data points lie relatively well clustered about the line, with price changes explaining about 40 percent of the annual variability in per capita consumption. These findings are in keeping with the national data on residential energy prices and residential per capita consumption that we analyzed: Those states with higher energy prices have lower per capita consumption and vice versa (*see Figure 4*).[9]

Electricity prices in California are higher than those in the United States as a whole, and the difference in price has become more marked over the past thirty-five years. In 1970, the price of residential electricity in California was 0.0809 cents per kWh, only a little higher than the U.S. average of 0.0806 cents/kWh. By 2005, the price had risen by 37 percent in California, to 0.1109 cents/kWh. In the United States as a whole, however, it had risen by just 4 percent, with the 2005 price, at 0.0838 cents/kWh, substantially lower than in California.[10]

If there is a planetary imperative to

reduce overall energy consumption, and California's marked departure in historical per capita consumption trend in relation to the balance of the United States is in large part, energy price induced, one might ask, why not just raise energy prices further? California energy policymakers and regulators discuss EE as the one component of the state's aggressive GHG-emissions reduction policy that will keep money in state and local economies, while all of the other GHG-reduction strategies will be expensive. In other words, California needs moderate energy prices to help keep the economy going.[11]

■ **Climate:** Not surprisingly, the weather also is a strong driver of per capita electricity use. We conducted an analysis of the relationship between the number of cooling degree days (CDDs) in California against per capita residential electricity consumption.[12] This analysis showed that years with higher numbers of CDDs, are associated with higher levels of per capita electricity consumption (*see Figure 5*.). This is in large part due to the electricity demands of air conditioners in years with warm summers.

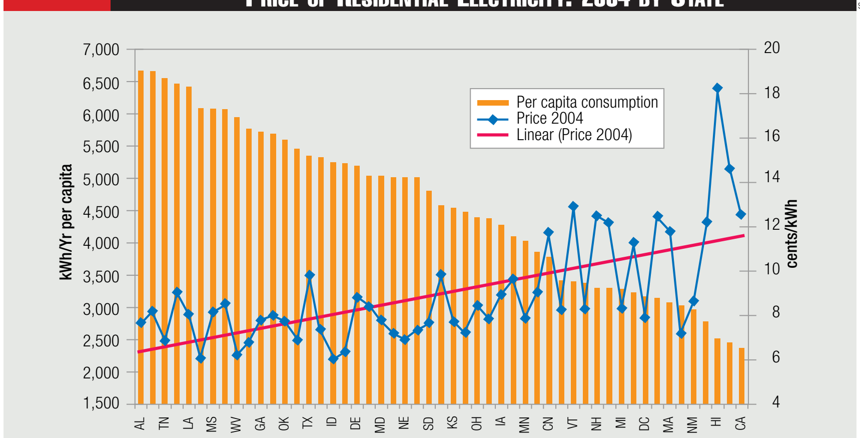
> **Changes in energy-efficiency savings were small compared to changes in California's electricity consumption.**

We also found that California tends to experience fewer CDDs than the United States as a whole. The state's relatively moderate climate greatly affects the amount of residential electricity that is used for space cooling in the summer. Heating is less of an issue because of the dominance of gas heating in the state. A good summary measure of the difference between California and the United States as regards climate is the annual number of CDDs each experience. For the period between 1975 and 2005, California had an average of 932 CDDs annually. This is substantially less than the U.S. average of 1,274 CDDs, and represents an average difference of 342 CDDs, or 27 percent fewer.[13] While there is limited evidence of a divergence between California and the United States in terms of the number of CDDs over the past 30 years, it is likely that part of the reason for California's relatively low per capita residential electricity consumption is due to the state's lower average number of CDDs. California's relatively mild climate means that the demand for air conditioning is likely to have increased less than in the United States as a whole, despite the rising income levels in the state.

■ **Household Size:** In explaining the overall trend in consumption, we need to assess the impact of variables such as household size and housing mix. In California, use per household has increased more than electricity use per capita since the introduction of EE programs. California households are larger than average for the United States: In 2006, they contained an average of 2.93 persons compared to 2.61 persons in the United States as a whole.[14]

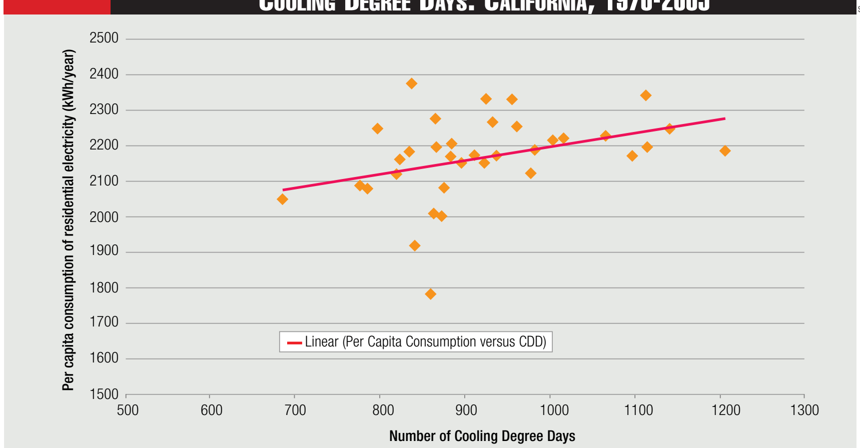
Household size is important because while each additional person in a household adds to household consumption, they do so by a declining amount.[15] Furthermore, in California, household size has increased since 1980, when there was an average of 2.68 persons per »

FIG. 4 PER CAPITA RESIDENTIAL ELECTRICITY CONSUMPTION AND PRICE OF RESIDENTIAL ELECTRICITY: 2004 BY STATE



Source: Energy Economics Inc.

