CALIFORNIA
ENERGY
COMMISSION

INCREMENTAL IMPACTS OF ENERGY EFFICIENCY POLICY INITIATIVES RELATIVE TO THE *2009 INTEGRATED ENERGY POLICY REPORT* ADOPTED DEMAND FORECAST

DRAFT STAFF REPORT

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Abstract

This report provides estimates of the impact on energy and peak demand of a set of electricity energy efficiency policy initiatives that were adopted in 2008 by the California Public Utilities Commission. These estimates are designed to be incremental to savings already included in the adopted *2009 Integrated Energy Policy Report* demand forecast. Estimates are provided for three scenarios, low, medium, and high, that vary by level of policy stringency. For the three major investor-owned utilities combined, estimated incremental energy savings in 2020 total between 10,700 gigawatt hours and 14,400 gigawatt hours; 2020 peak savings total between 4,000 megawatts and 5,400 megawatts. These savings would reduce projected energy growth from 2008-2020 by between 57 and 77 percent and projected peak demand growth by between 56 and 91 percent. These scenario results and the adopted 2009 demand forecast will be used in the California Public Utility Commission's forthcoming 2010 procurement rulemaking as key inputs into supply-side portfolio assessments and will ultimately affect procurement authority granted to investor-owned utilities.

Keywords: Efficiency, committed savings, uncommitted savings, incremental uncommitted savings, Total Market Gross, Big Bold initiatives, managed forecast

Executive Summary

Energy efficiency is the top priority for addressing California's electricity system issues. Quantitative goals reflective of this commitment are established in state law, decisions by various agencies and planning analyses. Although California has pursued energy efficiency since the 1970s through building and appliance standards, utility and public agency programs, local ordinances, and loan/grant programs, it can be hard to determine the incremental impact of undefined future efforts. Resource planners, who must identify the amount and type of additional grid-connected power plants and local capacity to support reliability, need accurate projections of incremental savings from energy efficiency beyond the funded programs included in the baseline demand forecasts. This report documents efforts to develop sufficiently rigorous analyses of a future set of policy initiatives to use in resource planning and reliability studies.

Incremental Impacts of Energy Policy Initiatives Relative to the 2009 Integrated Energy Policy Report Adopted Demand Forecast provides estimates of the impact on energy and peak demand by a set of electricity energy efficiency policy initiatives[1] that were adopted by the California Public Utilities Commission (CPUC) in D.08-07-047. With few exceptions, the policy initiatives evaluated are the same set of hypothetical delivery mechanisms that were originally evaluated by Itron and adopted by the CPUC in the *2008 Energy Efficiency Goals Update Report*[2] *(2008 Goals Study)*. The Energy Commission does not consider this set of delivery mechanisms to be *committed*, or firm, and so their impacts are not included within the *2009 Integrated Energy Policy Report*[3] *(IEPR)* demand forecast.[4] At the request of the CPUC, this report documents the results of an analysis designed to estimate the *incremental* impacts of three levels of policy stringency for these initiatives. In this context, incremental refers to savings from the CPUC efficiency policy initiatives that are net of any overlap with savings already included in the demand forecast. CPUC staff intends to use these projected load impacts as part of the portfolio assessment analyses used to define the need for electricity resources in the forthcoming 2010 Long-Term Procurement Plan rulemaking.

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1 In this report, "initiatives" refer to all types of policy-related efficiency delivery mechanisms, including utility and public agency programs, codes and standards, and efficiency-related legislation.

2 http://www.cpuc.ca.gov/NR/rdonlyres/8944D910-ECA2-4E19-B1F3-96956FB6E643/0/Itron2008CAEnergyEfficiencyStudy.pdf.

3 California Energy Commission, *2009 Integrated Energy Policy Report, Commission Final Report*, December 2009, CEC-100-2009-003-CMF. http://www.energy.ca.gov/2009publications/CEC-100-2009-003/CEC-100-2009-003-CMF.PDF.

4 California Energy Commission, *California Energy Demand 2010-2020, Commission Adopted Forecast*, December 2009, CEC-200-2009-012-CMF. http://www.energy.ca.gov/2009publications/CEC-200-2009-012/index.html.

Table 1 provides a summary of the 2020 energy and peak savings that are considered incremental to savings included in the *2009 IEPR* demand forecast for each of the three major investor-owned utility service areas and for each of the three scenarios that were investigated. The peak and energy impacts of the three scenarios can be subtracted directly from the *2009 IEPR* demand forecast as part of the effort to develop a *managed demand forecast*[5] that investor-owned utilities would use in the resource planning assessments for the 2010 Long-Term Procurement Plan.

Table 1: 2020 Incremental Impacts of *2008 Energy Efficiency Goals Update Report* Policy Initiatives Beyond Those Included in the *2009 IEPR* Demand Forecast

Utility	Savings	Scenario		
		Low	Mid	High
PG&E	Energy (GWh)	4,634	5,130	6,087
	Peak (MW)	1,731	2,245	2,722
SCE	Energy (GWh)	4,971	5,874	6,848
	Peak (MW)	1,941	2,593	3,160
SDG&E	Energy (GWh)	1,091	1,222	1,440
	Peak (MW)	363	514	602
Total IOUs	Energy (GWh)	10,658	12,225	14,374
	Peak (MW)	4,034	5,352	6,484

Source: Itron and California Energy Commission, 2009.

Table 2 shows the percentage of projected demand forecast load growth represented by the incremental energy and peak savings in 2020. For example, in the low savings scenario for Pacific Gas and Electric, 56 percent of energy growth from 2008-2020 projected in the *2009 IEPR* demand forecast would be eliminated by estimated incremental uncommitted savings.

5 *Managed demand forecast* means a forecast that is different from "business as usual" through the explicit use of program activities to adjust demand downward. Such adjustments could include any demand-side policy initiatives: energy efficiency, distributed generation, and other types of response considered demand adjustments rather than supply-side resources.

Table 2: 2020 Incremental Impacts of 2008 Energy Efficiency Goals Update Report Policy Initiatives as a Percentage of Projected Load Growth

Utility	Savings	Scenario		
		Low	Mid	High
PG&E	Energy	56%	62%	74%
	Peak	70%	91%	110%
SCE	Energy	62%	74%	86%
	Peak	50%	67%	81%
SDG&E	Energy	44%	49%	58%
	Peak	46%	65%	77%
Total IOUs	Energy	57%	65%	77%
	Peak	56%	75%	91%

Source: Itron and California Energy Commission, 2009.

This analysis was prepared by Energy Commission staff and Itron, and was funded by the CPUC. With some exceptions, the definitions of initiatives established in the *2008 Goals Study*, used to establish the investor-owned utility interim 2012–2020 energy efficiency goals, have remained the same. A few have been modified because they were assumed in that study to have been started by January 2009 but, were not. Also, the values for fundamental inputs used in this analysis have been updated from those used in the *2008 Goals Study* to conform to those used in the *2009 IEPR* demand forecast. Finally, some energy efficiency programs considered prospective in previous forecasts now satisfy the Energy Commission's criteria for being considered as committed. These impacts are embedded in the *2009 IEPR* demand forecast, so are not included in this analysis. Consequently, this project has been conceived to reassess the impacts of the original policy initiatives first quantified in the *2008 Goals Study*, adjusting the analyses to reflect changes that arose in the intervening period and to ensure consistency with the *2009 IEPR* demand forecast. The impacts resulting from this approach are incremental to, and consistent with, the analyses in the base *2009 IEPR* demand forecast itself.

The results shown in **Table 1** document estimated energy and peak impacts for a specific set of hypothetical energy efficiency initiatives that the CPUC identified as part of its most recent goal-setting effort. Four broad categories of policy initiatives were included:

- Expanded investor-owned utility programs
- State and federal codes and standards
- CPUC's Big Bold energy efficiency initiatives
- Lighting efficiency measures in satisfaction of Assembly Bill 1109 (Huffman, Chapter 534, Statutes of 2007)

The *2008 Goals Study* defined three scenarios involving various stringencies and degrees of effort across these four categories. The CPUC chose to adopt the results of the mid scenario as the basis for interim energy efficiency savings goals for 2012–2020. The scenario definitions have been retained, and the impacts resulting from each of the three have been projected through 2020.

The three scenarios reflect a specific set of hypothetical delivery mechanisms that have been defined in terms that allow broad quantification of their energy impacts. The scenarios are alternative interpretations of how the Energy Commission, CPUC, and other agencies might pursue a high energy efficiency future for California. These results can be viewed as a step in the direction of quantifying the Energy Commission's *2007 IEPR* policy recommendation to pursue all cost-effective energy potential. By identifying hypothetical designs for a set of energy efficiency mechanisms, one can make initial estimates of impacts and costs. These hypothetical designs can also be viewed as specifying a set of programmatic mechanisms, which, if pursued through actual program design and implementation, would begin to achieve the high energy efficiency goals established in the California Air Resources Board (ARB) *AB 32 Scoping Plan*.[6]

The estimates of incremental uncommitted savings in this analysis are not directly comparable to the AB 32 *Scoping Plan* targets. Instead, those targets are statewide goals specified relative to a "business as usual" future developed using the *2007 IEPR* demand forecast. However, an approximate contribution that the estimated incremental savings may make toward meeting the 2020 AB 32 target can be calculated. This is done by adjusting the 2020 target by the increase in efficiency impacts in the *2009 IEPR* demand forecast relative to the 2007 forecast (extrapolated to 2020 by Energy Commission staff). The AB 32 *Scoping Plan* specifies a statewide electricity reduction target of 32,000 GWH in 2020 (Appendix C, p. C-99) relative to the 2007 forecast. Subtracting the *2009 IEPR* demand forecast increase in efficiency impacts statewide projected for 2020 (around 10,000 GWH) leaves 22,000 GWH. In the low, mid, and high scenarios for this report, combined IOU incremental uncommitted savings in 2020 are estimated at 10,700 GWH, 12,200 GWH, and 14,400 GWH, respectively. These estimates are for just the three large IOUs, which are roughly 75 percent of statewide electricity consumption, making this range of incremental estimates 65 - 90 percent of the *Scoping Plan* goal.

Considerable uncertainty exists about the results of a pursuing a high energy efficiency future through this or other sets of hypothetical delivery mechanisms. The CPUC characterized policy uncertainty by positing three scenarios of alternative assumptions, which varied the stringency of standards, the levels of incentive funding for voluntary programs, and assumptions about the proportion of future homes and businesses constructed to reduce energy usage. The three resulting amounts of incremental annual energy and peak demand impacts presented in this report reveal the spread resulting from the specific delivery mechanism specifications. In addition, there are numerous dimensions of technical uncertainty that should also be recognized, even though they have not been quantified. For example, the level of economic and demographic growth through 2020 has a direct impact on the savings that can be achieved

5 http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm.

through mandatory Title 24 building standards affecting new construction. Further, whether end-use customers will voluntarily agree to participate in utility programs to the degree assumed here depends on their general willingness to participate, the incentive levels for high efficiency measures, and the amount of disposable income available to invest in more efficient equipment. Finally, whatever the quantity of more efficient equipment installed, realized savings could be higher or lower than assumed in this study. These factors, and numerous others, mean that the point estimates of savings for each of these three scenarios have a considerable band of uncertainty. The uncertainties identified in this report will be addressed further in the CPUC's procurement and energy efficiency implementation process.

Although the precise details of how these energy efficiency scenario results will be used in the 2010 procurement proceedings remain to be determined, **Attachment C** of this report provides a sketch of the how CPUC Energy Division staff anticipates use of these results to prepare managed demand forecasts for use in supply-side portfolio assessments.

Three, more general points need to be made regarding the results in this analysis. First, resource planning assumptions about supply resources needed to meet energy demand must be based on a holistic approach toward efficiency adjustments designed for managed demand forecasts and their likelihood of occurrence. Historically, economic and demographic variables have been the main drivers of energy growth trends, but the results of this analysis imply that policy drivers are also a large factor. Economic and demographic growth are always uncertain, but future ranges can generally be bounded. Policy drivers are more difficult to predict. Second, decision makers must consider the implications of efficiency-induced projections for very low or even negative energy and peak demand growth through 2020. While the *Energy Action Plan* loading order emphasizes cost-effective energy efficiency as California's first choice to meet demand growth, relying solely on these resources for long-term resource adequacy is uncharted territory. Third, if decision makers postpone decisions to invest in supply-side resources and energy efficiency fails to deliver as forecasted, serious reliability (and cost) consequences could result, unless such shortfalls have been anticipated and contingency actions identified.

Energy Commission staff recommends the following:

- In further goal-setting proceedings, goals should be described with reference to a baseline projection or set of assumptions. This will make clearer the incremental impacts of such goals beyond similar impacts already included in the baseline.
- The CPUC should use the projections of incremental uncommitted initiative impacts developed in this report as one of several adjustments to the adopted *2009 IEPR* demand forecast to develop three separate managed demand forecasts to use as the basis for portfolio analyses in the forthcoming 2010 LTPP proceeding.
- To the extent that separate models (such as the Energy Commission's demand forecasting models and Itron's SESAT) are used in subsequent analyses to determine the incremental impact of hypothetical policy initiatives, then somewhat better coordination of primary input assumptions should be made, such as rerunning all models with a common set of price projection assumptions.

- The Energy Commission staff should continue to develop a capability for making incremental uncommitted energy efficiency projections for use in the 2011 IEPR proceeding, CPUC 2012 LTPP proceedings, ARB efforts to assess options for satisfying the GHG emission reduction requirements of AB 32, and related inquiries. This capability will require further coordination of modeling methods and assumptions between those used to prepare baseline demand forecasts and those used to estimate the incremental impacts of uncommitted policy initiatives. In turn, such efforts depend upon appropriate staffing and data collection activities.

CHAPTER 1: Introduction

This report, along with a detailed appendix prepared by Itron, provides an assessment of the *incremental* impacts of a set of California Public Utilities Commission (CPUC) energy efficiency policy initiatives[7] not incorporated in the demand forecast adopted by the California Energy Commission[8] (Energy Commission) in the *2009 Integrated Energy Policy Report*[9] (*2009 IEPR*) proceeding. In this context, incremental refers to electricity savings from the CPUC efficiency initiatives that are net of any overlap with savings already included in the adopted *2009 IEPR* demand forecast. These initiatives were not incorporated in the *2009 IEPR* demand forecast because they were not considered *committed*, or firm. This analysis uses the *2009 IEPR* demand forecast as the reference point, since this forecast will be used in procurement assessments at the CPUC.

The Energy Commission and other energy agencies are dedicated to pursuing energy efficiency at a level exceeding that incorporated in the *2009 IEPR* demand forecast. In some cases, this pursuit is described in non-quantitative terms, such as all cost-effective energy efficiency potential. In other cases, it is put in terms of quantitative goals for a specific year, such as 33,000 GWh of electricity savings by 2020. In its most recent cycle of strategic planning and energy efficiency goal setting, the CPUC identified a specific set of initiatives to reflect its aggressive treatment of energy efficiency. Through various decisions, the CPUC stipulates that such aggressive treatment be incorporated in long-term procurement planning for the investor-owned utilities (IOUs) it regulates. The CPUC requests that the Energy Commission develop corresponding incremental energy efficiency estimates that can be subtracted from the Energy Commission's adopted demand forecast. These energy efficiency adjustments contribute to a *managed demand forecast*[10] that IOUs would use in the resource planning assessments for the 2010 Long-Term Procurement Plan (LTPP) proceeding. This report includes low, medium, and high estimates of incremental load impacts from these initiatives.

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7 In this report, "initiatives" refer to all types of policy-related efficiency delivery mechanisms, including utility and public agency programs, codes and standards, and other efficiency-related legislation.

8 California Energy Commission, *California Energy Demand 2010-2020, Commission Adopted Forecast*, December 2009, CEC-200-2009-012-CMF. http://www.energy.ca.gov/2009publications/CEC-200-2009-012/index.html. Referred to in this report as the *2009 IEPR* demand forecast.

9 California Energy Commission, *2009 Integrated Energy Policy Report, Commission Final Report*, December 2009, CEC-100-2009-003-CMF. http://www.energy.ca.gov/2009publications/CEC-100-2009-003/CEC-100-2009-003-CMF.PDF.

10 *Managed demand forecast* is meant to convey a forecast that is different from "business as usual" through the explicit use of program activities to adjust demand downward. Such adjustments could include any demand-side policy initiatives: energy efficiency, distributed generation, and other types of response considered demand adjustments rather than supply-side resources.

Energy Commission Demand Forecast

The Energy Commission prepares an *IEPR* on a biennial cycle, with the report typically adopted in November of odd-numbered years (an update to the currently adopted IEPR is prepared in even-numbered years). The electricity demand forecast covers 10 future years, so the forecast extends to 2020 for the *2009 IEPR*. The Energy Commission forecasts demand for eight "planning areas" encompassing all of the load and resources for the five balancing authorities contained within California. (Minor portions of upper Northern California and the Lake Tahoe area are served by utilities centered in Oregon and Nevada, respectively.) The analysis discussed in this report requires demand forecasts for the actual IOU service areas, which differ from the planning areas in the case of Pacific Gas and Electric (PG&E) and Southern California Edison (SCE). The *2009 IEPR* demand forecast provides these service area forecasts by subtracting out demand forecasts for all of the publicly owned utilities included within the broader PG&E and SCE planning areas. No such adjustments are needed for San Diego Gas & Electric (SDG&E) since there are no publicly owned utilities embedded within the SDG&E planning area.

In preparing its long-run demand forecasts, the Energy Commission follows a practice of distinguishing between demand-side impacts that it considers *committed* and others that are *uncommitted.* Committed initiatives include utility and public agency programs, codes and standards, and legislation and ordinances that have final authorization, firm funding, and a design that can be readily translated into characteristics that can be evaluated and used to estimate future impacts (for example, a package of IOU incentive programs that has been funded by CPUC order). In addition, committed impacts include *naturally occurring* savings, which consist of price effects and other savings not directly related to a specific initiative.[11] Committed impacts are evaluated and embedded within the demand forecast. The impacts of initiatives that do not meet the committed criteria, uncommitted impacts, are typically more uncertain and cannot be projected with the accuracy expected of baseline demand forecasts used for resource planning and investment decision-making. Additional discussion of committed versus uncommitted impacts is provided in **Chapter 2**.

An illustrative instance for this rationale involves CPUC-funded energy efficiency programs administered by the IOUs. Funding cycles for these energy efficiency programs are approved typically in three-year cycles. As a result of CPUC Decision D.09-09-047, programs are committed through the end of 2012.[12] The *2009 IEPR* demand forecast, however, extends through 2020. On the one hand, the Energy Commission aims to include only committed initiatives in its demand forecast. On the other hand, there is a high probability that the CPUC will fund additional energy efficiency programs of some type during the time frame covered by

11 The naturally occurring category also includes savings resulting from social phenomena that induce shifts toward lower energy consumption and technological innovation bringing more efficient products to market.

12 CPUC energy efficiency decisions referenced in this report are documented in **Attachment B**.

the *2009 IEPR* demand forecast. Therefore, this analysis serves as a supplement to the *2009 IEPR* demand forecast by providing estimates of incremental impacts of prospective CPUC-funded energy efficiency programs in the years following 2012. This analysis also includes estimated energy efficiency savings from other sources that, like the CPUC-funded energy efficiency programs, are expected to occur during the forecast period but are appropriately designated as uncommitted. Through its goal setting process, the CPUC is making commitments to further energy efficiency policy initiatives, even though the characterization or content of the delivery mechanisms is highly likely to change over time.

The repeal of large sections of the Public Resources Code through Senate Bill 1389 (Bowen, Chapter 568, Statutes of 2002) and their replacement with the current language of Public Resources Code Sections 25300 – 25322 removed from law the efficiency-related concept described as "reasonably expected to occur." This term served as guidance for the level of energy efficiency the Energy Commission should consider in its electricity planning efforts, functioning as a constraint in Energy Commission demand forecasts. Although the current approach should not necessarily be construed as being consistent with the former statutory test, those portions of energy efficiency impacts considered committed, and therefore already included in the *2009 IEPR* demand forecast, might be readily agreed to satisfy the former "reasonably expected to occur" standard.

This standard could also serve as a constraint for the analysis of uncommitted initiatives, in terms of which ought to actually be recognized in electricity planning efforts. However, this report has not been designed to endorse a position regarding whether or to what degree the energy efficiency initiatives and associated levels of commitment included in this analysis are "reasonably expected to occur" or whether some other level, higher or lower, might be expected. **Attachment D** to this report provides a discussion of application of the concept of "reasonably expected to occur" as the CPUC/Energy Division (ED) staff proposes it be applied in the forthcoming 2010 Long-Term Procurement Process (LTPP) proceeding.

CPUC Specification of Alternative Sets of Hypothetical Policy Initiatives

There are undoubtedly many descriptions of uncommitted energy efficiency initiatives that could potentially occur during the forecast period. However, this analysis is not designed to quantify the potential universe of all energy efficiency investments that might be considered economic. Rather, this report seeks to quantify the projected effects from a specific set of activities outlined in the CPUC-sponsored *2008 Energy Efficiency Goals Update Report*[13] (*2008 Goals Study*). The *2008 Goals Study* focused on energy efficiency that could be captured as a result of key initiatives likely to affect efficiency in the IOU service territories through 2020,

13 http://www.cpuc.ca.gov/NR/rdonlyres/8944D910-ECA2-4E19-B1F3-96956FB6E643/0/Itron2008CAEnergyEfficiencyStudy.pdf.

based on information that was available at the time the report was prepared in 2008. The CPUC intends to update the *2008 Goals Study*, as well as CPUC-adopted energy efficiency goals, every few years to include new analyses and information as appropriate.

The CPUC is interested in obtaining the incremental impacts relative to Energy Commission IEPR demand forecasts from a set of prospective energy efficiency impacts defined as part of the *2008 Goals Study* and D.08-07-047. In this case, incremental impacts will be used to modify the *2009 IEPR* demand forecast in the 2010 LTPP proceeding. The CPUC/ED staff proposes that managed demand forecasts incorporating these and other adjustments will be the basis for resource portfolio assessments that will set the stage for procurement authority issued by the CPUC for each IOU.[14]

The CPUC has indicated that, in the 2010 cycle, the LTPP will be split into two proceedings: one addressing electricity system reliability and need assessments and a second addressing "bundled" IOU procurement plans.[15] Thus, there are two potentially distinct applications for this analysis. First, the entire amount of any of the three scenario impacts through time may properly be used to develop a managed demand forecast for an IOU service area as a basis for determination of need for new system resources. Second, a smaller amount, scaled down to reflect the portions of the results that apply strictly to bundled service customers, may be the appropriate amount to use in devising procurement authority for IOU bundled service customers. The second application is likely to become more important over time with the recent passage of SB 695 (Kehoe, Chapter 337, Statutes of 2009), allowing the expansion of direct access service to individual retail non-residential end-use customers.

Focus for Energy Commission Demand Forecasting Efforts in the *2009 IEPR* Cycle

The Energy Commission's demand forecasting efforts require most of a two-year IEPR cycle to prepare for and complete. Given the issues of the day, sometimes the emphasis within a specific biennial cycle may be targeted to a specific topic needing more attention. As a result of controversy in past CPUC procurement proceedings about the level of efficiency savings actually embedded in the Energy Commission demand forecast, the emphasis in the *2009 IEPR* cycle was on better quantifying energy efficiency. Within this broad topic, two principal efforts focused on:

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14 See Attachment 2 to the July 1, 2009, Assigned Commissioner's Ruling in the 2008 LTPP Rulemaking (R.) 08-02-007: *Energy Division Straw Proposal on LTPP Planning Standards*, July 2009. http://docs.cpuc.ca.gov/word_pdf/RULINGS/103212.pdf

15 See December 3, 2009, *Assigned Commissioner's Ruling Addressing Future Commission Activities Related to Procurement Planning*. http://www.cpuc.ca.gov/EFILE/RULINGS/110674.pdf. Bundled service refers to customers who receive electric generation, transmission, distribution, and related customer service and support functions as a combined service.

