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Energy Efficiency in Western Utility Resource Plans: Impacts on Regional Resource Assessment and Support for WGA Policies

Nicole Hopper, Charles Goldman, and Jeff Schlegel

Environmental Energy Technologies Division

August 2006

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Energy Efficiency in Western Utility Resource Plans: Impacts on Regional Resource Assessment and Support for WGA Policies

Prepared for
Western Interstate Energy Board
Committee on Regional Electric Power Cooperation

and
Office of Electricity Delivery and Energy Reliability
Department of Energy

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Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

aMW	average megawatts
BC	British Columbia
CDEAC	Clean and Diversified Energy Advisory Committee
CEC	California Energy Commission
CPUC	California Public Utilities Commission
DSM	demand-side management
EE	energy efficiency
GWh	Gigawatt-hour
IOU	investor-owned utility
IRP	integrated resource plan
LBNL	Lawrence Berkeley National Laboratory
LCP	least cost plan
LCRP	least cost resource plan
L&R	loads and resources
MW	Megawatts
NPCC	Northwest Power and Conservation Council
NWE	Northwestern Energy
PG&E	Pacific Gas & Electric Co.
PGE	Portland General Electric
PNM	Public Service of New Mexico
PSCO	Public Service of Colorado
PSE	Puget Sound Energy
PUC	Public Utilities Commission
SDG&E	San Diego Gas & Electric
SCE	Southern California Edison
WECC	Western Electricity Coordinating Council

Executive Summary

In the aftermath of the consumer price shocks and short-term power shortages of the 2000–01 electricity crisis, policymakers and regulators in Western states are placing increased emphasis on integrated resource planning (IRP), resource adequacy and assessment and a diversified portfolio of resources to meet the needs of electricity consumers. In some states, high growth in electricity demand, rapid increases in natural gas prices, concerns about the environmental impacts of electricity generation, and the potential to provide utility bill savings for households and businesses have led to renewed state and utility commitments to energy efficiency. At the regional level, the Western Governor's Association (WGA) has set a high priority for energy efficiency, establishing a goal of reducing projected electricity demand in 2020 by 20% in a policy resolution on Clean and Diversified Energy for the West (WGA 2004). Nationally, the North American Electric Reliability Council (NERC) calls for improved tracking of demand-side resources in load forecasts in its recently adopted reliability standards (NERC 2005a and 2005b).

In this study, we examine the treatment of electric end-use energy efficiency[2] in recent resource plans[3] issued by fourteen investor-owned utilities (IOUs) in the Western United States and Canada.[4] The goals of this study are to:

- summarize energy-efficiency resources as represented in a large sample of recent resource plans prepared by Western utilities and identify key issues;
- evaluate the extent to which the information provided in current resource plans can be used to support region-wide resource assessment and tracking of state/utility progress in meeting the WGA's energy-efficiency goal (WGA 2004); and
- offer recommendations on information and documentation of energy-efficiency resources that should be included in future resource plans to facilitate comparative review and regional coordination.

Utilities Included in this Study

The most recent resource plans published by the following large investor-owned utilities as of February 2006 were reviewed for this study:[1]

- Avista Corp.
- BC Hydro
- Idaho Power Co.
- Nevada Power
- NorthWestern Energy Corp. (NWE)
- PacifiCorp
- Pacific Gas & Electric (PG&E)*
- Portland General Electric (PGE)
- Public Service of Colorado (PSCO)
- Public Service of New Mexico (PNM)
- Puget Sound Energy (PSE)
- San Diego Gas & Electric (SDG&E)*
- Sierra Pacific
- Southern California Edison (SCE)*

* Due to data redaction in the California utilities' resource plans, energy-efficiency and load forecast data were taken from alternate sources (see Appendices A and B).

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[1] This is not a comprehensive review of all utilities in the West. We did not include resource plans prepared by power marketing authorities or municipally owned utilities.

[2] While a few utilities included additional demand-side resources, such as demand response, in their plans, we do not report that information. However, many of the issues and recommendations presented for energy efficiency in this report are relevant and applicable to other demand-side resources.

[3] We refer to "integrated resource plans", "default supply plans", "long-term procurement plans", "least-cost resource plans", and "electric supply plans" collectively as "resource plans."

[4] This is one in a series of technical reports on utility resource planning in the West prepared by Lawrence Berkeley National Laboratory (LBNL) on behalf of the Western Interstate Energy Board Committee on Regional Electric Power Cooperation (CREPC).

Accounting for Energy Efficiency Resources over Time

The reviewed resource plans were all filed or updated in 2003, 2004 or 2005, and they cover a range of time horizons. We adopted an analysis period for this study beginning in January 2004 (see Figure ES-1). Projected energy-efficiency activity is reported over two timeframes: 2004–08, a near- or-mid-term planning horizon; and 2004–13, a longer-term horizon. The 2006–20 timeframe established for the WGA energy-efficiency goal is also represented in Figure ES-1.

The economic lifetimes of installed energy-efficiency measures are varied and can exceed the time horizon of utility resource plans. Thus, it is important to track not only utility investments in energy efficiency proposed for implementation during the resource plan, but also to account for previous investments that still provide energy savings during the timeframe of interest. Accordingly, we define a "pre-analysis" period whose length varies by utility (see Figure ES-1).

Three primary energy-efficiency policies and strategies may contribute to the total energy-efficiency resource in a given state or utility service territory:

- *Energy-efficiency programs,* administered by utilities (or third parties) and funded by utility ratepayers, that facilitate the installation of energy-saving measures at customers' sites through technical assistance, information, and/or financial incentives;
- State or federal *energy-efficiency standards* for appliances or other equipment; and
- *Building codes* that stipulate specific design efficiency levels for new construction and/or major facility renovations.

Ideally, these energy-efficiency strategies should be identified and tracked separately over time and their contribution to the load forecast clearly defined. However, we found several important shortcomings in the reporting of data in the resource plans:

- *Lack of clarity*—the treatment of key information (e.g., whether and how energy-efficiency impacts were included in load forecasts) was often difficult to discern;
- *Inconsistencies across resource plans*—inconsistent treatment and reporting of energy efficiency impacts across resource plans confounded comparative review and analysis of results;
- *No information on non-programmatic efficiency*—the plans only reported savings from energy-efficiency programs (i.e., the effects of standards and codes were not reported);
- *Program details provided for a limited time period*—most plans only reported effects of programs proposed for implementation during the resource plan period (i.e., pre-plan effects were not reported), and a few only reported savings for the initial years of the plan; and
- *Under-reporting of capacity impacts*—several Pacific Northwest utilities did not report the capacity (MW) savings from energy-efficiency resources.

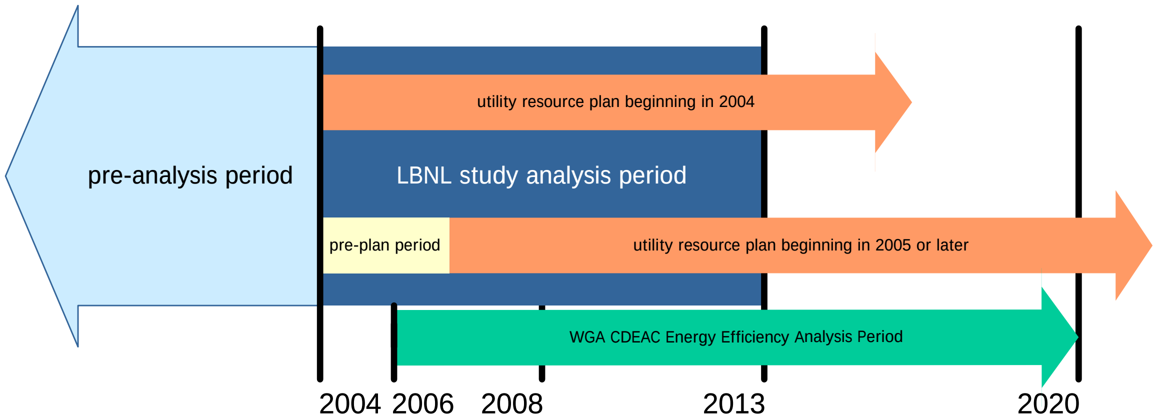

Figure ES-1. Timeframes of Resource Plans, Study Analysis and the WGA Goal

Impacts of Programs Proposed in Western Utility Resource Plans

Information on *plan program effects*, the resource savings in 2008 and 2013 from utilities' proposed energy-efficiency program investments starting in 2004, were available for twelve utilities.[5] The results (shown in Figure ES-2) indicate that a handful of utilities in our sample provide a large portion of the energy-efficiency resource savings in the West. However, differences in *plan program effects* across utilities are clearly correlated with utility size (e.g., the largest savings are observed for the California utilities and BC Hydro).

To adjust for utility size and allow for more meaningful comparison across utilities, we represent projected savings in 2008 and 2013 from energy-efficiency program additions as a share of the average annual growth in each utility's *total resource requirements*[6] over the periods 2004–08 and 2004–13. The results are shown for energy (GWh) and summer-peak capacity (MW) in Table ES-1.

The results illustrate the potential of energy-efficiency programs to mitigate projected load growth. Four utilities (PSE, PG&E, SCE, and SDG&E) proposed energy-efficiency programs that are projected to offset more than 70% of their forecasted energy load growth between 2004 and 2013. For these utilities, and Avista, these programs are expected to reduce annual energy load growth from 1.6–2.6% per year to ~0.5% or less. The other utilities project a more moderate role for energy-efficiency programs. For three, (PNM [not shown], Idaho Power and Nevada Power), energy-efficiency programs proposed in the resource plans play a very minor role (0% to 7% of projected load growth).

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[5] Note that these results do **not** include savings from programs implanted prior to 2004 or impacts of standards or codes. See Appendix A for the specific data used and assumptions made for each utility in compiling *plan program effects* from the resource plans.

[6] *Total resource requirements* refers to the utility's load forecast, not including reductions in demand from energy efficiency or other demand-side management programs (see section 2.4 and Appendix B). Reserve margins are also not included.

