

DRAFT STAFF PAPER

DOCKET

11-IEP-1C

DATE _____

RECD. AUG 26 2011

ENERGY EFFICIENCY PROGRAM CHARACTERIZATION IN ENERGY COMMISSION DEMAND FORECASTS: STAKEHOLDER PERSPECTIVES AND STAFF RECOMMENDATIONS

Chris Kavalec

Demand Analysis Office

Electricity Supply Analysis Division

California Energy Commission

DISCLAIMER

This paper was prepared by a member of the staff of the California Energy Commission. As such, it does not necessarily represent the views of the Energy Commission or the State of California. The Energy Commission, the State of California, its employees, contractors, and subcontractors make no warrant, express or implied, and assume no legal liability for the information in this paper; nor does any party represent that the uses of this information will not infringe upon privately owned rights. This paper has not been approved or disapproved by the California Energy Commission nor has the Commission passed upon the accuracy or adequacy of the information in this paper. This paper has not been approved or disapproved by the full Commission.

AUGUST 2011

CEC-200-2011-010 SD

ACKNOWLEDGEMENTS

The authors wish to acknowledge the contributions of Tom Gorin, Mike Jaske, and Don Schultz of the California Energy Commission; Carmen Best of the California Public Utilities Commission; Sierra Martinez of the Natural Resources Defense Council; Richard Aslin and Luke Nickerman of Pacific Gas and Electric; Phil Toth of Southern California Edison; Athena Besa of San Diego Gas & Electric; Cynthia Mitchell representing The Utility Reform Network; and Sy Goldstone. Special thanks to Chris Ann Dickerson of CAD Consulting for organizing meetings involving the participants listed above and for helping to develop a draft of this report.

ABSTRACT

A clear, consistent historical record of evaluated program achievements is not readily available. This creates large uncertainty around any estimate of historical impacts. Even where evaluated program data are available, the estimates have proven to be controversial, which leads to questions regarding characterization of both current and historical program impacts in the California Energy Commission demand forecasts. Stakeholders in recent Demand Analysis Working Group meetings have debated these uncertainties, along with other issues related to treatment of energy efficiency in the forecasts. This paper provides background on the issues, and summarizes the positions of key stakeholders regarding energy efficiency program accounting within *IEPR* forecasts through responses to nine key questions. The paper also provides California Energy Commission staff recommendations for the 2011 *IEPR* preliminary forecast and beyond.

Keywords: Energy efficiency programs, *ex ante*, *ex post*, reported program accomplishments, forecast, incremental, evaluated, uncommitted, evaluation.

Please use the following citation for this report:

Kavalec, Chris. *Energy Efficiency Program Characterization in Energy Commission Demand Forecasts: Stakeholder Perspectives and Staff Recommendations*. Staff Paper, California Energy Commission, Electricity Supply Analysis Division. CEC-200-2011-010-SD.

Table of Contents

	Page
Acknowledgements.....	i
Abstract.....	ii
Introduction.....	1
Background.....	1
Demand Analysis Working Group	4
Stakeholder Perspectives	5
Energy Efficiency Programs 1976-1997	6
Energy Efficiency Programs 1998-2005.....	12
Energy Efficiency Programs 2006-2009	15
Energy Efficiency Programs 2010-2012	18
Attribution between Categories of Historical Energy Efficiency Savings.....	20
Attribution for Incremental Uncommitted Savings.....	23
Energy Commission Staff Recommendations	25

List of Tables

	Page
Table 1: Additional Effort for 1976-1997	9
Table 2: Program Results to Use for 1976-1997	10
Table 3: Econometric Analysis for 1976-1997	11
Table 4: Additional Effort for 1998-2005	13
Table 5: Program Results to Use for 1998-2005.....	14
Table 6: Program Results to Use for 2006-2009.....	17
Table 7: Program Information to Use for 2010-2012	19
Table 8: Attribution in Historic Period	22
Table 9: Attribution for Incremental Uncommitted Savings.....	24

Introduction

Proper accounting of energy efficiency is an increasingly important requirement in California Energy Commission (Energy Commission) demand forecasts. All stakeholders agree that “the best available information” should be used in the Energy Commission’s *Integrated Energy Policy Report (IEPR)* demand forecasts. Unfortunately, a clear, consistent record of evaluated program achievements is not readily available, at least not before the 2006–2008 California Public Utilities Commission (CPUC) energy efficiency program cycle (although the results from the 2006-2008 evaluation remain in dispute). This creates large uncertainty around any estimate of historical impacts. Even where evaluated program data are available, the estimates have proven to be controversial, which leads to questions regarding characterization of current historical program impacts in the Energy Commission demand forecasts. Stakeholders in recent Demand Analysis Working Group (DAWG) meetings have debated these uncertainties, along with other issues related to treatment of energy efficiency in the forecasts.

This paper provides background on the issues, and summarizes the positions of key stakeholders regarding energy efficiency program accounting within *IEPR* forecasts through responses to nine key questions. The questions were developed during DAWG meetings and addressed at a May 25, 2011, *IEPR* staff workshop and in comments submitted afterward. This paper provides a summary of responses and Energy Commission staff recommendations for the 2011 *IEPR* preliminary demand forecast and beyond.

Background

There has been considerable attention in recent years to the use and characterization of utility and public agency program history in the Energy Commission demand forecasts. As described by Chris Kavalec and Don Schultz¹, energy efficiency enters the demand forecasting models in a number of ways. With each passing regulatory cycle, Energy Commission staff strives to improve modeling techniques, and fine tune them to reflect the best available information and forecasting approaches.² However, leaving aside the

1 Kavalec, Chris and Don Schultz. 2011. *Efficiency Programs: Historical Activities and Incorporation in Energy Commission Demand Forecasts*. Staff Paper. California Energy Commission, Electricity Supply Analysis Division. CEC-200-2011-005-SD. [http://www.energy.ca.gov/2011_publications/CEC-200-2011-005-SD.pdf](http://www.energy.ca.gov/2011_publications/CEC-200-2011-005/CEC-200-2011-005-SD.pdf)