- Updating and improving the analysis of energy efficiency savings considered committed for the *2009 IEPR* demand forecast.
- Creating a new capability to assess the incremental impacts of what the Energy Commission considers uncommitted energy efficiency savings.[16]

The analysis of the incremental impacts of uncommitted initiatives builds from the *2009 IEPR* electricity demand forecast in two ways. First, it reduces the original programmatic scope of the scenarios from the *2008 Goals Study* by eliminating programs now considered committed by the Energy Commission and whose impacts are included within the *2009 IEPR* demand forecast. This is an accounting treatment that recognizes that the passage of time between adoption of the *2008 Goals Study* and the preparation of the *2009 IEPR* demand forecast. The obvious example of this is the 2009-2011 energy efficiency program proposals that were adopted by the CPUC in September 2009 as 2010-2012 programs by D.09-09-047.

Second, it conforms the underlying impacts analysis of the uncommitted initiative designs in the *2008 Goals Study* to the economic driver assumptions (for example, household and commercial floor space growth) used in the *2009 IEPR* demand forecast. This reflects the fact that, while the energy efficiency goals articulated in D.08-07-047 are commonly thought of in terms of absolute energy and peak demand reductions that utilities are required to achieve, the goals are actually conditional upon economic and demographic growth and other descriptors of underlying energy usage behavior. The analysis in the *2008 Goals Study* was developed in large part using economic, demographic, and other assumptions used in the *2007 IEPR* demand forecast. In the real world, neither economic and demographic activity nor energy usage behavior conform neatly to planning assumptions. Therefore, the newer assumptions used in the *2009 IEPR* demand forecast were used to recalculate the savings impacts of the portion of the *2008 Goals Study* scenarios that are still considered to be uncommitted.

Under the direction contained in the *2009 IEPR*, this draft report is prepared in advance of a workshop expected to be called under the authority of the Energy Commission's Electricity and Natural Gas Committee.[17] Discussion at that workshop, comments received, and direction of this committee will be guides for preparation of a final report. The final report and appropriate communications from the Energy Commission will be provided to the CPUC as an input in the 2010 LTPP rulemaking, which is expected to begin in February 2010.

Organization of This Report

Chapter 1 provides the basic background needed to understand the context of this report. **Chapter 2** provides a summary of the specific policy context for incremental uncommitted

16 The CPUC funded Itron to assist the Energy Commission staff in both elements of this effort.

17 *2009 IEPR*, Executive Summary, page 5.

energy efficiency savings, as first debated in R.06-02-013. **Chapter 3** discusses the conceptual issues related to determining the portion of uncommitted energy efficiency impacts incremental to the *2009 IEPR* demand forecast. **Chapter 4** discusses the method used to estimate incremental uncommitted savings. **Chapter 5** provides a summary of the results for each of the three scenarios that were investigated. **Chapter 6** provides conclusions, caveats, and recommendations.

Attachment A, prepared by Itron, gives a full description of the incremental uncommitted analysis and provides detailed results. **Attachment B** provides an explanation by CPUC/ED staff of the series of adjustments to IOU energy efficiency goals and the CPUC efficiency goal-setting history since 2004. **Attachment C** gives a brief explanation by CPUC/ED staff concerning the concept of a managed demand forecast and how such a demand forecast could be used in supply-side portfolio assessments. **Attachment D** is a technical glossary.

CHAPTER 2: Policy Context

The Energy Commission and CPUC both conduct electricity planning processes under various statutory directives and agency prerogatives. Some coordination between these processes has been accomplished, while further coordination discussions between the two Commissions and with the California Independent System Operator (California ISO) are underway.

In the context of long-run demand forecasts and assessing the impacts of energy efficiency on annual energy and peak demand, the Energy Commission conducts planning assessments for all of California, while the CPUC conducts assessments for the service areas where its regulated utilities provide energy and distribution services. Further reflecting slightly different legislative mandates, the Energy Commission's assessments find use in many applications, while the CPUC is especially concerned with authorizing energy efficiency programs and procuring generation services for utility bundled service customers, and assessing the financial consequences of these actions on IOU customer rates. The CPUC also authorizes IOU procurement of new resources for system reliability through the resource adequacy program, under Public Utilities Code Section 380.

Problems arose in the 2006 LTPP proceeding when the CPUC attempted to combine an Energy Commission baseline demand forecast with independently prepared estimates of energy efficiency program impacts analyzed using different models and input assumptions. Lacking sufficient time and resources to resolve this problem when it was encountered, the CPUC and Energy Commission decided to improve coordination to avoid the problem in subsequent IEPR/LTPP planning cycles.

Context of 2006 LTPP Proceeding and D.07-12-052

Following passage of SB 1389, directing the Energy Commission to undertake a biennial planning and policy report cycle culminating in the *IEPR*, and AB 57, establishing a legal foundation for IOU electricity resource procurement under ground rules set by the CPUC, D.04-01-050[18] created a biennial LTPP rulemaking process. The LTPP cycle was designed to follow completion of a biennial IEPR so that the IEPR's information and analyses could be used in the LTPP analyses.

As a part of planning process coordination discussions between the Energy Commission and the CPUC, CPUC President Michael Peevey issued two Assigned Commissioner Rulings in the 2006 LTPP rulemaking that directed use of the demand forecast and consideration of other information and analyses contained within the Energy Commission's *2005 Integrated Energy*

18 California Public Utilities Commission, Decision 04-01-050, *Interim Opinion*, January 22, 2004, available at http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/33625.htm.

Policy Report (*2005 IEPR*).[19] This information was communicated to the CPUC in a November 2005 "transmittal report" developed to provide the results contained within the *2005 IEPR* and references to the key aspects of the Energy Commission's IEPR proceeding. Utilities raised various issues about the *2005 IEPR* demand forecasts in the CPUC rulemaking, making unclear for a time whether the Energy Commission's forecasts would actually be used.

A key issue during the 2006 LTPP rulemaking was the extent to which projections of future utility "net short" positions[20] would take into account estimates of modifications to base energy forecasts for demand-side policy impacts such as energy efficiency, demand response, and other preferred resource types. The more the base demand forecast was adjusted downward for impacts of policies not already embedded in the base demand forecast, the lower the "net short" results would be.

Late in the 2006 LTPP rulemaking, when the proposed decision relied on the *2007 IEPR* demand forecast[21] (to be adjusted by subtracting out utility estimates of preferred demand-side resource additions), utilities questioned the extent to which the impacts of such policy initiatives might already be embedded in the Energy Commission forecast. At this point in the proceeding, there was neither time nor detailed documentation from the Energy Commission about its 2007 demand forecast to settle this question. This gave rise to the initial supposition within the proposed decision that 50 percent of initiative impacts were already embedded in the demand forecast, leaving 50 percent to be "subtracted off" as a further adjustment to the forecast before computing "net short" positions. Utilities protested this solution, and eventually D.07-12-052 adopted 80 percent as overlap factors for PG&E and SCE (20 percent of impacts subtracted off the forecast), and a 100 percent overlap factor for SDG&E. These values meant that relatively little impacts of the proposed policy initiatives were considered incremental to the baseline demand forecast, resulting in a larger "net short" position for the IOUs.

Figure 1 illustrates how one might think of the issue of overlap between committed and uncommitted savings, using the *2007 IEPR* demand forecast and PG&E for this example.[22] The

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19 ACRs issued September 2004 and March 2005 in CPUC R.04-04-003.

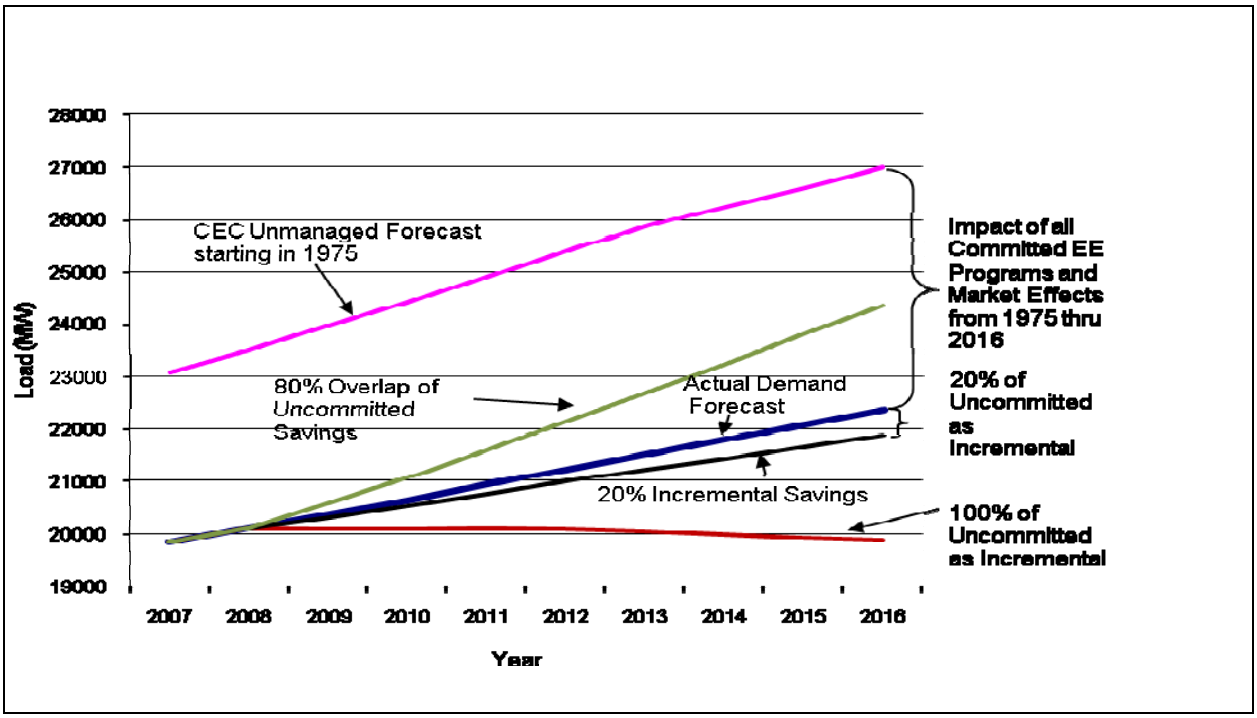
20 Net short is the difference between projected utility sales and forward purchase contracts, after adjusting for loading order resources such as energy efficiency.

21 Due to the passage of time, the Energy Commission had already completed another biennial cycle for its *Integrated Energy Policy Report*. CPUC staff proposed to substitute the *2007 IEPR* demand forecast for the *2005 IEPR* demand forecast. The detailed documentation for this demand forecast, including description of the energy efficiency program impacts embedded within it, was not released until November 2007, only weeks before the final decision in the 2006 LTPP rulemaking was adopted. California Public Utilities Commission, Decision 07-12-052, *Opinion Adopting Pacific Gas and Electric Company's Long-Term Procurement Plans*, December 20, 2007, available at: http//docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/769079.htm.

22 Figure 1 uses peak demand data for PG&E from D.07-12-052 to illustrate the issue. Similar graphs could be developed for SCE and SDG&E from the same source. An earlier version of this figure was included in the Energy Commission's *2008 IEPR Update*.

topmost curve shows what the demand forecast for PG&E would look like on a completely unmanaged basis, that is, without any impacts from committed energy efficiency savings from 1975 onward. The distance between this curve and the one showing the actual demand forecast represents the total amount of committed savings incorporated in the forecast. Two additional lines show the implied impacts of an overlap factor for uncommitted savings of 80 percent: The distance between the curve labeled "80% Overlap of Uncommitted Savings" and the actual demand forecast curve represents the amount of uncommitted savings impacts that would already be embedded in the forecast under the 80 percent assumption. The corresponding curve labeled "20% Incremental Savings" shows the managed forecast[23] under this assumption. On the other hand, assuming no overlap between committed and uncommitted savings, meaning all uncommitted savings would be subtracted, results in a declining managed forecast (bottom curve labeled "100% Incremental Savings"). Clearly there is a major distinction between these two results in terms of the amount of generating resources required to provide energy and/or satisfy reliability standards.

Figure 1: Illustration of CPUC D.07-12-052 Adjustments to Energy Commission Demand Forecast for Incremental EE Impacts (PG&E Service Area Values)



Source: California Energy Commission, 2009

23 For this example, adjustment from the demand forecast to the managed forecast is assumed to include only additional efficiency impacts.

2008 Goals Update Report and D.08-07-047

Beginning in 2007, CPUC/ED staff initiated an effort with Itron as principal contractor to develop what became the *2008 Goals Study*. Augmenting previous energy efficiency potential studies, including a utility-funded *2008 Energy Efficiency Potential Study*,[24] this effort considered the long-range impact of a wide range of initiatives, not just utility-based efficiency programs. Through the CPUC's *California Long-Term Energy Efficiency Strategic Plan*[25] and as part of energy agency contributions to the development of the California Air Resources Board (ARB) AB 32 *Climate Change Proposed Scoping Plan*[26] for greenhouse gas reductions, the CPUC thought expansively about how to realize large amounts of remaining untapped energy efficiency potential from all customer sectors. It recognized that IOU programs were not the only delivery mechanisms operating in the real world, nor should they be the only source of prospective savings to consider when determining goals to achieve.

Itron was charged with developing a study that identified impacts from energy efficiency initiatives pursued through a broad range of delivery mechanisms. These initiatives included:

- Expanded utility programs
- Periodically updated state Title 20 and 24 standards along with updated federal appliance standards
- CPUC's Big Bold energy efficiency initiatives
- Lighting efficiency measures in satisfaction of Assembly Bill 1109 (Huffman, Chapter 534, Statutes of 2007)

Energy efficiency savings that could potentially be achieved from these sources taken together were referred to as *total market gross* savings. The CPUC adopted this concept in D.08-07-047. This was a policy shift in two respects. First, "total market" refers to policy initiatives beyond those historically pursued through utility programs. For example, the goals adopted in D.08-07-047 explicitly include codes and standards, which the utilities could not implement themselves, although they have pursued programs intended to increase compliance. Second, "gross" means that ancillary consequences of programs, such as free-ridership and spillover, would be counted toward the goal. This policy shift therefore means that a variety of savings sources now count toward goal achievement. Itron assessed the likely total market gross savings impacts from three different scenarios (high, mid, and low). **Chapter 3** provides details on each of these scenarios.

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24 http://www.calmac.org/publications/PGE_PotentialStudy_Vol1_05242006.pdf.

25 California Public Utilities Commission, *California Long Term Energy Efficiency Strategic Plan*, September 2008. http://www.cpuc.ca.gov/NR/rdonlyres/D4321448-208C-48F9-9F62-1BBB14A8D717/0/EEStrategicPlan.pdf.

26 http://www.arb.ca.gov/cc/scopingplan/document/psp.pdf

Itron developed its report, the CPUC/ED prepared a white paper proposing how the results should be used, parties provided responses, a proposed decision was issued, and the CPUC ultimately adopted energy efficiency total market gross goals described in D.08-07-047. In addition to its role in providing an estimate of energy efficiency savings that ARB could rely upon for its *Climate Change Proposed Scoping Plan*, the decision also directed that the total market gross goals be used in subsequent LTPP rulemakings to guide IOU generation procurement actions. Of importance to this analysis, the CPUC elaborated upon the direction it had provided to the IOUs in a previous decision[27] to incorporate 100 percent of the adopted savings goals in subsequent LTPP proceedings.[28] The adopted values came from the mid savings scenario results provided in the *2008 Goals Study*.

The switch to total market gross goals has numerous implications for how energy efficiency programs are implemented, incorporated into Energy Commission *IEPR* demand forecasts, and used for procurement planning purposes. This analysis begins the process of examining these implications, but further work is needed to transition demand forecasting and resource planning to this new paradigm.

Energy Commission Use of Committed/Uncommitted Paradigm

In response to positions advocated by various parties (IOUs in particular), the Energy Commission considered in the *2008 IEPR Update* proceeding whether it should revise its traditional use of the committed/uncommitted paradigm. IOUs urged the Commission to abandon its traditional approach and instead shift to a managed demand forecast that would broaden the energy efficiency activities and other demand-side policy initiatives and other embedded in the demand forecast to include the goals established by the CPUC. The Energy Commission rejected this approach and decided to continue using the committed/uncommitted distinction for the *IEPR* demand forecast, but also to develop a separate capability to assess the incremental effects of additional uncommitted initiatives. This decision was made in the context of a CPUC request to the Energy Commission in the text of the 2008 LTPP Order Instituting Rulemaking (OIR) as well as CPUC/ED comments filed as part of the *2008 IEPR Update* proceeding.

The incremental energy efficiency provided in this report will be used in the 2010 LTPP, along with other adjustments (distributed generation and demand response, for example) to produce a managed forecast. The distinction is that the *2009 IEPR* forecast incorporates only committed energy efficiency, while the estimates of incremental effects from uncommitted initiatives are produced separately.

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27 D.04-09-060, OP 6.

28 D.08-07-047, p. 26 and OP 3.

2008 LTPP Assignment to *2009 IEPR* and *IEPR* Activities

In the OIR for the 2008 LTPP proceeding, the CPUC, in consultation with the Energy Commission, directed utilities and other parties to pursue the issue of overlap between the energy efficiency impacts embedded in Energy Commission demand forecasts and the uncommitted savings corresponding to CPUC energy efficiency goals in the *2009 IEPR* proceeding. Energy Commission staff proposed an overall project design with two subprojects: (1) improvements in the characterization of committed efficiency program impacts in the staff's *2009 IEPR* demand forecasts, and (2) estimation of incremental uncommitted savings from policy initiatives using the *2008 Goals Study* program delivery mechanisms.

To facilitate communication by more informal means than the usual IEPR workshop process, Energy Commission staff formed a Demand Forecast Energy Efficiency Quantification Project (DFEEQP) working group. Along with Energy Commission staff, membership includes CPUC/ED, IOUs, publicly owned utilities, ARB, and other stakeholders interested in this effort. Beginning in December 2008, the DFEEQP working group has met roughly every six weeks to obtain briefings on the status of this project, discuss sources of information that can be used to improve assessments of energy efficiency programs in a demand forecasting context, compare and contrast forecasting and efficiency measurement approaches used by the utilities with those used by Energy Commission staff, and attempt to devise a more standardized set of terminology between the demand forecasting and energy efficiency measurement and evaluation communities.

To date, the DFEEQP Working Group has conducted 12 meetings or webinars. These meetings have been the principal working mechanism for the Energy Commission and CPUC staff to communicate about this overall effort to stakeholders, both to inform them of plans and results once available and to seek data and solutions to analytic problems. The most recent of these working group meetings was held in December 2009 to discuss the preliminary results of this analysis and to present an initial draft of Itron's technical appendix (**Attachment A**) to obtain feedback from working group members that could be incorporated into the final results and documentation.

The Energy Commission's *2009 IEPR* Committee conducted five public workshops devoted entirely or partly to the question of energy efficiency embedded in the demand forecast and the plan to develop a complementary assessment of the incremental impacts of uncommitted policy initiatives, as follows:

- March 11, 2008, focused on a review of the energy efficiency embedded in the *2007 IEPR* demand forecast and staff's plans for the effort requested by the CPUC.
- August 12, 2008, focused on the multistage plan proposed by Energy Commission staff and initial efforts by Itron as part of its contractual efforts underwritten by the CPUC.
- May 21, 2009, focused on the energy efficiency program assessment efforts completed in time for the draft staff demand forecast for the *2009 IEPR.*

- June 26, 2009, focused on the draft staff demand forecast, including the extent to which this demand forecast was reduced through the incorporation of improved assessment of committed energy efficiency programs.
- September 21, 2009, focused on a revised demand forecast and remaining issues, including the then-pending proposed decision to convert utility 2009–2011 energy efficiency programs to cover 2010–2012.

In addition to these public events, Energy Commission staff, CPUC/ED, and Itron have met informally numerous times to refine project plans, exchange data, discuss reviews of methods and assumptions, and make other necessary efforts to coordinate activity among the three entities.

CHAPTER 3: Conceptual Approach for Determining Incremental Impacts Above Historical/Committed Impact Projections

This chapter describes the conceptual approach used to measure the incremental impacts of the uncommitted initiatives described in **Table 3**, an approach that involves minimizing overlap of these initiatives' impacts with historical/committed savings embedded in Energy Commission demand forecast.

Background

Meaningful estimates of the impacts of additional uncommitted initiatives are impossible without considering the impacts of committed programs already included within the adopted demand forecast, and the methods for developing the demand forecast itself. As noted, this approach requires consideration of two elements: (1) the inclusion of specific programs and other delivery mechanisms within the committed and uncommitted categories, and (2) methods of analysis for committed and uncommitted impacts.

Questions about committed/uncommitted overlap could not be answered during the 2006 LTPP and *2007 IEPR* proceedings because neither the demand forecast nor the estimates of additional energy efficiency savings were prepared or documented in a manner that could allow technical answers. Therefore, simple assumptions were made, as described in **Chapter 2**. The analyses documented in this report seek to eliminate overlap by preparing savings estimates that are explicitly incremental to the *2009 IEPR* demand forecast.

This chapter will address the overlap problem conceptually in the context of the forthcoming CPUC 2010 LTPP rulemaking: how to estimate incremental impacts of the three future energy efficiency scenarios described in the *2008 Goals Study* relative to the Energy Commission's *2009 IEPR* demand forecast. Although a literal reading of the text of the final decision of the 2006 LTPP rulemaking (D.07-12-052) implies that the *2007 IEPR* demand forecast should be the reference point, the timeline required to develop analytically defensible solutions to the problem allowed the use of an updated 2009 forecast.

During the March 11, 2008, workshop, Energy Commission staff proposed to upgrade the level of energy efficiency program assessment for programs considered committed as well as to develop a new capability to estimate the incremental impacts of uncommitted energy efficiency

initiatives. During the August 12, 2009, workshop, Energy Commission staff presented a conceptual project plan[29] that encompassed three steps:

- Improve characterization of energy efficiency within the base demand forecast for the *2009 IEPR.*
- Create/adapt a capability to assess incremental impacts of uncommitted initiatives.
- Create/adapt a capability to assess the incremental impacts of further energy efficiency initiatives.

A multi-step process to achieve these goals was later ratified by the Energy Commission in the *2008 IEPR Update*,[30] **Chapter 2**.

This analysis draws upon Step 1 efforts, which are documented in the *2009 IEPR* demand forecast report.[31] Although Energy Commission staff has made and will continue to make progress in the direction of developing an independent uncommitted projection capability (Step 2) this analysis still depends upon the technical expertise of Itron. In Step 3, Energy Commission staff will also develop a capability to project energy efficiency potential and its various categories of interest (technical potential, economic potential, achievable economic potential, and so on).

End-Use/Measure Penetration Assumptions and CPUC Goals

Extending back as far as 2004, the CPUC has adopted electricity energy and peak and natural gas energy goals for IOU energy efficiency efforts. Such goals have encompassed various portions of the total cost-effective energy efficiency potential identified in technical and economic studies. The goals are periodically revised as new information becomes available. **Attachment B**, prepared by CPUC/ED staff, summarizes the changes in electricity goals through time, including the latest adjustment to the goals for each IOU given in D.09-09-047.

The literal language of CPUC decisions directs IOUs to achieve the stated values, making up shortfalls in any one program year's efforts in subsequent years. While CPUC decisions consider the goals as a "hard constraint," a series of CPUC decisions continue to clarify what this means in practice.