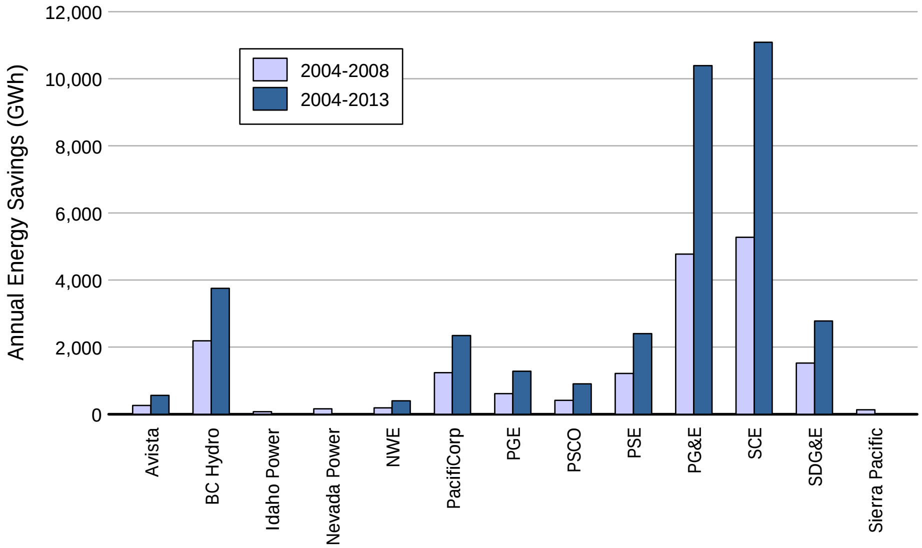

Figure ES-2. Plan Energy Efficiency Program Effects: Annual Energy Savings

Notes for Figure ES-2 and Table ES-1: (1) BC Hydro's plan only commits to implementing its PowerSmart-2 program through 2012; possible continued savings from PowerSmart-3 are included for 2013. (2) Nevada Power only reported annual savings for 2004; this level of savings was assumed for each year from 2004 through 2008. (3) PacifiCorp identifies 200 aMW of plan savings for 2004–05, assigned here to 2008, and 250 aMW between 2006 and 2015, assigned to 2013. (4) PGE identifies additions for 2005–11; the 2013 value was extrapolated. (5) PSE values include residential fuel conversion programs—standalone energy-efficiency program savings were not available. (6) The energy savings goals for the California utilities (PG&E, SCE and SDG&E) include all programs administered by the utilities, including those offered to direct access customers. Some portion of savings from energy-efficiency standards is included in these goals, as the utilities administer programs to support their implementation. (7) Sierra Pacific only reported annual savings for 2005; this level of savings was assumed for each year from 2004 through 2008.

Table ES-1. Plan Energy Efficiency Program Effects as Percentage of Growth in Total Resource Requirements[1]

Utility	2004–2008		2004–2013	
	Energy (GWh)	Summer-Peak Capacity (MW)	Energy (GWh)	Summer-Peak Capacity (MW)
Avista	26%	*29%*	23%	*25%*
BC Hydro	64%	*63%*	47%	*48%*
Idaho Power	5%	6%	5%	6%
Nevada Power	*7.5%*	*15%*	——	——
NWE	26%	——	36%	——
PacifiCorp	44%	14%	30%	12%
PGE	27%	*36%*	26%	*29%*
PSCO	16%	34%	14%	28%
PSE	100%	*123%*	79%	*96%*
PG&E	74%	62%	72%	65%
SCE	76%	53%	77%	58%
SDG&E	91%	74%	76%	67%
Sierra Pacific	*23%*	*24%*	——	——

LBNL made assumptions in calculating Italicized values—values in regular font are compiled directly from resource plan data.
[1] *Total resource requirements* do not include load reductions from *plan program* effects or reserve margins.

In interpreting the impacts of energy efficiency in the resource plans, several points should be noted:

- The data represent a snapshot in time for each utility. Energy-efficiency commitments made subsequent to the filing of the resource plans, or addressed in separate regulatory proceedings, are not included.
- Among the reviewed plans, utilities with high load growth (>2% per year) tend to meet a smaller share of that growth with energy-efficiency resources than utilities forecasting lower load growth.
- Some utilities in the West are projecting higher growth in peak demand than energy sales, due primarily to increased saturation of air conditioning.
- It is clear that state and regional regulatory policies that support energy efficiency and establish specific targets are an important factor driving these results, particularly in the longer term.[7]
- New energy-efficiency programs proposed by utilities may be affected by prior utility or state energy-efficiency activities.

Measuring Progress toward the WGA Energy Efficiency Goal

Policymakers will require publicly available information to track progress toward the region-wide WGA goal of meeting 20% of projected energy demand with energy efficiency by 2020. One potential source of information is utility resource plans. From the reviewed plans, we were able to develop a crude proxy of individual utilities' progress in 2008 and 2013. The results suggest that utilities' proposed energy-efficiency programs will meet from less than 1% to over 6% of utilities' *total energy requirements*[8] in 2008, and from less than 1% to over 11% in 2013. However, this metric falls short of measuring utilities' and states' actual progress because it does not include non-programmatic energy efficiency (e.g., efficiency standards and building codes) that should be counted toward the WGA goal.

Summary of Key Findings

We offer the following key findings from our review of Western utility resource plans:

1. Energy-efficiency programs are projected to meet a significant fraction of some utilities' incremental resource needs.
2. Energy-efficiency programs can help utilities manage and partially offset growth in peak demand and sales.

[7] The greatest proposed investments observed in 2013 are driven by aggressive energy-efficiency policies and goals set by the California Public Utilities Commission (CPUC) for investor-owned utilities. The targets proposed by the Northwest Power and Conservation Council (NPCC) in its 5th Regional Plan may also be influential for some of the Pacific Northwest utilities (NPCC 2005).
[8] *Total energy requirements* refers to the utility's load forecast, not including reductions in demand from energy efficiency or other demand-side management programs (see section 2.4 and Appendix B). Reserve margins are also not included.

3. Utilities currently do not explicitly account for the combined impact of energy-efficiency strategies (programs, standards and codes) in their resource plans.
4. In most resource plans, energy-efficiency effects were implicit, or fixed, in the modeling process. Few utilities explicitly modeled energy efficiency as a resource, allowing it to compete with supply-side resources in identifying a least-cost portfolio.
5. Although utilities in the West have made significant progress in analyzing alternative resource portfolios under different risk scenarios, none explicitly analyzed the risk-mitigation benefits of energy-efficiency resources.

Recommendations

To improve the ability of utilities and state regulators to track energy efficiency as a resource, we offer specific recommendations for standardizing and improving the availability of information on energy-efficiency impacts in utility resource plans.[9]

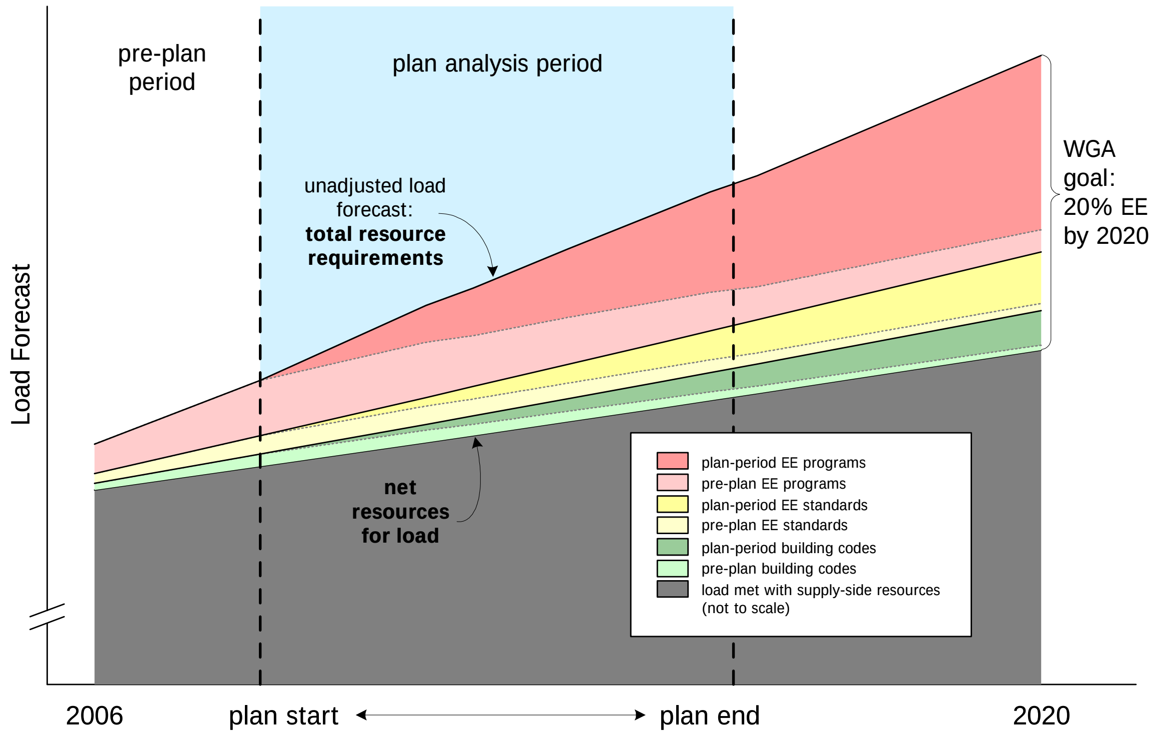

Figure ES-3. Tracking Energy Efficiency Resources in Load Forecasts to Support WGA and Resource Assessment Goals

Figure ES-3 provides a conceptual overview of these recommendations. The reference dates (2006, 2020 and generic plan start and end dates) are tailored to future resource plans and the time period over which implemented strategies may count toward the WGA

[9] Some resource plans already incorporate several of these recommendations; however, implementation of all recommendations by utilities (and public utility commissions) in the West would greatly facilitate comparative review and analysis on a regional basis.

clean energy goal. Among the concepts illustrated in Figure ES-3, we highlight two important quantities:

- *Total resource requirements*—a load forecast (net of losses but not including reserve margins) that represents the amount of energy or capacity that would be required to meet projected demand in the absence of any energy-efficiency strategies; and
- *Net resources for load*—a load forecast net of all projected energy-efficiency resources (i.e., *total resource requirements* minus the impacts of energy-efficiency programs, appliance standards and building codes).

The following recommendations provide guidance to utilities in developing these two important load forecast quantities, as well as other important information to support regional resource assessment activities.

1. Provide information on all demand-side resources (energy efficiency and other demand-side resources) included in the resource plan, by type of resource.
2. Clearly identify which types of energy efficiency strategies are included in the resource plan—i.e., ratepayer-funded energy efficiency programs, building energy codes, and appliance efficiency standards.
3. Treat energy efficiency as an explicit, load-modifying resource.
4. Clearly and separately identify the effects of energy-efficiency measures installed during the resource plan analysis period, and the residual effects of measures installed in the pre-plan period.
5. Describe the relationship between near-term energy-efficiency program plans and long-term goals/targets for energy efficiency.
6. Provide both energy savings (MWh or GWh) and summer coincident peak demand reductions (MW) for energy-efficiency resources.
7. Provide annual effects of energy-efficiency resources by program year and by calendar year.
8. Provide energy-efficiency savings data for all years of the resource plan analysis period.
9. Include key metrics describing the relationship between the energy-efficiency resources and key resource issues in the resource plan.
10. Clearly identify the basis or criteria for determining the level of investment in energy-efficiency resources in the plan.
11. As the new NERC reliability standards are implemented[10], work with appropriate NERC and WECC committees and subcommittees to ensure that demand-side management data reporting protocols and definitions are consistent across NERC, WECC and state/regional assessments as well as utility resource plans.

[10] NERC standards MOD-016-0 and MOD-021-0 require that DSM be explicitly included in load forecasts.

Each of these recommendations is described in detail in section 4.3 of this report. Example spreadsheet forms, that illustrate how utilities could implement these recommendations, are described in Appendix E and are available for download at http://eetd.lbl.gov/ea/EMS/rplan-pubs.html.