2 See for example, Kavalec, Chris and Tom Gorin, 2009. *California Energy Demand 2010-2020, Adopted Forecast*. California Energy Commission. CEC-200-2009-012-CMF, and Electricity and Natural Gas Committee. *Incremental Impacts of Energy Policy Initiatives Relative to the 2009 Integrated Energy Policy Report Adopted Demand Forecast*. CEC-200-2009-CTF. http://www.energy.ca.gov/2009_publications/CEC-200-2009-012/CEC-200-2009-012-CMF.pdf

complexity of the forecasting models, identifying and preparing annual program accomplishments data for use in the forecasting process is a step that itself has become controversial. While all stakeholders agree that the best available data representing utility³ energy efficiency accomplishments should be used in the forecasts, there is no single, agreed upon representation of annual program accomplishments over time. Rather, there are multiple versions of the program history constructed for different purposes. Furthermore, the different versions of program accomplishments vary in terms of the clarity, availability, and quality of the record. Versions of annual program accomplishment data of interest in this discussion include:

Ex Ante Forecast Program Accomplishments—For a given implementation cycle, the investor-owned utilities (IOUs) forecast the savings they expect to achieve in that cycle. These are the *ex ante* (before the fact) forecasts undertaken during the planning portion of the program cycle.

Ex Ante Reported Program Accomplishments—Following completion of each annual reporting cycle, the IOUs report the program accomplishments in terms of the number of units installed and the best estimate of the energy savings that will result from those installations. These reported savings estimates tend to be the records that have been most regularly compiled and published from the inception of programs in the 1970s to the present time. At the “*ex ante* reported” stage, the results have not yet been verified by the CPUC’s evaluation, measurement and verification (EM&V) processes.

Ex Post Evaluated Program Accomplishments—The CPUC conducts extensive *ex post* (after the fact) evaluation of reported energy efficiency program accomplishments, including database and record review, telephone and onsite inspections, statistical analysis of data including energy bills, metering results, and engineering analyses of energy savings attributable to the programs. These analyses result in adjustments to the reported savings values based on factors that may include identification of errors or omissions in databases or reported records, and/or based on alternative parameter estimates produced by the evaluations. Parameters updated by evaluation results may include installation rates, operating hours, net-to-gross ratios (the percent of savings that are attributable to the program and would not have occurred in the absence of the program), and measure life, among others. The ratio of the evaluated results to the accomplishments originally claimed in the *ex ante* reports yields a *realization rate* for the program.

The CPUC energy efficiency program reporting structure is founded on the notion that *ex post* results are preferred to *ex ante* claims. In CPUC Decision 10-12-049, December 16, 2010,

³ In practice, the majority of historical utility energy efficiency program impacts have been achieved by CPUC-sponsored programs implemented by the California IOUs. To the extent that other entities, including the publicly-owned utilities have begun to implement programs, their programs effects are also included in the Energy Commission demand forecasts. As a practical matter, however, the discussion in this paper focuses on investor-owned utility programs.

the CPUC affirmed the importance of updating utility-reported savings when using estimates for purposes such as demand forecasts that affect supply-side planning:

For purposes of determining the actual impacts of energy efficiency programs in reducing demand and obviating the need for supply side resources, it is clearly incumbent on the Commission to update the assumptions used to quantify the impacts of the utilities' efforts. Because the actual impacts of energy efficiency play a key role in determinations of supply side resource need, it would be inappropriate to assess savings achieved from energy efficiency based on outdated assumptions in this context (p 33).

Records of *ex ante* program accomplishments claimed by the utilities are available on a consistent basis for forecasting purposes. Records of *ex post* results are available at the CPUC, although not in a usable time series format suitable for forecasting. Ideally, forecasters need annual streams of savings at least by customer class—residential, commercial, industrial and agricultural, by utility service territory. Data series offering the possibility of additional levels of disaggregation are preferred. In the past, the Energy Commission's *IEPR* adopted demand forecast has relied primarily upon *ex ante* reported results of energy efficiency program accomplishments. Efforts to improve forecasting techniques for the 2009 *IEPR* demand forecast and accompanying incremental uncommitted energy efficiency forecast prompted staff to engage in efforts to better approximate *ex post* evaluated results for use in the 2009 forecasts and *IEPR* report. These efforts, which addressed program savings back to 1998, led to changes in the amount of energy efficiency compared to what had been reported in previous forecasts, and has prompted controversy among stakeholders regarding which data streams of energy efficiency program accomplishments should be used for the Energy Commission's forecasting purposes in 2011 and beyond.

Pre-1998 energy efficiency program activity, although not playing a major role in more recent forecasts, is also receiving increased scrutiny as a measure of past program success and a guide for future efforts. A particular issue among stakeholders is the amount of program savings for 1976–1997 as presented in *ex ante* claims made by program implementers versus a significantly lower amount of savings shown in Energy Commission demand forecasts. Some parties have stated that historical program impacts incorporated in Energy Commission demand forecasts vastly underestimate actual savings prior to 1998. The staff paper by Chris Kavalec and Don Schultz⁴ described the basic process Energy Commission staff has followed in adjusting claimed savings for this historical period in staff demand forecasts.

⁴ Kavalec, Chris and Don Schultz, 2011, *op cit*.

Demand Analysis Working Group

The DAWG has devoted significant attention to understanding approaches to, and the implications of, various approaches to characterizing historical energy efficiency in demand forecasts. The DAWG was organized by Energy Commission staff in 2008⁵ to provide a forum for sharing information pertinent to demand forecasting in California, particularly inputs and approaches related to incorporating energy efficiency.

A fundamental goal of the DAWG is to provide a forum for interaction among key organizations on topics related to energy efficiency, demand forecasting, and energy procurement, recognizing that in many cases these activities operate in separate arenas within the member organizations. Membership in the DAWG includes staff from the California Energy Commission (Energy Commission), the California Public Utilities Commission Energy Division (CPUC/ED), the Department of Ratepayer Advocates, the California IOUs, several publicly-owned utilities (POU), and other interested parties, including the California Air Resources Board (ARB), The Utility Reform Network (TURN), and the Natural Resources Defense Council (NRDC). The member list has grown to include over 100 participants.