FIG. 5 PER CAPITA RESIDENTIAL ELECTRICITY USE VS. NUMBER OF COOLING DEGREE DAYS: CALIFORNIA, 1970-2005



Source: Energy Economics Inc.

household. This is in contrast to the pattern in the United States as a whole, which has seen household size decline over the same period: In 1980 the average U.S. household size was 2.75, a little higher than for California, whereas by 2006 this figure had fallen to 2.61. Given that larger households consume less electricity per person than do smaller households, these trends in household size may have contributed to the divergence between California and the United States in terms of residential electricity consumption.[16]

California has become more highly urbanized with multi-family and attached housing accounting for 39 percent of total units.

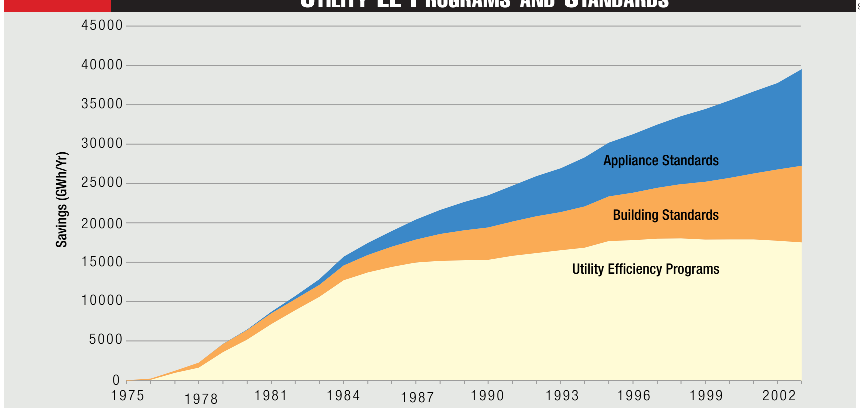
■ **Housing Mix:** California has become more highly urbanized with multi-family and attached housing accounting for 39 percent of total units in 2000, compared to an average of 31 percent in the rest of the United States.[17] In addition, the state has diverged from the rest of the United States in this respect: Since 1970 the proportion of total units accounted for by multi-family and attached housing has increased in California (from 33 percent to 39 percent) whereas in the rest of the country it has remained stable. Housing mix is important to understanding per capita consumption of electricity because multi-family and attached housing units generally use less energy than detached structures due to the insulating effects of multiple units.

■ **California's Conservation Ethic:** While we found that annual changes in savings from EE programs do not well predict changes in per capita consumption of electricity in California, the state's focus on EE and conservation issues, along with the impact of price differentials, may have helped to create a "conservation ethic." Data from the 2001 Residential Energy Consumption Survey (RECS) show that California households are more likely than those in the United States overall to report that they lower their winter temperature settings when no one is at home or during sleeping hours. For example, almost 60 percent of California households reported lowering their winter temperature settings when no one is at home or during sleeping hours, compared to less than 45 percent of all U.S. households.[18] While this does not contribute significantly to reduced electricity usage, it is in keeping with other data that support the idea of a California "conservation ethic." For example, in California a smaller proportion of households report using electricity for heating water and cooking, and fewer households have electric dryers for clothing and a freezer separate from their refrigerator, than is the case nationally.[19] These findings likely reflect the state's efforts with regard to EE and the promotion of energy conservation.

Industrial Shift

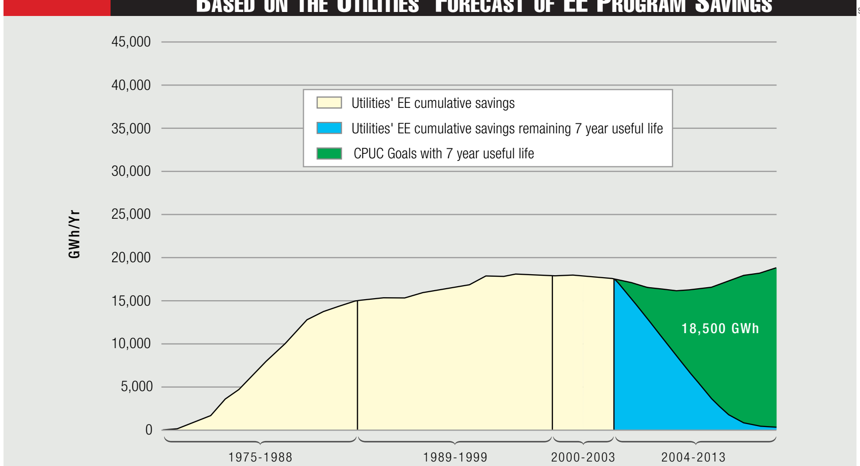
One of the factors that can influence a state's consumption of energy is the type of industries that dominate the economy. The manufacturing sector is second only to transportation in terms of its share of total energy consumed nationally, and so can heavily influence »

FIG. 6 Re-ordered California Cumulative Energy GWh Savings: Utility EE Programs and Standards



Source: Energy Economics Inc.

FIG. 7 Forecast of California Cumulative GWh Savings 2004-2013 Based on the Utilities' Forecast of EE Program Savings



Source: Energy Economics Inc.

overall consumption levels. Thus, the mix of industries in California is likely to be a contributing factor to the state's relatively stable electricity consumption trend. Our analysis indicates that the manufacturing sector has contributed both to the relatively low levels of per capita consumption of electricity in California, and the divergence between trends in consumption in the state and those in the rest of the United States. The California manufacturing economy is more heavily dominated by non-energy-intensive industries than is the case nationally, and between 1990 and 2005, employment in energy-intensive industries declined more in California than was the case for the rest of the United States.