1. Introduction

In the aftermath of the consumer price shocks and short-term power shortages of the 2000–01 electricity crisis, policymakers and regulators in Western states are placing increased emphasis on integrated resource planning (IRP), resource adequacy and assessment and a diversified portfolio of resources to meet the needs of electricity consumers. In some states, this has led to a resurgence in state and utility commitments to energy efficiency.[11] Increasing interest in acquiring energy efficiency as a power-system resource is also driven by the desire to dampen high growth rates in electricity demand in some Western states, rapid increases in natural gas prices, concerns about the environmental impacts of electricity generation (e.g. water consumption by power plants, air quality), and the potential of energy efficiency to provide utility bill savings for households and businesses (WGA CDEAC 2006). Recognizing the cost-competitiveness and environmental benefits of energy efficiency, the Western Governor's Association (WGA) has set a high priority for energy efficiency, establishing a goal of reducing projected electricity demand by 20% across the West by 2020 in a policy resolution on Clean and Diversified Energy for the West (WGA 2004). Nationally, the need for improved tracking of demand-side resources in load forecasting is formalized in the North American Electric Reliability Council (NERC)'s recently adopted reliability standards, which utilities and regional reliability organizations will need to comply with (NERC 2005a and 2005b).

In this study, we examine the treatment of energy efficiency in recent resource plans issued by fourteen investor-owned utilities (IOUs) in the Western United States and Canada. The goals of this study are to:

- summarize energy-efficiency resources as represented in a large sample of recent resource plans prepared by Western utilities and identify key issues;
- evaluate the extent to which the information provided in current resource plans can be used to support region-wide resource assessment and tracking of state/utility progress in meeting the WGA's energy-efficiency goals (WGA 2004); and
- offer recommendations on information and documentation of energy-efficiency resources that should be included in future resource plans to facilitate comparative review and regional coordination.

This is one in a series of reports on utility resource planning in the West prepared by Lawrence Berkeley National Laboratory (LBNL).[12] These comparative studies are conducted on behalf of the Western Interstate Energy Board Committee on Regional

[11] The Northwest Power and Conservation Council (NPCC) has established energy-efficiency targets based on cost-effective energy-efficiency potential for the Pacific Northwest region (NPCC 2005). In California, the CPUC and the CEC have also set aggressive goals for energy efficiency (CPUC 2004). Several state regulatory authorities in the Southwest (Nevada, Arizona, Utah) have approved increases in utility energy-efficiency spending since the resource plans included in this study were filed (Geller 2006) and BC Hydro is also ramping up its energy-efficiency goals (BC Hydro 2006).

[12] For other LBNL studies that analyze information included in utility resource plans in the West, see Barbose et al. (2006) on resource assessment and need and Bolinger and Wiser (2005) on the treatment of renewable energy in Western utility resource plans.

Electric Power Cooperation (CREPC). CREPC (and LBNL) place a high priority on regional coordination and sharing of “best practices” on key issues facing the electric power sector and state agencies with responsibility for overseeing the electricity industry.

The information and recommendations included in this report should be useful to policymakers, utilities, and analysts interested in energy efficiency from the following perspectives:

- individual utilities’ resource planning processes;
- regional and West-wide resource adequacy and assessment;
- tracking state/utility progress toward the WGA goal; and
- assessing the role of energy efficiency in achieving environmental benefits across the West.[13]

The scope of this report covers projected electric end-use efficiency investments reported in all Western utility resource plans that were publicly available as of February 2006.[14] While a few utilities included additional demand-side resources, such as demand response, in their plans, we do not report that information. However, many of the issues and recommendations in reference to energy efficiency in this report are relevant to other demand-side resources as well.

This report is organized as follows. Section 2 outlines the data sources and approach used in this study and conceptualizes methods and metrics for tracking energy-efficiency resources over time. Section 3 presents results from the review of the utility resource plans. Important issues encountered in reviewing the resource plans are discussed in section 4. Finally, section 5 concludes with recommendations for improving the tracking and reporting of energy efficiency in forthcoming resource plans.

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[13] Energy efficiency may be counted toward state or regional markets for pollutant emission reductions. Several western states (e.g., California, Oregon, Washington) are also pursuing coordinated initiatives to reduce greenhouse gas emissions by developing joint policy recommendations (WCGGWI 2004).

[14] While some of the resource plans also addressed natural gas efficiency, this study focuses only on electric end-use efficiency.

2. Methods and Concepts for Tracking Energy Efficiency Resources

Utility resource plans provide detailed information on existing and projected loads and resources (L&R), assumptions underlying L&R projections, and the methods used to model utility systems within Western power markets. Many of the plans also contain detailed descriptions of demand-side management (DSM) programs. In this section, we describe these data sources and the process used to review the plans, and define important metrics for tracking energy-efficiency resources over time.

We begin by introducing the specific utility resource plans, commenting on geographic representation (section 2.1). Next, we discuss issues in analyzing resource plans across multiple timeframes and establish date reporting conventions for this study (section 2.2). In section 2.3, we develop a framework for conceptualizing and tracking energy-efficiency resources over time. Sections 2.4 and 2.5 describe the treatment of energy efficiency in load forecasts, and define the energy-efficiency metrics used in this study. Section 2.6 concludes with examples of "best practices" among current resource plans.

2.1 Approach and Data Sources

We reviewed the most recent resource plans published by fourteen large IOUs in the Western United States and Canada as of February 2006 (see Table 2-1). For the purposes of this study, we refer to "integrated resource plans", "default supply plans", "long-term procurement plans", "least-cost resource plans", and "electric supply plans" collectively as "resource plans."

Table 2-1. Investor-owned Utility Resource Plans Reviewed for this Study

Utility	Year and name of the resource plan	Location of operations
Avista Corp.	2005 Integrated Resource Plan	ID, WA
BC Hydro	2004 Integrated Electricity Plan	BC
Idaho Power Co.	2004 Integrated Resource Plan	ID, OR
Nevada Power	2003 Integrated Resource Plan	NV
NorthWestern Energy Corp. (NWE)	2005 Electric Default Supply Resource Procurement Plan	MT
PacifiCorp	2004 Integrated Resource Plan	OR, ID, UT, CA, WA, WY
Pacific Gas & Electric (PG&E)	2004 Long-term Procurement Plan	CA
Portland General Electric (PGE)	2004 Final Action Plan to 2002 Integrated Resource Plan	OR
Public Service of Colorado (PSCO)	2003 Least-Cost Resource Plan; Comprehensive Settlement Agreement (December 2004)	CO, NM, WY
Public Service of New Mexico (PNM)	2005 Electric Supply Plans	NM
Puget Sound Energy (PSE)	2005 Least Cost Plan	WA
San Diego Gas & Electric (SDG&E)	2004 Long-term Resource Plan	CA
Sierra Pacific	2004 Integrated Resource Plan	NV, CA
Southern California Edison (SCE)	2004 Long-term Procurement Plan	CA

This study is not a comprehensive review of all resource plans in the West due to limited resources, time constraints, and plan availability. Our review was limited as follows:

- Resource plans and plan updates released after February 2006 are not included in this study.
- Utility resource plans represent a snapshot of the utility's projected resource mix, resource need, and proposed actions at a specific time; plans evolve over time and are typically updated every two or three years. Several of the utilities included in this study are issuing resource plan updates for 2006.
- Resource plans prepared by power marketing authorities and municipally owned utilities are not included in this study. While municipally owned utilities play a major role in Western markets, access to their resource plans is limited.[16]
- We focus only on electric end-use efficiency in this study—although natural-gas efficiency was included in some IOUs' resource plans, we did not compile or evaluate this information.

The Western region as defined in this study is the Western Interconnection overseen by the Western Electricity Coordinating Council (WECC), which includes Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming, and the Canadian provinces of British Columbia and Alberta.[17] The utilities included in this study account for approximately 59% of the total electricity sold in the Western Interconnection (WECC 2006).

Geographically, the sample of resource plans is over-represented by utilities in the Pacific Northwest region—an area with a traditionally hydroelectric-based electric system and, for several utilities, winter-peaking electric loads. Historically, resource plans of utilities

> ***Energy and Peak Capacity Units***
>
> We report *plan* and *plan and pre-plan program effects* both in terms of energy savings[15] and reductions in peak demand.
>
> Several of the Northwest utilities' resource plans did not report the impacts of energy-efficiency programs on reducing system peak demand. For most of the West, however, peak capacity is limiting and is the primary basis for assessing resource adequacy. Further complicating the matter, four utilities—Avista, BC Hydro, PGE and PSE—experience their peak demand in the winter, whereas the majority of the West is summer-peaking.
>
> We addressed these issues by converting reported energy savings to peak-demand savings for those utilities that did not report them, and, for winter-peaking utilities, winter-peak to summer-peak demand. We made use of conversion factors used by regional planning organizations in the Pacific Northwest (see Appendix C). All converted results are indicated with *italics* in tables and asterisks in figures. We caution that they are illustrative at best, as they are not directly reported in the resource plans.

[15] All the utilities reported energy-efficiency savings data in either Gigawatt-hours (GWh) or average-megawatts (aMW). An aMW is defined as the amount of energy that a 1 MW resource would produce if it ran continuously for one year (8760 hours). This energy unit is commonly used as a proxy for capacity in hydroelectric-based systems. Most of the Pacific Northwest resource plans reported energy-efficiency and other L&R data in aMW. We converted all aMW data to GWh, a more commonly used and recognized energy unit.

[16] While municipal-owned utilities that purchase electricity from the Western Area Power Administration are required to prepare resource plans, they are not required to make the plans available to the public.

[17] The WECC control area is not precisely bounded by state lines, and it also extends into Mexico.

in the Pacific Northwest have focused on managing potential energy constraints (e.g., ensuring that there is adequate energy at all times of the year, given variations in availability of hydroelectric power). By contrast, in most other parts of the West, utility resource planning activities have focused on ensuring adequate generating capacity to meet summer peak loads. These different planning perspectives present challenges in tracking demand-side resource investments across the Western region as a whole.

We conducted a detailed review of each resource plan. They varied substantially in the availability, completeness, and specificity of L&R data and the treatment and reporting of energy-efficiency resource data. One important issue that required addressing was the units in which energy and peak capacity savings were reported (see the textbox above). For several resource plans, energy-efficiency projections were difficult to discern, internally inconsistent or absent.[18] PNM's resource plan focuses entirely on supply-side (generation) resources—as a result, PNM does not appear in any of the results in section 1.

Where possible, we adopted consistent data treatment and reporting conventions across utilities (see the textbox to the right).