The DAWG meets regularly, either as the full DAWG or in two key “subgroups” — one related to demand forecasting in general and one related to energy efficiency. From late 2010 through the second quarter of 2011, the Energy Savings subgroup devoted significant attention to understanding Energy Commission staff’s approach to characterizing energy efficiency in the Energy Commission and utility forecasts, focusing primarily on Energy Commission forecasts. A number of questions related to treatment of energy efficiency program activity were addressed including:

- What data sources are used as inputs for historic energy efficiency in the forecast?
- How is this information used in the forecast?
- How would different characterizations of energy efficiency affect the forecast?
- How has the characterization of energy efficiency changed over time, and indeed why has it changed at all?
- What adjustments did Energy Commission staff make to *ex ante* reported program accomplishments to approximate *ex post* reported accomplishments for use in the 2009 IEPR adopted forecast?
- What approach is proposed for the Energy Commission’s 2011 IEPR and incremental uncommitted energy forecasts?

⁵ The DAWG was known as the Demand Forecast Energy Efficiency Quantification Project (DFEEQP) from 2008–2010.

- How do the utilities characterize energy efficiency history in their forecasts?

Stakeholder Perspectives

The DAWG has been successful in providing clarity regarding the positions of Energy Commission staff, the IOUs, and other stakeholders and in gaining consensus around many technical issues regarding modeling techniques, some assumptions, and a variety of model inputs. However, there are issues that have not been resolved. The DAWG has not been able to achieve consensus on the treatment and attribution of historic and forecast energy efficiency savings, and whether or not it is appropriate for Energy Commission staff to re-estimate historic energy efficiency savings as was done in the 2009 *IEPR* adopted demand forecast and as staff proposes to do in the 2011 demand forecast.

To address these concerns, Energy Commission staff convened a workshop on May 25, 2011, to allow stakeholders to express opinions on key issues related to the use and characterization of utility energy efficiency program history in the Energy Commission staff forecast(s).⁶

The following stakeholders submitted written comments to the Energy Commission's 11 IEP-1C Docket prior to the workshop:

- California Energy Efficiency Industry Council (CEEIC)
- California Public Utilities Commission/Energy Division staff (CPUC/ED)*
- Natural Resources Defense Council (NRDC)*
- Pacific Gas & Electric Company (PG&E)*
- San Diego Gas and Electric Company (SDG&E)*
- Southern California Electric Company (SCE)*

The Utility Reform Network (TURN)*

The organizations denoted above with asterisks are key stakeholders in the DAWG. These stakeholders participated in developing a set of questions to be addressed in their initial written comments, and discussed in their response presentations given during the May 25, 2011, workshop. Following the presentations by Energy Commission staff and DAWG stakeholders, a moderated panel discussion was held. The panel included Energy Commission staff, in addition to the DAWG stakeholders listed above.

Following the workshop, the following organizations submitted follow-up comments.

- CEEIC

⁶ Documents submitted for the May 25, 2011, Energy Commission staff workshop are available at: http://www.energy.ca.gov/2011_energypolicy/documents/-05252011

- Joint IOUs (PG&E, SCE, SDG&E)
- NRDC

Based on discussions in DAWG meetings, subgroup meetings, and the May 25, 2011, Energy Commission staff workshop, staff and stakeholders developed a list of nine key topics where there are differing perspectives regarding the characterization of energy efficiency in Energy Commission demand forecasts. These topics, together with summaries of the stakeholder positions, are described below.

Energy Efficiency Programs 1976-1997

In the earliest historic period (1976–1990), reporting requirements for energy efficiency programs were minimal and did not require *ex post* evaluation. An early form of *ex post* evaluations were conducted in the early 1990s: utilities agreed that they would participate within ad hoc groups of interested parties to identify and conduct selective measurement and evaluation studies to provide evidence that efficiency programs were, in fact, reducing the energy consumption of program participants. For the 1993-1997 period, program evaluations were more extensive, guided by EM&V protocols established in 1993. Records of *ex post* evaluated savings for this period are available although not in a readily usable fashion. For the 2009 *IEPR* and previous forecasts, Energy Commission staff used judgment to adjust the available records of *ex ante* savings claims made by the IOUs between 1976–1997 period in an effort to approximate *ex post* results. The staff approach was described at the May 25, 2011, workshop and is detailed in a staff paper posted online.⁷ Energy Commission staff proposes to continue this approach for the 2011 forecasts.

Stakeholders were asked to answer three questions related to this earlier era, summarized below in **Table 1**, **Table 2**, and **Table 3**. The first question, summarized in **Table 1**, asks whether, for the 2011 and future forecasts, Energy Commission staff should devote additional effort to characterizing energy efficiency program history for the 1976–1997 period, beyond using either the staff approach developed for previous forecasts or higher totals based on the record of *ex ante* reported savings. Additional efforts could include further examination of evaluation reports prepared during this period—there are few reports available before the 1990s, but more are available for the 1993–1997 period. Developing savings streams suitable for forecasting purposes by reviewing these reports would require expert judgment, but could to some degree provide improved documentation to support the analytic decisions regarding adjustments to *ex ante* reported results.

⁷ Kavalec, Chris and Don Schultz, 2011, *op cit*.

All stakeholders agreed that searching for additional analytic information for this historic period would be difficult, and may not be worth much additional staff time. This is particularly true since the results from the 1976-1997 period have little effect on the current forecast, because the measures installed in that early period have mostly decayed and been replaced by new technologies. However, for purposes beyond forecasting, such as communicating the history of California's success in energy efficiency, some stakeholders urged that additional resources should be dedicated to such an effort.