In California, energy-intensive manufacturing industries[20] accounted for about 20 percent of total manufacturing employment in 2005 compared to 26 percent in the rest of the United States.[21] In terms of trends over time, in California, energy-intensive manufacturing industries have shown greater reductions in employment than is the case for the rest of the United States. Between 1990 and 2005, employment in the groups of industries characterized by high energy use fell by 20 percent in California compared to 16 percent in the rest of the United States. This helps explain the divergence between California and the rest of the country in terms of overall energy consumption per capita. Trends within the primary metal industries provided additional evidence to suggest that employment in the specific industries that are particularly energy intensive declined to a greater extent in California than nationally. In California, the number of employees in the energy-intensive aluminum industry declined by 40 percent compared to 31 percent in the rest of the United States. Conversely, employment in the less energy-intensive pharmaceutical industry (a sub-industry within the chemicals group) grew more rapidly in California than nationally (by 81 percent compared to 34 percent). In addition, the energy intensity of one of California's most important industries, computer and electronic product manufacturing (which accounts for over one-fifth of both manufacturing employment and manufacturing value added in the state, compared to 10 percent nationally), has declined substantially over the past 20 years. Not only is this industry a relatively low user of energy, but its use of energy per $ value added also has declined.[22]

Energy-intensive industries in California have shown greater reductions in employment than in the rest of the United States.

This analysis indicates that the manufacturing sector has contributed both to the relatively low levels of per capita consumption of electricity in California and the divergence between trends in consumption in the state and those in the rest of the United States. The California manufacturing economy is more heavily dominated by non-energy intensive industries than is the case nationally, and between 1990 and 2005 employment in energy-intensive industries declined more in California than was the case for the rest of the United States.

Energy-Efficiency Savings

Interestingly, our per capita analysis provides additional insight to our earlier separate analysis concerning the utility EE program savings portion of California's cumulative energy savings (*see Figure 2*).[23] If utility program EE savings are most likely less robust than historically characterized, then it makes sense that California's historical EE savings *(see Figure 1)* cannot fully account for California's per capita consumption *(see Figure 2)*.

Since the late 1980s, California's utility EE programs have contributed to only a modest growth in new or incremental savings;[24] building and appliance standards apparently register the lion's share of continued EE savings growth.[25] This is illustrated per Figure 6, which reorders or restacks the CEC's estimate of California's historical cumulative EE savings shown in Figure 1, so that the utility EE program savings are layered in first, followed by building and appliance standard savings.[26]

This is in part because the utilities have relied on EE measures that are short-lived, such as compact fluorescent lamps, (or CFLs). In essence what this means is the California utilities are treading water when it comes to growing cumulative long-term EE savings.[27]

The historical California utility EE program savings data used by the CEC in its DSM forecasting model is as reported by the utilities on an *ex ante* basis—or prior to measurement and verification. Recent preliminary independent analysis of the California utilities' 2006 and 2007 reported EE accomplishments indicate the utilities' claimed savings to be off or high by a significant amount.[28]

Not until 1989 were utility-reported savings adjusted for free ridership or net-to-gross (NTG) ratios. In response to the possible argument that via spillover (or "free drivers"), the California utilities have caused much greater levels of EE than reflected in Figure 1, it is important to note two important facts: The current NTG ratios were in fact derived by the California utilities; and the current NTG values include the effects of free ridership and both participant » and nonparticipant spillover.[29]

From 1989 through 1999, some billing analysis also was used to adjust reported savings on an *ex post* basis. Since that time, the EE savings data has reverted to utility-reported *ex ante* savings. Also, for the first decade of run-up in claimed EE savings from zero to close to 15,000 GWh, the utility EE programs largely were home audits and education and information programs, with the first cash rebate given in 1982. Thus, to represent those EE savings as equivalent "steel in the ground" supply-side resources is extremely far-fetched. Further, about 10 percent of the generation and capacity savings are ascribed to utility T&D conservation voltage reduction implemented from 1975 through 1980. Such utility-system efficiency savings, while beneficial, are not generally classified as consumer EE.

If the current trend continues (from 2006 through 2008) in utility EE savings as forecasted by the utilities, there will be little if any new or incremental utility EE savings towards the CPUC's aggressive EE saving targets. That trend can be seen in the forecast of California's cumulative utility EE program savings from 2004 to 2013, based on PG&E, SCE, and SDG&E's forecast of 2006 through 2008 EE portfolio savings (*see Figure 7*).[30] To develop this forecast, a weighted average EE measure (energy useful life) EUL of 7.1 years was used, calculated from the IOUs' forecasts of the mix of EE measures in their 2006 through 2008 EE portfolios. By 2013 there will be little if any gains in new or incremental GWh savings.[31] *(See Fig. 7)*

Restarting Growth

Over the past 20 years, there has been a strong divergence between California and the United States with regard to per capita electricity consumption. This divergence has been attributed to California's ambitious and far-reaching EE programs and standards. However, this school of thought fails to address the fact that California is different from the rest of the United States in multiple respects—many of which influence electricity consumption. To isolate one particular difference between California and the United States (EE savings) and attribute the divergence in per capita use to this one factor, is likely to overstate the impact or import of that variable. While EE programs and standards undoubtedly have contributed to the relatively stable pattern of per capita electricity consumption in California, our analysis found a relatively weak association between California's EE savings and per capita consumption. Rather, these savings have been achieved within a specific socioeconomic context that also acted on electricity consumption trends.