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29 California Energy Commission, *Conceptual Project Plan: Demand Forecast and Energy Efficiency Impact Assessment*, August 2008 IEPR Workshop. http://www.energy.ca.gov/2008_energypolicy/documents/2008-08-12_workshop/2008-08-08_CONCEPTUAL_PROJECT_PLAN.PDF

30 California Energy Commission, *2008 Integrated Energy Policy Report*, November 2008, CEC-100-2008-008-CMF. http://www.energy.ca.gov/2008publications/CEC-100-2008-008/CEC-100-2008-008-CMF.PDF.

31 *California Energy Demand 2010-2020, Commission Adopted Forecast*, Chapter 8.

This analysis, focused on quantifying the incremental impact of uncommitted initiatives beyond those included in the 2*009 IEPR* demand forecast, requires attention to the specification of the various delivery mechanisms that collectively define the end-use/measure penetration assumptions used in the *2008 Goals Study*, rather than the numeric long-term goals specified in CPUC decisions. It is impossible to assess the incremental portion of a quantity goal without understanding the precise specification of its end-use/measure effects relative to the underlying adopted demand forecast. Therefore, this report and its attachments focus on the policy initiatives specified in the *2008 Goals Study* process and provide estimates of the incremental impact of these collections of policy initiatives at the end-use level relative to the results in the *2009 IEPR* demand forecast.

2009 IEPR Assessments of Committed Impacts

Using the DFEEQP working group as a sounding board, Energy Commission staff proposed to focus on improving utility program savings assessment in the *2009 IEPR*. In part, this was accomplished by tying much more directly than in the past to the savings estimates for measures end uses, and other disaggregated descriptors of program activity quantified through the evaluation, measurement, and verification (EM&V) processes. Although participants agreed that this made conceptual sense, the mechanics of gaining access to a comprehensive body of utility program activity results proved to be much more difficult than Energy Commission staff had anticipated. For projections of the impacts of codes and standards, Energy Commission staff proposed no substantive changes to methods used in prior forecast cycles. During this project, the creation of various federal stimulus programs centered on energy-increased interest in assessing the impacts of these non-IOU policy initiatives, but this proved to be impossible for the *2009 IEPR*.

Tasks undertaken to improve measurement of utility program impacts culminated in a major upgrade for the *2009 IEPR* cycle. These included:

- Compiling first-year savings by end use and measure for program year activities extending back to 1998.
- Developing a new system to track the savings from program-induced energy efficiency that incorporates measure decay[32] and *ex post* (relative to initial reported or projected savings) adjustments that may occur as a result of EM&V processes.
- Segregating between measures/end uses whose impacts would be explicitly included in the Energy Commission staff demand forecasting models and those that would not.
- Upgrading Energy Commission staff demand forecasting models to create a residential lighting end use along with acquiring data to rationalize historical growth in fixture/socket

[32] Measure decay arises when an energy efficiency measure is installed, reaches an end to its useful life, and is replaced, but with a less efficient measure.

potential and shifts in the shares among bulb types (incandescent, compact fluorescent, LED, and so on) through time.

- Modifying preparation of the final forecast to adjust the raw model output for the impacts of programs not incorporated directly into the models.

This set of activities was accomplished for the draft demand forecast released by Energy Commission staff in June 2009. The approach and methods were discussed in both the May 21, 2009, and the June 26, 2009, workshops. Some refinements and adjustments to assumptions were made as part of a September 2009 revised forecast, and one key final adjustment (shift of IOU programs from 2009–2011 to 2010–2012) was made as part of a second revised demand forecast at the request of the 2009 IEPR Committee.[33] The Energy Commission adopted the second revised forecast at its regular business meeting on December 2, 2009.

The improvement in treatment of IOU program impacts is documented in the demand forecast report,[34] which provides a basis for fully understanding the level of energy efficiency embedded within the final demand forecast adopted as part of the *2009 IEPR*. This documentation should allow the effort to identify incremental savings impacts beyond those in the forecast to be more transparent.

IOU Program Impacts

Energy Commission staff found that acquiring estimates of energy efficiency savings by measure across programs and applying the various appropriate *ex post* EM&V adjustments was much more difficult than anticipated. No single database across utilities, or even a single database for each utility, existed with the needed information. Thus, finding a common format and acquiring consistent data to fit into a database was an unforeseen first step. Working with Itron, Energy Commission staff created a format for aggregated savings resembling IOU net first year savings reports to the CPUC. Some measures were carried separately while others were grouped into end uses. Itron provided savings in this format for program years 2004 and 2005 and Energy Commission staff developed values for 2006-2008 first-year savings. Earlier years were added at a later stage, but some approximations were needed since the primary sources of reported measure installations were less readily accessible and pre-2004 measure data were named and classified in a different style. The numerous data sources and judgments required to adjust these data to prepare a consistent time series are described in the *2009 IEPR* demand forecast report.[35]

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33 The CPUC adopted a set of IOU program designs and funded these for years 2010-2012 on September 24, 2009.

34 *California Energy Demand 2010-2020, Commission Adopted Forecast*, Chapter 8.

35 *California Energy Demand 2010-2020, Commission Adopted Forecast*, Chapter 8.

To characterize the program accomplishments in life cycle savings terms, Energy Commission staff developed spreadsheet methods to track measure savings across time using first-year measure installation data, estimates for expected useful life available in the CPUC's Database for Energy-Efficient Resources[36] (DEER), and assumed decay functions. Discounts to reported savings estimates as a result of recent CPUC energy efficiency verification reports were also merged into the data. Finally, assumptions about IOU energy efficiency program activity for 2009 through 2012 were made based on the latest set of IOU program plans submitted to the CPUC. The analysis of the impacts of 2009–2011 programs based on these plans was pushed forward to become the assumed impacts for 2010–2012, with 2009 treated as a continuation of 2008 activities.[37] Since program activity beginning in 2013 is considered uncommitted from the Energy Commission's perspective, no new IOU program savings for this or subsequent years were included in the demand forecast. The accumulated savings achieved by earlier first-year accomplishments gradually diminish beyond 2012 as the measures decay according to the expected useful life formulas. (Further consideration of savings decay from committed programs will be discussed later in this chapter.)

The level of disaggregation carried by the end-use/measure format was designed to accommodate the fact that some measures are addressed directly within Energy Commission staff demand forecast models while others are not evaluated in any measure-specific manner, but only at the more aggregate end-use level. The database and spreadsheet method described above is needed to account for all first-year savings from utility programs, with impacts for some end uses incorporated directly in the forecast models and savings for the rest subtracted from the "raw" model results.

Industrial and agricultural IOU program savings collected through this process were not used in the *2009 IEPR* demand forecast. That is, no *net* program savings were assumed in the industrial or agricultural/water pumping sectors. Evidence suggests a potentially much higher level of free-ridership[38] in the industrial sector compared to other sectors. For the 2009 forecast, staff did not have the time to do an in-depth analysis and assumed that all reported program savings would have occurred whether the programs existed. This assumption will be revisited for the *2011 IEPR*.

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36 http://www.deeresources.com/.

37 Energy Commission staff monitored 2009 monthly IOU reports to the CPUC concerning measure adoption, and concluded that the first half of 2009 was similar to 2008 for SCE and SDG&E, but that PG&E was achieving only around one-half of 2008 accomplishments. Therefore, SCE and SDG&E were assigned 2008 efficiency program savings in 2009, while PG&E was assigned one-half of their 2008 total.

38 That is, industrial firms tend to adopt more energy-efficient methods for competitive reasons whether utility program incentives are available.

Other Changes in Methods and Assumptions

The largest single change in methods used to incorporate efficiency measures results from creating a lighting end use in the residential sector. The staff residential forecasting model as it existed through the *2007 IEPR* included lighting along with other miscellaneous plug loads as a single end use. However, the growth in lighting use as a result of higher average intensities[39] and the interest in more lighting efficiency as typified by the AB 1109 legislation motivated a change. Staff separated lighting from the miscellaneous end use, maintaining the aggregate residential consumption backcast[40] by the model in the recent historical period by subtracting from miscellaneous use the same energy consumed in the new lighting end use. The residential forecasting model can now incorporate lighting measures and changing lighting patterns in the residential sector directly, including shifts in bulb type from incandescent to compact fluorescent lamps.

The methods of analysis for building and appliance standards were unchanged in the 2009 forecast cycle. The 2002 refrigerator standards were introduced in the residential model. The only other differences in aggregate impacts of standards result from different patterns of new construction exposed to these requirements, or slight changes resulting from slightly different turnover of appliances, which is caused by different assumptions of growth in economic inputs, including housing and commercial floor space.

Although staff's demand forecasting models have always included some degree of response to electricity price, conservative assumptions about price increases included in previous forecast cycles made these effects small. The *2009 IEPR* demand forecast includes a 15 percent increase in electricity prices over the 10-year forecast horizon—a much higher increase than had been projected in previous IEPR forecasts. This price increase induces some degree of consumption reduction and efficiency improvement.

Price response is grouped into the category of naturally occurring savings. For the *2009 IEPR* demand forecast, this category also includes additional, non-incentivized residential lighting savings assumed to occur after 2012. Energy Commission staff assumed average lighting per household would remain at 2012 levels in the IOU planning areas and at 2009 levels for the publicly owned utilities without incentives through the rest of the forecast period. The difference between the 2009 or 2012 average and an increasing average that would have occurred as utility impacts decayed was assigned to naturally occurring savings. Staff felt that it was unrealistic to assume no continued lighting savings beyond utility programs given the legislative focus on lighting programs (particularly AB 1109). These savings were meant to be a placeholder for further refinement in this analysis.

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39 An increasing number of lighting sockets and lamps are being installed in new homes.

40 A backcast refers to model estimates for a historical period before any adjustment is made based on actual historical data.

Committed Savings Embedded in 2009 IEPR Demand Forecast

Table 3 provides a summary of estimated historical and projected committed energy savings embedded in the *2009 IEPR* demand forecast for the three IOU planning areas beginning in 2006, the base year for the incremental uncommitted analysis. Energy Commission staff demand forecast models are benchmarked to 1975, a year roughly matching the commencement of major energy efficiency programs.[41] By 2006, substantial savings have already reduced demand from what it would otherwise have been. Overall, projected committed savings in 2020 are almost 75 percent higher than the 2006 level. Savings from building and appliance standards continue to rise after 2006 as greater portions of the stock of buildings and appliances are covered by such standards, even though no increase in stringency is included through the forecast period. Naturally occurring savings rise as a result of the 15 percent increase in real electricity rates and the additional residential lighting savings. Utility program savings rise through 2012 and then gradually decrease as measures reach their useful life, decay, and are not replaced. Numerous small state and municipal programs make up the Public Agency category.

Table 3: Aggregate Energy Savings by Program Delivery Mechanism Embedded in *2009 IEPR* Demand Forecasts for the IOU Planning Areas (GWh)

Year	Building Standards	Appliance Standards	Utility Programs	Public Agency Programs	Naturally Occurring Savings	Total Savings
2006	8,814	13,016	5,059	11	13,277	40,178
2007	9,333	13,821	6,569	7	12,898	42,628
2008	9,853	14,574	8,661	3	11,526	44,617
2009	10,170	15,226	9,898	1	13,332	48,627
2010	10,612	15,969	10,731	1	13,671	50,984
2011	11,079	16,730	11,500	0	14,084	53,393
2012	11,580	17,501	12,227	0	14,537	55,846
2013	12,119	18,259	11,542	0	15,238	57,158
2014	12,677	19,003	10,808	0	16,030	58,518
2015	13,260	19,742	10,008	0	16,961	59,972
2016	13,829	20,466	9,132	0	18,241	61,668
2017	14,378	21,169	8,174	0	19,633	63,353
2018	14,904	21,843	7,152	0	21,068	64,967
2019	15,430	22,499	6,105	0	22,536	66,570
2020	15,903	23,125	5,081	0	23,986	68,095

41 The year 1975 is a starting point for the residential sector model corresponding to the 1975 building standard promulgated by the California Housing and Community Development Department.

Source: California Energy Commission, *2009 IEPR* Demand Forecast

Approach to Potential Overlap With Impacts From Program Designs Embodied in CPUC Goals Study Scenarios

As discussed, the basis for assessing further energy efficiency policy initiatives in this analysis is the *2008 Goals Study*. In this study, Itron developed prospective impacts for a series of program delivery mechanisms, including:

- Expanded utility programs
- Periodically updated state Title 20 and 24 standards along with updated federal appliance standards
- CPUC's Big Bold energy efficiency initiatives
- Lighting efficiency measures in satisfaction of AB 1109

Each of these categories was evaluated starting in 2006 for multiple levels of stringency/number of assumed updates extending through 2020. Three scenarios were simulated that could be characterized as resulting from pursuing the same four strategies, but with levels of effort resulting in low, mid, and high savings. These scenarios are reassessed for this analysis. **Table 4** details these scenarios by initiative type. The policy assumptions used to define these initiatives and scenarios are described in **Attachment A**.

Given the definition of committed programs used by Energy Commission staff, there are various degrees of expected overlap between the assumptions about each of these specific categories of program. The discussion that follows is a high-level assessment of the overlap or duplication that one might expect simply on the basis of a qualitative understanding of the Energy Commission's demand forecast methods and assumptions versus the analysis conducted by Itron for the *2008 Goals Study*. A more detailed discussion of the methods to adjust for overlap can be found in **Attachment A** of this report.

Utility Programs

The category of utility programs clearly presents opportunities for overlap with energy efficiency savings included in the *2009 IEPR* demand forecast. Energy Commission staff extensively modified its methods for computing savings from utility programs in the *2009 IEPR* cycle of analysis and extended the period considered committed out through 2012, consistent with D.09-09-047 adopted by the CPUC on September 24, 2009. The *2008 Goals Study* included savings from IOU programs beginning in 2006; so it would be reasonable to expect that some of the savings in the *2008 Goals Study* are now included within the Energy Commission *2009 IEPR* demand forecast, and that such savings are no longer appropriate to include in the analysis of incremental uncommitted programs.

Table 4: Overview of Energy Efficiency Initiative Scenarios Defined in the *2008 Goals Study*

Category of Initiative	Description	Scenario		
		Low	Mid	High
IOU Programs	Continuation of 2006-2008 program mix through 2020	Partial incentives	Partial incentives	Full incentives
Codes and Standards	Title 24 Building Standards ratcheted multiple times	Residential: 10% ratchet in 2014 only Commercial: 5% ratchet in 2014 only	Residential: 10% ratchet in 2011 and 2014 Commercial: 5% ratchet in 2011 and 2014	Residential: 10% ratchet in 2011, 2014, 2017 Commercial: 5% ratchet in 2011, 2014, 2017
	Federal appliance standards updated according to DOE schedule issued in 2006	Updates to standards for residential clothes washers, dishwashers, central AC and room AC; updates to standards for commercial packaged AC units	Same as Low	Same as Low
Big Bold Initiatives	Zero Net Energy level achieved by 2020 in residential and by 2030 in commercial new construction	Residential 60% Tier 2 25% Tier 3 Commercial 40% Tier 2	Residential 80% Tier 2 60% Tier 3 Commercial 55% Tier 2	Residential 100% Tier 2 90% Tier 3 Commercial 70% Tier 2
	HVAC standards modified to match "hot, dry" conditions	Accelerated penetration of SEER 15 AC units	Accelerated penetration of SEER 15 AC units	Accelerated penetration of SEER 15 AC units
Huffman (AB 1109)	Lighting measure efficiency increased according to adopted Title 20 standard	Low compliance	Mid compliance	Mid compliance

Source: *2008 Goals Study*

To separate net and gross impacts, utility program savings estimates in the *2008 Goals Study* incorporate naturally occurring savings through estimates of the extent to which customers would have adopted the same measures included within programs irrespective of the incentives and information distributed as a result of their operation. Price effects in the *2009*

IEPR demand forecast could overlap with these estimates of naturally occurring savings. Especially in the commercial building sector model, where price effects are pervasive in the design of the model, the Energy Commission's assumption that rates will increase 15 percent in real terms by 2020 leads to price-induced energy efficiency. The question is to what extent this price effect duplicates some portion of the naturally occurring savings estimated in the *2008 Goals Study*. This question is addressed in **Attachment A** and is summarized in **Chapter 5**.

Codes and Standards

The *2008 Goals Study* scenarios assumed periodic updates every three to six years to state Title 20 and 24 standards. The differences in overall savings across the three scenarios are based on the number of revisions through 2020 and the increase in severity of the standards in each revision. The first revision cycle was assumed to occur in 2008 and then in three- to six-year periods thereafter. The *2009 IEPR* demand forecast does not include the impacts of updated state standards beyond 2005, so there is no reason to believe that the impacts calculated as part of the *2008 Goals Study* are already counted within the Energy Commission's *2009 IEPR* demand forecast.

Future federal appliance standards for various residential and commercial building end uses were assumed in the *2008 Goals Study* scenarios, but not in the *2009 IEPR* demand forecast. Thus, there is no substantial reason to believe that energy efficiency savings from this source of impacts is duplicative.

Big Bold Initiatives

The Big Bold category consists of three individual initiatives—two of which involve new construction in both the residential and non-residential sectors and one encompassing heating, ventilation, and air-conditioning (HVAC) systems "tuned" to hot, dry climates. The new construction programs tighten efficiency standards for new construction in conjunction with on-site power generation (for example, photovoltaic systems) to achieve zero net energy use for individual sites. The three scenarios vary the proportion of new construction that is assumed to achieve this combination of lower energy usage and onsite generation. The *2009 IEPR* demand forecast includes a major penetration of rooftop photovoltaic, which is an ingredient of the Big Bold initiatives, but does not include the energy efficiency improvements that correspond to the Big Bold assumptions. Thus the *2009 IEPR* demand forecast cannot be assumed to incorporate the energy efficiency reductions that are part of the Big Bold strategies.

Lighting Reductions Required by AB 1109

Lighting is affected by state legislation adopted as AB 1109, calling for major reductions in residential and commercial lighting relative to consumption in 2007. Lighting is also affected by federal appliance standards that call for elimination of incandescent lighting in most

applications by 2012. As discussed above, the *2009 IEPR* demand forecast now includes significant reductions in residential lighting that reflect AB 1109 and federal legislation. Thus, the assumptions made in the *2008 Goals Study* for lighting are likely to be at least partially duplicative of lighting impacts already included within the *2009 IEPR* demand forecast. As a result, considerable care was devoted to understanding what Energy Commission staff assumed in the forecast, what Itron had assumed in the *2008 Goals Study*, what has happened since the AB 1109 legislation was enacted, and how to reconcile these considerations.

Overview of Qualitative Assessment Results

Table 5 provides an overview of the relative size of electricity energy savings in 2020 for all three electric IOUs that D.08-07-047 attributes to the mid-level scenario from the *2008 Goals Study*, and a qualitative assessment of the degree to which such impacts might already be considered committed in the *2009 IEPR* demand forecast. As the table reports, overlap could be expected in two of the four categories (shaded), which are also the two largest. **Chapter 5** and **Attachment A** provide the results of the in-depth assessment of this overlap, focusing on IOU programs and AB 1109 lighting measures.

Treatment of Savings Decay From Committed IOU Programs

Besides overlap, an additional category of adjustment—committed program savings decay in the *2009 IEPR* demand forecast—must be considered in developing incremental impacts to assess IOU procurement requirements. The concept of savings decay arises when an energy efficiency measure is installed, reaches an end to its useful life, and is replaced, but with a less efficient measure. This category stems from modeling differences between Itron's ASSET model[42] and the Energy Commission staff's demand forecast models.

As described earlier in this chapter, for the *2009 IEPR* demand forecast, staff obtained first-year savings data from programs and decayed the savings from these measures using standard decay formulas and measure lifetime assumptions from DEER. It is also possible that the replacement is equally or more efficient, in which, case there is no decay. The situation is further complicated by new building codes that may phase in over time. Forecasters must develop frameworks for simulating these situations. In the Energy Commission models, if a utility program is operating in the year in which decay takes place, the installed program measures are assumed to be going to new first savings, not decay replacement. In effect, the energy efficiency savings are assumed lost as measures decay. The aggregate consequence of such decay was shown in **Table 3**, where IOU program savings drop from a high value of 12,227 GWh in 2012 to 5,081 GWH in 2020.

42 Itron's ASSET model uses a behavioral framework to predict customer adoptions of efficiency measures from utility programs, based on cost, benefits, and awareness of measure availability. ASSET provides predictions of measure adoptions as input for the SESAT model, discussed in Chapter 4.

Table 5: Potential Duplication Between 2008 *Goals Study* Program Categories and Energy Efficiency Impacts Included Within *2009 IEPR* Demand Forecasts

Category of Initiative	Cumulative 2012–2020 Impacts (GWh)	Overlap with *2009 IEPR* Demand Forecast?
IOU Programs (and Naturally Occurring Savings)	8,508	*IEPR* demand forecast includes IOU program activities through 2012 and then the continued effects of the savings from such programs not decayed away in a future year. IEPR includes price effects resulting from 15% increase in rates. *2008 Goals Study* includes naturally occurring stemming from ASSET analyses.
Codes and Standards	2,880	*IEPR* demand forecast includes no state or federal standards beyond the T24 update in 2005
Big Bold Initiatives	1,252	*IEPR* demand forecast does not contain these new program initiatives
Huffman (AB 1109)	3,658	*IEPR* demand forecast includes savings that partially implement Huffman lighting reduction requirements
Total Market Gross	16,298	*IEPR* demand forecast includes at least some savings from the two AB 1109 and IOU Program categories of the *2008 Goals Study*

Source for 2020 Goal Savings: D.08-07-047 (Itron *2008 Goal Study* Mid Case)

In contrast, Itron's analysis for the *2008 Goals Study* assessed prospective IOU programs and associated decay using Itron's ASSET model. To track decay in ASSET, two phenomena are considered. First, in ASSET some measures are not allowed to revert back to pre-installation efficiency levels if the associated equipment investment does not make economic sense. For example, if a lighting measure funded in part by IOU subsidies converted incandescent sockets and bulbs to linear fluorescent tubes, the customer is not likely to remove the fluorescent fixture upon tube burnout, but simply replace the tubes. Second, even if this "hardwiring" of choices is not applicable, ASSET's choice algorithm allows a portion of the customers for which the measure is cost effective without a utility program subsidy to make the choice to install the measure. Some portion of customers will choose not to install at program end; so some savings is lost to decay, but not to the degree as in the Energy Commission forecast.

In addition, the Itron *2008 Goals Study* examined only the impacts of new program funding beginning in 2006; so it did not include savings decay from the entire historical period of utility program activity. Most measures have lifetimes that would not expose the majority of programmatic activity beginning in 2006 to measure decay before 2020. Therefore, replacement of decayed savings from committed programs was not a major issue in the *2008 Goals Study*.

The mandate in D.08-07-047 that IOUs achieve *cumulative* measure saving goals means that the utilities are likely faced with making up at least some portion of decay. This requirement, combined with the differences in analytic treatment of measure decay between Itron and the Energy Commission, means that an adjustment to savings loss in the *2009 IEPR* demand forecast from measure decay of committed program impacts accumulating through 2012 must be considered. This issue is discussed further in Chapter 5.

CHAPTER 4: Technical Approach

This chapter describes the approach used by Itron and Energy Commission staff to develop estimated incremental impacts of energy efficiency policy initiatives to be used to adjust the *2009 IEPR* demand forecast for use in forthcoming 2010 LTPP portfolio analyses. The specific methods used by Itron to recompute the *2008 Goals Study* scenarios are described in detail in **Attachment A**.