The second question, summarized in **Table 2**, asks stakeholders to indicate which program accomplishments data should be used to reflect program accomplishments in the 1976–1997 period. CPUC/ED staff and TURN support the Energy Commission staff's current approach. TURN, in particular, has emphasized that unadjusted *ex ante* reported savings should not be used because experience demonstrates that these estimates overstate the level of savings from programs and are not an accurate reflection of program history:

In particular, some of the earlier reported savings estimates did not take into account either net-to-gross ratios or the limited value of education, information, and audits when it comes to generating savings that are equivalent to supply-side resources.⁸

NRDC and the IOUs state that *ex post* results should be used when available. When not available, the best available information to use would be the utility-reported *ex ante* savings claims. NRDC states:

The CEC's revisions [in the 2009 IEPR-adopted forecast] were not based on new or improved technical information or substantive analyses; instead, adjustments were made based on staff's judgment. Moreover, the CEC did not provide a public record of those revisions nor their rationales, and the detailed revisions were not discussed or vetted through a thorough public process.⁹

Finally, in the May 25, 2011, workshop, Energy Commission staff proposed an alternative approach to estimating energy efficiency program impacts for 1976–1997 based on econometric modeling techniques and presented some preliminary results. Stakeholders were asked whether this approach would be a suitable for use in the 2011 demand forecasts. While stakeholders universally expressed an interest in pursuing this line of research, none were prepared at this stage to rely upon an econometric estimate of energy efficiency savings for the early historic period. In their comments following the workshop, the Joint IOUs commented on the econometric approach:

At the workshop, CEC staff presented preliminary results from two regression analyses using claimed EE savings and EE expenditures, among other variables to estimate their influence on electricity consumption. The results were interesting,

⁸ TURN comments for May 25, 2011, workshop.

⁹ NRDC comments for May 25, 2011, workshop.

suggestive, but not conclusive. The IOUs see value conceptually in this analysis and would like to work collaboratively with the CEC staff in further developing a vetted analysis. However, the IOUs do not feel that staff's proposal to estimate historic energy efficiency savings through the use of a regression model is appropriate at this time. The regression method needs vetting by key stakeholders outside of CEC staff.

Other stakeholders echoed these general sentiments. Results are summarized in **Table 3**. Stakeholders' full comments are available online.¹⁰

¹⁰ http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-25_workshop/additional/;
http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-25_workshop/comments/.

Table 1: Additional Effort for 1976–1997

1. Should there be additional effort to compile a more refined energy efficiency program history for 1976–1997?	
CPUC Staff Recommendation	No.
NRDC Recommendation	The Energy Commission should use the officially-adopted CPUC evaluated results and supplement with results reported according to CPUC protocols for all historical years before 2005, which, together, are the best available estimates of savings for this time period and do not need further modifications. If the Energy Commission staff simply used <i>ex ante</i> reported results, no additional effort would be required.
PG&E Recommendation	No.
SCE Recommendation	No. Expending additional time and resources to further define historical (pre 1999) program savings using EM&V study impacts is not a good use of time and resources; the focus should be on more recent and future model inputs that impact the forecast results. Any depiction of energy efficiency load impacts should reflect the time period where program savings impact the forecast.
SDG&E Recommendation	The Energy Commission staff should be focused on future energy requirements and should not take the time, effort, or expense to calculate all possible sources of historic Energy Efficiency efforts. There is little or no benefit in trying to re-estimate old, historical data that has already been adopted by the CPUC.
TURN Recommendation	No. Essentially all historic information and data have been unearthed and analyzed.

Table 2: Program Results to Use for 1976–1997

2. Which energy efficiency program results should be used for 1976–1997?	
CPUC Staff Recommendation	The Energy Commission should use the <i>ex ante</i> estimates, adjusted per Energy Commission staff recommendations to approximate <i>ex post</i> values.
NRDC Recommendation	The CEC should use the officially-adopted CPUC evaluated results, and supplement with results reported according to CPUC protocols for all historical years before 2005, which, together, are the best available estimates of savings for this time period.
PG&E Recommendation	<i>Ex-ante</i> reported savings data is the best available data given the lack of EM&V studies for this period and the fact that data prior to 1999 is not used for forecasting purposes. As a secondary option, PG&E is also open to Energy Commission staff using a range with <i>ex-ante</i> IOU reported as a high and Energy Commission adjusted as a low.
SCE Recommendation	Prior to 2006, where reliable and publically-vetted EM&V information is available to reasonably augment IOU reported <i>ex ante</i> program savings, SCE supports using <i>ex post</i> energy savings. In cases where information is lacking or professional judgment was used, SCE advocates omitting questionable data or vetting judgment based decisions. All changes to historical program savings should be documented and made publically available.
TURN Recommendation	The <i>ex ante</i> information going back to 1975 as adjusted by Energy Commission staff using the approach developed in 2009.

Table 3: Econometric Analysis for 1976-1997

3. Would an econometric analysis as described in the 5/25/11 workshop be a viable solution for characterizing program history for years 1976–1997?	
CPUC Staff Recommendation	CPUC staff is interested in the concept and in coordinating with Energy Commission staff on work underway on this topic at both agencies. However, it is not at this time a priority for the demand forecast.
NRDC Recommendation	NRDC does not agree with using the recently-presented consumption-based estimate of program savings, because the methodology has not yet been meaningfully reviewed, documented, nor vetted. It also suffers from the same inadequacies as the aberrant 2009 method of reducing savings by supplanting previously-adopted official savings estimates.
PG&E Recommendation	PG&E believes the econometric analysis is interesting and warrants further development; however, the model has not been vetted and should not be used until such time as it has been more thoroughly explained and examined.
SCE Recommendation	SCE finds value conceptually in the econometric analysis, and would like to continue to work collaboratively with the Energy Commission staff in further developing a vetted analysis aimed at estimating historic program savings.
TURN Recommendation	TURN found the analysis presented at the May 25, 2011 workshop interesting, providing yet another way to analyze the historic information and data. However, TURN does not believe it necessary to spend more time on this matter.

Energy Efficiency Programs 1998–2005

While few *ex post* results are available for the early historic period, 1976–1997, more *ex post* information is available for 1998–2005. Similar to studies in the early 1990's, however, the *ex post* evaluated program impact results for this timeframe are not readily available in a form suited for demand forecasting and therefore would require additional resources to incorporate into a forecast. Evaluation studies may combine programs together from multiple program years, across utilities, and/or focus attention on different components of program results (for example, specific technologies, market segments, or geographic regions). This renders it difficult to deconstruct *ex post* reports into component pieces and apply appropriate realization rates to yield data streams of consistent annual *ex post* accomplishments. At this time, the records of *ex post* analyses reside within hundreds of evaluation reports and regulatory documents. For the 2009 *IEPR* forecast, Energy Commission staff approximated *ex post* results for this period by applying a single realization rate to the utility *ex ante* claims adjusted for net-to-gross.