Conventions Used in this Report

- In most cases, we limited our review to resource plans, and did not include supplemental documents with additional information on energy-efficiency resources, such as utility DSM filings.
- Most of the L&R data in the California utilities' resource plans were redacted—this, combined with significant energy-efficiency savings goals adopted by the California Public Utilities Commission (CPUC), prompted us to make an exception to the above rule and supplement the California IOUs' resource plans with data from other sources. Peak demand and load forecasts were obtained from a California Energy Commission (CEC) report (CEC 2005a). Energy-efficiency goals were obtained from a CPUC Decision (CPUC 2004); this information was augmented with the utilities' 2006–08 DSM plan advice filings (PG&E 2006, SCE 2006, SDG&E 2006).
- Where conflicts arose between data in an original plan and any updates and/or action plans, the latter documents were relied upon.
- Where multiple load forecasts were provided within a plan, we used the "moderate", "expected", or "base case".
- We made several adjustments to load forecasts, detailed in Appendix B.
- In some cases, we made assumptions in modifying, converting or extrapolating data. We identify these results with *italics* for tabular data and asterisks (*) in figures.

2.2 Coordinating Analysis Timeframes

The reviewed resource plans were all filed or updated in 2003, 2004 or 2005. Because they have differing start dates and cover a range of planning horizons, it is somewhat challenging to compare plan effects. Utilities' resource planning horizons are typically specified as part of state regulatory or legislative rules, which vary considerably—the

[18] Where possible, information gaps were filled using judgment and interpretation of related information (e.g., where data were missing for certain key years, we extrapolated or interpolated from the closest data available in the resource plan). In some cases, we had informal discussions with state public utility commission staff to clarify certain energy-efficiency-related program elements or data. The specific sources and treatment of the energy-efficiency data obtained for each utility are detailed in Appendix A.

resource plans reviewed for this study covered forecast periods of 10 to 22 years. Moreover, the WGA's Clean and Diversified Energy Advisory Committee (CDEAC) has established energy-efficiency goals effective from 2006 through 2020. These different planning perspectives are represented, along with key reference dates adopted for this study, in Figure 2-1.

The analysis period adopted for this study begins in January 2004 (the first year for which complete efficiency and L&R forecast data were available in the earliest of the reviewed plans). We report projected energy-efficiency activity over two timeframes: 2004–08, a near- or-mid-term planning horizon that often corresponds to Action Plans included in the resource plans; and 2004–13, a ten-year, longer-term horizon, and the last year for which most resource plans provided forecasted L&R data. For reference, we also show the 2006–2020 timeframe established for the WGA CDEAC energy-efficiency goal in Figure 2-1.

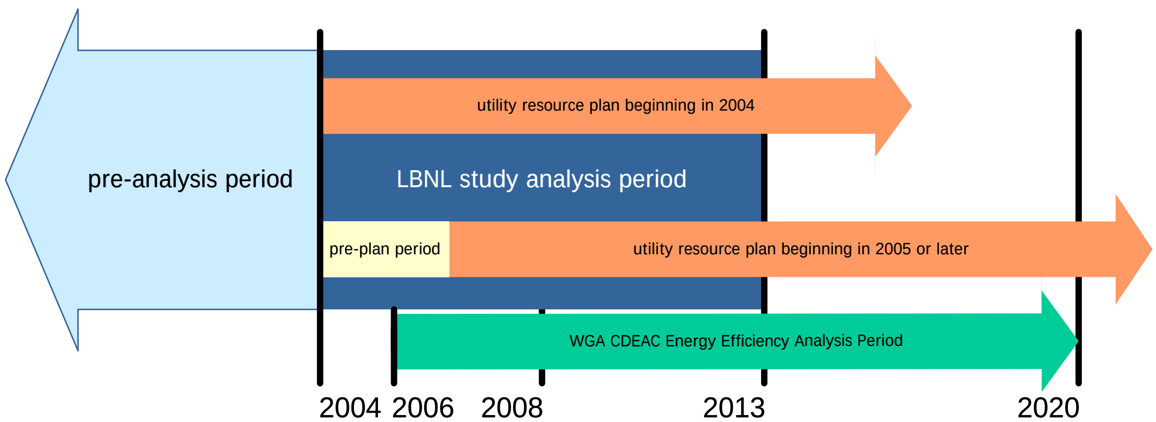

Figure 2-1. Timeframes of Resource Plans, Study Analysis and WGA CDEAC Goal

For utilities with resource plans starting in 2005 or later, a "pre-plan period" exists from the beginning of 2004 until the first year of L&R projections in the plan (see Figure 2-1). For these utilities, we imputed load and efficiency-resource data backward to 2004—this allowed us to compare utilities' progress in implementing energy efficiency over time on a consistent basis.[19]

The economic lifetimes of installed energy-efficiency measures are varied and can exceed the time horizon of utility resource plans. Thus, it is important to track not only utility investments in energy efficiency proposed for implementation during the resource-plan or study-analysis period, but also to account for previous investments that still provide energy savings during the timeframe of interest. Accordingly, we define a "pre-analysis" period (see Figure 2-1). This period is not well defined and varies across utilities and resource plans. Its length depends on a combination of factors, including: (1)

[19] For load "forecast" data in pre-plan years, we simply extrapolated backward from the earliest available forecast year, using the annual rate of increase calculated over the two earliest years of load forecast data available. For energy-efficiency data, we used actual energy-efficiency investments made in pre-plan years as "forecasts". See Appendices A and B for details on adjustments made for individual utilities.

when historical energy-efficiency investments were made, (2) the lifetime of the measures installed, and (3) accounting conventions.[20] In practice, utilities reported savings from pre-analysis period energy-efficiency programs beginning anywhere from 1991 through 2002 (see Appendix A).

2.3 Accounting for Energy Efficiency Resources over Time

States and utilities can adopt a range of strategies to obtain energy-efficiency resources. Utilities (or third party program administrators) may administer *energy-efficiency programs*, funded by utility ratepayers, in which the program administrator facilitates the installation of energy-saving measures at their customers' sites through a combination of technical assistance, information, and financial incentives. *State or federal energy-efficiency standards* for appliances or other equipment also contribute to the energy-efficiency resources in a given utility's service territory. *Building codes* that stipulate specific design efficiency levels for new construction and/or major facility renovations are another important resource. Finally, utility load forecasts may make adjustments for a certain amount of energy efficiency that is "naturally occurring"[21], reflective of customer's investments in new and replacement equipment based on current and projected electricity prices and underlying improvements in the technical performance of that equipment.[22]

Ideally, these sources of energy efficiency should be identified and tracked separately over time. Figure 2-2 demonstrates how this would be done for the pre-analysis and study-analysis periods defined for this study. In any given year, the contributions of each of the tracked energy-efficiency resources can be evaluated. This is demonstrated in Figure 2-2 for the two reference years chosen for this study as "snapshots" of utilities' future energy-efficiency resources—2008 and 2013—as well as the 2020 WGA CDEAC goal timeframe.[23] More generically, we refer to the "pre-analysis" and "LBNL study analysis" periods shown in Figure 2-2 as "pre-plan" and "plan" periods.[24]

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[20] For example, the earliest allowable grandfathering of prior investments proposed as part of the WGA CDEAC goals—the current recommendation is 2006 (WGA CDEAC 2006).

[21] It is our understanding that accounting for naturally-occurring energy efficiency, at least implicitly, is standard practice in load forecasting. Nonetheless, this practice was not obvious in the resource plans we reviewed for this study.

[22] In practice, it may be difficult to distinguish between naturally occurring efficiency and program-induced efficiency. Building codes and standards may also raise similar issues.

[23] The WGA CDEAC (2005) recommendation is that savings only be counted from strategies implemented beginning in 2006, so not all resources represented in Figure 2-2 would be allowable for this goal. A more precise accounting tailored to the actual WGA CDEAC time horizon and goals is presented in section 4.3.

[24] These generic terms are relevant to future efforts to track energy-efficiency resources relative to the goals and timing of specific resource plans. For example, if a utility were to issue a resource plan in 2008 with L&R forecasts beginning in 2009, then *plan* savings would be measured relative to 2009, and any savings from strategies implemented between, for example, 2006 (the proposed baseline year for the WGA CDEAC goal) and 2009 would be considered *pre-plan* savings and contribute to *plan and pre-plan* impacts in a given year—2020 being of interest for the CDEAC goal. Recommendations for states and utilities on tracking this information in future are provided in section 4.3.

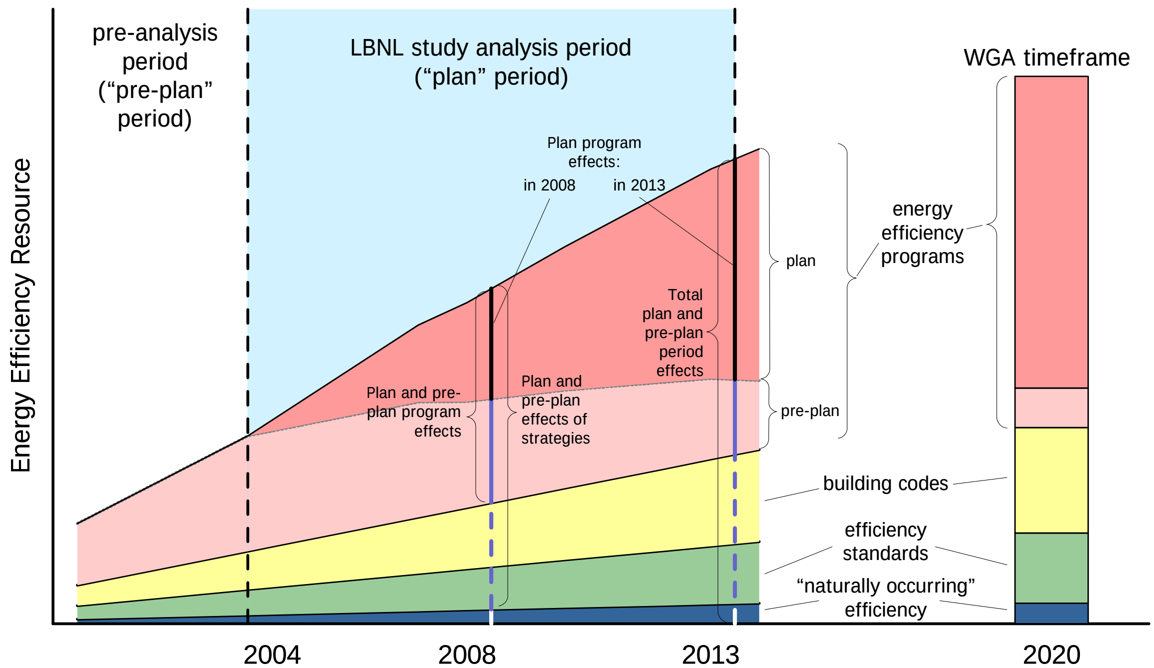

Figure 2-2. Accounting for Energy Efficiency Resources

In addition to disaggregating energy-efficiency resources by type, for energy-efficiency programs, Figure 2-2 also distinguishes between investments made prior to and during the study-analysis (or plan) period. Most utilities in our sample offered energy-efficiency programs in the "pre-analysis" period prior to 2004. Beginning in 2004, Figure 2-2 shows savings from these pre-plan investments declining over time, as individual measures reach the ends of their effective economic lifetimes. Savings from program measures proposed in the resource plans for implementation during the "plan" period (beginning in 2004) are tracked separately. Drawing from this framework, we identify the following energy-efficiency "quantities" (see Figure 2-2):

- *Plan program effects*—the savings, in a specific year, from energy-efficiency program measures implemented during the plan period up to the year in which effects are measured (e.g., in this study, the savings in 2008 from program measures implemented in 2004–08 and the savings in 2013 from program measures implemented in 2004–13).
- *Plan and pre-plan program effects*—*plan program effects* in a specific year plus residual savings occurring in that same year from program measures implemented in the pre-plan period.
- *Plan effects of strategies* (not shown)—the savings, in a specific year, from energy-efficiency measures associated with all energy-efficiency strategies (i.e., energy-efficiency programs, energy-efficiency standards and building codes) implemented during the plan period up to the year in which effects are measured.