A number of factors distinguish California from the rest of the United States, and may have contributed to keeping the state's electricity consumption relatively stable. Understanding the role of these factors, as well as savings from EE programs and standards, will allow for a better assessment of the extent to which the California model successfully can be transplanted to other states, regions, or countries. Although the California model may offer lessons for other states or countries, its applicability to meeting global warming targets is limited at best, since what's necessary are sustained absolute reductions in energy consumption, something not observed in the state of California as a whole or anywhere else.

Slow growth in California's per capita electricity consumption over the past several decades combined with population growth equals significant (~2 percent p.a.) growth in total electricity consumption for the state. This is the variable that must be tracked—and reversed.

Endnotes

1. California's Energy Action Plan II adopted in 2005 by the California Public Utilities Commission (CPUC) and California Energy Commission (CEC) established a "loading order" of preferred resources—placing EE as the state's top priority procurement resource—and set aggressive long-term goals for EE. See CPUC and CEC, *Energy Action Plan II, October, 2005*. Available at: *http://docs.cpuc.ca.gov/word_pdf/REPORT/51604.pdf.*
2. CPUC and CEC, *Energy Efficiency: California's Highest Priority Resource - Lowering Energy Costs, Promoting Growth, and Protecting the Environment*, August 2006. Available at: *www.epa.gov/cleanenergy/documents/calif_cleanenergy.pdf.* See also the CEC's 2007 Integrated Energy Policy Report (IEPR), Executive Summary, p. 2:

   "Largely as a result of these [energy efficiency] policies, California has the lowest electricity use per person in the nation. While the United States has increased by nearly 50 percent over the past 30 years, California's per capita electricity use remained almost flat, demonstrating the success of a variety of cutting-edge energy efficiency programs and cost-effective building and appliance efficiency standards." (emphasis added).

   CEC, *Integrated Energy Policy Report*, CEC-100-2007-008-CMF-ES, December, 2007. Available at:*http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF-ES.PDF*. Further, see CPUC and CEC, *Energy Action Plan: 2008 Update*, February, 2008, Available at: *http://www.cpuc.ca.gov/NR/rdonlyres/58ADCD6A-7FE6-4B32-8C70-7C85CB31EBE7/0/2008_EAP_UPDATE.PDF*, February 2008.

   "Below we have included one of California's famous graphics of success in energy efficiency. As Figure 3 indicates *[U.S. v. California Per Capita Electricity Sales]*, electricity use per person in California has remained relatively stable over the past 30 years, while nationwide electricity use has increased by about 50 percent.

   While this stabilization of per capita electricity use is something we are proud of, it is not nearly enough to meet our AB 32 goals. To address this emissions reduction challenge for electricity, we will need to bend this curve downward, because, among other reasons, the population of California continues to grow rapidly, causing overall electricity use in the state to continue to rise by between one and two percent every year." (emphasis added) p.7.
3. Data supplied by CEC.
4. See Figure 1 in CPUC and CEC, *Energy Efficiency: California's Highest Priority Resource - Lowering Energy Costs, Promoting Growth, and Protecting the Environment*, August 2006. Available at: *www.epa.gov/cleanenergy/documents/calif_cleanenergy.pdf.*
5. Figure 2 reflects total per capita consumption, which includes, or has embedded in it, economic structural changes over time. To isolate this effect on per capita consumption from EE savings, in our statistical analysis to the extent data was available ,we utilized residential per capita »

consumption and residential savings.