The 1998–2005 historic period differs from the 1976–1997 period in that the program impacts from this timeframe are likely to have at least some continued effect in current forecasts. Stakeholders were asked whether additional Energy Commission staff time should be devoted to refining estimates for the 1998–2005 program era, beyond the 2009 approach. If staff were to devote time to this exercise, developing a clear time series of program results suited for forecasting purposes would still require judgment regarding interpretation of the results presented in evaluation reports, for the reasons described above.

Responses are presented in **Table 4** and **Table 5**. CPUC/ED staff and TURN recommend retaining the method developed during the 2009 forecasting cycle. SCE conducted an internal analysis comparing SCE's estimate of its 2000–2005 *ex post* results to the Energy Commission staff's estimates based on the approach developed in 2009 and found the results to be comparable. Thus, SCE supports Energy Commission staff's proposed approach for the 2011 forecasting cycle, provided that the judgments used to adjust *ex ante* reported results to approximate *ex post* results are clearly vetted and documented. PG&E suggests that a range of results could be shown, with the utility reported *ex ante* estimates as a high number and the Energy Commission staff's estimates shown as a low. NRDC states that the approach developed for the 2009 *IEPR* adopted forecast is not sufficient and, in addition, there does not need to be any refinement of savings estimates that were already officially adopted by the CPUC in Annual Earnings Assessment Proceedings and/or CPUC adopted evaluation studies during this period.

Table 4: Additional Effort for 1998–2005

4. Should there be additional effort to compile a more refined energy efficiency program history for 1998–2005?	
CPUC Staff Recommendation	No.
NRDC Recommendation	There does not need to be a “refinement,” or adjustments, of savings estimates that were already officially adopted by the CPUC in Annual Earnings Assessment Proceedings and/or CPUC adopted evaluation studies, which cover the years 1999-2005. The fact that the CEC applied portfolio-wide realization rates and NTG ratios from the un-adopted, highly contested, and unresolved evaluation studies from 2006-2008 back to years 1998-2005, is inappropriate and should not be used to convey California’s EE history.
PG&E Recommendation	It depends. The approach developed for the 2009 <i>IEPR</i> adopted forecast is not sufficient. Instead, a range of savings values, from IOU <i>ex ante</i> reported accomplishments to CPUC <i>ex post</i> adjusted is most appropriate. This would require additional effort to develop since a clear record of CPUC-reported <i>ex post</i> results is not readily available. If a range is shown, using the Energy commission staff-adjusted <i>ex ante</i> results to approximate CPUC <i>ex post</i> results would be acceptable.
SCE Recommendation	Not necessarily. Internal analysis comparing SCE’s estimate of its 2000-2005 <i>ex post</i> results to the Energy Commission staff’s estimates based on the approach developed in 2009 and found the results to be comparable. In cases where information is lacking or professional judgment was used, SCE advocates omitting questionable data or vetting judgment based decisions. All changes to historical program savings should be documented and made publically available.
TURN Recommendation	No. The approach proposed by Energy Commission staff, as developed for the 2009 <i>IEPR</i> adopted forecast, should be used.

Table 5: Program Results to Use for 1998–2005

5. Which energy efficiency program results should be used for 1998–2005?	
CPUC Staff Recommendation	Use the approach proposed by Energy Commission staff. Also, SCE has indicated that SCE has compared <i>ex post</i> and results from Energy Commission staff's estimates (2000–2005) using the approach developed in 2009 and the results are comparable. Recommend that SCE share this analysis with stakeholders.
NRDC Recommendation	The Energy Commission should use the officially-adopted CPUC evaluated results and/or results reported according to CPUC protocols for all historical years before 2005 (thus including the 1998-2005 period), which are the best available estimates of savings for this time period.
PG&E Recommendation	PG&E recommends using a range of savings values, from IOU <i>ex ante</i> reported accomplishments to CPUC <i>ex post</i> evaluated accomplishments. If a range is shown, using the Energy Commission-staff adjusted <i>ex ante</i> results to approximate CPUC <i>ex post</i> results would be acceptable since a clear record of <i>ex post</i> evaluated results is not readily available.
SCE Recommendation	SCE supports the approach proposed by Energy Commission staff. SCE has compared Energy Commission staff adjustments with SCE's available <i>ex post</i> program results for the 2000–2005 period. Based on the results of this analysis, SCE believes the Energy Commission -proposed adjustments are reasonable. SCE is willing to share this analysis with stakeholders.
TURN Recommendation	The Energy Commission's analysis as developed for the 2009 <i>IEPR</i> adopted forecast should be used. These values are based on IOU <i>ex ante</i> reports adjusted to reflect Energy Commission staff's judgment to approximate <i>ex post</i> results.

Energy Efficiency Programs 2006-2009

Beginning with the 2006–2008 program implementation cycle, the CPUC instituted a more comprehensive process for capturing, retaining, and reporting *ex post* evaluation results. Thus, beginning in 2006 and up through the 2009 program year, it is possible to obtain detailed *ex post* evaluated savings information in a manner suited for demand forecasting. However, the CPUC’s 2006-2008 (plus 2009) EM&V results, which show a significant difference between reported and evaluated savings over the 2006–2009 period, have proven to be controversial.¹¹ For example, in its comments for the May 25, 2011, workshop, SCE states:

...the controversial 2006-2008 IOU energy efficiency program EM&V studies do not produce reliable or meaningful representation of SCE’s 2006-2008 energy efficiency program results. SCE strongly believes that SCE’s *ex ante* estimates for the 2006-2010 program years represent the best available energy efficiency savings data. As shown in **Table 6** SCE advocates using the utility reported *ex ante* results.

CPUC/ED staff and TURN stand behind the CPUC’s evaluated results for 2006–2008 (and 2009). As CPUC/ED staff wrote in comments submitted to the Energy Commission’s 2011 *IEPR* proceeding:¹²

We strongly support the use of evaluated energy efficiency savings results in procurement planning and forecasting efforts when the information is available. Evaluation-based estimates provide a more accurate reflection of the savings that were achieved for the time period and the likely impacts of the installed technologies over their lifetime, rather than planning assumptions. CPUC staff has provided the Energy Commission with evaluation-based results for the 2006–2008 program cycle as well as evaluation-based savings estimates for the 2009 program cycle. Energy Division believes these to be the best estimates of savings available on the grid for that time period and the likely future impact of these technologies over their lifetime. CPUC staff conducted comprehensive field based evaluation of the portfolio activities in the 2006–2008 time frame and the results of these studies were found to be statistically robust.¹³

TURN suggests in comments submitted for the May 25, 2011, workshop:

11 The IOUs criticize the general approach to the 2006–2008 study as non-cooperative, with interim results not properly vetted among stakeholders.