- *Plan and pre-plan effects of strategies—plan effects of strategies* in a specific year plus residual savings occurring in that same year from energy-efficiency strategies implemented in the pre-plan period.
- *Total plan period effects* (not shown)—*plan effects of strategies* in a specific year plus "naturally occurring" energy efficiency that materializes during the plan period up to the year in which effects are measured.
- *Total plan and pre-plan period effects—plan and pre-plan effects of strategies* in a specific year plus residual savings occurring in that same year from "naturally occurring" energy-efficiency materialized during the pre-plan period.

Note that it is the timing of the implementation of the measures and achieved savings, not the enactment of associated programs, policies, or strategies, that determine whether savings should be counted as plan or pre-plan quantities.[25]

While the distinction between pre-plan and plan period resources is only made for utility energy-efficiency programs in Figure 2-2, it would be possible, and certainly desirable, to separate other energy-efficiency resource categories (e.g., standards and codes) in the same way—this is demonstrated in the list of energy-efficiency quantities above. In practice, none of the reviewed resource plans provided information on energy-efficiency standards or building codes. However, *plan program effects*—utility energy-efficiency program investments proposed for implementation during the plan period—were reported consistently across utilities. A few utilities reported *plan and pre-plan program effects*, although the period covered by these savings was not consistent (see Appendix A for details on individual utilities).

2.4 Accounting for Energy Efficiency in Load Forecasts

The energy-efficiency accounting methods illustrated in the previous section may be used as a basis for incorporating energy efficiency into utility, state or regional load forecasts. Figure 2-3 demonstrates how this is accomplished, using the same timeframes and energy-efficiency quantities introduced in Figure 2-2.

The load forecast is first projected assuming no energy-efficiency strategies are implemented, although "naturally occurring" energy-efficiency may be incorporated into the forecast model, along with other assumptions (e.g., economic trends, weather) at this stage. We refer to this unadjusted load forecast as *total resource requirements* (the top line in Figure 2-3). It represents the amount of load that would have to be served with supply-side resources if no energy-efficiency strategies were implemented during the forecast period.

[25] For example, using the reference dates adopted for this study, savings from an energy-efficiency program that was approved and implemented in 2002, with investments made over a three year period, would be included as *pre-plan program effects* for measures implemented in 2002 and 2003, and *plan program effects* for measures implemented in 2004.

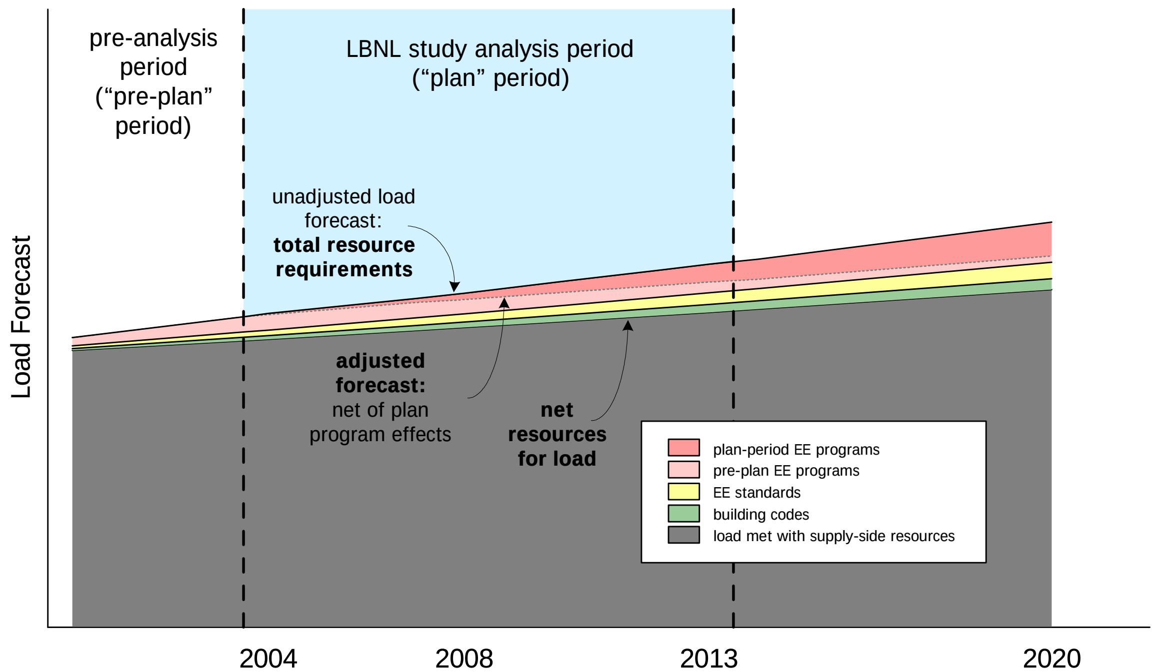

Figure 2-3. Accounting for Energy Efficiency Resources in Load Forecasts

Next, each source of energy-efficiency savings is backed out of the load forecast separately. At each step, a new *adjusted forecast* is produced—in Figure 2-3, this is illustrated for the forecast net of *plan program effects*. The process of backing out savings may include accounting for the ongoing impacts of historical energy-efficiency strategies (beginning at an appropriate starting date) as well as any strategies proposed during the forecast period.[26] This produces a load forecast, net of energy-efficiency strategies, that is equivalent to forecast retail sales plus losses.[27] Reserve margins are not included in this schematic.[28] This is equivalent to NERC's definition of "Net Energy for Load", defined in its proposed reliability standards as:

> *Net Balancing Authority Area generation, plus energy received from other Balancing Authority Areas, less energy delivered to Balancing Authority Areas through interchange. It includes Balancing Authority Area losses*

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[26] Savings during the forecast period from strategies implemented prior to the forecast period may be tracked implicitly or explicitly. Most of the resource plans we reviewed treated such savings implicitly—in other words, the savings were incorporated into the load forecast to the extent that historical load used as the starting point for the forecast was already reduced in response to the historical strategies. In the coming years, for purposes of tracking progress toward the WGA CDEAC goal over time, it will be necessary for utilities to explicitly track savings from historical strategies (beginning in ~2006), as demonstrated in Figure 2-3 (see section 4.3). This will entail adding back savings from such strategies to the historical-load starting point, so as not to double-count these resources.

[27] Unfortunately, because many of the utility resource plans did not clarify whether losses were included in their load forecasts or their energy-efficiency savings projections, this definition may not be entirely accurate for the forecast and energy-efficiency savings data reported in this study.

[28] To properly account for the full value of energy efficiency, reserve margins should be calculated *after* the load forecast is adjusted for expected demand reductions (i.e., "net resources for load" in Figure 2-3).

but excludes energy required for storage at energy storage facilities (NERC 2006).

We adopt this convention more generically as *net resources for load* in Figure 2-3.

Note that all these quantities may be measured in energy or capacity terms. For example, in this report, we refer to *total energy requirements*, *total summer-peak capacity requirements*, and *total winter-peak capacity requirements*. All represent *total resource requirements* as depicted in Figure 2-3 but are distinguished according to the specific units measured.

Matching the load forecasts in the utility resource plans to this conceptual typology presented considerable challenges. Most utilities specified whether or not their load forecasts included *plan program effects*, but, with the exception of the California utility forecasts published by the California Energy Commission (CEC), it was unclear whether or how energy-efficiency standards and building codes were treated. Where utilities indicated that their load forecasts were net of *plan program effects*, we used the available information to add these savings back. We made the assumption that the resulting load forecast was representative of *total resource requirements* (see Appendix B for the treatment of and any adjustments made to load forecasts for individual utilities).

We were also interested in characterizing *net resources for load*, to compare load growth with and without energy-efficiency strategies. Unfortunately, deriving this quantity would have required complete information on all energy-efficiency strategies, which was not available in any of the resource plans. Instead, we derived an *adjusted forecast*, net of *plan program effects*, for each utility (see Figure 2-3). This approach was feasible given the available data, and allowed us to compare utilities' load growth with and without the energy-efficiency program effects proposed during the study period.

2.5 Energy Efficiency Metrics Reported in this Study

In section 3, we report "gross" projected energy-efficiency program savings and estimate the relative impact of energy-efficiency resources in each utility's resource plan. This is accomplished through three metrics:

- *Plan program effects* are represented in 2008 and 2013 as a share of growth in utilities' *total resource requirements* over the respective 2004–08 and 2004–13 periods. This metric normalizes savings for the relative size of the utility and facilitates comparison of utilities' energy-efficiency commitments.[29]
- *Plan and pre-plan program effects* are represented for each utility as a share of *total resource requirements* in 2008 and 2013. From a resource assessment perspective,

[29] This metric was calculated separately as a share of energy in Gigawatt-hours (GWh), summer peak capacity in Megawatts (MW) and, for winter-peaking utilities, winter peak capacity (MW) requirements. Assumptions used to convert savings for Pacific Northwest utilities from energy to peak demand units are described in Appendix C.

this provides insights into the projected shares of energy-efficiency programs in utilities' resource portfolios.

- *Plan program effects* are represented as a share of *total energy requirements* in 2008 and 2013. This provides a proxy by which to measure utilities' progress toward achieving the WGA goal of 20% energy efficiency by 2020 (see section 3.3 for a discussion of how this goal is defined). However, because it only includes program effects, and no other energy-efficiency strategies, this metric underestimates actual progress toward this goal.

Some analysts measure energy efficiency as a percent of a utility's retail sales, largely because retail sales data are readily available, either from the U.S. Energy Information Administration or utilities' annual reports (e.g., York and Kushler 2005).[30] Our departure from this metric is motivated in part by the way in which the WGA CDEAC goal is defined (see section 3.3). It is also a consistent characterization of energy-efficiency resource shares in the context of resource assessment.

2.6 Examples of "Best Practices"

In this section, we have proposed a conceptual framework for accounting for energy-efficiency savings over time and applying these methods to develop load forecasts that explicitly define and characterize energy-efficiency resources.