6. See Mitchell, Cynthia, Reuben Deumling and Gill Court, "Is Energy Efficiency Enough? An Exploration of California Per Capita Electricity Consumption Trends," presented at ACEEE Summer Study on Energy Efficiency in Buildings, August 17-22, 2008, *http://www.aceee.org/conf.*
7. It is important to note that a relatively stable pattern of per capita electricity consumption in this case translates into a moderate but still exponential growth in total residential electricity consumption of an average 2.1 percent per year between 1985 and 2007 (residential account data for PG&E, SCE, and SDGE supplied by the CEC). Such observed growth, though it may be slower than in the majority of other states, is nevertheless antithetical to the state's global warming goals.
8. Energy Information Administration, *State Energy Consumption, Price and Expenditure Estimates*, various years, available at: h*ttp://www.eia.doe.gov/emeu/states/_seds.html*; Energy Information Administration, *State Energy Data 2004*, Appendix C: Resident Population, Tables C1-C5; and Energy Information Administration, *Annual Energy Review*, Appendix D1: Population, U.S. Gross Domestic Product, and Implicit Price Deflator, available at: *http://www.eia.doe.gov/emeu/aer/append_d.html.*
9. *Id*. A simple linear regression of 2004 per capita residential electricity consumption against the 2004 price of residential electricity by state indicated that 45 percent of the variability in consumption could be accounted for by the price variable.
10. All prices in constant 2000 $.
11. See page 3, heading "Supports Economic Development and Creates Jobs in California," in CPUC and CEC, *Energy Efficiency: California's HighestPriority Resource - Lowering Energy Costs, Promoting Growth, and Protecting the Environment*, supra note 2.
12. Energy Information Administration, *Electricity Consumption Estimates by Sector*, various years; Energy Information Administration, *State Energy Data 2004*, Appendix C: Resident Population, Tables C1-C5 Source; and National Climatic Data Center. A cooling degree day (CDD) indicates how heavy the air conditioning needs are under certain weather conditions. One CDD is accumulated for each degree the average temperature for a day is over 65 degrees F (see *http://www.energy.ca.gov/glossary/glossary-c.html and http://www.weather2000.com/dd_glossary.html*). A simple linear regression of California per capita consumption of residential electricity against the number of CDDs for the years 1970-2005 showed that the CDD variable "explained" almost 15 percent of the variability in the per capita consumption variable.
13. Data from the National Climatic Data Center.
14. 1970 data supplied by Reuben Deumling, Energy & Resources Group, UC Berkeley; 2006 data from U.S. Census Bureau, American Community Survey, 2006.
15. See William B. Marcus, Gregory Ruszovan, and Jeffrey A. Nahigian, *Economic and Demographic Factors Affecting California's Residential Energy Use*, (West Sacramento, Calif.: JBS Energy, Inc., 2002), Figure 3.
16. This is not simply because larger households have larger houses. A recent study has found that larger houses have higher energy consumption not because there are more people in them but because the people in them consume proportionately more energy than people living in smaller houses. That is, electricity use per household member increases with the size of the house. See Mithra Moezzi and Rick Diamond. *Is Efficiency Enough? Towards a New Framework for Carbon Savings in the California Residential Sector*. CEC, PIER Energy-Related Environmental Research. CEC-500-2005-162.
17. U.S. Historical Census of Housing Tables – Units in Structure, available at: *http//www.census.gov/hhes/www/housing/census/historic/units.html.*
18. Energy Information Administration, *Residential Energy Consumption Survey, Table HC6-7a: Usage Indicators by Four Most Populated States, 2001*. Available at: *http://www.eia.doe.gov/emeu/recs/recs2001/hc_pdf/usage/hc6-7a_4popstates 2001.pdf.*
19. Energy Information Administration, *Residential Energy Consumption Survey 1997, Table HC5-7a: Appliances by Four Most Populated States.* Available at: *ftp://ftp.eia.doe.gov/pub/consumption/residential/four_states/appl_4states.pdf*; Energy Information Administration; *Residential Energy Consumption Survey 2001, Table CE4-7c: Water-Heating Energy Consumption in U.S. Households by Four Most Populated States. http://www.eia.doe.gov/emeu/recs/recs2001_ce/ce4-7c_4popstates2001.html.*
20. These include the following industries: nonmetallic minerals, primary metals, food, paper, petroleum and coal, and chemicals. See Energy Information Administration, *Annual Energy Outlook 2007*.
21. *Current Employment Statistics Survey* – various years, Bureau of Labor Statistics. Available at *http://data.bls.gov*. These data exclude the pharmaceutical industry, which in contrast to "bulk chemical" manufacturing, is not energy intensive. Pharmaceuticals dominate in California, accounting for over 50 percent of employment in the chemical industry in 2005 compared to 31 percent in the rest of the United States.
22. U.S. Department of Energy, *Indicators of Energy Intensity in the U.S: Industrial Sector Data*. Available at: *http://intensityindicators.pnl.gov/trend_data.stm.*
23. Work of Energy Economics Inc. as consultant to TURN in R.06-04-010 during 2nd and 3rd quarters 2007. *http://www.cpuc.ca.gov/Published/proceedings/R0604010_doc.htm*. Energy Economics Inc. per capita analysis separate and apart from the TURN work.
24. It is important to point out that "a modest growth in [energy] savings" is not the same thing as "an absolute reduction in energy consumption," although this often is implied. The only outcome commensurate with California's global warming policies is unambiguous and sustained declines in total energy/electricity consumption. Slight variations in the positive rate of growth are still movement in the opposite direction of that now mandated.
25. The characterization of California's historical building and appliance standard EE savings is an entirely separate matter worthy of additional detailed analysis, given the fact that the savings are highly dependent on assumed levels of compliance rates. The CEC DSM Forecast assumes relatively high levels of building and appliance standards compliance. The May 2007 "Statewide Codes and Standards Market Adoption and Noncompliance Rates," *Final Report*, CPUC Program No. 1134-04 SCE0224.01 by Quantec Consulting found very high noncompliance rates for residential building measures updated per California's Title 24 standard. *http://www.calmac.org/*. Appliance standard compliance rates are easier to estimate because: (1) appliance standards set dates for changes in appliance manufacturing and stocking; and (2) appliance turnover rates can be tracked through retail sales data (with additional consideration needed on whether the replaced appliance enters a secondary market).
26. Data supplied by CEC.
27. *http://docs.cpuc.ca.gov/Published/proceedings/R060410.htm, Decision 07-10-032*, Oct. 18, 2007, Commission Discussion, page 21: "TURN [The Utility Reform Network] correctly notes that an emphasis on measures with savings that decay quickly creates a 'treading water effect' whereby the measures are replaced in the next portfolio cycle with little development towards sustainability programs that do not require continual reinvestments of ratepayer funds."
28. *http://www.cpuc.ca.gov/PUC/energy/electric/Energy+Efficiency/EM+and+V/081117_Verification+Report.htm,* CPUC EE 2006-2007, Verification Report Review Draft prepared by Energy Division Feb. 5, 2009.The California utilities (Pacific Gas & Electric, Southern California Edison, San Diego Gas and Electric, and Southern California Gas) reported 2006 and 2007 EE accomplishments that collectively the utilities had achieved almost 130 percent of the CPUC's electric goal and over 110 percent of the CPUC's gas goal. In contrast, the CPUC's Energy Division Staff has reached a significantly different conclusion on California IOUs' 2006 and 2007 EE accomplishments. Per the CPUC's utility incentive mechanism based on a sharing between ratepayers and shareholders of the net benefits, the California IOUs claimed they were due a shareholder incentive of $236 million. Per the Energy Division's February 5, 2009 *Interim Claim Report*, the California IOUs are collectively at only 78% percent of the CPUC's combined electric and natural »

gas goals. On an individual basis, the thee electrics are entitled to zero shareholder incentives, with SoCalGas entitled to $2.89 million. *www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/081117_Verification+Report.htm*. CPUC *Decision 08-12-059* dated Dec. 18, 2008 authorized interim payments based on utility submitted performance reports subject to a 65 percent holdback pending the results of Energy Division's ex post measurement and verification results. *http://docs.cpuc.ca.gov/Published/proceedings/R0604010.htm*.