12 Comments of the California Public Utilities Commission’s Energy Division on the Renewable Net Short Estimate Methodologies for the 2011 *IEPR* (submitted May 12, 2011), referenced in CPUC/ED staff’s comments for the May 25, 2011, workshop on energy efficiency in demand forecasts.

13 California Public Utilities Commission. 2006–2008 *Energy Efficiency Evaluation Report*. July 2009; page 89.

The CEC should use CPUC/ED's *ex-post* evaluated results to characterize the effects of 2006-2008 results. These results derive from an extensive EM&V process that generated information on all measures accounting for 1 percent or more of IOU program savings. It is unthinkable that the results of the process should be ignored for planning purposes.

NRDC and PG&E recommend that a range of results should be shown, using the CPUC/ED evaluated results as a low and the utility reported *ex ante* estimates as a high case. As NRDC stated in comments for the May 25, 2011, workshop:

NRDC proposes the use of high and low cases to characterize the effects of the 2006-2008 programs, since the CPUC has not yet formally adopted final savings estimates for those program years, and the Energy Division's recommendations remain hotly contested and unresolved. Indeed, as noted above, the CPUC explicitly chose not to rely on the Energy Division's recommended savings numbers in D.10-12-049 citing the 'substantial controversy surrounding their accuracy, and their magnitude.'

Therefore we recommend that the savings estimates based on *ex ante* values used in D.10-12-049 should be used to represent the high case, and the Energy Division's savings estimates should be as the low case. The CPUC has not yet resolved the remaining disputes surrounding the 2006–2008 results, so the CEC's representation of those years should acknowledge that uncertainty.

Stakeholder recommendations regarding which program savings estimates to use for the 2006–2008 and 2009 cycles are summarized in **Table 6**.

Table 6: Program Results to Use for 2006–2009

6. Which energy efficiency program results should be used for 2006–2008 plus 2009?	
CPUC Staff Recommendation	The <i>ex post</i> evaluated results prepared by CPUC/ED should be used.
NRDC Recommendation	NRDC recommends that the savings estimates based on ex-ante values used in the CPUC Decision 10-12-049 should be used to represent the high case of EE savings, and the Energy Division's savings estimates should be as the low case. The CPUC has not yet resolved the remaining significant disputes surrounding the hotly-contested 2006-2008 results, and the CPUC explicitly chose not to rely on the Energy Division's recommendations in D.10-12-049, citing the substantial controversy surrounding their accuracy and magnitude. The CEC's representation of those years should acknowledge this uncertainty by using high and low cases, as recommended by NRDC, to characterize the effects of the 2006-2008 programs.
PG&E Recommendation	PG&E recommends using a range of savings values, from IOU <i>ex ante</i> reported accomplishments to CPUC <i>ex post</i> evaluated accomplishments.
SCE Recommendation	SCE support using the best available data, and believes that the controversial 2006–2008 IOU energy efficiency program EM&V studies do not produce reliable or meaningful representation of SCE's 2006–2008 energy efficiency program results. SCE strongly believes that SCE's <i>ex ante</i> estimates for the 2006–2010 program years represent the best available energy efficiency savings data.
SDG&E Recommendation	The 2006–2008 EM&V results should not be used in any form for the determination of attribution of the EE programs. Using these studies would not only result in a historically false attribution, but lead to an inaccurate evaluation of the future role that should be played by EE programs.
TURN Recommendation	The CPUC/ED evaluated results should be used.

Energy Efficiency Programs 2010-2012

For program years 2010–2012, IOU *ex ante* reported results are available for inclusion in the 2011 Energy Commission demand forecasting cycle. No *ex post* evaluated results are available for this cycle.

Energy Commission staff have proposed using scenarios that include the IOU *ex ante* reported results for 2011–2012 as high estimates, and another scenario as the low case that uses those same values, adjusted downward to reflect *ex post* realization rates consistent with the 2006–2008 and 2009 EM&V results. A mid-case would be between these two and would be applied to 2010 *ex ante* results.

Stakeholders differ somewhat in their opinions regarding which results/estimates to use for the 2010–2012 program cycle. NRDC recommends using CPUC goals for the middle scenario, in addition to higher and lower scenarios. CPUC and TURN recommend using utility forecast *ex ante* estimates (with underlying values updated per an impending CPUC decision in 2011), possibly adjusted by Energy Commission staff to reflect expected *ex post* results, providing such adjustments were “implemented carefully.” In comments prepared for the May 25, 2011 workshop, CPUC/ED recommended:

Presenting the estimated savings for the 2010–2012 program cycle in the proposed scenarios is an appropriate approach to reflect and compare the possible outcomes and policy direction. Since these programs include many elements that are carried over from the 2006–2008 program cycle, it may be appropriate to apply realization rates. However, this would only be appropriate with careful review of the program and technology similarities. A portfolio level application of ‘realization rates’ would not be appropriate or accurate.

PG&E recommends using the energy efficiency goals articulated in CPUC D.09-09-047, and SCE recommends using the *ex ante* program results for 2010 and *ex ante* forecasts for 2011–2012. Stakeholder responses are summarized in **Table 7**. SDG&E recommends three scenarios be used, but the low case should not be based on 2006–2008 EM&V results.