Several utilities and state agencies in the West have adopted elements of our proposed conceptual framework in their resource plans for tracking and accounting for energy efficiency resources.[31] For example:

- Avista's resource plan tracks energy efficiency in three categories: (1) savings from prior utility energy-efficiency programs identified separately and incorporated as part of the load forecast in the current resource plan, (2) "existing resources", or future investments in already-committed energy-efficiency programs, and (3) "new resources", or future programmatic investments for which funding mechanisms have yet to be committed. The treatment of these three categories of resources in developing and reporting the load forecast is clearly identified.
- PacifiCorp's plan numerically identifies the decrement to load in all historic and future projections from DSM programs. The plan provides peak and energy values for future years, and makes a clear distinction between programs administered by the utility versus the Energy Trust of Oregon.
- The CEC periodically publishes load forecasts for the three California IOUs. These forecasts are explicitly adjusted to account for the demand-modifying impacts of

[30] Note that retail sales are not the same as *net resources for load*, because losses are (ideally) included in the latter, while sales are measured at the customer meter.

[31] The Northwest Power and Conservation Council (NPCC)'s resource planning activities provide another "best practices" example, by a regional organization. In developing its regional resource plan for the Pacific Northwest, NPCC estimates the technical, achievable, and cost-effective energy efficiency potential and estimates and tracks historic savings from BPA and utility EE programs, state building codes and federal appliance standards (NPCC 2005).

future IOU-administered energy-efficiency programs, commercial and residential building and equipment standards, and "market and price impacts"[32] (CEC 2006).

[32] "Market and price impacts" include naturally occurring conservation and demand response to rising electricity prices (CEC 2006).

3. Energy Efficiency in Recent Western Utility Resource Plans

In this section, we report the projected impacts of energy-efficiency programs in the resource plans of Western utilities and highlight several key trends. In section 3.1, we summarize utilities' reported *plan program effects* in 2008 and 2013 from resource additions beginning in 2004. Section 3.2 reports *plan and pre-plan program effects* reported in the resource plans for these same reference years. Insights into utilities' progress in meeting the WGA energy efficiency goal are presented in section 3.3.

3.1 Plan-Period Energy Efficiency Program Effects

Thirteen utilities reported *plan program effects* in their resource plans (i.e., the resource savings from utilities' energy-efficiency program investments proposed for implementation starting in 2004).[33] The reported impacts in 2008 and 2013 are expressed in terms of energy savings in Figure 3-1 and summer-peak demand savings in Figure 3-2.[34] Data that were not directly available in the resource plans are marked with an asterisk in Figure 3-2.

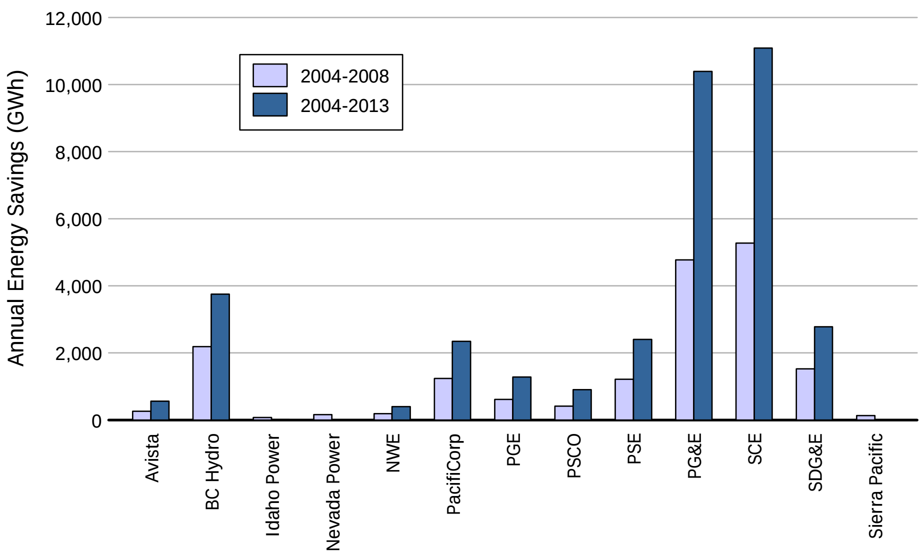

Figure 3-1. Plan Energy Efficiency Program Effects: Annual Energy Savings

Notes for Figures 3-1, 3-2 and 3-3, and Tables 3-1 and 3-2: (1) BC Hydro's plan only commits to implementing its PowerSmart-2 program through 2012; potential continued savings from PowerSmart-3 are included for 2013. (2) Nevada Power only reported annual savings for 2004; this level of savings was assumed for each year from 2004 through 2008. (3) PacifiCorp identifies 200 aMW of plan savings for 2004–05, assigned here to 2008, and 250 aMW between 2006 and 2015, assigned to 2013. (4) PGE identifies additions for 2005–11; the 2013 value was extrapolated. (5) PSE values include residential fuel conversion programs—standalone energy-efficiency program savings were not available. (6) The energy savings goals for the California utilities (PG&E, SCE and SDG&E) include all programs administered by the utilities, including those offered to direct access customers. Some portion of savings from energy-efficiency standards is included in these goals, as the utilities administer programs to support their implementation. (7) Sierra Pacific only reported annual savings for 2005; this level of savings was assumed for each year from 2004 through 2008.

[33] PNM's plan did not propose any energy-efficiency investments so is not included in Figure 3-1.
[34] Appendix A shows the specific data used and assumptions made in for each utility in compiling *plan program effects* from the resource plans.

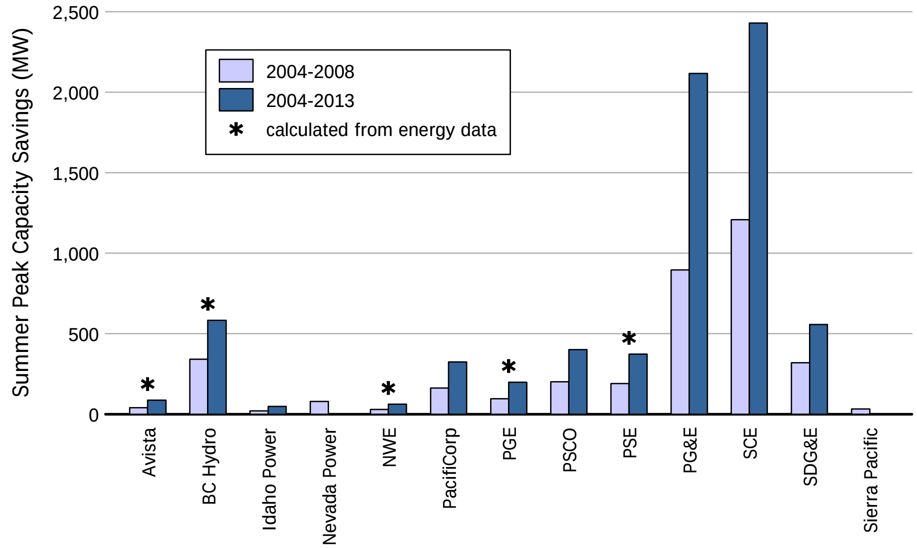

Figure 3-2. Plan Energy Efficiency Program Effects: Capacity Savings

See Figure 3-1 for notes.

The results point out that a handful of utilities in this sample provide a large portion of the energy-efficiency resource savings in the West. However, differences in *plan program effects* across utilities are clearly correlated with utility size (e.g., the largest savings are observed for the California utilities and BC Hydro).

To adjust for utility size and facilitate comparison across utilities, we represent projected savings in 2008 and 2013 from energy-efficiency program additions as a share of the average annual growth in each utility's *total resource requirements* over the periods 2004–08 and 2004–13.[35] The results are represented as a share of energy load growth in Table 3-1; Table 3-2 provides results in terms of summer-peak capacity and, for winter-peaking utilities, winter-peak capacity.[36]

The results illustrate the potential of energy-efficiency programs as a resource to mitigate load growth. For a number of Western utilities, proposed energy-efficiency programs are projected to offset a substantial portion of forecasted load growth. Four utilities (PSE, PG&E, SCE, and SDG&E), proposed energy-efficiency programs in their resource plans that are projected to offset more than 70% of their forecasted energy load growth between 2004 and 2013. In contrast, for PNM (not shown), Idaho Power and Nevada Power, energy-efficiency programs proposed in the resource plans play a very minor role, offsetting from 0% to 8% of the projected increase in *total energy requirements* between 2004 and 2008.

[35] *Total resource requirements* refers to the utility's load forecast, not including reductions in demand from energy efficiency or other DSM programs do not include energy reductions due to energy efficiency or other demand-side management programs (see section 2.4 and Appendix B). Reserve margins are also not included.

[36] The load forecast in NWE's resource plan was expressed in energy units only; thus, NWE is not included in Table 3-2.

Table 3-1. Plan Energy Efficiency Program Effects as Percentage of Growth in Total Energy Requirements

Utility	2008		2013	
	Average Annual Growth in Total Energy Requirements[1] (2004–08)	Plan Energy Savings from Energy Efficiency Programs as % of Growth in Total Energy Requirements (2004–08)	Average Annual Growth in Total Energy Requirements[1] (2004–13)	Plan Energy Savings from Energy Efficiency Programs as % of Growth in Total Energy Requirements (2004–13)
Avista	2.6%	26%	2.6%	23%
BC Hydro	1.5%	64%	1.5%	47%
Idaho Power	2.5%	5%	2.3%	5%
Nevada Power	2.6%	*7.5%*	2.2%	——
NWE	2.9%	26%	2.0%	36%
PacifiCorp	1.1%	44%	1.3%	30%
PGE	2.7%	27%	2.5%	26%
PSCO	2.4%	16%	2.5%	14%
PSE	1.5%	100%	1.6%	79%
PG&E	1.8%	74%	1.7%	72%
SCE	1.8%	76%	1.6%	77%
SDG&E	1.9%	91%	1.8%	76%
Sierra Pacific	1.5%	*23%*	1.4%	——

LBNL made assumptions in calculating Italicized values—values in regular font are compiled directly from resource plan data.
[1] *Total energy requirements* do not include load reductions from *plan program* effects or reserve margins.
See Figure 3-1 for additional notes.

The summer-peak capacity reduction impacts of the proposed energy-efficiency programs vary somewhat more across utilities than the energy impacts of the same programs (see Table 3-2). PSCO, Nevada Power and (to a lesser extent) Avista and PSE[37] show higher peak demand than energy savings. These utilities appear to be targeting peak load reductions with their energy-efficiency programs.

Total resource requirements, the load forecast reported in Table 3-1 and Table 3-2, represents the total amount of energy or capacity that would be required to serve expected load if no energy-efficiency programs were implemented during the plan period. Comparing this to an *adjusted load forecast*, that accounts for *plan program effects*, illustrates the potential of energy-efficiency programs to mitigate load growth. Figure 3-3 compares the growth in utilities' *total energy requirements* to their *adjusted load forecasts* over the full analysis period (2004–13). For five utilities (Avista, PSE, PG&E, SCE, and SDG&E), savings from proposed energy-efficiency programs are forecasted to reduce energy load requirements from 1.6–2.6% per year to ~0.5% or less per year. The range in results across utilities is wide—Avista projects an 83% decline in projected load growth from energy-efficiency programs, while Idaho Power projects only 4%.

[37] PSE did not report capacity savings in its resource plan—the data in Table 3-2 were calculated from reported energy impacts—so this result should be viewed with caution.