Overview of Approach

This analysis focuses on the technical specification of the program delivery mechanisms included in the *2008 Goals Study* and recomputes savings resulting from these policy initiatives, after adjusting for committed energy efficiency embedded in the *2009 IEPR* demand forecast. That is, because of likely overlap, the analysis does not rely simply upon subtracting the mid-level savings results adopted in D.08-07-047 from the demand forecast. Therefore, accounting for the impact of committed programs included in the *2009 IEPR* demand forecast is a foundational step.

Itron used the Scenario-based Energy Savings Analysis Tool (SESAT) for this analysis. SESAT is a spreadsheet-based model designed specifically for the analysis of wide-ranging efficiency scenarios embodied in the total market gross approach. SESAT was also used in the *2008 Goals Study*. The results of this analysis are based on matching Energy Commission demand forecast input assumptions and results with Itron's SESAT modeling assumptions and then preparing results for each of the three scenarios of the *2008 Goals Study*.

A fundamental issue is the extent to which a demand-side goal can be stated in absolute energy or peak terms when most demand-side opportunities are conditional on economic and demographic growth, the saturation of appliances and energy-consuming equipment, and a wide range of behavioral influences on equipment operation. Assumptions for these factors must be updated periodically, and it is therefore necessary to update the assumptions used to produce energy efficiency goals. Furthermore, as discussed earlier, initiatives that were considered uncommitted in prior forecasts often become committed over time as plans are approved and funded. Some initiatives evolve over time, modified or implemented in time frames that differ from the assumptions used to construct the goals. This means that estimates of measure savings, penetration, and many other types of input assumptions used to create initial energy efficiency goal estimates will need revision. Moreover, the further forward in time goals are focused, the greater the problem because of increasing uncertainty about underlying demand. The short-term forecasts implicitly underlying the three-year IOU authorization cycle have not had to confront this issue because, typically, there is relatively small range of uncertainty in economic and demographic activity projections three years forward. In addition, IOU programs have been dominated by retrofit of existing customer premises with modest

reliance upon savings that depend on economic growth, such as those from new construction programs.

However, the long-term goals established in D.04-09-040 and D.08-07-047 confront 10-year or longer time horizons, as do the assessments that are required of the IOUs in the LTPP rulemaking to provide procurement guidance. Over this time horizon, energy service demand in some market segments addressed by specific program designs in the *2008 Goals Study* could change appreciably. For example, the Energy Commission's commercial floor space projections in the *2009 IEPR* forecast are lower in every year compared to the values assumed in the *2007 IEPR* demand forecast and used in the *2008 Goals Study* (for example, 12 percent lower in 2012 and 6 percent lower in 2018). Clearly, projected service demand and, therefore, savings related to commercial new construction should be smaller compared to what was adopted in D.08-07-047.

Consequently, this analysis has been designed to reassess the impacts of the original program designs first quantified in the *2008 Goals Study*, adjusting not only for the penetration of committed efficiency measures encompassed within the *2009 IEPR* demand forecast, but also for changes in the key economic and demographic assumptions behind the forecast. The impacts resulting from this approach will be truly incremental to, and consistent with, the analyses in the base *2009 IEPR* demand forecast itself.

Methods

Background

For this analysis, the CPUC augmented a pre-existing contract with Itron to assist the Energy Commission in preparing both energy efficiency program savings for its baseline demand forecast and estimates of the incremental impacts of uncommitted energy efficiency initiatives. The quantitative work to identify potential overlap began in the spring of 2009 using the first of three iterations of the staff demand forecast.

The *2009 IEPR* demand forecast was finalized in three stages: (1) a draft demand forecast released in June 2009, (2) a revised demand forecast prepared in September 2009, and (3) a second, final revised demand forecast adopted by the Energy Commission as part of the *2009 IEPR*. Each of these iterations incorporates some degree of improvement in energy efficiency program impact assessment. Itron received data from all three demand forecast iterations; the draft and initial revised demand forecast results identified characteristics of the demand forecast that could be aligned to features of the SESAT model for comparing assumptions and results.

Upgrading and fully documenting the committed savings effort took longer than expected. In addition, the economic downturn and related uncertainties prompted Energy Commission staff,

at the direction of the IEPR Committee, to spend a significant amount of time developing alternative economic scenarios for the *2009 IEPR* demand forecast. Thus, this incremental impacts assessment is coming later in time than originally expected, although still in time for use within the 2010 LTPP rulemaking, which itself has suffered schedule slips.

Use of SESAT to Estimate Future Load Impacts

For the *2008 Goals Study*, Itron obtained various input data from the Energy Commission's *2007 IEPR* demand forecast and combined this with output data from runs of its ASSET model for IOU programs along with other assumptions to create SESAT. SESAT is a relatively simple model that develops estimates of savings from prospective energy efficiency initiatives quantified through reductions in projected end-use consumption. Although SESAT is relatively simple, careful preparation of the input assumptions can yield not only estimates of impacts of single programs but also of the combined effects of multiple initiatives influencing the same market sector/end use.

While not a demand forecasting model *per se*, SESAT bears some resemblance to an end-use forecasting model. Aggregate energy consumption in SESAT is the sum across all market sectors of each end use's energy consumption, which is calculated by multiplying estimated base year unit energy consumption by a saturation index for the future year relative to the base year and an intensity-of-use index for the future year relative to the base year, and multiplying this product by units of consumption (for example, number of households).

Table 6 extracts key equations used in SESAT to provide a better sense of its level of computations. A significant part of the effort for this analysis focused on updating the unit energy consumption (UEC) and energy use intensity (EUI) reduction assumptions in SESAT associated with the definitions of the various *2008 Goals Study* delivery mechanisms, given the committed savings impacts incorporated in the *2009 IEPR* demand forecast.

This analysis required that Itron update the basic drivers of service demand in SESAT—the projected number of residential households and amount of commercial building floor space—to match those developed by the Energy Commission staff for the *2009 IEPR* demand forecast. Itron also updated its end-use UEC and EUI assumptions to reflect changes the Energy Commission staff had made since the *2007 IEPR* cycle, including the effect of adding additional years of utility energy efficiency programs within the demand forecast definition of committed impacts, since IOU programs funded in 2009 and for 2010–2012 now meet the Energy Commission's criteria for being committed.

Table 6: Key Equations Defining the Computations in SESAT

Three identities define how SESAT computes total electricity energy requirements, one each for the three broad customer sectors.

$$\textit{Total residential energy use} = \sum_{ij} UEC_{ij} * SAT_{ij} * HH_j$$

$$\textit{Total commercial energy use} = \sum_{ik} EUI_{ik} * SAT_{ik} * FloorArea_k$$

$$\textit{Total industrial energy use} = \sum_{il} kWh_{il}$$

where: i = end use

j = residential building type

k = commercial building type

l = industrial subsector

UEC = unit energy consumption by end use i in building type j (kWh/household)

SAT = end-use saturation (%)

HH = total number of building type j

EUI = unit energy intensity by end use i in building type k (kWh/ft^2)

$FloorArea$ = floor area of building type k (ft^2)

kWh = annual consumption by end use i in subsector l (kWh)

The impacts of specific energy efficiency measures affect individual end uses in the residential sector as defined in the following equation. Commercial EUIs are affected in a similar manner.

$$UEC_{ijy} = UEC_{ijbase} * EffAdj_{ijy} * UseAdj_{ijy}$$

where: UEC_{ijy} = unit energy consumption for end-use i in building type j in year y

UEC_{ijbase} = unit energy consumption for end-use i in building type j in the base year

$EffAdj_{ijy}$ = technical efficiency for end-use i in year y relative to technical efficiency

Data Provided to Itron

Energy Commission staff provided three kinds of data and input assumptions from the *2009 IEPR* demand forecast in order to reduce inconsistencies between the inputs and assumptions used in SESAT for the *2008 Goals Study* and those used to prepare the adopted forecast:

- The residential and commercial sector economic/demographic projections used to prepare the final *2009 IEPR* demand forecast. Itron used these new projections to replace those included in SESAT as originally configured to prepare the *2008 Goals Study*.
- Energy efficiency savings estimates incorporated in the *2009 IEPR* demand forecast.
- Information resulting from special runs of the Energy Commission forecasting models to determine energy efficiency initiative and naturally occurring impacts subsequent to 2006 to match the *2008 Goals Study* benchmark.

Preparing Peak Demand Impacts

The majority of the analysis within SESAT is conducted using annual energy values. Once energy results have been obtained, their impacts on peak demand are computed using peak-to-energy ratios by end use. The data for this purpose were taken from the *2008 Goals Study* and from the *2009 IEPR* demand forecast. For ratios taken from the demand forecast, the first projected year (2009) was used as opposed to a specific historical year to avoid excessively high or low peak impact values that could result from actual weather conditions. A list of the peak-to-energy ratios used in this analysis is included in **Attachment A**.

Model Reconciliation

The modeling tools and input assumptions used in the *2009 IEPR* demand forecast and the *2008 Goals Study* are quite different in some respects, even though both approaches ultimately make use of highly detailed end-use/measure computations. Reconciling two such highly detailed sets of models was a formidable task. Since many of the model inputs for each approach by necessity come from estimates rather than actual recorded data, the decision on which of the alternative characterizations is most correct is somewhat arbitrary. Itron computed "calibration" results at the sector level, which satisfied the project team that the SESAT and Energy Commission models were in rough agreement.

Itron's ASSET model plays a key input role for SESAT, defining the results of hypothetical utility programs driven by alternative incentive levels, which is the category with the largest expected savings of the four categories in the *2008 Goals Study* shown in **Table 5**. In the review of historical IOU program first-year accomplishments and *ex post* measurement indicators that led to Energy Commission staff's assumptions for utility program savings through 2012, considerable differences with the ASSET projections were discovered. That is, there were differences in the pre-2013 period that could not be fully reconciled. In addition, SESAT includes a very small amount of savings not included in the *2009 IEPR* demand forecast from

the other three initiative categories prior to 2013. Therefore, the project team decided that incremental results would be computed as starting in 2013 and assumed no incremental impacts for the savings computed by SESAT in 2012. This "zero-basing" avoided the need to reconcile ASSET, SESAT, and the Energy Commission models prior to 2013. Charts in Attachment A show the size of this "gap" between ASSET/SESAT and *2009 IEPR* demand forecast savings from 2008–2012. This is a conservative approach that is intended to assure that savings attributable to the policy initiatives are not already included in the baseline demand forecast.

SESAT also incorporates naturally occurring savings estimates from ASSET. The modeling assumptions used in ASSET included constant electricity prices, while Energy Commission staff assumed 15 percent real price growth by 2020 in the *2009 IEPR* demand forecast. The resources required to rerun ASSET with a comparable price projection were beyond the scope of the budget for this project, so naturally occurring savings estimates from the *2009 IEPR* demand forecast were incorporated in the analysis.[43]

Itron generally resolved questions of "calibrating" SESAT to the *2009 IEPR* demand forecast by comparing its end-use reductions to those included in the Energy Commission demand forecast. By focusing on percentage reductions in end-use usage values through time, Itron minimized the impact of differences in their absolute UECs and EUIs with those in the underlying *2009 IEPR* demand forecast.

Despite these attempts to reconcile the two models, there are differences that could not be resolved in the time frame for this analysis. Some limitations to the results reported in the next chapter are based on differences between Itron and Energy Commission models. As explained in more detail in **Attachment A**, the computation of incremental savings takes a conservative approach intended to assure savings attributable to the policy initiatives are truly incremental to the demand forecast.

Annual Impacts

SESAT and Energy Commission forecasting models have quite different architecture with respect to individual years within the analysis:

- SESAT devotes the majority of its assessment to the 2020 (or other target years), and only in a secondary assessment converts the 2020 impacts into a time series of impacts. In contrast, the Energy Commission models compute each year individually, providing results for every

43 Note that the concept of naturally occurring savings differs slightly between ASSET and the Energy Commission demand forecasting models. ASSET estimates naturally occurring savings by simulating the level of measure adoption that customers would have made with no incentive programs. Such customer adoptions are assumed to take place according to the behavioral parameters to which the model is benchmarked along with the technical range of measure efficiencies that are input to the model. No comparable measure-specific determination of naturally occurring savings is possible within the Energy Commission demand forecast models. In addition, the Energy Commission models incorporate two types of price response: increased efficiency investment and reduced usage. ASSET incorporates only increased efficiency.

year through the forecast time horizon. Adapting SESAT to operate annually was beyond the scope of this project.

- The implication of this limitation in SESAT is that there is an additional element of uncertainty about the precise pattern of annual savings between 2012 and 2020.

Building and Appliance Vintaging

Although the market segments of SESAT and the Energy Commission demand forecasting models align reasonably well, SESAT uses a much simpler vintaging (age) structure than does the Energy Commission. Some specific differences were not fully resolved:

- Energy Commission models use annual vintages from 1975 through 2020 while SESAT has a two-vintage structure—existing and new, starting in 2006.
- Energy Commission models carefully track the survival of commercial floor space or housing stock in years beyond 2006 and take into account the age structure of these inputs. SESAT cannot track age structure within the "existing" vintage.
- Energy Commission models simulate appliance and equipment survival using decay functions nested within housing and commercial building age while SESAT does not. This is especially important for HVAC end uses where there are strong interactions between appliance efficiency and building shell characteristics that affect actual end-use energy consumption.
- The implication of this difference in model structure is that the exposure to mandatory standards over time is approximated in the SESAT analysis, compared to a more precise savings computation in the Energy Commission models.

Decayed Measure Savings Induced by IOU Incentive Programs

The Energy Commission and Itron modeling approaches have a quite different treatment of measuring "replacement on burnout," as discussed in **Chapter 3**.

Analyses documented in this report and its attachments sought to eliminate the issue of overlap by preparing savings estimates that are explicitly incremental to the baseline demand forecast. The consequence of the modeling differences described above means that there are a few remaining uncertainties about the degree of overlap between the energy efficiency impacts within the *2009 IEPR* staff demand forecast and the uncommitted impacts estimated with SESAT. It is not possible at this point to describe the overall impact of the differences described above. However, the majority of analytic issues related to overlap, including timing of program initiatives and consistency between the underlying forecast assumptions in the *2009 IEPR* and the incremental efficiency analysis, were resolved.

Computing Incremental Impacts From SESAT Scenario Results

SESAT produces a series of scenario outputs in which the input characteristics of the scenario, which affect estimated UECs and EUIs, produce a different set of end-use results. These reductions are net of UEC and EUI impacts related to savings embedded in the *2009 IEPR* demand forecast, so there is no overlap with committed savings. For example, the residential refrigerator end-use savings from proposed federal appliance standards is computed as percentage change in refrigerator UECs above and beyond those already assumed in the *2009 IEPR* demand forecast. The results for each such scenario are then incremental to savings incorporated in the demand forecast.

As discussed above, the incremental results were computed as starting in 2013, zero-based to the impacts computed by SESAT in 2012. This reduces the incremental impacts compared to what they would have been had the raw SESAT results been used, but also avoids the need to reconcile the two models and their respective sets of input assumptions.

This adjustment has little impact on two of the four categories—Title 24 and federal standards and Big Bold initiatives – but diminishes the incremental savings from AB 1109 and from IOU programs. Of these two categories, the IOU programs are affected the most. However this is the category with the greatest propensity for misalignment between the two models and their vintages of input assumptions.

In eliminating some of the raw SESAT results for IOU programs, the project team acknowledges unresolved differences in computing incremental savings. Efforts to prepare incremental impacts of uncommitted policy initiatives in future IEPR and LTPP cycles should benefit from lessons learned from this analysis and result in closer coordination and less need to impose methods like zero-basing to a future year to reduce concerns about inconsistency.

CHAPTER 5: Results of Incremental Energy and Peak Savings Projections

This chapter summarizes the incremental savings impacts estimated for each of the three scenarios of hypothetical initiatives defined within the *2008 Goals Study*. More detailed results are included in the Itron technical report attached as **Attachment A** of this report. The peak and energy impacts of the three scenarios can be subtracted directly from the *2009 IEPR* demand forecast as part of the effort[44] to develop three managed demand forecasts for use in the 2010 LTPP proceeding.

Results by Savings Scenario

Table 7, Table 8, and Table 9 show estimated incremental uncommitted savings for the low, mid, high scenarios, respectively, for the IOUs combined. Individual utility results by year are given in **Attachment A**. **Figure 2** shows mid-case incremental energy savings in graphical form. Characteristics of the different cases were given in **Table 4**; more details are provided in **Appendix A**.

In 2020, IOU utility programs produce the highest levels of incremental energy savings in each scenario, followed by AB 1109 in the low case and the Big Bold initiatives in the mid and high cases. More aggressive utility program efforts in the mid and high scenarios reduce the impact from AB 1109 compared to the low scenario—a significant portion of savings in the low case from AB 1109 are credited to utility programs in the mid and high cases. Big Bold initiatives claim the highest peak savings in the low and high cases and yield virtually the same savings as utility programs in the mid case. These initiatives gain in relative importance for peak because of their HVAC impacts.

44 Energy Commission staff understands the CPUC/ED July 1, 2009, straw proposal in the 2008 LTPP rulemaking to assume that several categories of "incremental" impacts will be used to adjust the baseline demand forecast of the *2009 IEPR* to produce one or more managed demand forecasts. Other categories of adjustment include: demand-response programs, combined heat and power program impacts, and other distributed generation impacts. Thus, energy efficiency is just one of several programmatic adjustments to produce a managed demand forecast that becomes the basis for supply-side portfolio assessments.

Table 7: Electricity Energy and Peak Demand Impacts Incremental to *2009 IEPR* Demand Forecast for Combined IOUs: Low Savings Scenario

Low Goals Case	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Energy Impacts (GWh)								
IOU programs	642	1,258	1,853	2,376	2,920	3,431	3,940	4,448
Huffman Bill (AB 1109)	740	785	645	1,220	2,213	3,224	3,653	3,602
Title 24 & Fed Standards	28	75	143	261	380	516	656	798
Big Bold Initiatives	163	333	549	776	1,013	1,267	1,533	1,809
Total GWh	**1,573**	**2,452**	**3,191**	**4,632**	**6,526**	**8,439**	**9,782**	**10,658**
Peak Impacts (MW)								
IOU programs	189	373	554	723	895	1,063	1,230	1,396
Huffman Bill (AB 1109)	102	110	93	172	307	445	504	498
Title 24 & Fed Standards	16	35	66	162	260	368	477	588
Big Bold Initiatives	132	271	455	647	849	1,073	1,308	1,552
Total MW	**439**	**788**	**1,168**	**1,705**	**2,312**	**2,949**	**3,518**	**4,034**

Source: Itron and California Energy Commission, 2009

Table 8: Electricity Energy and Peak Demand Impacts Incremental to *2009 IEPR* Demand Forecast for Combined IOUs, Mid Savings Scenario

Mid Goals Case	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Energy Impacts (GWh)								
IOU programs	1,050	2,055	3,017	3,847	4,716	5,521	6,325	7,126
Huffman Bill (AB 1109)	345	302	163	430	941	1,469	1,678	1,628
Title 24 & Fed Standards	55	133	254	437	624	844	1,071	1,304
Big Bold Initiatives	194	397	655	926	1,209	1,516	1,835	2,167
Total GWh	**1,644**	**2,888**	**4,089**	**5,640**	**7,490**	**9,350**	**10,909**	**12,225**
Peak Impacts (MW)								
IOU programs	284	560	830	1,081	1,336	1,583	1,830	2,075
Huffman Bill (AB 1109)	49	46	29	67	137	210	240	234
Title 24 & Fed Standards	36	76	143	294	448	623	803	987
Big Bold Initiatives	175	358	602	857	1,123	1,421	1,732	2,056
Total MW	**544**	**1,039**	**1,604**	**2,298**	**3,045**	**3,839**	**4,605**	**5,352**

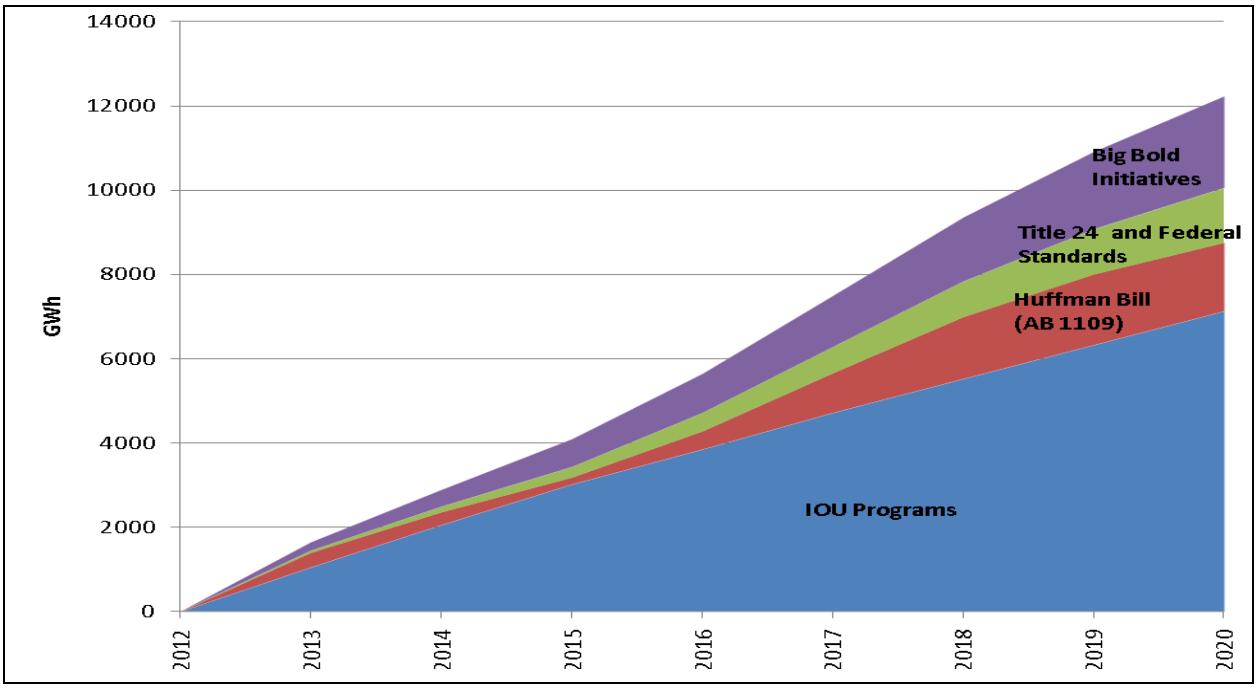
Source: Itron and California Energy Commission, 2009

Table 9: Electricity Energy and Peak Demand Impacts Incremental to *2009 IEPR* Demand Forecast for Combined IOUs, High Savings Scenario

High Goals Case	2013	2014	2015	2016	2017	2018	2019	2020
Energy Impacts (GWh)								
IOU programs	1,050	2,055	3,017	3,847	4,716	5,521	6,325	7,126
Huffman Bill (AB 1109)	514	509	369	768	1,486	2,220	2,524	2,473
Title 24 & Fed Standards	79	187	356	606	864	1,168	1,482	1,805
Big Bold Initiatives	266	544	899	1,271	1,659	2,078	2,515	2,970
Total GWh	**1,910**	**3,296**	**4,642**	**6,492**	**8,724**	**10,988**	**12,845**	**14,374**
Peak Impacts (MW)								
IOU programs	284	560	830	1,081	1,336	1,583	1,830	2,075
Huffman Bill (AB 1109)	72	74	57	112	211	312	355	349
Title 24 & Fed Standards	43	92	173	365	560	782	1,009	1,241
Big Bold Initiatives	241	492	827	1,177	1,543	1,951	2,377	2,820
Total MW	**640**	**1,217**	**1,887**	**2,735**	**3,651**	**4,629**	**5,570**	**6,484**

Source: Itron and California Energy Commission, 2009

Figure 2: Uncommitted Energy Impacts Incremental to *2009 IEPR* Demand Forecast for Combined IOUs, Mid Savings Scenario



Source: Itron and California Energy Commission, 2009

Table 10 compares IOU-specific and total results in 2020 with the service area energy and peak forecasts from the *2009 IEPR* demand forecast and shows the percentage of projected demand forecast load growth represented by the total incremental energy and peak savings. For example, in the low savings scenario for PG&E, 56 percent of projected energy growth from 2008-2020 would be avoided by estimated incremental uncommitted savings.