29. See Program Elements Attachment A: PG&E, SCE, SDG&E, SCG, Sept. 22, 2000; and CALMAC Public Workshops on PY 2001 EE Programs: Day 1 & 2, Sept. 12 and 13, 2000, Day 3 & 4, Sept. 19 and 20, 2000. California Measurement Advisory Council (CALMAC) Workshop Report 9/25/2000 Proposed NTG Ratios for PY2001. *http://www.calmac.org*.
30. Analysis of savings data supplied by the CEC and savings goals data in CPUC, *Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond*, *Decision 04-09-060*, Sept. 29, 2004, Table 1E. Available at: *http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/40212.PDF.*
31. The utilities forecast of savings as shown in Figure 7 is more robust than the CPUC's Energy Division Staff November 2008 *Interim Claim Report* noted above in endnote 27.

TURN
THE UTILITY REFORM NETWORK
Lower bills. Livable planet.

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Mark W. Toney, Ph.D., Executive Director

February 8, 2010

Commissioner Dian Grueneich
Administrative Law Judge David Gamson
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

Re: Concerns on Cost-Effectiveness of 2010-2012 Energy Efficiency Portfolios

Dear Commissioner Grueneich and ALJ Gamson:

On December 14, 2009, The Utility Reform Network protested the compliance filings the utilities served in late November 2009. TURN's protest raised doubts about whether the utility-administered programs in 2010-2012 will deliver the promised levels of energy savings and whether the delivered savings would prove to be cost-effective.

In our follow-up letter to you of January 6, 2010, TURN raised further concerns that the utilities selective use of *ex ante* values could result in inflated levels of expected cost-effectiveness. Despite our call for a workshop or other forum that would permit a public discussion of these issues, to date there has been no action (or at least none shared with parties).

And so California consumers face being required to fund utility energy efficiency programs with direct costs of $3 billion, plus significant additional amounts in energy efficiency administration costs covered by other utility revenue requirements (such as GRC rates) and potential incentives awarded to shareholders, even as doubts grow about whether the money will produce cost-effective savings. With such a price tag and with the success of California's greenhouse gas reduction efforts so tied to the success of energy efficiency efforts, the Commission must ensure that these funds are likely to deliver the promised benefits. Finding out after-the-fact that the actual savings were nowhere close to the estimated savings would not only mean that ratepayers spent more than they should have, but that the efforts to address greenhouse gas are at risk of being a failure.

TURN has continues to analyze the 2006-2008 Ex Post EM&V results. As the accompanying table indicates, when viewing the performance of the four utilities as a whole the ex post adjusted savings represent only 61% of the GWh goals for energy savings, and 60% and 79% of the MW and therm demand reduction goals.[1] This is not just a question of measuring the

[1] This is a conservative calculation that very much favors the utilities. The ED 06-08 ex post M&V did not evaluate all EE measures or all critical EE variables. TURN's calculation assumes that the unevaluated savings are as the

utilities' past peformance, since the saving inputs in their November 2009 Compliance Filings are very similar to their 4th quarter 2008 claimed savings (used as the starting basis for Energy Division's 2006-08 ex post M&V work). This explains why this further analysis reinforces TURN's earlier-stated concerns that the 2010-12 EE portfolios are not prospectively cost-effective.

FROM JANUARY LETTER: TURN reiterates our earlier call for you to take the necessary steps to get a clearer understanding of these data questions and to respond appropriately to ensure the state's customers that energy efficiency is indeed an appropriate investment of their funds and the low-cost step toward greenhouse gas reductions that towardtake remedial actions to ensure the compliance filings use the most recent version of *ex ante* values, as described in D.09-09-047.

The most important next step you can take is to ensure that the utilities revise their compliance filings so that they reflect the most recent Energy Division adjustments to the E3 calculators, as called for in D.09-09-047. In addition, a public workshop or similar forum addressing the process that led from D.09-09-047 to the compliance filings could help foster a sense of transparency and accountability in the process.

Thank you for your attention to these matters.

Yours truly,

Robert Finkelstein
Legal Director

cc: Service list for A.08-07-021, et al.

IOUs claim. The portion of claimed savings that ED did not evaluate are 20% GWh, 32% MW, and 30% Therms. In addition, for the portion of claimed savings that ED did evaluate, many of the key savings variables were not adjusted consistently or uniformly.

Attachment 3
CEC Number 09-IEP-1C "IEPR – Electricity Demand Forecast"
Additional Adjustments to TURN's Analysis of the
IOUs' 2006-2008 Program Evaluations

TURN offers the following comments regarding two overall areas or categories of additional ex post adjustments that should be considered.

1. Portfolios as a whole: adjustments not made.

While the consultants evaluated a substantial portion of the programs that generated energy efficiency savings in the 2006-2008 cycle, some programs were not evaluated at all. In our work we were able to calculate adjustments to 80% of the IOUs' claimed GWh savings, 68% of claimed MW savings, and 70% of claimed Therm savings. Our work to date has assumed that the savings that we were not able to adjust will remain as claimed by the IOUs. The overwhelming pattern to emerge from the programs that were evaluated, however, is that the IOUs claimed savings levels are high. If the remaining, unevaluated programs are also adjusted, portfolio savings are likely to decline further. TURN Table 2 (at the end of this document) shows the effect on total portfolio savings of various assumptions regarding the actual level of savings from unevaluated programs. It shows that if the claimed savings from programs that TURN was not able to adjust were reduced by 25%, the savings attributable to IOU programs could decline by an additional 460 GWh, 127 kW, and 11 Therms.