Table 3-2. Plan Energy Efficiency Program Effects as Percentage of Growth in Total Capacity Requirements

Utility	2008			2013		
	Average Annual Growth in Total Capacity Requirements[1] (2004–08)	Plan Summer Peak Demand Reductions from Energy Efficiency Programs as % of Growth in Total Summer-Peak Capacity Requirements (2004–08)	Plan Winter Peak Demand Reductions from Energy Efficiency Programs as % of Growth in Total Winter-Peak Capacity Requirements (2004–08)	Average Annual Growth in Total Capacity Requirements[1] (2004–13)	Plan Summer Peak Demand Reductions from Energy Efficiency Programs as % of Growth in Total Summer-Peak Capacity Requirements (2004–13)	Plan Winter Peak Demand Reductions from Energy Efficiency Programs as % of Growth in Total Winter-Peak Capacity Requirements (2004–13)
Avista	2.5%	*29%*	*32%*	2.6%	*25%*	*28%*
BC Hydro	1.7%	*63%*	48%	1.6%	*48%*	36%
Idaho Power	2.7%	6%	——	2.5%	6%	——
Nevada Power	2.6%	*15%*	——	2.1%	——	——
PacifiCorp	3.3%	14%	——	3.3%	12%	——
PGE	2.0%	*36%*	*41%*	2.2%	*29%*	*34%*
PSCO	2.7%	34%	——	2.7%	28%	——
PSE	1.1%	*123%*	*90%*	1.2%	*96%*	*70%*
PG&E	1.8%	62%	——	1.7%	65%	——
SCE	2.6%	53%	——	2.0%	58%	——
SDG&E	2.5%	74%	——	2.1%	67%	——
Sierra Pacific	1.9%	*24%*	——	1.8%	——	——

LBNL made assumptions in calculating Italicized values—values in regular font are compiled directly from resource plan data.
[1] *Total Capacity Requirements* do not include load reductions from *plan program effects* or reserve margins. For winter-peaking utilities, summer-peak capacity requirements were converted from winter-peak capacity data (see Appendix B)—thus the growth rates for these utilities are implicitly assumed to be the same for both winter and summer peak capacity.
See Figure 3-1 for additional notes.

In interpreting the impacts of energy efficiency programs reported in the resource plans, several points should be noted. First, the data represent a snapshot in time for each utility and (with the exception of the California utilities) only reflect what is reported in the resource plans. Energy-efficiency commitments made subsequent to the filing of the resource plans, or addressed in separate regulatory proceedings, are not represented. For example, Nevada Power and Sierra Pacific both filed their resource plans in 2004 and subsequently increased their commitments to energy efficiency through separate DSM proceedings (Geller 2006).

Second, among the reviewed plans, utilities with high load growth (>2% per year) tend to meet a smaller share of that growth with energy-efficiency resources than utilities forecasting lower load growth. This phenomenon is illustrated in Figure 3-4, which plots each utility's *plan program effects* as a proportion of forecast growth in *total energy requirements* against their average annual growth in *total energy requirements* for 2004–08 and 2004–13. This result is not entirely intuitive. On the one hand, utilities with higher load growth require greater nominal investments in energy efficiency to meet a large share of that load growth with energy-efficiency resources. But on the other, such utilities enjoy substantial opportunities for cost-effective energy efficiency—through more efficient new construction, for example.

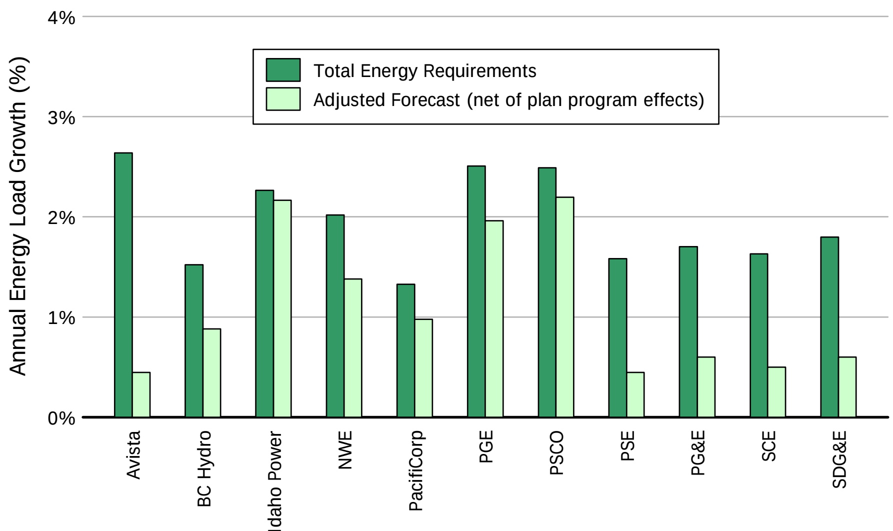

Figure 3-3. Impact of Energy Efficiency Programs on Forecast Energy Load Growth: 2004–2013

Notes: (1) *Total energy requirements* do not include load reductions from *plan program effects* or reserve margins. (2) *Adjusted forecast* does not include reserve margins.
See Figure 3-1 for notes.

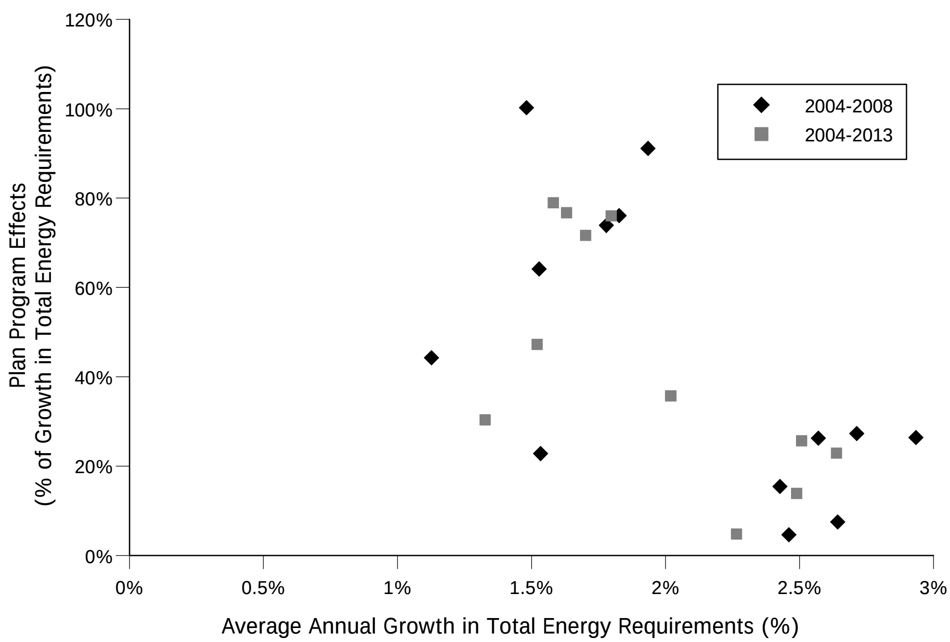

Figure 3-4. Energy Demand Growth vs. Relative Share of Plan Program Effects

Note: *Total Energy Requirements* do not include load reductions from *plan program effects* or reserve margins.

Third, some utilities in the West are projecting higher growth in peak demand than energy sales, due primarily to increased saturation of air conditioning. For example, PacifiCorp's resource plan projects strong growth in summer-peak demand relative to overall energy usage (e.g., 3.3% annual growth in *total capacity requirements* versus only 1.1% annual growth in *total energy requirements* over the 2004–08 period). This change in the company's load factor, combined with aggressive energy savings targets, explains the utility's sizeable projected energy-efficiency savings as a proportion of energy load growth in 2004–08, but the relatively low proportional reductions in summer-peak demand during this time period.

Fourth, it is clear that state and regional regulatory policies that support energy efficiency and establish specific targets are an important factor driving these results, particularly in the longer term. The greatest proposed investments observed in 2013 are driven by aggressive energy-efficiency policies and goals set by the California Public Utilities Commission (CPUC) for investor-owned utilities. The targets proposed by the Northwest Power and Conservation Council (NPCC) in its 5th Regional Plan may also have influenced the goals set by some of the Pacific Northwest utilities (NPCC 2005).

Finally, new energy-efficiency programs proposed by utilities may be affected by the magnitude and duration of prior utility or state energy-efficiency activities (e.g. building codes or other state programs).

3.2 Plan and Pre-plan Energy Efficiency Program Effects

Only four utilities' resource plans provided projected savings from energy-efficiency program measures implemented both prior to and during the plan period (see Appendix A for details). We report these *plan and pre-plan program effects* in this section.

Ideally, it would be most useful to compare this quantity across utilities using a common starting date (e.g., cumulative effects of program measures implemented since 2000, or some other reference year). This would put the utilities on equal footing, and would also provide a means to meaningfully track utility and public-purpose program savings towards specific objectives, such as the WGA CDEAC goal. In practice, however, the data contained in the resource plans were often reported as a lump sum, and the starting point was either unknown or varied significantly (from 1991 for PGE to 2002 for BC Hydro). Another problem is that most utilities did not specify whether historical program effects were adjusted to account for declining savings over time due to savings erosion or energy-efficiency measures reaching the ends of their economic lifetimes. We therefore caution that the results in this section should be viewed as illustrative, rather than definitive. They provide a starting point for comparing Western utilities' long-term accounting for energy-efficiency programs, and also highlight the lack of standardized reporting conventions in current utility resource plans.

The *plan and pre-plan program effects* for the four utilities that provided this information are presented in aggregated form in Table 3-3. The combined savings in 2008 from these utilities' *plan and pre-plan program effects* is about 8,300 GWh. Together, these savings are expected to supply about 5.2% of these utilities' collective *total energy requirements* in 2008. In 2013, their *plan and pre-plan program effects* are projected to account for over 11,000 GWh of savings in 2013, almost 7% of their *total energy requirements* in that year.

Table 3-3. Availability of Data on Plan and Pre-plan Energy Efficiency Program Effects

Year	Number of Utilities with Plan and Pre-plan Program Effects in their Resource Plans	Plan and Pre-plan Program Effects (GWh) for these Utilities	Plan and Pre-plan Program Effects as % of Total Energy Requirements for these Utilities [1]
2008	4 of 14	8,270	5.2%
2013		11,487	6.7%

[1] *Total energy requirements* do not include load reductions from *plan program effects* or reserve margins.

The projected energy savings from individual utilities' *plan and pre-plan program effects* in 2008 and 2013 are shown in Figure 3-5.