Table 10: Incremental Uncommitted Savings in 2020 and Impact Relative to Energy Commission *2009 IEPR* Forecast by Service Area

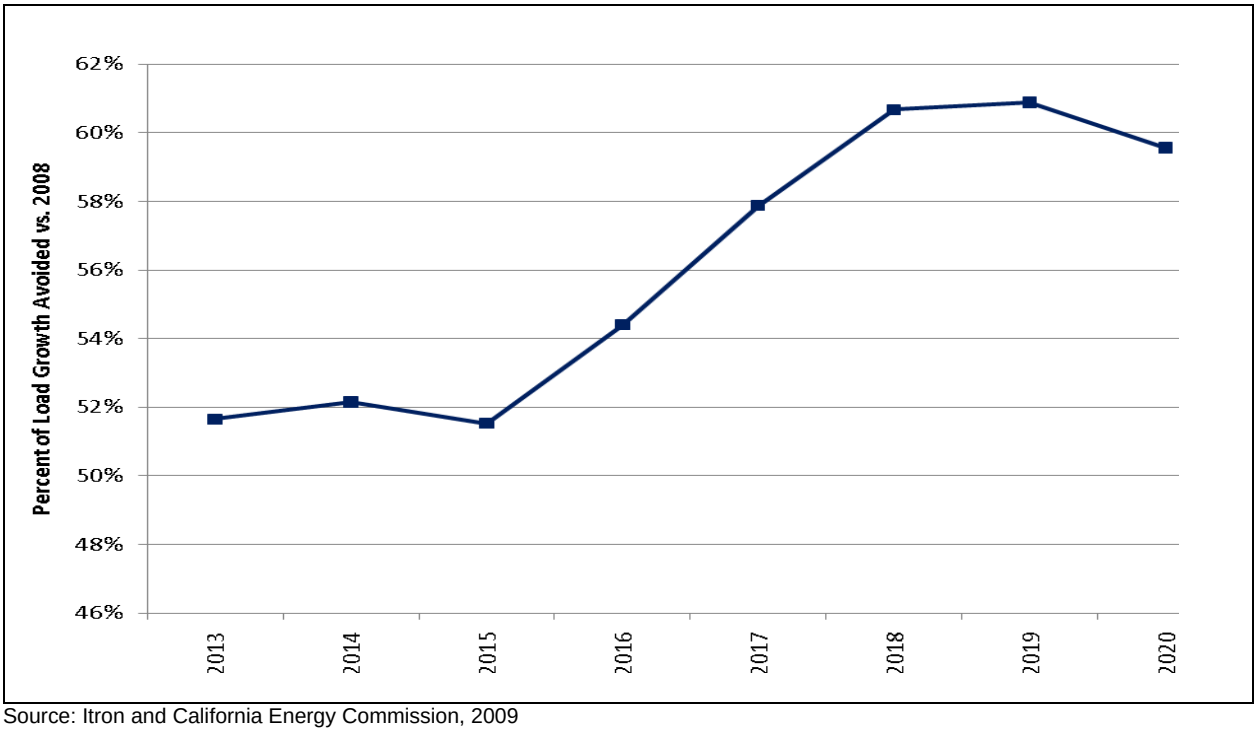
		2009 IEPR Forecast		2020 Incremental Uncommitted Impacts			Percent Load Growth Avoided		
Utility	Units	2008	2020	Low	Mid	High	Low	Mid	High
PG&E	Energy (GWh)	88,359	96,612	4,634	5,130	6,087	56%	62%	74%
	Peak (MW)	20,204	22,683	1,731	2,245	2,722	70%	91%	110%
SCE	Energy (GWh)	90,009	97,995	4,971	5,874	6,848	62%	74%	86%
	Peak (MW)	20,262	24,146	1,941	2,593	3,160	50%	67%	81%
SDG&E	Energy (GWh)	20,623	23,102	1,091	1,222	1,440	44%	49%	58%
	Peak (MW)	4,371	5,157	363	514	602	46%	65%	77%
Total IOUs	Energy (GWh)	198,991	217,709	10,658	12,225	14,374	57%	65%	77%
	Peak (MW)	44,837	51,986	4,034	5,352	6,484	56%	75%	91%

Source: Itron and California Energy Commission, 2009

For SCE and PG&E, incremental uncommitted savings reduce load growth by at least one-half in all three scenarios and by over 70 percent in the high case. Peak demand in the PG&E service territory is reduced by a greater percentage than in the SCE territory as a result of a different mix of utility programs combined with lower projected peak growth. Percentage reductions in load growth are lowest for SDG&E, a function of lower relative impacts from the Big Bold initiatives (see **Attachment A** for details) and higher projected energy and peak demand growth.

Note that, as reflected in **Table 7, Table 8,** and **Table 9**, the pattern of expected impact is weighted toward the end of the forecast period, so that there is a lower percentage impact on load growth earlier in the forecast period compared to later years. **Figure 3** shows the percentage of projected energy growth relative to 2012 avoided for the three IOUs combined from the incremental uncommitted savings for the mid scenario. The percentage rises sharply between 2015 and 2018, largely a result of growing impacts from Title 24 and federal standards and the Big Bold initiatives.

Figure 3: Percentage of Energy Load Growth Avoided Relative to 2012, Mid Savings Scenario, Three IOUs Combined

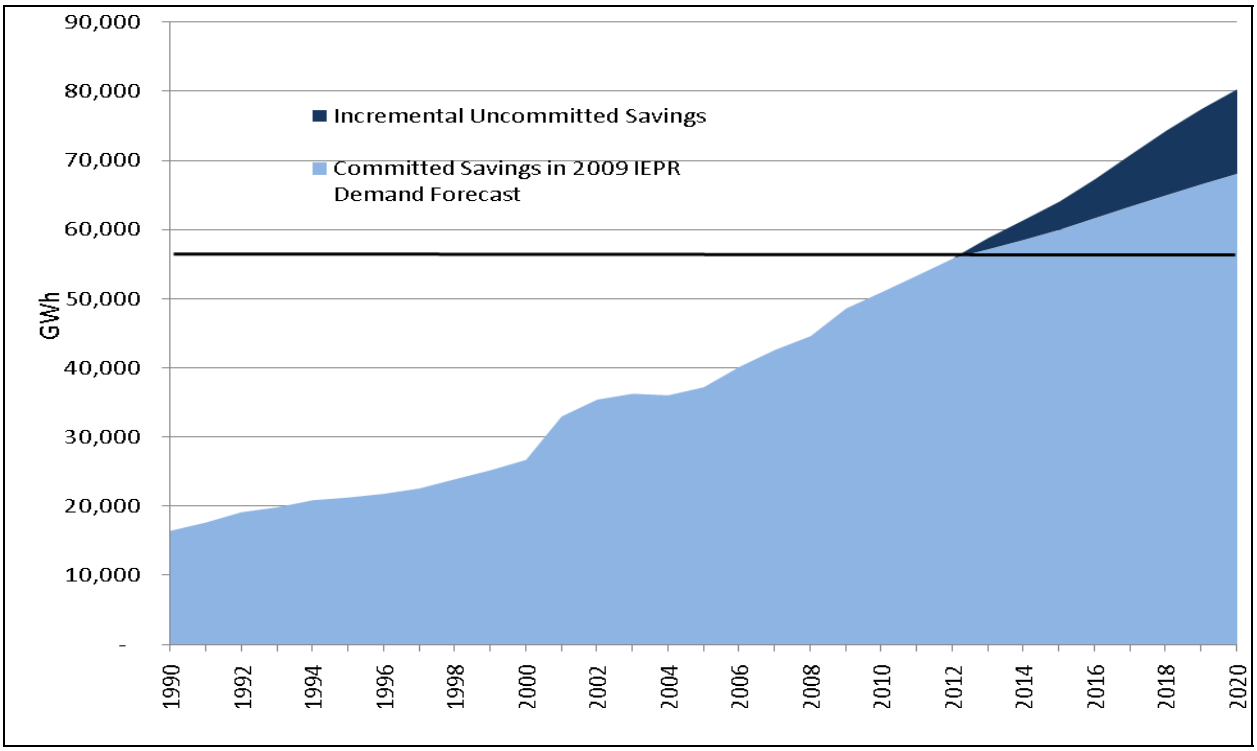


Source: Itron and California Energy Commission, 2009

For perspective and comparison, **Figure 4** shows the incremental energy savings from the mid case for the three IOUs combined, stacked on top of the committed energy savings from the *2009 IEPR* demand forecast. The figure shows all of the historical/committed savings embedded in the demand forecast, accumulating since 1975, including impacts from programs, codes and standards, and naturally occurring savings.[45] The thick black line in the middle of the figure allows a comparison of the incremental uncommitted savings in this scenario with committed savings accumulating from 2012 onward: By the end of the forecast period, incremental uncommitted savings roughly match additional committed savings.

45 Note that this figure is not directly comparable with similar figures in Attachment A, since the figures in the attachment omit Energy Commission savings from codes and standards—these savings from standards already included in the 2009 adopted demand forecast were left out to highlight the analysis of incremental savings that Itron undertook. In addition, savings shown in the attachment are incremental to 2006.

Figure 4: Comparison of Incremental Impacts in the Mid Savings Case of *2008 Goals Study* Policy Initiatives to *2009 IEPR* Committed Savings, Three IOUs Combined



Source: Itron and California Energy Commission, 2009

Impacts of Historical Measure Decay on IOU Program Savings

As noted at the end of Chapter 3, the method of including IOU energy efficiency program impacts in the *2009 IEPR* demand forecast results in a loss of savings through measure decay that is not replaced. The CPUC needs to determine whether the prior energy efficiency goal-setting decisions outlined in **Attachment B** require that some portion of these decayed savings be replaced by IOUs and, if so, what proportion. Assuming fully replacing such decayed savings becomes a requirement, **Table 11** provides annual values that should be used as an estimate of the aggregate "lost" savings for each IOU in each year following 2012. These estimates were developed by subtracting the *2009 IEPR* demand forecast IOU program savings for 2013-2020 from the 2012 program savings.

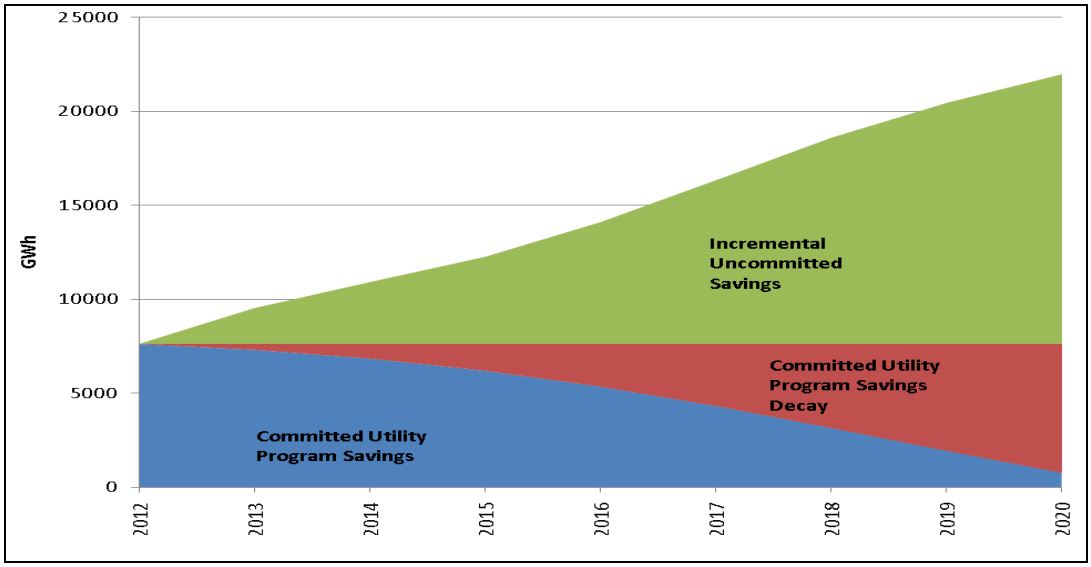
Table 11: IOU Program Savings "Lost" Through Measure Decay Without Replacement

	PG&E		SCE		SDG&E	
Forecast Year	Energy (GWh)	Peak (MW)	Energy (GWh)	Peak (MW)	Energy (GWh)	Peak (MW)
2013	379	79	250	64	56	12
2014	766	163	532	137	121	25
2015	1,167	255	858	225	193	41
2016	1,589	358	1,234	332	272	59
2017	2,041	473	1,657	455	355	77
2018	2,522	598	2,111	588	442	97
2019	3,018	727	2,573	723	531	117
2020	3,505	853	3,020	854	621	137

Source: California Energy Commission, 2009

Figure 5 provides a graphical interpretation of these "lost" savings. Incremental uncommitted energy savings from the mid savings scenario is stacked on top of cumulative committed utility program savings and associated decay from the *2009 IEPR* demand forecast. The figure shows the magnitude of savings lost to decay relative to incremental uncommitted savings. If it is determined that the IOUs are responsible for making up for some or all of this decay, this would constitute an additional adjustment to the *2009 IEPR* demand forecast. The effect would be to subtract additional energy efficiency savings, thereby further reducing forecasted demand in a managed forecast compared to the adopted *2009 IEPR* demand forecast.

Figure 5: Comparison of Savings "Lost" Through Measure Decay Compared to Impacts From the Mid Savings Scenario, *2008 Goals Study* Policy Initiatives



Source: Itron and California Energy Commission, 2009

CHAPTER 6: Conclusions, Caveats, and Recommendations

Conclusions

This analysis is meant to provide a directly useful product to the CPUC for use in the 2010 LTPP rulemaking, as requested by the CPUC in earlier decisions and rulemaking scoping memos. The results of the analysis give incremental impacts of specified efficiency initiatives taken directly from the *2008 Goals Study*, which was the basis for the adopted energy savings goals included in D.08-07-047 and modified subsequently as described in **Attachment B**. Adjustments to the *2008 Goals Study* have been made to account for the updated economic and demographic projections used in the *2009 IEPR* demand forecast and for the increased amount of energy efficiency impacts now embedded within the demand forecast, due both to inclusion of now-committed IOU programs through 2012 as well as from improved estimates of savings from IOU programs through 2008.

For the three IOUs combined, estimated incremental uncommitted energy savings in 2020 total between 10,700 GWh and 14,400 GWh; 2020 peak savings total between 4,000 MW and 5,400 MW. These savings would reduce projected energy growth from 2008-2020 by between 57 and 77 percent and projected peak demand growth by between 56 and 91 percent. Savings impacts are weighted toward the last years in the forecast period. The CPUC may choose to adjust these estimates based on the discussion of committed savings decay given in **Chapter 3** and **Chapter 5**.

The three sets of scenario impacts correspond to different groupings of proposed program initiatives, which can be thought of as reflecting policy uncertainty. Other uncertainties, of a technical nature, have not been quantified, although they have been acknowledged in **Chapter 4**. Except possibly for the treatment of loss of savings through measure decay, this analysis requires no further adjustments to be used, along with other demand side policy adjustments, to produce a managed demand forecast as proposed by the CPUC/ED staff.

Caveats

Three alternative scenarios are presented, with the decision about which case to use in the LTPP process left to the CPUC. However, there is no assurance that efficiency savings from any of the three scenarios will be realized. Even the low case requires that various state and federal entities continue to pursue energy efficiency activities under their jurisdiction in what historically is considered an aggressive approach.

On the one hand, the effort to continue increasing efficiency may grow more difficult through time as future initiatives exhaust the "low-hanging fruit." On the other, even though they have not been quantified, there are additional energy efficiency savings that may be accomplished through time across the entire range of delivery mechanisms. For example, the Energy Commission adopted television standards in late 2009, and the savings from such standards are not included within the scope of the state or federal standards evaluated in this project.

The use of scenarios defined through alternative policy initiative assumptions is a key element in incorporating uncertainty about future uncommitted program impacts. This uncertainty reflects in part the question of whether future policy makers will enact the standards and other programs required to achieve ever higher levels of cumulative savings. Commissions and boards typically resist making commitments binding on future commissioners and board members, yet the uncommitted program initiatives that are the basis for the *2008 Goals Study* presume that IOU programs will be continue to be funded at current or higher costs, that the Energy Commission will continually ratchet building standards tighter with each three-year update cycle, and that the Big Bold concepts will actually be enacted on schedule and to an extent comparable to that quantified in the *2008 Goals Study*.

There are other dimensions of uncertainty that have not been fully explored in this analysis. Decision makers should be aware of the following:

- IOU program impacts constitute a large percentage of total future efficiency savings, and they rely upon voluntary decisions by end users to participate. Unprecedented levels of participation are projected, levels which depend on many factors, including the state of the economy.
- The Energy Commission's *2009 IEPR* demand forecast assumes a 15 percent increase in retail prices by 2020, and some impact via price elasticity is included in the base demand forecast. However, it is easily conceivable that retail prices could rise by 30 percent or more in the next 10 years, which would mean more naturally occurring savings and raises the possibility that, given the CPUC's total market gross approach, presumed programmatic activity could be scaled back.

In general, decision makers must consider the implications of efficiency-induced projections of very low or even negative energy and peak demand growth through 2020. While the *Energy Action Plan* loading order emphasizes cost-effective energy efficiency as California's first choice to meet demand growth, relying solely on these resources for long-term resource adequacy is uncharted territory. If decision makers postpone decisions to invest in supply-side resources and energy efficiency fails to deliver as forecasted, then serious reliability (and cost) consequences could result, unless such shortfalls have been anticipated and contingency actions identified.

Recommendations

Energy Commission staff recommends the following:

- In further goal-setting proceedings, goals should be described with reference to a baseline projection or set of assumptions. This will make clearer the incremental impacts of such goals above similar impacts already included in the baseline.
- The CPUC should use the projections of incremental uncommitted initiative impacts developed in this report as one of several adjustments to the adopted *2009 IEPR* demand forecast to develop three separate managed demand forecasts to use as the basis for portfolio analyses in the forthcoming 2010 LTPP proceeding.
- To the extent that separate models (such as the Energy Commission's demand forecasting models and Itron's SESAT) are used in subsequent analyses to determine the incremental impact of hypothetical policy initiatives, then somewhat better coordination of primary input assumptions should be made, such as rerunning all models with a common set of price projection assumptions.
- The Energy Commission staff should continue to develop a capability for making incremental uncommitted energy efficiency projections for use in the *2011 IEPR* proceeding, CPUC 2012 LTPP proceedings, ARB efforts to assess options for satisfying the GHG emission reduction requirements of AB 32, and related inquiries. This capability will require further coordination of modeling methodologies and assumptions between those used to prepare baseline demand forecasts and those used to estimate the incremental impacts of uncommitted policy initiatives. In turn, such efforts depend upon appropriate staffing and data collection activities.

APPENDIX A: Glossary Of Terms

Introduction

This glossary of terms briefly defines key general concepts and terms arising in the *Incremental Effects of Energy Efficiency Policy Initiatives* report. The purpose of these general definitions is to help policymakers and others in interpreting information provided in this report that employs technical language. It is the initial product of a much more involved consideration of taxonomic issues related to reconciling models and more generally adopting common language between forecasting and energy efficiency.

To adequately interpret the information in this report, policy makers and others must also appreciate that these brief general definitions are not the same as the much more detailed technical definitions that are used to operationalize models in conjunction with available data in order to derive quantitative estimates of the naturally occurring and incremental energy efficiency saving impacts. A concentrated effort was made to present and compare technical operational definitions for the models described in this report, but the barriers cited below were not overcome, and consequently developing meaningful conceptual definitions became the focus of this effort. Future modeling exercises or modifications should strive to have common operational and conceptual definitions from initiation of the analyses through completion.

The distinction between general conceptual and more detailed operational definitions is important because the quantitative estimates in this report are derived from more than one model, each of which has different operational definitions. For example the CED and Asset models each have different operational definitions for a number of the basic terms such as, base year, naturally occurring savings, free ridership, and energy efficiency, that are defined conceptually below.

These different operational definitions come about because the model builders had to adapt to the differences that they confronted at the time of their model construction with respect to the practical limits of available data and the different purposes their models were originally intended to serve.

The reader should be forewarned that such differences in the detailed definitions are conducive to the creation of problems such as the possible overlap and other possible inconsistencies between incremental savings from one model and embedded savings in the other.

This report represents an attempt to cope with these potential problems of inconsistency between models and coordination of the Energy Commission and Itron modelers involved. It should nevertheless be noted that the differences in operational definitions preclude the resolution of such lurking inconsistencies by means of explicit formal modeling approaches. Instead, the information provided in this report results on reliance on an inherently less

transparent use of collaborative professional judgment on the part of the Energy Commission and Itron modelers.

In addition to reconciling these two specific models it was also revealed, through review of several leading resource documents, that the terms that are so commonly used in describing energy efficiency are not consistent or defined in a meaningful way. If energy efficiency is to be an essential resource, the terminology used needs to be tight enough to accurately describe the resource and should continue to be refined.

Terms

Attribution

The process of identifying the fraction of energy savings in a given market or end use that is estimated to be solely caused by (or *attributed to*) a specific policy or program.

Base Year

A reference year used in forecasting models that can be used for calibrating to existing historical data or calibrating to another model, or to characterize changes over time (that is, changes are expressed relative to values in the base year), or some combination of those purposes.

Committed Savings (or Committed Load Impacts)

The energy and demand savings from energy efficiency policies or programs that have been implemented or for which funding has been approved and some form of program and/or implementation plan developed. *Committed savings* includes all explicit energy efficiency impacts in the base demand forecast, including utility programs, implemented building and appliance standards, public agency programs, and naturally occurring savings.

Cumulative Load Impacts

The accumulation or sum of the annual load impacts from energy efficiency programs or policies over the lifecycle of energy efficiency measures for a specific period. Cumulative impacts include the first year impacts of new programs or policies plus the residual impacts from measures installed in prior years minus any decay using estimates of annual measure savings and effective useful life.

Delivery Mechanism

A method by which demand-side measures can be promoted or introduced to the end user either voluntarily through programs or through mandates. This includes but is not limited to utility programs, building codes, and appliance standards.

Energy Efficiency Initiative

Any policy-related effort to increase energy efficiency. Includes utility programs, building codes, appliance standards, and other efficiency-related legislation and ordinances.

End Use

An activity or process for which energy is used to accomplish a specific purpose. For example, end uses include cooking, lighting, space conditioning and clothes washing/drying.

End Use Intensity

The average energy use for an end use. The intensity measurement may differ depending on the sector in question (for example, per square foot of floorspace for commercial lighting or refrigeration; or per unit of production for agricultural pumping or industrial process).

Energy Efficiency

Using less energy to perform the same function or provide the same or an improved level of service to the energy consumer.

Energy Savings

The load impacts (energy and demand) resulting from naturally occurring savings, building codes and appliance standards, and energy efficiency programs or policies.

Energy Service

The desired level of benefit obtained from using energy for purposes such as such as heating, cooling, refrigeration, or operating appliances.

Free-Ridership Rate

An estimate of the fraction of energy efficiency savings arising from program participants who would have implemented the program measure or practice even in the absence of the program.