2. Additional Adjustments to Evaluated Programs.

A. Retro-Commissioning

TURN did not include adjustments to claimed savings based on the Retro-Commissioning evaluation in the original analysis. This was because the data are not presented in a useful format. The Retro-Commissioning (RCx) report presents many detailed findings, but there is no summary table providing information on gross and net claimed savings. There are detailed tables with gross claimed savings and gross and net evaluated savings, but the figures in these tables do not seem compatible with those in the rest of the report. The report does present the figure below, which shows that gross evaluated savings were about 50%-60% of gross claimed savings. The IOUs' E3 calculators show that RCx programs generally were assigned ex-ante NTGRs of 0.8-1.0. The evaluated NTGRs are mostly in this range. In the table below we have applied a NTGR of 0.8 to the gross savings claims to get an estimate of net claimed savings. We then took the net evaluated savings and compared them with our estimate of net claimed savings to generate the % difference data:

Table 1: Gross Claimed and Net Evaluated kWh savings from Retro-Commissioning Measures (with TURN estimated Net Claimed Savings)

IOU	Gross Claimed kWh	Net Claimed kWh Assuming 0.8 NTGR	Net Evaluated kWh	% Difference
PG&E	20,822,117	16,657,694	9,407,653	- 43%
SCE	11,028,879	8,823,103	7,499,795	- 15%
SDG&E	1,869,234	1,495,387	1,422,229	- 5%
Total	33,720,230	26,976,184	18,329,677	-32%

Source: TURN calculations based on Draft 2006-2008 Retro-Commissioning Impact Evaluation Tables 30, 32, 34, 36

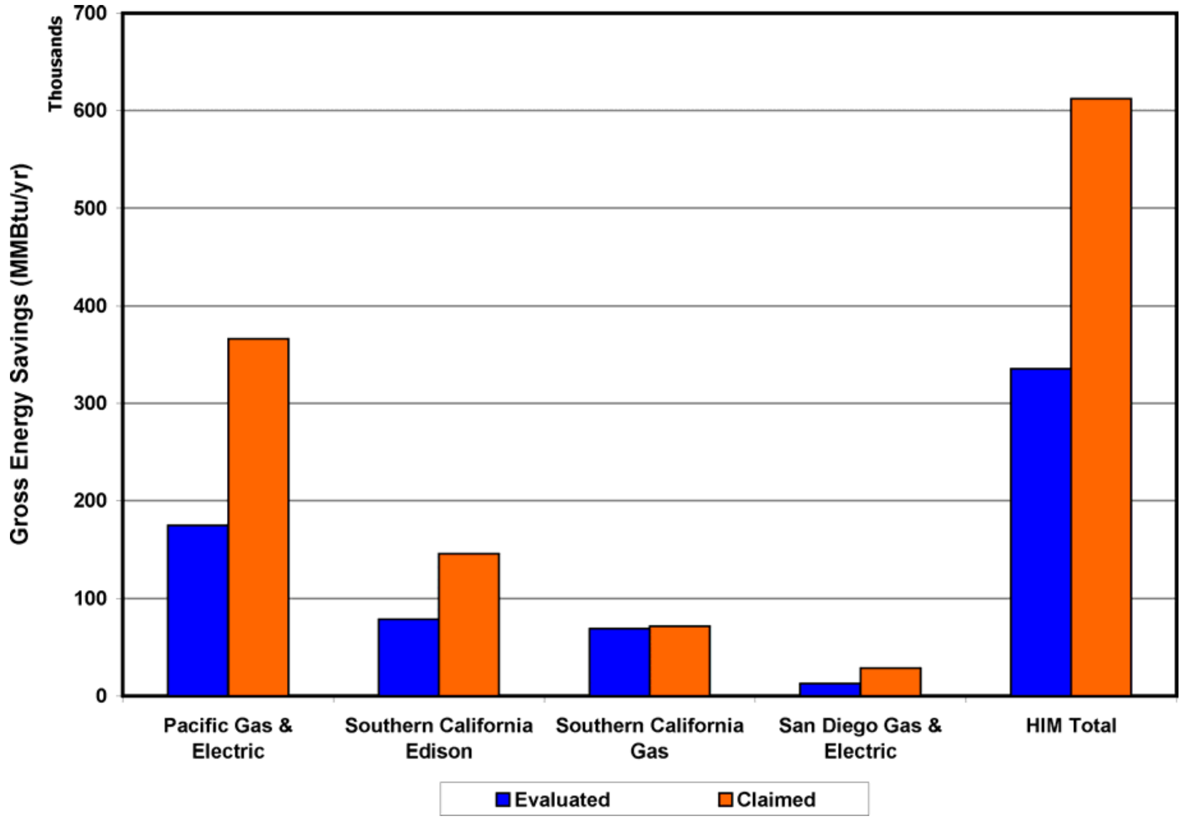

Figure 3: Comparison of evaluated and claimed gross energy savings

Source: SBW Draft Final Report 2006-2008 Retro-Commissioning Impact Evaluation, p. 23

B. Further adjustments from the Residential Retrofit Evaluation

In our initial analysis of the evaluation reports, we adjusted the following programs only for the evaluated NTGRs. Additional adjustments for these programs could also be made to reflect evaluated Unit Energy Savings (see Tables 3 and 4):

- Furnaces (therms)
- Clothes washers (therms)
- Room AC (kW and kWh)
- Pool Pumps (kW and kWh)
- Downstream Lighting (kW and kWh)

Table 2: Additional Adjustments to Claimed Savings: Previously Unadjusted Savings Under Different Savings Scenarios