Table 7: Program Information to Use for 2010–2012

7. Which energy efficiency program data should be used for 2010–2012?	
CPUC Staff Recommendation	Energy Commission staff should use as a starting point IOU filed estimates of savings after the <i>ex-ante</i> proposed Decision on frozen values is adopted; in the meantime use the filed savings from November 2009. Presenting the estimated savings for the 2010–2012 program cycle in the proposed scenarios is an appropriate approach to reflect and compare the possible outcomes and policy direction.
NRDC Recommendation	NRDC proposes using the following sources to provide the scenario estimates for the 2010–2012 program cycle: <ul style="list-style-type: none"> ▪ Low EE impacts scenario: 2009 <i>IEPR</i> adjustments to 2010–2012 programs, which applied the CPUC-adopted interim verification report results to 2010–2012 plans, ▪ Mid EE impacts scenario: CPUC goals for 2010–2012, and ▪ High EE Impacts scenario: Utilities' projected savings approved in their compliance filings for 2010–2012.
PG&E Recommendation	Until better data is available, PG&E believes the CPUC goals, as filed in D.09-09-047, is most appropriate.
SCE Recommendation	Until better information is available, SCE supports using energy efficiency savings estimates from program plans approved by the Energy Commission in 2010. As required by the CPUC, SCE utilized the most current information available to estimate 2010–2012 program impacts, and are designed to be cost-effective, reliable and feasible to exceed the CPUC adopted energy efficiency savings goals promulgated in D.04-09-060 and D.09-09-047.
SDG&E Recommendation	At least three scenarios should be included, but the 2006–2008 should not be used as the low case or for any scenarios in the analysis for the reasons stated in Table 6 until the CPUC has formally approved the appropriate 2006-2008 results.
TURN Recommendation	TURN recommends applying realization rate based on 2006–2009 results and/or using frozen <i>ex ante</i> updates to forecast savings.

Attribution between Categories of Historical Energy Efficiency Savings

As described by Kavalec and Schultz,¹⁴ Energy Commission staff estimates reductions in energy demand associated with three sources:

...utility and public agency efficiency programs, building and appliance standards, and naturally occurring savings, which are intended to capture the impacts from energy price changes and certain market trends not directly associated with programs or standards. The impacts of standards are incorporated in the end-use forecasting models directly through changes in average energy consumption at the end-use level, assuming a certain compliance rate.¹⁵ Naturally occurring savings are simulated by changes in average end-use energy consumption and by application of price elasticities within the forecasting models (pages 1-2).

Kavalec and Schultz provide a summary of the modeling techniques used to develop savings estimates for these categories. They also discuss a number of uncertainties associated with the attribution of savings between categories.

...program impacts likely overlap with standards and naturally occurring savings. One example is appliance rebate programs, where impacts are difficult to separate from appliance standards. Price effects (by far the dominant source of naturally occurring savings in Energy Commission forecasts) almost certainly overlap with program impacts, since the availability of incentives for and information on efficiency measures would tend to increase price response in the face of a rate increase. Although these have not been reported in past forecasts, naturally occurring savings also occur in the other sectors, (besides residential and commercial), yielding the same attribution issues (p. 11).

Because of these uncertainties, some stakeholders recommend that no attribution among these three sources be presented in the *IEPR* forecast reports until more work is undertaken to better quantify the degrees of overlap. The views of CEEIC, NRDC, and the IOUs can be summarized in the CEEIC comments submitted for the May 25, 2011, workshop:

We believe the 2009 energy efficiency savings graph that showed and implied categorical attribution, to codes and standards, programs, and “naturally occurring savings,” can be dangerously misleading given the uncertainty associated with the analyses and attribution corrections that were used to create the graph. Without showing the uncertainty in attribution and providing further explanation of what “naturally occurring savings” may mean in this context, the graph risks implying,

¹⁴ 2011, *op cit*.

¹⁵ Typically 70–80 percent, with a *ramp up* period when new standards (or a change in existing standards) are introduced.

because of uncertain data, to the casual observer that a laissez-faire approach to energy efficiency will allow the State to meet its stated energy efficiency and AB 32 goals.

It would be very unfortunate if a single graph, with much uncertainty, was to even suggest that taking no action is more effective than the sustained investment in the efficiency programs, as well as codes and standards, that are required to overcome market barriers to wide-spread adoption of energy efficiency. Indeed, the term “naturally occurring savings” may well be a misnomer in a state with such significant activity in education, codes, standards and programs that promote energy efficiency and we would recommend that the term be avoided entirely.

There is a definite but poorly understood overlap among the various sources and causes of savings, which makes attribution between them extremely complicated. Efficiency programs play an interconnected role with and help pave the way for cost-effective codes and standards updates as well as natural market adoption. Though it is important to strive toward a better understanding of attribution for different efficiency strategies to inform policy decisions going forward, the *IEPR* Demand Forecast is not the correct forum for reaching a conclusion on the attribution of historical impacts. This is especially the case when sufficient historical data have not been collected and when significant debate remains surrounding the appropriate values to be used.

TURN supports the current Energy Commission staff approach in presenting attribution, and CPUC/ED staff takes no position on whether or how attribution between savings categories is shown in Energy Commission forecasts. Stakeholders were asked whether attribution between categories of energy efficiency savings should be shown in the demand forecasts, and if so, which categories should be shown. Responses are summarized in **Table 8**.

Table 8: Attribution in Historic Period

8. Should attribution between categories of energy savings be made within the forecast report? Which categories should be used?	
CPUC Staff Recommendation	No preference.
NRDC Recommendation	NRDC recommends that the CEC use, exclusively, one single total estimate of energy savings as a temporary fix in the 2011 IEPR demand forecast, instead of attempting to use the CEC's demand forecast model (which is not made for or capable of attributing energy savings) to develop attribution wedges. Previous DAWG meetings and presentations at the May 25th workshop by staff, showed that there is significant overlap among the categories, that the naturally-occurring wedge was created on an insufficient (and a not-yet-documented) basis, and that the amount attributed to various categories changes depending on the order in which the model is run, which makes it unreasonable for the CEC to use such a model to publish inaccurate attribution wedges that will be considered the official CA EE history record throughout California and beyond.
PG&E Recommendation	PG&E believes that attribution should not be made unless depictions can be made on a consistent basis (<i>ex ante</i> /unadjusted, <i>ex post</i> /adjusted) across savings categories and there is a thorough explanation of steps taken to produce the depictions and the use intended for those depictions (forecasting, policy, etc). Note that comparability between program savings and savings attributable to codes and standards is an issue of concern, as the savings streams are not necessarily comparable given that the current analytic treatment dictates that IOU program accomplishments decay whereas savings from codes and standards do not decay.
SCE Recommendation	The 2009 IEPR adopted forecast graphics depicting attribution between categories lacked a thorough explanation of how total estimated energy efficiency savings were allocated across categories for modeling purposes and therefore should not be interpreted as a policy stance on the historical energy efficiency savings attributable to particular categories, such as IOU programs. Depictions of historic aggregate energy efficiency savings should be consistent with those that have been filed, reported and depicted previously by the Energy Commission, CPUC, and other State and Federal agencies in which IOU building standards, appliance standards, and IOU program savings are all shown on a consistent <i>ex-ante</i> modeled and reported basis.
SDG&E Recommendation	Energy Commission models should not be the source for determining attribution. It is the aggregated savings that is important, not which programs get attribution.
TURN Recommendation	TURN supports the use of the historic attribution categories proposed by Energy Commission staff.
California Energy Efficiency Industry Council Recommendation	The Energy Commission should provide only one graph that indicates total historical energy efficiency and conservation savings. This graph should consist of only a single line that totals estimates of all gross energy savings associated with all sources, for example, efficiency utility and public sector programs, codes and standards, and other. Gross energy savings should be defined as in the Model Energy Efficiency Program Impact Evaluation Guide: "The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated."