Incremental Savings

The energy and demand savings from energy efficiency policies or programs that were identified in the CPUC's *2008 Energy Efficiency Goals Update* report but for which funding has neither been approved nor an implementation plan developed, net of any overlap with committed savings included in the *2009 IEPR forecast*. *Incremental savings* are associated with uncommitted programs or policies, and are not included in the Energy Commission's base demand forecast. They are therefore considered incremental to that forecast.

Incremental Savings Projection

The analytic characterization of energy and demand impacts resulting from uncommitted energy efficiency delivery mechanisms defined as part of the *2008 CPUC Energy Efficiency Goals Update Report* and D.08-07-047, net of any overlap with committed savings included in the base

demand forecast. Three sets of projected incremental impacts on electricity demand (low, medium and high assumptions for energy efficiency, corresponding to three scenarios developed as part of the CPUC's *Energy Efficiency Goals Update Report*) will be used to modify base demand forecasts obtained from the *2009 IEPR*. The projection is being developed for the CPUC's 2010 Long Term Procurement Plan (2010 LTPP).

Managed Demand Forecast

A *managed demand forecast* describes the peak and energy demand that results from decrementing the results of an external analysis such as the incremental-uncommitted energy efficiency projection from the baseline demand forecasts published in the Energy Commission's *IEPR*. Conversely, an "unmanaged" demand forecast refers to a base forecast. Note that there could be multiple types of managed forecasts, wherein one or more sets of activities (for example, preferred resources such as energy efficiency, self-generation, demand response, and so forth) are added to, or more commonly, subtracted from a base forecast.

Naturally Occurring Savings

Naturally occurring savings are energy savings that are independent of specific programs or standards effects, caused instead by the combination of customer energy conservation choices and supplier product mix and development choices that result from interacting forces of market supply and demand, which, in turn, respond to changes in societal norms, prices, and other energy product information.

Overlap

A phenomenon wherein projections of uncommitted energy efficiency savings may coincide with or *overlap* committed savings already included in the base forecast. Overlap is especially likely to happen when one model and set of assumptions are used to prepare a base forecast, and another model and set of assumptions is used to develop uncommitted savings, with little or no coordination between the two efforts.

Program Net Savings

Program net savings in the context of this report refers to load impacts or savings from energy efficiency programs sponsored by the CPUC and implemented by the investor-owned utilities and their contractors, adjusted for estimates of free-ridership.

Total Market Gross Savings

A term coined in the CPUC's *2008 Energy Efficiency Goals Update* report to describe total savings impacts from key programs, policies and market forces relative to a base year. "Total market" refers to policy initiatives beyond those historically pursued through CPUC-sponsored utility programs. "Gross" means that ancillary consequences of programs, such as free-ridership and spillover, would be counted as savings.

Uncommitted Savings

The estimated future energy and demand savings from energy efficiency policies or programs for which funding has not yet been approved and/or an implementation plan developed. *Uncommitted savings* are associated with uncommitted programs or policies, and therefore are not included in the Energy Commission's base demand forecast. In this report, the uncommitted savings measured are those from initiatives that were identified in the *CPUC's 2008 Energy Efficiency Goals Update* report.

Unit Energy Consumption (UEC)

The average energy use for an end use, per unit of measurement (usually a residential dwelling) in a given year, for use in forecasting models. *Unit energy consumption* tends to be used as an analytic term when modeling impacts from appliances and equipment in the residential sector (for example, residential refrigerators), and describes the average consumption per unit (for example, dwelling unit) for a particular end use within the forecast area in a given year.

ATTACHMENT A: Technical Report
Incremental Impacts of Energy Efficiency Policy Initiatives Relative to the *2009 Integrated Energy Policy Report* Adopted Demand Forecast

This consultant report is available as a separate volume. Please download that report at:

www.energy.ca.gov/2010publications/CEC-200-2010-001/index.html

ATTACHMENT B: History of California Public Utility Commission Goals for Energy Efficiency[46]

California Public Utilities Commission

Energy Division

Energy Efficiency

Original Goals Decision: D. 04-09-060; September 23, 2008

http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/40212.pdf

The original goals decision established goals for 2004-2013 based on the Secret Surplus potential study[47]. In addition a Statewide Goals Study prepared by CEC staff was used identify achievable potential and establish the adopted goals.[48]

> *". . . today's adopted savings goals reflect the expectation that energy efficiency efforts in their combined service territories should be able to capture on the order of 70% of the economic potential and 90% of the maximum achievable potential for electric energy savings over the 10-year period based on the most up to date study of that potential. These efforts are projected to meet 55% to 59% of the IOUs' incremental electric energy needs between 2004 and 2013. .. . For natural gas, our adopted savings goals are designed at this time to capture approximately 40% of the maximum achievable potential identified in the most recent studies of that potential." p. 2-3*

In the decision the goals are identified as stretch goals, but consistent with the findings of the most currently available potential study. It also established the definition of cumulative savings goals.

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[46] This appendix was prepared for the Energy Commission's Demand Forecast Energy Efficiency Quantification Project Working Group by CPUC/ED staff, January 12, 2010.

[47] Mike Rufo and Fred Coito, Xenergy Inc., 2002. *California's Secret Energy Surplus: The Potential for Energy Efficiency,* prepared by Xenergy Inc. for the Energy Foundation and Hewlett Foundations, October, 2002.

[48] Mike Messenger, California Energy Commission Staff Report. *Proposed Energy Savings Goals for Energy Efficiency Programs in California.* October 27, 2003

> *"The cumulative numbers represent the annual savings from energy efficiency program efforts up to and including that program year."p.10*

The application of the goals for long term planning is also called out in this decision in Ordering Paragraph 6.

> *"The energy savings goals adopted in this proceeding shall be reflected in the IOUs' resource acquisition and procurement plans so that ratepayers do not procure redundant supply-side resources over the short- or long-term. . . . subsequent procurement plan cycles . . . shall incorporate the most recently-adopted energy savings goals into those filings."p.52-53*

Incentive Mechanism: D. 07-09-043; September 20, 2007

http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/73172.PDF

The Shareholder Risk/Reward Incentive Mechanism for Energy Efficiency Programs was adopted in D. 07-09-043 and was superimposed upon the administrative structure adopted for the 2006-2008 energy efficiency program cycle. In this decision the "Minimum Performance Standard" (MPS) for utilities to make an earnings claim was based on partial achievement of the goals.

> *"The MPS is the minimum level of savings that utilities must achieve relative to their savings goal before accruing any earnings, and is expressed as a percentage of that savings goal." p.22*

That minimum threshold is 85% of the goals averaged across GWH, MW and Therms AND 80% of any given savings metric. This decision put added emphasis on the numeric goals adopted by the Commission by linking them to earnings.

2008 Goals Decision: D. 08-07-047; July 31, 2008

http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/85995.PDF

D. 08-07-047, the "Decision Adopting Interim Energy Efficiency Savings

Goals For 2012 Through 2020, and Defining Energy Efficiency Savings Goals for 2009 Through 2011" utilized an updated potentials study, and goals study (by Itron) to develop total market gross goals for 2012-2020.

> *"In a hybrid goal structure, goals are established for all energy efficiency actions taken across the market within a utility service territory, referred to as Total Market Gross (TMG), and for the savings associated specifically with each utility energy efficiency portfolio (utility program-specific)."Appendix p 1. D. 08-07-047*

The rationale for this goals paradigm was stated in that decision.

> *"Energy Division believes a hybrid goal structure (which incorporates both a total market gross goals and a utility program–specific goal) which measures all savings achievements within IOU service territories begins to solve the crucial interagency need for a metric appropriate to load forecasts, associated emission reduction baselines, and economically efficient procurement plans." p. 13*

The need for more evaluation and measurement frameworks to measure these savings was also recognized in this decision.

> *"Such a definition must be accompanied by a Commission commitment to develop any significant missing evaluation, measurement & verification (EM&V) protocols for attributing savings to utility programs." p. 13*

> *"Energy Division believes a hybrid goal structure employing "expansive net" as the metric for which IOU program efficacy is measured also encourages utilities to innovate their program delivery through non-traditional channels. The EM&V profession refers to these additional EE effects variously as "participant spillover," "market effects," "naturally occurring" savings." p. 14*

More details regarding this proposal were presented in a Staff White Paper (May 12, 2008.) entitled *"2012-2020 Energy Efficiency Goal Setting: Technical and Policy Issues."*

Goals for 2008-2020 were proposed, and cited in D. 08-07-047, but were adopted on an interim basis (OP1). They were adopted for use by the California Air Resources Board in its Assembly Bill 32 planning process and again cited to be used in the Commission's long-term procurement planning process (OP3).

> *"3. Energy utilities shall use one hundred percent of the interim Total Market Gross energy savings goals for 2012 through 2020 in future Long-Term Procurement Planning proceedings, until superseded by permanent goals."*

This decision also characterized the existing goals for the 2009-2011 energy efficiency program cycle as 'gross' to better align them with the 2002 Secret Surplus study. However, the numeric values of the goals did not change. (OP4)

A preliminary target for updating the goals was also ordered in this decision.

> *"5. The 2012 through 2020 interim goals shall be updated and utility portfolio goals shall be established after the 2006 -2008 Impact Evaluation studies are completed (expected to be March 2010) and the inquiry shall be completed by October of 2010. The assigned Commissioner and/or Administrative Law Judge may adjust the schedule for updating and establishing new energy savings goals for 2012 through 2020."*

May 2009 decision: D.09-05-037; May 21, 2009

http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/101543.PDF

This decision redefined cumulative savings for the 2009-2012 program cycle to begin in 2006 rather than 2004. It removed the savings for the 2004-2005 period as part of the cumulative goals in the 2009-2011 program period, subsequently removing the obligation of the utilities to make up any shortfall in savings in future cycles. The reasoning for removing 2004-2005 was because the evaluations in this period were not guided by the CPUC and the standard protocols were not in effect.

This decision granted SDG&E and PG&E (dual fuel utilities) reductions in their therm goals of 22% and 26% respectively. This was done to align expectations with the DEER 2008 application of interactive effects primarily for prescriptive lighting measures.

Energy Division was directed to do further study on measure decay in preparation for the next program cycle (2012-2015). (OP 2)

> *"Energy Division shall study specific assumptions around decay in advance of the 2012-2015 energy efficiency portfolio applications, with opportunities for interested parties and persons to provide input on and comment on the Energy Division recommendations."*

September 2009 Decision: D. 09-09-047; September 24, 2009

http://docs.cpuc.ca.gov/PUBLISHED/GRAPHICS/107829.PDF

D. 09-09-047 granted SDG&E, PG&E and SCE all 5% and 1% decrement to their annual goals for kWh and kW respectively. The purpose was to align expectations for meeting the goals with the requirement to apply the DEER 2008 ex-ante assumptions to 2006-2008 and 2009-2012 claims.

SDG&E also had a long standing anomaly in their goals compared to the other utilities; they had been required to achieve a larger portion of electric potential than the other utilities. The correction in the decision resulted in a 25% reduction on their kWh and kW annual goals. This was applied before the 5% and 1% corrections were made. This correction was also applied retroactively to the 2006-2008 period to correct for cumulative savings shortfall.

This decision also adopted the D. 04-09-060 goal for 2012 (with the subsequent adjustments); not the D. 08-07-047 goal for 2012.

This decision required that the utilities should make up 50% of the savings decay as measures expire, but also for further study.

> *". . . until EM&V results inform better metrics, utilities may apply a conservative deemed assumption that 50% of savings persist following the expiration of a given measure's life. This reflects our expectation that our energy efficiency program efforts are in fact resulting in market transformation, changing consumption habits and preferences, while acknowledging that measure uptake in the absence of program support may not be universal.*
>
> *Given the exclusion of 2004-2005 from cumulative savings calculations in D.09-05-037, measure life drop off is expected to have a relatively minor effect on utility goal achievement for the current cycle, hence the appropriateness of a deemed assumption. However, we understand that the scope of this issue will grow over time as cumulative savings obligations increase and a larger swath of measure lives expire. Therefore, this is an important analytical issue critical to our understanding of savings persistence over time, and demands greater attention in our EM&V work. D.09-05-037 directed Energy Division to study specific assumptions around efficiency measure savings "decay" in advance of the 2012-2014 (now 2013-2015) portfolio applications. We intend to take this up for further examination in R.06-04-010, or its successor rulemaking." p 38-39*

Current Status of Goals

The following graphics illustrate the affect on the CPUC adopted goals as a result of decisions since D.04-09-060. Actual values are provided in the Decisions.

Figure 1. Changes to GWH Savings Goals [Projection] per decision

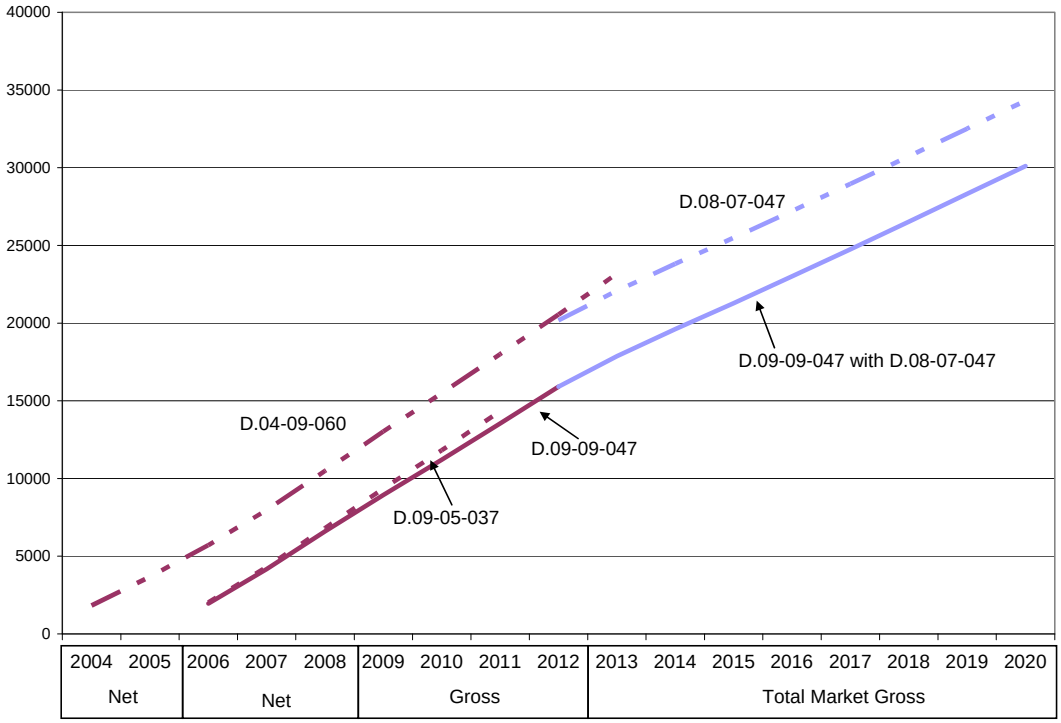


Figure 2. GWH Savings Goals [Projection]

Comparison of Original D. 04-09-060 to Current D. 09-09-047 [aggregate effects]

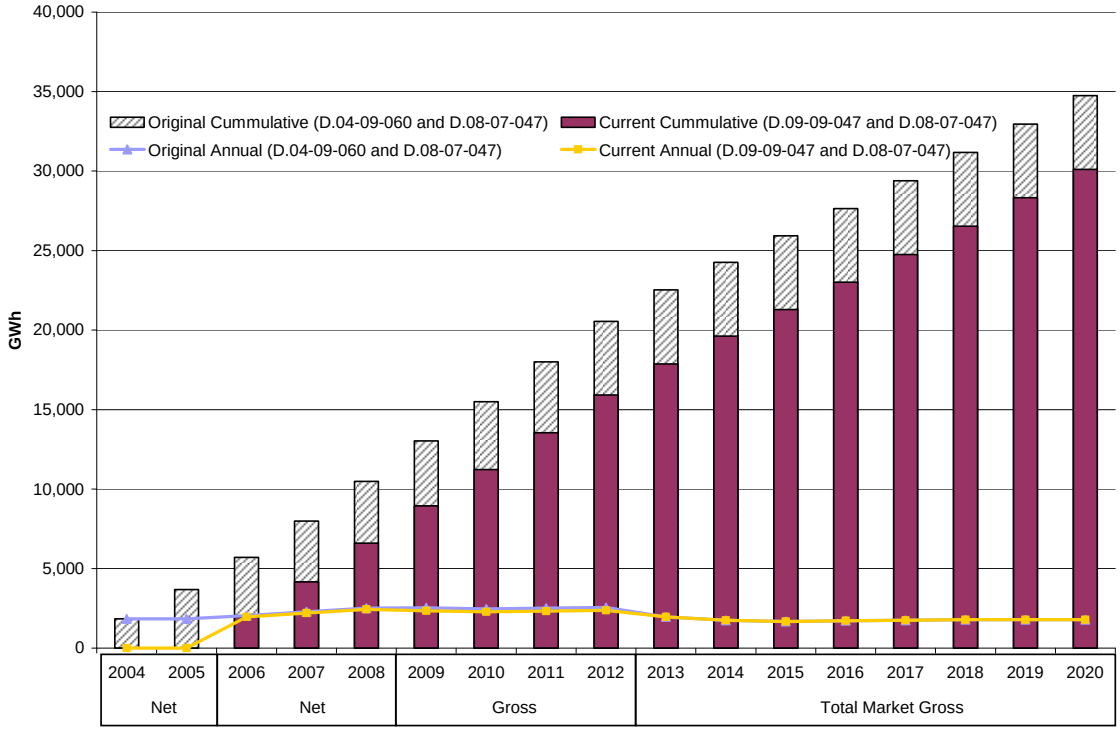


Figure 3. MW Savings Goals [Projection]

Comparison of Original D. 04-09-060 to Current D. 09-09-047 [aggregate effects]

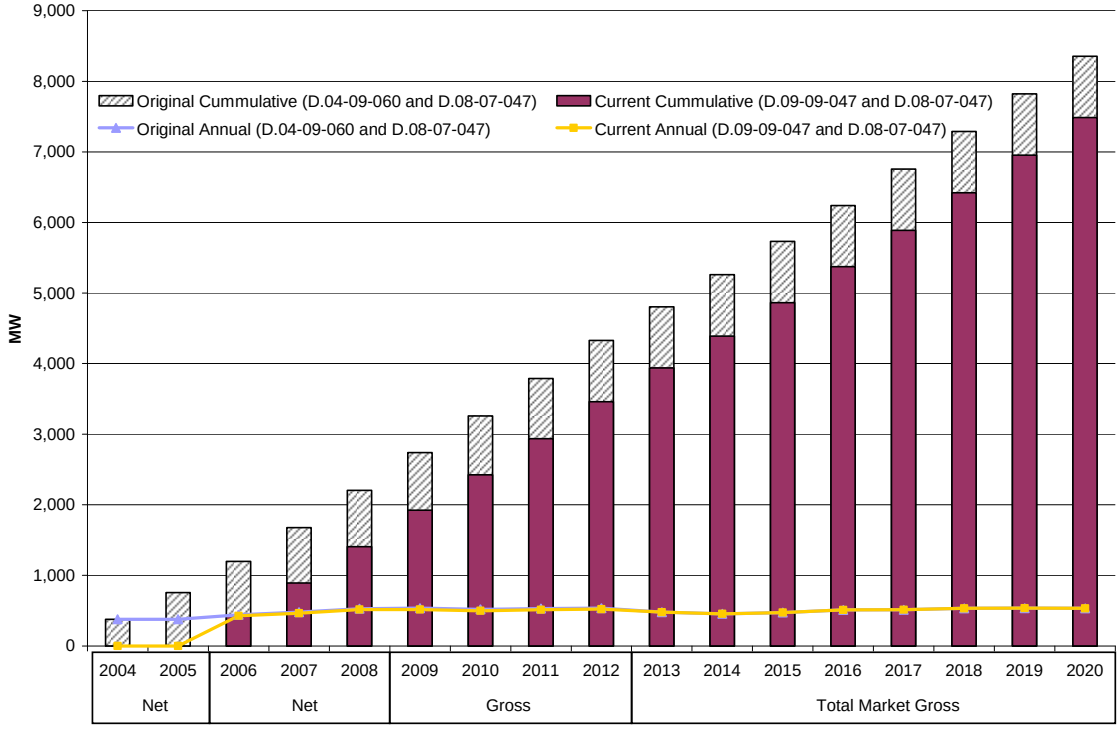
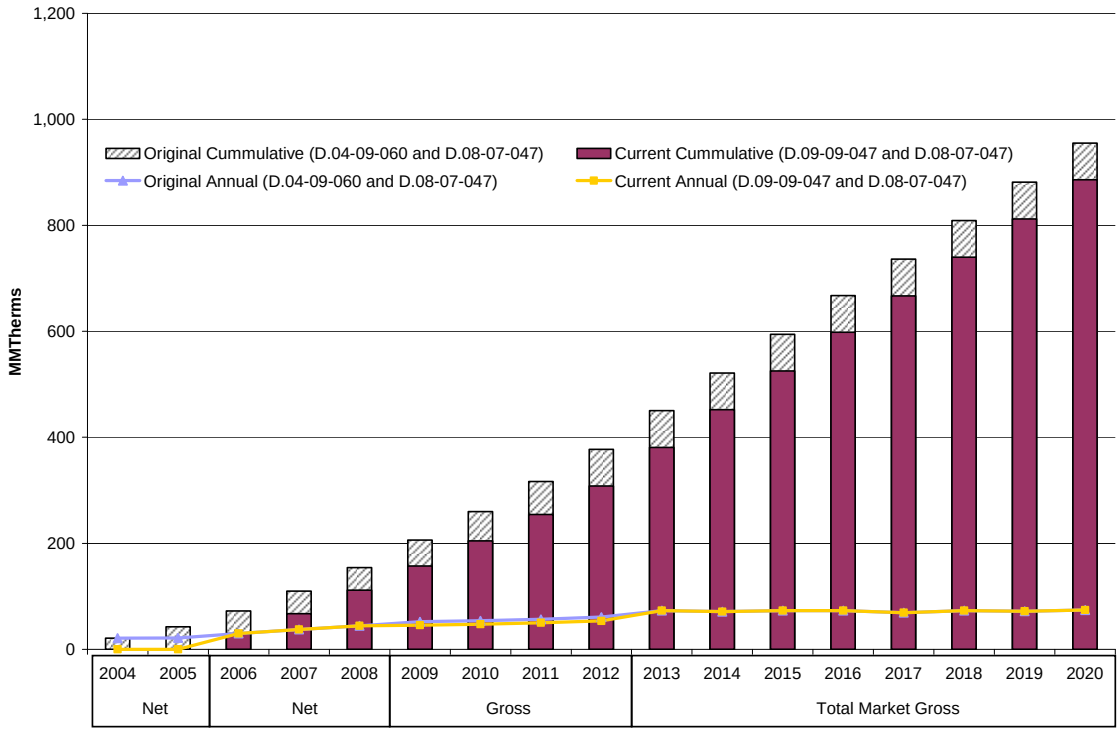


Figure 4. Therm Savings Goals [Projection]

Comparison of Original D. 04-09-060 to Current D. 09-09-047



Lifecycle Logged Savings by Utility by Fuel Type

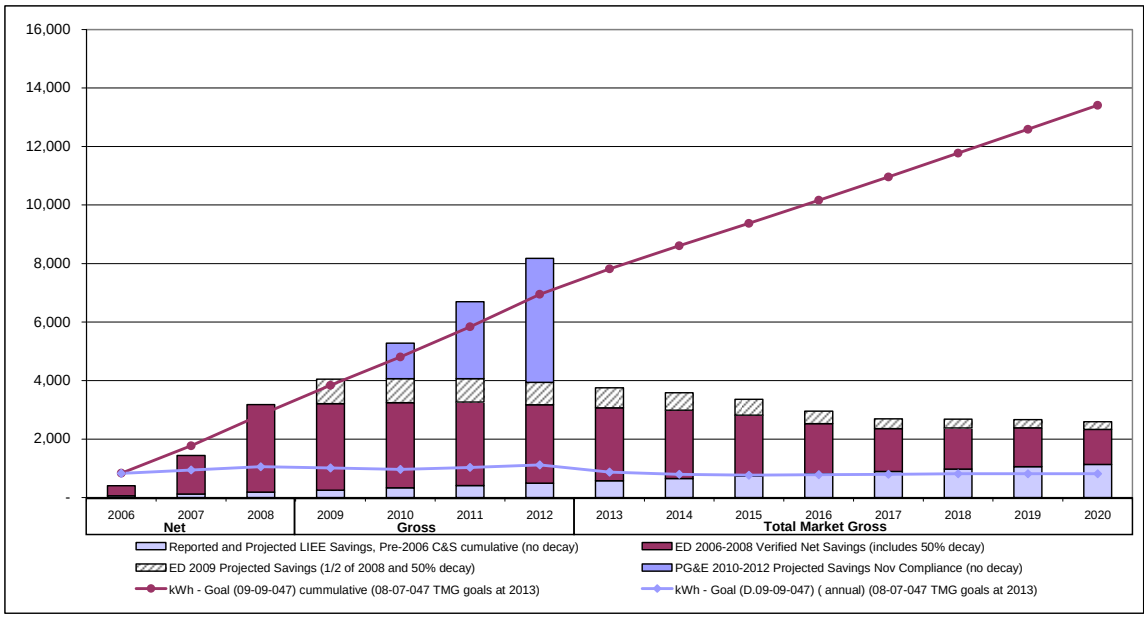
The following figures illustrate the *verified* savings the Commission has so far acknowledged for the 2006-2008 program period including 50 percent of the decay projected for these measures expiring over time. The savings in the 2010-2012 period are *projected* based on their July 2nd 2009 filings.