	Total Portfolio Claimed Savings (a)	Claimed Savings from Evaluated Programs that could be Adjusted (b)	Evaluated Savings from Evaluated Programs that could be Adjusted (c)	Claimed Savings from Unadjusted Programs (a - b=d)	Unadjusted Savings Plus Evaluated Savings from Programs that could be Adjusted (c+d=e)	Total Adjusted Portfolio Savings Under Different Assumptions Regarding Unevaluated Programs' Claimed Savings (Actual Savings = x % of claimed) [f]				Difference due to the additional adjustment (f-e)				% Change Additionally Adjusted Portfolio Savings to Partially Adjusted Portfolio Savings (f-e/e)			
						90%	85%	75%	65%	-10%	-15%	-25%	-35%	-10%	-15%	-25%	-35%
Total GWh	9,373.8	7,522.3	2,288.1	1,851.5	4,139.6	3,954.5	3,861.9	3,676.7	3,491.6	-185.2	-277.7	-462.9	-648.0	-4%	-7%	-11%	-16%
Total MW	1,589.7	1,080.7	356.8	509.0	865.8	814.9	789.5	738.6	687.7	-50.9	-76.3	-127.3	-178.2	-6%	-9%	-15%	-21%
Total MMTherms	145.1	101.8	45.4	43.3	88.7	84.4	82.2	77.9	73.5	-4.3	-6.5	-10.8	-15.1	-5%	-7%	-12%	-17%

Table 3

Residential Retrofit Furnaces and Clothers Washers - Differences Between Claimed and Evaluated / DEER 2008 Unit Energy Savings: Therms per Year			
	Claimed UES	DEER 2008/ Evaluated UES	% difference
Furnaces	Therms/Year	Therms/Year	
PG&E AFUE 90%	30.70	28.38	-8%
PG&E AFUE 92%	40.47	34.26	-15%
PG&E AFUE 94%	47.87	40.26	-16%
SCG AFUE 90%	29.61	23.51	-21%
SCG AFUE 92%	35.72	28.22	-21%
Clothes Washers			
SDGE ES Washer	21.90	17.70	-19%
PG&E ES CEE Tier 1 MEF 1.60/1.80	15.00	6.38	-57%
PG&E ES CEE Tier 1 MEF 1.80	20.00	6.38	-68%
PG&E ENERGY STAR CEE Tier 2 MEF >= 2.0 WF 4.6 - 6.0	17.73	12.41	-30%
ENERGY STAR CEE Tier 2 MEF >= 2.0 WF 4.6 - 6.0	19.70	12.41	-37%
ENERGY STAR CEE Tier 3 MEF >= 2.0 WF 4.6 - 6.0	20.00	12.41	-38%
SCG Tier 1	19.65	14.96	-24%
SCG Tier 1	7.25	14.96	106%

Source: Residential Retrofit Final Evaluation Report, Table 11; Table 44

Table 4

Residential Retrofit Clothes Washers, Room AC, Pool Pumps and Downstream Lighting - Differences Between Claimed and Evaluated Unit Energy Savings: kW and kWh per Year						
	Claimed UES	Evaluated UES	% difference	Claimed UES	Evaluated UES	% difference
	kW/Year	kW/Year		kWh/Year	kWh/Year	
Clothes Washers						
SDGE ES Washer	na	na	na	0.00	151.80	na
PG&E ES CEE Tier 1 MEF 1.60/1.80	na	na	na	69.60	300.49	332%
PG&E ES CEE Tier 1 MEF 1.80	na	na	na	79.20	300.49	279%
PG&E ENERGY STAR CEE Tier 2 MEF >= 2.0 WF 4.6 - 6.0	na	na	na	272.80	435.33	60%
ENERGY STAR CEE Tier 2 MEF >= 2.0 WF 4.6 - 6.0	na	na	na	314.40	435.33	38%
ENERGY STAR CEE Tier 3 MEF >= 2.0 WF 4.6 - 6.0	na	na	na	107.28	435.33	306%
Room AC						
SDGE	0.099	0.045	-55%	127.0	47.0	-63%
SCE CZ 6	0.132	0.014	-89%	198.0	20.0	-90%
SCE CZ 8	0.132	0.034	-74%	247.0	34.0	-86%
SCE CZ 9	0.132	0.041	-69%	232.0	49.0	-79%
SCE CZ 10	0.132	0.063	-52%	220.0	60.0	-73%
Pool Pumps (SDGE)						
High Efficiency Pool Pump and Motor Single Speed	0.104	0.373	259%	650.0	578.6	-11%
High Efficiency Pool Pump and Motor Multispeed	0.540	0.153	-72%	1400.0	810.1	-42%
Pool Pump Timeclock Reset Agreement	1.000	1.190	19%	900.0	217.2	-76%
Downstream Lighting						
SDGE Interior CFLs				43.5	36.3	-17%
SDGE Linear Fluorescents	0.041	0.000	-100%	17.5	28.4	62%
SDGE Interior CFLs: Lighting Exchange				47.4	31.6	-33%
SCE Exterior CF Fixtures				207.8	166.2	-20%
SCE Interior CF Fixtures				54.7	57.9	6%
SCE Interior CFLs				41.7	74.9	80%
SCE Linear Fluorescents				17.8	32.5	83%
SCE Interior CF Fixtures: Lighting Exchange				67.7	37.7	-44%
PG&E MF Interior CF Fixtures	0.010	0.000	-100%	94.0	73.1	-22%
PG&E MF Exterior CF Fixtures				194.5	184.0	-5%
PG&E MF Interior CFLs	0.010	0.000	-100%	145.8	97.9	-33%
PG&E MF Linear Fluorescents	0.020	0.000	-100%	159.1	28.9	-82%

Source: Residential Retrofit Final Evaluation Report, Table 154; Table 169; Tables 196-198 and Table 199