Attribution for Incremental Uncommitted Savings

As described at length in an Energy Commission report from 2009,¹⁶ the Energy Commission distinguishes between committed and uncommitted energy efficiency in its demand forecasts.

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.¹⁷ 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 (p. 8).

Beginning with the 2009 IEPR cycle, Energy Commission staff prepared an incremental uncommitted energy efficiency forecast as a supplement to the adopted demand forecast, which includes only the committed energy efficiency. Categories of energy efficiency savings shown in the incremental uncommitted forecast for 2013–2020 derive from the CPUC’s 2008 Energy Efficiency Goals Study¹⁸ and include IOU programs, AB 1109 (the Huffman bill), Title 24 impacts, and the CPUC’s Big Bold Energy Efficiency Initiatives.

Stakeholders were asked whether attribution between savings categories should be shown for uncommitted energy efficiency as proposed by Energy Commission staff. As shown in **Table 9**, stakeholders agree with the proposed approach.

¹⁶ Electricity and Natural Gas Committee, 2009, *op cit*.

¹⁷ 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.

¹⁸ Itron, Inc. *Assistance in Updating the Energy Efficiency Savings Goals for 2012 and Beyond*. Prepared for the California Public Utilities Commission, 2008.

Table 9: Attribution for Incremental Uncommitted Savings

9. Should there be attribution in forecast period (the incremental uncommitted portion of the forecast)?	
CPUC Staff Recommendation	Yes.
NRDC Recommendation	Yes.
PG&E Recommendation	Yes.
SCE Recommendation	Yes.
SDG&E Recommendation	Yes.
TURN Recommendation	TURN agrees with the Energy Commission staff proposed approach and believes there should be attribution between categories in both the historic and the incremental uncommitted periods.

Energy Commission Staff Recommendations

Energy Commission staff makes the following recommendations regarding efficiency impacts and presentation within the 2011 IEPR forecast.

- Energy Commission staff agrees with stakeholders that no staff time or resources should be used in re-estimating historic residential and commercial efficiency program load impacts for the 1976–1997 period for forecasting purposes through examination of *ex post* studies or other program data. Energy Commission staff feels that there is no reason to believe that re-analysis will yield different results given the lack of adequate *ex post* studies and data. In addition, program impacts from this period have minimal impacts of the forecast, since residual impacts from programs introduced during this period would likely be very small by 2010, the base year in the 2011 IEPR forecast.
- The current estimates of efficiency program impacts for 1976–1997 should be used in the IEPR forecasts. Energy Commission staff believes that there is ample justification for a heavy discounting of *ex ante* claimed savings for this historical period, particularly in the earliest years, when program savings relied on information and education programs. However, staff acknowledges the uncertainties and potential overlap among efficiency sources so that program impacts could be higher than estimated (see recommendation on attribution, below).
- Energy Commission staff should continue to investigate an econometric approach to estimating historical program savings, particularly for the 1976–1997 period, either through involvement in the CPUC’s consumption metric analysis or through additional work in house. Any analysis results should be vetted through the DAWG process and Energy Commission workshops before incorporation into an IEPR demand forecast.
- For the preliminary 2011 IEPR forecast, the current approach to adjusting reported savings for the 1998–2005 period (as detailed in the 2009 IEPR forecast report¹⁹) should be used. In addition, the CPUC 2006–2008 and 2009 EM&V results should serve as the basis for adjustments to reported savings for 2006–2009. It is not feasible to develop program savings scenarios in the historical period given staff forecast methodologies, as PG&E has suggested. However, staff is open to further refinement of these program adjustments after the preliminary forecast for incorporation in the revised and adopted 2011 IEPR forecasts. Estimated program impacts during these periods do affect the demand forecast, and staff recommends further discussion in the DAWG meetings and

19 Kavalec, Chris and Tom Gorin, 2009, *op cit*. *Ex post* results for 1998–2005 are approximated by applying a single realization rate, 0.70, to net reported savings. This rate is derived from EM&V results for the 2004–2005 period.

suggests that utilities provide their own analysis when possible (as SCE has already done).

- For the forecast period, staff believes it is important to provide scenarios for projected program savings given the associated uncertainties. Therefore, the proposed scenarios for 2011 and 2012 programming should be incorporated in the *2011 IEPR* preliminary forecast.
- Energy Commission staff acknowledges and shares the concerns voiced by stakeholders about savings attribution among the three sources of efficiency. For the preliminary forecast, staff proposes to present savings graphically as a sum total of the three sources, without attribution except for a later table showing estimated impacts from standards (since this is a key metric for the Energy Commission). Any attribution beyond this should be presented through qualitative discussion only. However, staff believes that full, defensible quantitative attribution is desirable, and work on disentangling the effects among the sources should continue for the post-1997 period, with the goal of providing at least some additional attribution for the revised and adopted *2011 IEPR* forecasts. Energy Commission staff does not believe any further work for the earlier (1976–1997) period is warranted, either for estimation of program savings, as discussed above, or for savings attribution. Full attribution should be provided for forecast incremental uncommitted savings.