The 2006-2008 verified energy savings can be found at the following link:

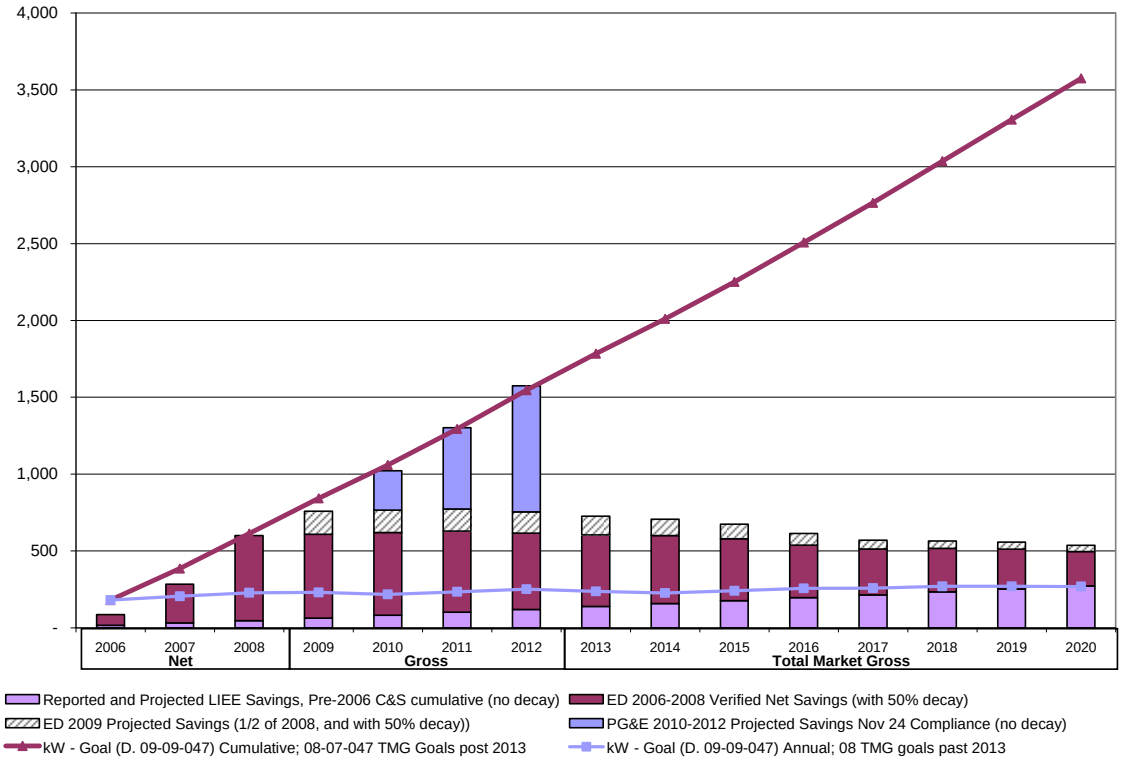
http://www.cpuc.ca.gov/NR/rdonlyres/73610663-B787-40D2-9588-9AAB62A306DF/0/ED_Draft_20062008_Verification_Report_for_Resolution_8509.pdf

No assumptions about the decay or lifecycle savings for the 2010-2012 proposed programs are included in these figures; and pre-2005 C&S and Low Income projections past 2009 assume continued savings at the same pace with no decay.

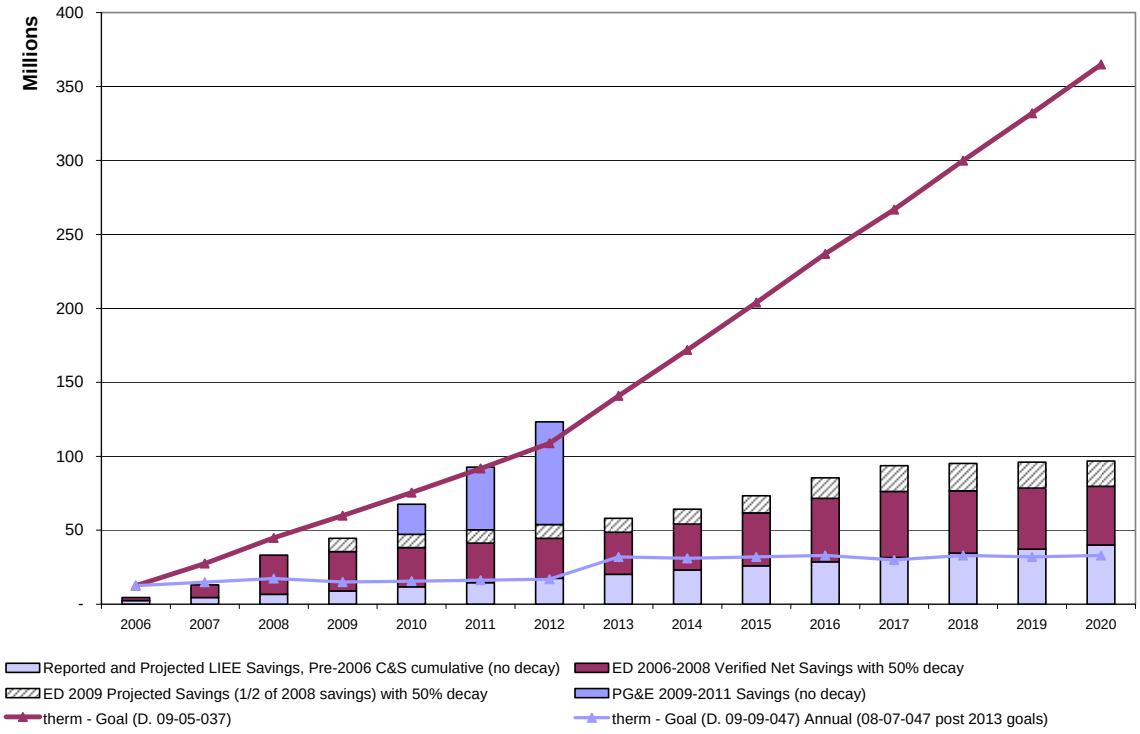
PG&E Recorded and Projected Savings v. Commission Adopted Goals GWh



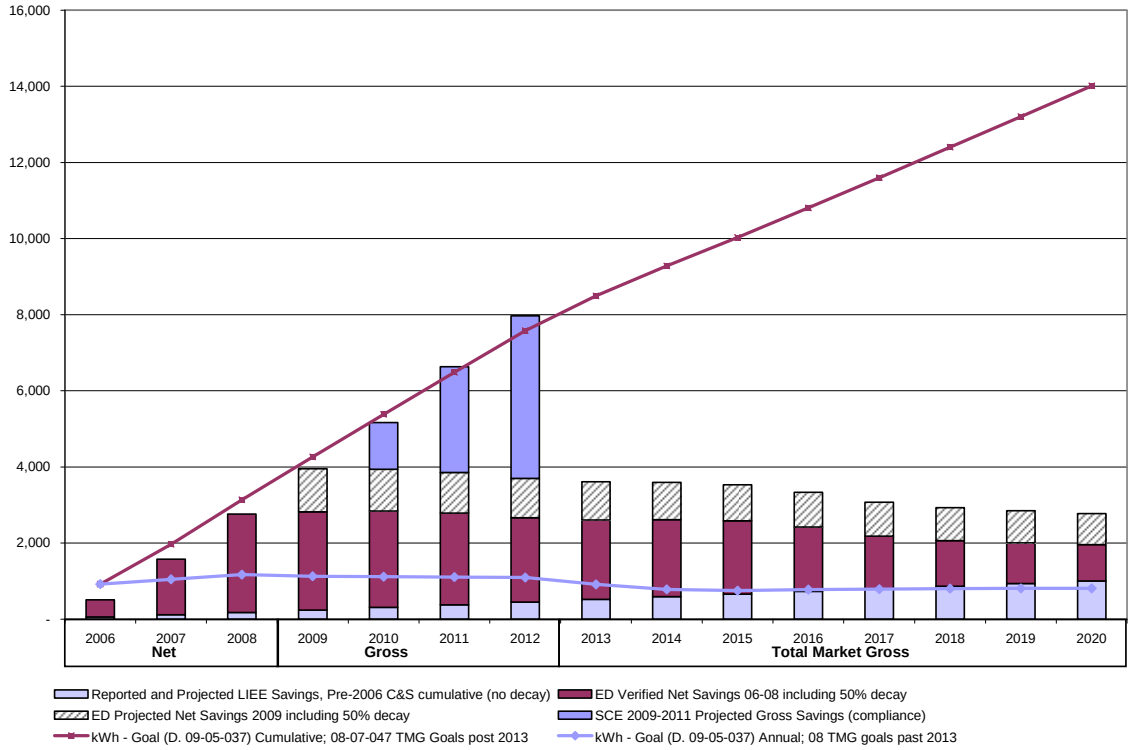
PG&E Recorded and Projected Savings v. Commission Adopted Goals MW



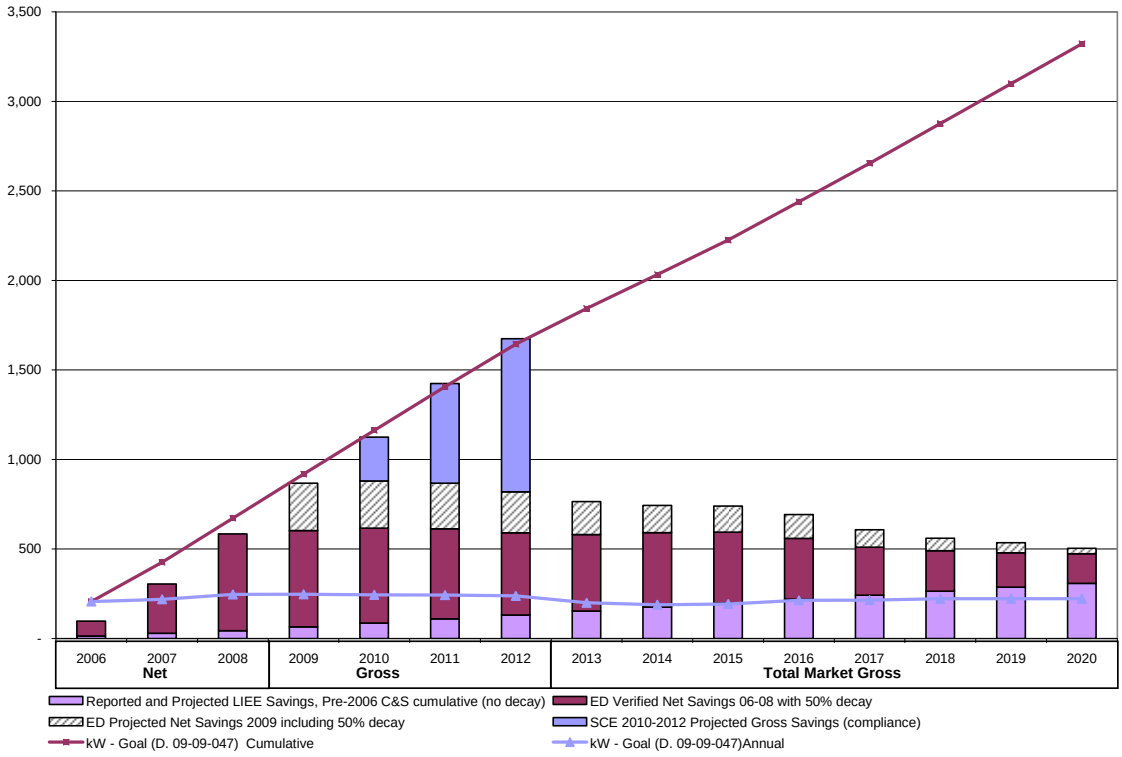
PG&E Recorded and Projected Savings v. Commission Adopted Goals MMTherms



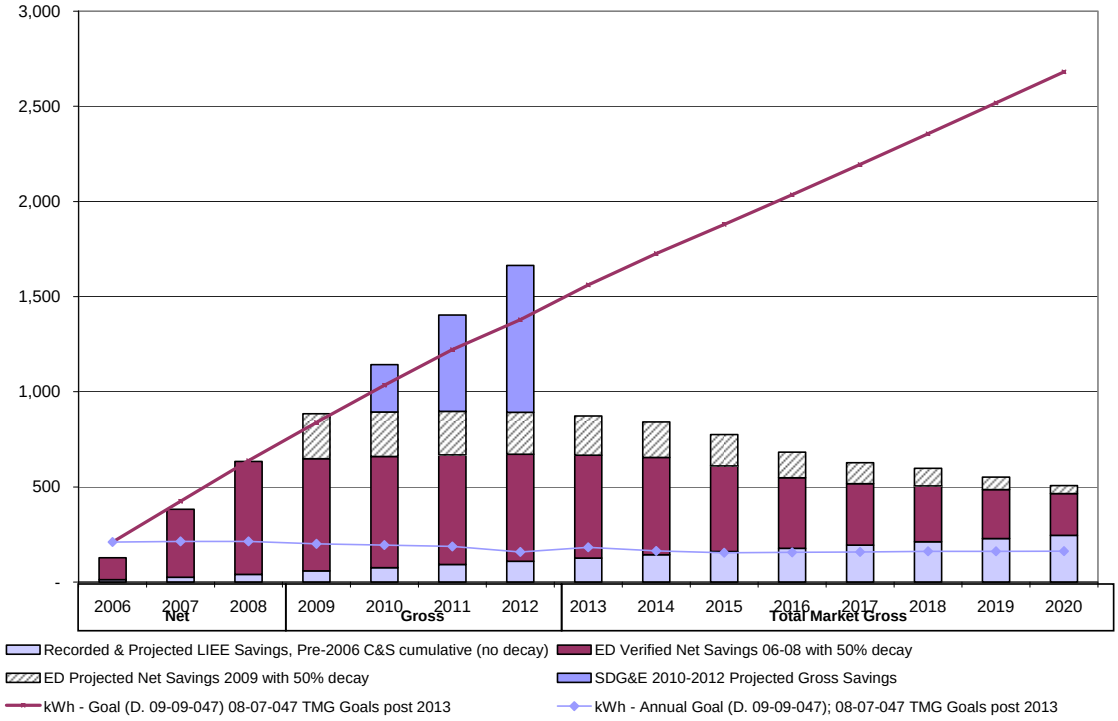
SCE Recorded and Projected Savings v. Commission Adopted Goals GWH



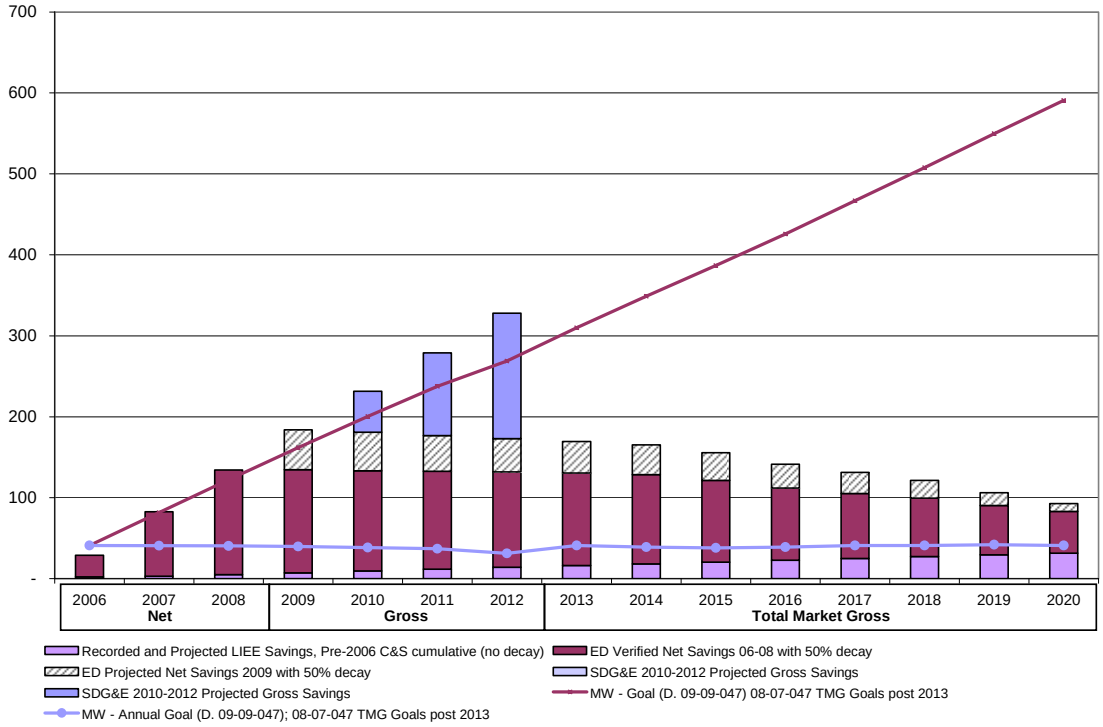
SCE Recorded and Projected Savings v. Commission Adopted Goals MW



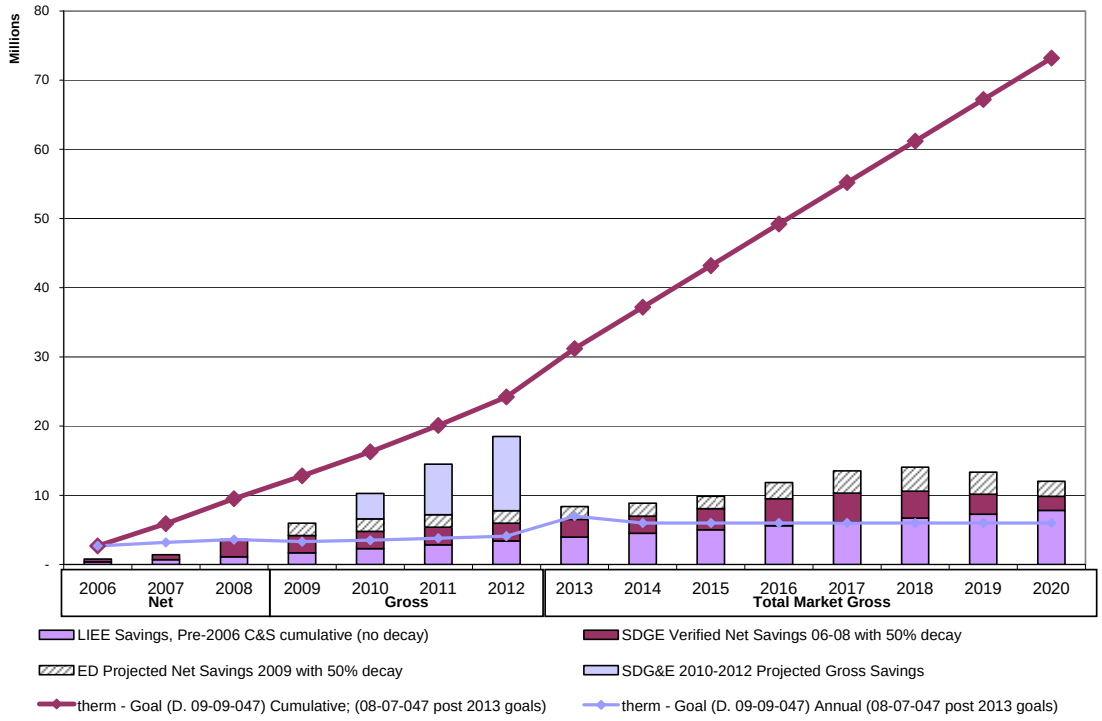
SDG&E Recorded and Projected Savings v. Commission Adopted Goals GWH



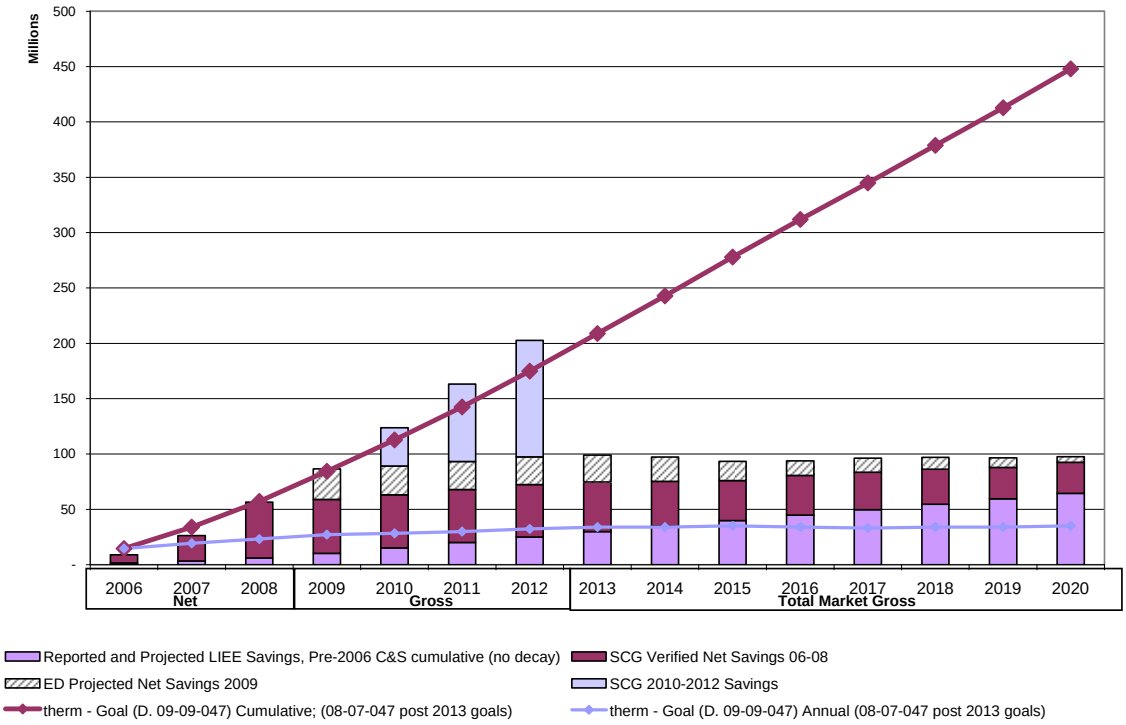
SDG&E Recorded and Projected Savings v. Commission Adopted Goals MW



SDG&E Recorded and Projected Savings v. Commission Adopted Goals MMTherms



SCG Recorded and Projected Savings v. Commission Adopted Goals MMTherms



ATTACHMENT C: Long-Term Procurement Planning Issues

California Public Utilities Commission

Energy Division

Procurement &Resource Adequacy

Developing a Managed Demand Forecast for Long-Term Procurement Planning

Prepared by: Simon Eilif Baker, CPUC Energy Division, Procurement

Nathaniel Skinner, CPUC Energy Division, Procurement

Energy Efficiency in the Procurement Process

Energy efficiency is California's first-choice to serve demand for electricity. Public Utility Code § 454.5, which codifies the CPUC's Long-term Procurement Plan (LTPP) process, states that an investor-owned utility's (IOU) procurement plan must show that it "will first meet its unmet resource needs through all available energy efficiency [EE] resources and demand reduction measures that are *cost effective, reliable and feasible*."[49] In 2003, the state reinforced this policy by placing EE first in the Energy Action Plan (EAP) loading order.[50]

In practice, this means the IOUs should plan to a "managed forecast," which, in resource planning parlance, is a base demand forecast (including some embedded EE), plus adjustments to represent incremental impacts of all "cost effective, reliable and feasible" demand-side resources.[51] In interpreting the statute, the challenge for demand forecasters, IOU resource planners, and the CPUC, is to estimate "cost-effective, reliable and feasible" levels of EE and determine what is "reasonably expected to occur." [52]

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[49] Pub. Util. Code § 454.5 at Subsection (b)(9)(C). Added by AB 57 (Wright, Chapter 850, Statutes of 2002). (Emphasis added.)

[50] CEC, CPUC, and CPCFA. (2003). *Energy Action Plan*, at p. 4; and CEC and CPUC. (2005) *Energy Action Plan II*, at p. 2.

[51] Examples of additional demand-side resources include combined heat and power facilities, and rooftop solar photovoltaic installations.

[52] Here, CPUC staff borrows from the "reasonably expected to occur" (RETO) concept that previously guided the Energy Commission's electricity planning efforts under SB 1389 (Bowen,

While P.U.C. § 454.5 originally focused on the procurement needs of the IOUs' bundled customers,[53] CPUC Decision (D.) 06-07-029 expanded the scope of the LTPP proceeding, on an interim basis, to identify system-wide[54] resource needs and provide a backstop procurement mechanism to ensure long-term resource adequacy, pursuant to P.U.C. § 380.[55] It is expected that the LTPP will continue to play this role in the forthcoming 2010 LTPP proceeding. Thus, a key role of the CPUC's oversight in the LTPP proceeding is to ensure system reliability, while verifying adherence to the EAP loading order.

In the CPUC's need determination, a unique challenge presents itself because procurement authorizations must consider longer timescales (about 5-7 years forward) than either utility or non-utility EE initiatives, which typically operate on three-year cycles (of program design, implementation/delivery, and evaluation). For the 2010 LTPP cycle, the CPUC will review procurement plans spanning the period 2010-2020 and most likely decide whether to construct new resources in the 2017-2018 timeframe. Compared to the currently approved 2010-2012 utility EE portfolios, procurement planning has a markedly different frame of reference. In effect, this means the CPUC's procurement decision must judge the expected impacts of EE policy initiatives which have yet to be concretely defined and for which measured impacts are difficult to predict.

The CPUC and Energy Commission, respectively, adopt specific new utility programs and standards every three years at a level of implementation detail. But, *both* processes are guided by longer-term policies (e.g. to strengthen standards by 15% each cycle), goals (e.g. out to 2020), and/or targets (e.g. 50% reduction in energy use by existing commercial buildings, as set forth in the CPUC's Energy Efficiency Strategic Plan). A similar situation occurs in procurement, where procurement authorizations are made 5-7 years forward, but specific resource additions get firmed up in later years. Thus, the CPUC's procurement decision must equally consider the likely composition of both supply- and demand-side resource acquisitions.

Chapter 568, Statutes of 2002). While the RETO concept was repealed from law under the current statute (P.R.C. §§25300 – 2532), it remains a familiar and useful criteria for resource planning because it entails a judgment by decision-makers regarding an acceptable level of uncertainty that specific amounts of EE will be available to serve load.

[53] Bundled customers take retail electric service from the IOUs as load-serving entities (LSEs).

[54] The CPUC has defined "system" as an IOU's service area including load from bundled, direct access (and community choice aggregator) customers; and excluding load from embedded publicly-owned utilities (D.07-12-052; see, e.g., Table PGE-1, footnote 2, p. 121 (116)). System also corresponds to the IOUs' distribution service territory.

[55] Added by AB 380 (Nunez, Chapter 367, Statutes of 2005).

The remainder of this appendix provides a staff-level synthesis of issues the CPUC faces when developing a managed demand forecast for procurement planning. It also traces the historical trajectory of the CPUC's examination of these EE uncertainties, beginning with the most recent LTPP decision.

Energy Efficiency Uncertainty in Procurement Planning

In making procurement decisions, the CPUC faces three types of uncertainty with regard to need determination and the projected impact of EE:

- **Methodological uncertainty** – This category addresses data and modeling assumptions underlying the Energy Commission's IEPR demand forecast and the CPUC's EE goals analyses. Uncertainty stems from two main sub-categories: (1) the forecast error *within* each agency's modeling effort (i.e., intra-agency issues); and (2) forecast errors that arise *between* modeling efforts and from the need to reconcile assumptions, when attempting to quantify incremental impacts of the CPUC's EE goals relative to impacts already embedded in the Energy Commission's demand forecast (i.e., inter-agency issues).

  As to intra-agency issues, a principal driver is the set of assumptions used to produce *ex-ante* forecasts of savings in the CPUC's goals-setting process. These uncertainties were evaluated in the *2008 Energy Efficiency Goals Update Report* (2008 Goals Study),[56] which looked at scenarios of expected savings expected from Huffman Bill,[57] codes and standards, and Big Bold Energy Efficiency Strategies (BBEES) [58] by varying implementation assumptions. The CPUC goals Decision (D.) 08-07-047, weighing the goals scenarios and evidence presented at the time, found that the TMG goal was realistic and achievable, and required that 100% of TMG be used in future LTPP proceedings.[59]

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[56] Itron Inc. (2008). *Assistance in Updating the Energy Efficiency Savings Goals for 2012 and Beyond: Prepared for the California Public Utilities Commission, Vols. 1 & 2.* Attachment to March 25, 2008 Assigned Commissioner's Ruling in R.06-04-010. Available at www.cpuc.ca.gov/NR/rdonlyres/D72B6523-FC10-4964-AFE3-A4B83009E8AB/0/GoalsUpdateReport.pdf.

[57] Assembly Bill 1109 (Huffman, Chapter 534, Statutes of 2007)

[58] Big Bold Energy Efficiency Strategies (BBEES) are strategies "to promote maximum energy savings through coordinated actions of utility programs, market transformation, and codes and standards." (D.07-10-032, at p. 35). In D.07-10-032, the CPUC adopted three BBEES: (1) All new residential construction in California will be zero net energy by 2020; (2) All new commercial construction in California will be zero net energy by 2030; and (3) The HVAC industry will be reshaped to assure optimal performance of HVAC equipment.

[59] See D.08-07-047, at pp. 24-26.

As to inter-agency issues, the modeling study in this uncommitted EE report addressed many of these uncertainties. But, the study also identified new ones which have yet to be resolved. These include the importance of a consistent calibration year when matching up peak-to-energy ratios in CPUC goals and Energy Commission estimates of committed/uncommitted EE; and the need for consistent approaches to modeling measure decay.

- **Policy uncertainty** – This category addresses what specific policies are adopted at the CPUC, Energy Commission, and other agencies; how they are structured over the forecast period; and the measurement of what is achieved. Some of these were evaluated in the 2008 Goals Study, such as the assumed level of IOU program funding. Others were not explicitly considered at that time, including effectiveness of mechanisms to enforce cumulative goals, changes in definitions or thresholds of cost-effectiveness, and accounting or attribution of utility savings in the Total Market Gross (TMG)[60] paradigm.

- **Implementation uncertainty** – This category addresses the likely level of savings that will be achieved in the implementation of EE policies at the CPUC (and other agencies). Here, the emphasis is on *ex-poste* assessments of savings actually achieved. *Implementation uncertainty* captures "yield" variations of EE initiatives versus what was expected (*ex-ante*) in CPUC goals studies. Yield variations arise from the way EE measures are deployed and function in the marketplace. The CPUC's Evaluation, Measurement, and Verification (E,M&V) studies inform these yield variations.

  For "committed" [61] utility programs, the Energy Commission captures *implementation uncertainty* by assuming certain "realization rates" of utility program savings, based on net-to-gross ratios from CPUC E,M&V studies. However, for the "uncommitted" period, other yield assessments (based on methodologies yet to be developed) may be required to fully characterize *implementation uncertainty* in the TMG paradigm.[62]

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[60] Total Market Gross is "all energy efficiency actions taken across the market within a utility service territory." (D.08-07-047, Appendix 1, at p. 1). See also Appendix B to this report, at p. B-2.

[61] The Energy Commission defines *committed* programs as "programs that have already been implemented or for which funding has been approved." "*Uncommitted* effects are the incremental impacts of the level of future programs…impacts of new programs, and impacts from expansions of current programs." (*California Energy Demand 2008-2018 Staff Revised Forecast*, at p. 25.)

[62] For example, net-to-gross ratios will likely become less relevant for procurement purposes under the TMG paradigm, because what matters is the total managed forecast, regardless of whether energy savings come from utility or non-utility actions.

In sum, uncertainty still surrounds the level of EE that is reasonable to assume for procurement planning purposes: some have yet to be addressed; and others are newly identified.

2006 Long-Term Procurement Plan Decision (D.) 07-12-052

In D.07-12-052 adopting the IOUs' 2006 LTPPs, the CPUC deferred to the Energy Commission's IEPR process to quantify impacts of the CPUC's EE goals embedded in the demand forecast. The CPUC also acknowledged uncertainty in attempting to quantify the incremental impacts, relative to the 2007 IEPR forecast, of "uncommitted" EE that is treated as a resource in procurement planning. The CPUC ultimately assumed that 20% of the CPUC's EE goals for PG&E and SCE and 0% of the goals for SDG&E,[63] as defined by D.04-09-060,[64] were incremental to the forecast.

Decision 07-12-052 also clarified the CPUC's definition of "uncommitted" EE "as the projected savings attributable to future EE program cycles (2009-2011 and beyond) that meet or exceed the Commission-adopted EE goals."[65] Because the CPUC goals at the time (D.06-09-060) were focused exclusively on net savings from *utility programs*, this use of the term differed slightly from the Energy Commission's more expansive concept of "uncommitted effects" which includes non-utility programs such as codes and standards, as well as conservation due to price or market effects. As it happens, the CPUC's goals update decision, D.08-07-047 (see below), later aligned with the Energy Commission's more expansive definition of uncommitted effects, which should help to reduce confusion and align future modeling efforts. However, *methodological uncertainty* remains in the quantification and attribution of savings from utility programs, non-utility programs, and market or price effects in the various models used to forecast these impacts.

Finally, D.07-12-052 recognized a need for a "robust methodology to quantify the portion of future EE program measures that are embedded in the CEC forecast."[66] Pursuant to this direction, CPUC staff devoted considerable time and resources to the 2009 IEPR effort to develop such a methodology.

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[63] Energy efficiency associated with SDG&E's goals was assumed to be 100% embedded (or conversely, 0% incremental).

[64] Because D.04-09-040 goals only extended to 2013, it was necessary to extrapolate those goals through 2016, the end of the 2006 LTPP planning period.

[65] D.07-12-052, at p. 42.

[66] D.07-12-052, at p. 45.

2008 Long-term Procurement Plan Rulemaking (R.) 08-02-007

A central focus of the Order Instituting Rulemaking (OIR) for the 2008 LTPP proceeding (R.08-02-007) was to "develop standardized resource planning practices, assumptions and techniques, based on an integrated resource planning framework."[67] The CPUC's consideration of this issue was partly informed by 2007 IEPR recommendations calling for a "common portfolio analytic method"[68] to the IOUs' resource plans.

In addition, the OIR scoped the CPUC's consideration of EE uncertainty in two main areas:

(1) Quantification of EE in the Energy Commission demand forecast; and
(2) Long-term firm capacity projections for demand-side resources

The first issue is being addressed through the Energy Commission's Demand Forecasting and Energy Efficiency Quantification Project (DFEEQP) in the 2009 IEPR. CPUC staff notes that the DFEEQP was originally conceived to address *methodological uncertainty* – and a great deal has been accomplished towards that end – but it was *not* designed to address *policy uncertainty* or *implementation uncertainty*.

The second issue deals primarily with *implementation uncertainty*, but also relates to *methodological uncertainty* in the CPUC's EE goals analyses. It was partly considered in the CPUC's EE goals update process, which culminated in D.08-07-047.

2008 Energy Efficiency Goals Decision (D.) 08-07-047

In the 2008 goals update proceeding (R.06-04-040) the CPUC evaluated scenarios for possible EE goals based on the 2008 Goals Study. The study scenarios put forth a new methodology to develop savings from utility and non-utility efforts. As discussed above and in Appendix A, Itron's scenarios assessed various levels of achievement of savings from utility and non-utility programs. In D.08-07-047, the CPUC adopted TMG goals based on the mid-range goals scenario.[69] Pursuant to the decision, TMG goals,

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[67] R.08-02-007 OIR, at p. 10 and pp. A-1 – A-10.

[68] CEC. *2007 IEPR*, at p. 67.

[69] The mid-range goals scenario assumed a high level of IOU program funding, with IOU programs offering aggressive rebates at or near 100% of incremental measure costs. It also assumed that revisions to Title 24 building codes and federal appliance standards would be more substantial than the low case and that new code compliance programs would capture additional savings. A mid range of savings from BBEES was assumed. Importantly, a more tempered outlook was assumed for savings from the Huffman Bill, reflecting potential challenges in complying with the standard and achieving significant savings from lighting applications. (See also Appendix A to this uncommitted EE report, at p. 9)

combining projected savings from utility and non-utility actions, were adopted for the period 2012-2020. The decision also ordered the utilities to use 100% of the TMG goal in the LTPP proceeding.

CPUC staff believes the 2008 Goals Study made considerable strides towards assessing both *methodological uncertainty* and *policy uncertainty*.

On August 28, 2008, the Scoping Memo for Phase 1 of the 2008 LTPP proceeding noted the EE goals decision (D.08-07-047) had considered "long-term firm capacity projections" for EE, pursuant to the LTPP OIR, and required 100% of TMG goals to be used in the LTPP proceeding.

2008 LTPP Staff Proposal

On July 1, 2009, an Amended Scoping Memo released an *Energy Division Staff Proposal on LTPP Planning Standards* (Staff Proposal), which proposed specific guidelines for how EE should be quantified and assessed in the IOUs' portfolio analysis. The Staff Proposal acknowledged the current effort to produce an uncommitted EE forecast, which, when combined with the Energy Commission's base forecast and other demand-side policy initiatives, would produce a managed forecast for procurement planning. CPUC staff recommended that the original CPUC goals scenarios be carried through the Energy Commission's quantification of uncommitted EE, so that the results of the analysis could be used in sensitivity analysis to quantify a range of for new resources in the LTPP.

The Staff Proposal also put forth a "Deliverability Risk Assessment" concept, analogous to the *implementation uncertainty* discussed herein and also analogous to the Energy Commission's "reasonably expected to occur" principle used in demand forecasting. Because the Energy Commission is not expected to rule on "reasonably expected to occur" projections of uncommitted EE, that determination would presumably be left to the CPUC. Indeed, the 100% of TMG requirement set forth in D.08-07-047 appears to be the CPUC's current position on "reasonably expected to occur" for procurement planning.[70] Anticipating that, with the passage of time and availability of new information, the CPUC may revisit the 100% of TMG requirement, the Staff Proposal recommended that the IOUs also be required to estimate the "probability of occurrence" of need sensitivities based, in part, on forecasts of uncommitted EE. Such information

[70] This assumes that *methodological uncertainty* is resolved through satisfactory reconciliation of data and models used in the Energy Commission demand forecast and the CPUC's EE goals analyses.

would provide additional evidence for the CPUC to consider in future determinations of "reasonably expected to occur" levels of EE for procurement purposes.

The Staff Proposal recognized, however, that interpreting the numerical impact of TMG goals relative to the IEPR forecast was a task best left to the Energy Commission. This is because estimates of committed and uncommitted EE must be rooted in the same underlying data and methodologies to avoid over- or under-counting savings.

The Energy Commission's 2009 IEPR forecast and uncommitted EE forecast are based on the most current datasets for economic and demographic drivers of EE (e.g., new housing starts, new commercial floor space). Because the 2008 Goals Study used older datasets, as well as other model inputs, a mismatch between the CPUC's numerical TMG goals and the Energy Commission's calculations of committed and uncommitted EE is almost inevitable. In fact, the results of the uncommitted EE report bear this out.

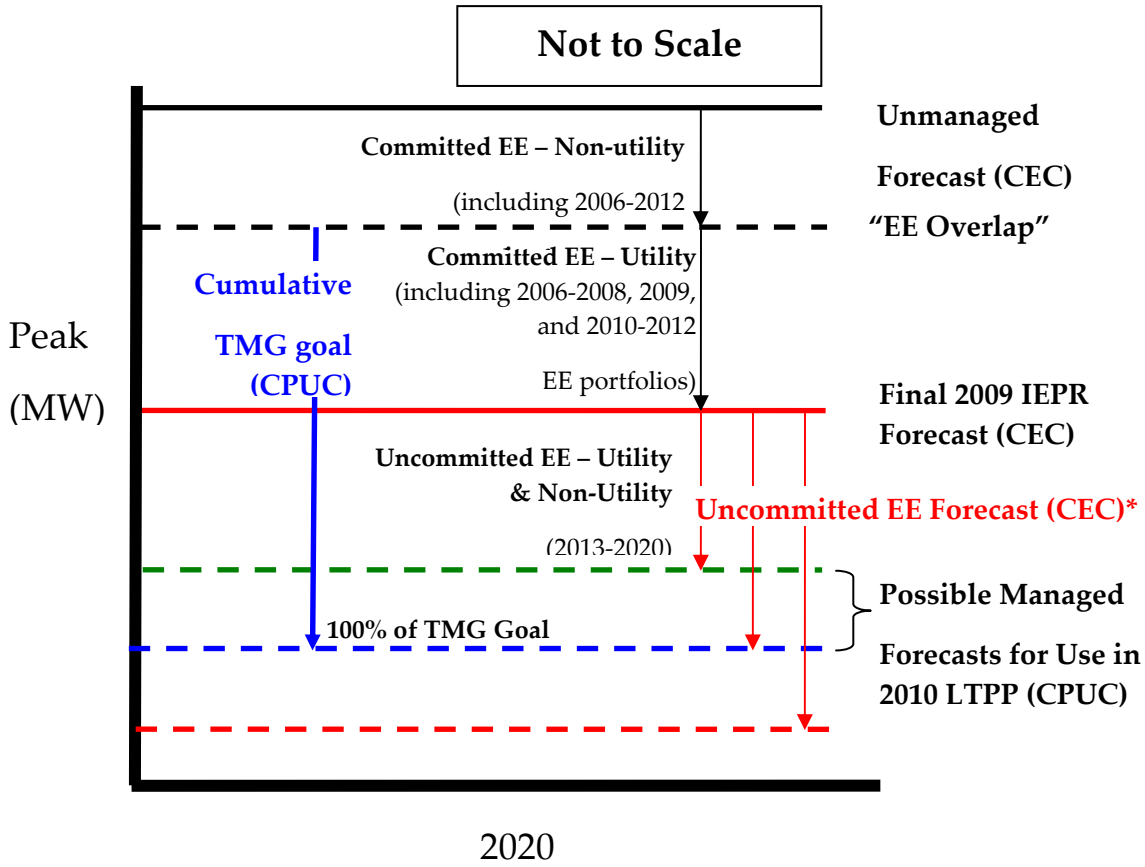
In the event of a mismatch, the Staff Proposal recommended using the lower of the two quantities for purposes of procurement planning. The rationale for using the lower of the two was "at worst, a conservative choice from among the two uncertain quantities would result in earlier procurement of resources than would otherwise be the case (even if this insurance comes at a cost)."[71]

Figure C-1 below provides a graphical illustration of how the Staff Proposal would be implemented in the 2010 LTPP. The solid black line represents the CEC's "unmanaged forecast" which subtracts out committed energy savings in the pre-2013 period. The CEC's Final 2009 IEPR Forecast, represented by the solid red line, includes these committed effects, some of which are attributed to utility programs, and others are not. The proportion of CPUC goals assumed to be embedded in the Energy Commission forecast has been called "EE overlap," which is shown in the black dashed line. The CPUC's TMG goal, represented by the solid blue arrow, includes cumulative impacts of utility programs implemented during the committed period (pre-2013), as well as impacts of new utility and non-utility initiatives in the uncommitted period (2013 and beyond). The Energy Commission's uncommitted EE forecast, represented by the red arrows, may or may not match up to the CPUC's numerical TMG goals for reasons described above (thus, the three red arrows illustrating three possible outcomes). Note these three possible outcomes represent a hypothetical range of results for the mid-range scenario; they do *not* correspond to the three original CPUC goals scenarios.

[71] Attachment 2 to July 1, 2009 ACR in R.08-02-007: *Energy Division Staff Proposal on LTPP Planning Standards*, at p. 92.

According to the Staff Proposal, if the Energy Commission's uncommitted EE forecast were to fall at the green dashed line, then the CPUC would use that value for the managed forecast instead of the blue dashed line. Conversely, if the Energy Commission's uncommitted EE forecast were to fall at the red dashed line, then the managed forecast for procurement purposes would use the blue dashed line.

Figure C-1. Conceptual illustration of 2020 peak demand and EE quantities used for procurement planning, as proposed in the July 1, 2009 CPUC Staff Proposal



*The three arrows represent a range of hypothetical results for the mid-range CPUC goals scenario

The CPUC received comments on the Staff Proposal, as well as party alternative proposals, during the fall of 2009.

Preliminary Direction for the 2010 LTPP Proceeding

On December 3, 2009, the Assigned Commissioner issued a ruling signaling a new direction for the LTPP proceeding.[72] First, the ruling suspended the previously determined schedule of activities, including the timeframe for a proposed decision. Second, the ruling indicated that, beginning in the 2010 cycle, the LTPP will be split into two separate proceedings: one addressing "system" reliability and need assessments; and another addressing "bundled" IOU procurement plans. CPUC staff expects the uncommitted EE scenarios would primarily inform need assessments for new resources in the system proceeding, but may also inform IOU contracting positions assessed in the bundled proceeding.

[72] December 3, 2009 *Assigned Commissioner's Ruling Addressing Future Commission Activities Related to Procurement Planning*, R.08-02-007.