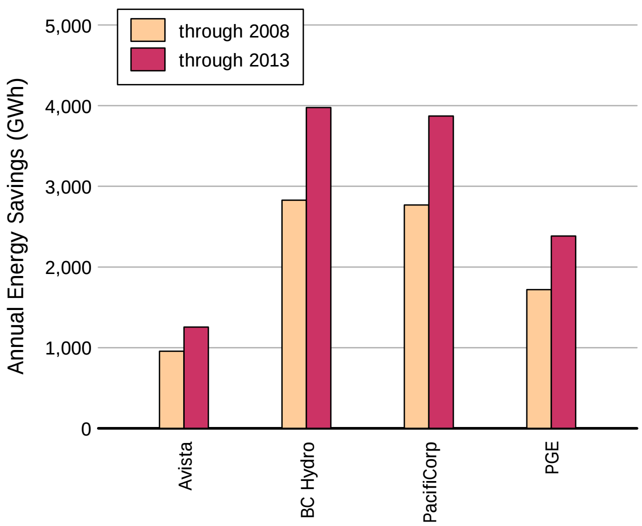

Figure 3-5. Plan and Pre-plan Energy Efficiency Program Effects: Annual Energy Savings

Notes for Figure 3-5 and Table 3-4: (1) BC Hydro's plan only committed to energy-efficiency savings from its 10-year PowerSmart-2 program through 2012; proposed possible continued savings from PowerSmart-3 are included for 2013.

Table 3-4. Plan and Pre-plan Energy Efficiency Program Effects as Percent of Total Energy Requirements

Utility	Plan and Pre-plan Program Effects as % of Total Energy Requirements[1]	
	2008	2013
Avista	9.2%	10.7%
BC Hydro	4.7%	6.1%
PacifiCorp	4.3%	5.6%
PGE	7.7%	9.5%

[1] *Total energy requirements* do not include load reductions from *plan program effects* or reserve margins.
See Figure 3-5 for additional notes.

To account for relative differences in utility size, we normalize *plan and pre-plan program effects* in 2008 and 2013 by utilities' *total resource requirements* in 2008 and

2013 (see Table 3-4).[38] In 2008, *plan and pre-plan program effects* range from less than 5% of *total energy requirements* for BC Hydro and PacifiCorp to just over 9% for Avista. For all utilities, this metric increases in 2013 to a range of 5.6% to over 10%.

3.3 Measuring Progress toward the WGA CDEAC Energy Efficiency Goal

WGA has established a goal for Western U.S. utilities of achieving 20% of energy resources with energy efficiency by 2020 (WGA 2004) and the CDEAC process has been tasked with evaluating the potential and means to meet this goal. The CDEAC Energy Efficiency Task Force further recommends that "all western states require utilities to integrate cost-effective energy efficiency options into resource planning and procurement decisions and pursue energy efficiency whenever it is the least cost option" (WGA CDEAC 2006, p. 56). One of the questions we set out to address in this study is whether the information currently reported in utility resource plans can support evaluating utilities' progress toward meeting this goal.

The WGA goal has been clarified and defined through the CDEAC process (see textbox to the right). Using available data, we developed an indicator—*plan program effects* as a proportion of *total energy requirements*[39]—that provides a crude proxy for utilities' progress toward the WGA CDEAC goal, as of 2008 and 2013. [40] The results for each utility are presented in Table 3-5 (see Appendix D for details on data sources and adjustments for individual utilities). Although 2004 is an appropriate starting point for tracking progress[41], *plan program effects* fall short in that they do not account for other energy-efficiency strategies that should be counted toward the WGA goal. Ideally, the most appropriate measure for evaluating utilities' (or states') progress using current resource plans would be *plan effects of strategies*, but this information was not available.

Defining the WGA CDEAC Goal

The WGA policy resolution calls upon Western Governors to examine the feasibility of actions that would be necessary to "increase the efficiency of energy use by 20% by 2020" (WGA 2004). The CDEAC Energy Efficiency Task Force has further defined the WGA goal as follows:

- Savings from all strategies—energy-efficiency programs, federal and state efficiency standards, and building codes—contribute to the energy efficiency goal.
- CDEAC currently defines the goal as reducing forecast demand for 2020 by 20%.

This last point is an appropriate definition for planning purposes. However, as we progress toward 2020, many load forecasts will be issued. Looking back in 2020, rather than using old load forecasts, it will make more sense to measure energy-efficiency resources against *total energy requirements*—the amount of load that would need to be served in the absence of energy-efficiency strategies.

Thus, we adopt this latter method for measuring progress toward the WGA goal. It is consistent with the CDEAC concept and can be applied using load forecasts or actual load requirements.

[38] *Total resource requirements* do not include energy reductions due to energy efficiency or other demand-side management programs (see section 2.4 and Appendix B). Reserve margins are also not included.
[39] *Total resource requirements* do not include energy reductions due to energy efficiency or other demand-side management programs (see section 2.4 and Appendix B). Reserve margins are also not included.
[40] We were unable to perform this analysis for 2020 because most utilities' resource plans did not extend their L&R forecasts this far into the future.
[41] The extent to which utilities may count impacts from historical energy-efficiency policies toward the 2020 goal has not yet been fully clarified by WGA.

Going forward, progress should be measured by *plan and pre-plan*[42] *effects of strategies* starting in 2005 (or thereabouts).

Table 3-5. Utilities' Progress toward the WGA CDEAC Energy Efficiency Goal

Utility	Plan Program Effects as % of Total Energy Requirements [7]	
	2008	2013
Avista	2.5%	4.8%
BC Hydro[1]	3.8%	6.0%
Idaho Power	0.4%	0.9%
Nevada Power[2]	*0.7%*	——
NWE	2.9%	5.9%
PacifiCorp	1.9%	3.4%
PGE[3]	2.8%	5.1%
PSCO	1.4%	2.8%
PSE[4]	5.7%	10.4%
PG&E[5]	5.0%	10.1%
SCE[5]	5.3%	10.4%
SDG&E[5]	6.7%	11.3%
Sierra Pacific[6]	*1.4%*	——

LBNL made assumptions in calculating Italicized values—values in regular font are compiled directly from resource plan data.

[1] BC Hydro's plan only commits to implementing its PowerSmart-2 program through 2012; possible continued savings from PowerSmart-3 are included for 2013.
[2] Nevada Power only reported annual savings for 2004; this level of savings was assumed for each year from 2004 through 2008.
[3] PGE identifies *plan program effects* for 2005–2011; the 2013 value was extrapolated.
[4] PSE values include residential fuel conversion programs—standalone energy-efficiency program savings were not available.
[5] The energy savings goals for the California utilities include all programs administered by the utilities, including those offered to direct access customers. Some portion of savings from energy-efficiency standards is included in these goals, as the utilities administer programs to support their implementation.
[6] Sierra Pacific only reported annual savings for 2005; this level of savings was assumed for each year from 2004 through 2008.
[7] *Total energy requirements* do not include load reductions from *plan program effects* or reserve margins.

The results in Table 3-5 can be viewed as a lower bound on utilities' progress in 2008 and 2013, because only program effects are considered. Based on programs alone, utilities are projected to achieve energy-efficiency resources ranging from less than 1% to over 6% of *total energy requirements* in 2008, and from less than 1% to over 11% in 2013.

The results demonstrate the translation of state regulatory and regional goals for energy efficiency into utility resource planning processes. For example, in California, the CPUC, working with the CEC, has established energy-efficiency goals for the IOUs that are intended to achieve the full cost-effective potential. This translates into considerable progress toward the WGA goal by the three California IOUs in 2013: 10–11% of *total*

[42] It is possible that *post-plan effects*—the effects of future strategies and measures that contribute to the 2020 goal, and may be reported in a resource plan as a high-level target that goes beyond the specific resource plan's analysis period—may also be applicable. For example, for a resource plan covering a 2006–15 forecast period might also address *post-plan effects* from 2016 through 2020.

resource requirements from energy-efficiency programs alone. Several Pacific Northwest utilities, which may be influenced by energy-efficiency goals set out the NPCC's regional power planning process, also project that their energy-efficiency programs will represent 3–6% of total energy requirements by 2013. Combined with efficiency standards and building codes, these utilities and states are projected to be well on their way to meeting the WGA goal in 2013.

For other utilities, actual progress is difficult to measure without more detailed information on savings from efficiency standards and building codes. However, these initial results suggest that, based on current resource-plan projections, some utilities in the West will need to implement more aggressive energy-efficiency programs than are currently proposed and/or states will have to enhance their energy-efficiency related standards and codes activities in order to meet the WGA CDEAC goal in 2020. More standardized reporting of data specific to the WGA CDEAC goals would allow for more precise estimates of progress made by specific utilities and states.

4. Key Findings and Recommendations

In this section, we summarize our key findings and provide recommendations based on our review of the treatment of energy efficiency in Western utility resource plans. Section 4.1 summarizes key findings based on the information provided in reviewed utility resource plans. In section 4.2, we provide high-level observations on the ability of data in current resource plans to support regional or West-wide analysis. Drawing from these observations, we provide specific recommendations to improve the consistency and completeness of energy-efficiency resource data in future utility resource plans (section 4.3).

4.1 Energy Efficiency Resources in the West

Energy efficiency programs are projected to meet a significant fraction of some utilities' incremental resource needs.

Between 2004 and 2013, four utilities (PSE, PG&E, SCE, and SDG&E) plan to meet more than 70% of their forecasted load growth with proposed energy-efficiency programs, while four other utilities (PGE, PacifiCorp, Northwestern Energy, and BC Hydro) plan to offset ~30–50% of forecasted load growth. A number of states have made significant policy commitments to energy efficiency as a resource, which are reflected in their utilities' resource plans, and several states are encouraging their utilities to ramp up energy-efficiency programs. However, progress among utilities (and states) in harnessing the cost-effective potential of energy efficiency is uneven across the West.

Energy-efficiency programs can help utilities manage and partially offset growth in peak demand and sales.

We found a few examples of utilities (PSCO, Nevada Power, Avista, PSE) that appear to be targeting their energy-efficiency programs toward peak load reduction impacts, illustrating the potential flexibility benefits of energy-efficiency resources.

Utilities currently do not explicitly account for the combined impact of energy-efficiency strategies in their resource plans.

While most utilities provided information on the impacts of energy-efficiency programs, none explicitly accounted for other types of strategies (building codes and energy-efficiency standards) in their resource plans. This is an area where additional analysis and reporting is needed.[43] Modeling efficiency standards and building codes is best done with

[43] In some states (e.g., California), state energy offices have assumed responsibility for tracking the separate impacts of various energy-efficiency strategies (programs, standards and codes). Where this capability exists, state energy offices may be the most appropriate entities to assume this role. However, in other states, utilities can perform this task. Even though they may not administer standards or codes themselves, utilities that offer energy-efficiency programs already have the capability to track these resources, because they are typically required to do so as part of the analysis and justification for their energy-efficiency programs (i.e., to avoid double-counting savings that are attributable to non-

end-use models that build load forecasts using a "bottom-up" approach. Most utilities rely on econometric load forecasting models, which are less adept at capturing the effects of these energy-efficiency strategies. However, utilities can incorporate the effects of savings from standards and codes through explicit end-use-based accounting models which can then be used to adjust results from their existing load forecasting models. Larger utilities may consider moving toward fully integrated end-use/econometric models.

In most resource plans, energy-efficiency effects were implicit, or fixed, in the modeling process. Few utilities explicitly modeled energy efficiency as a resource, allowing it to compete with supply-side resources in identifying a least-cost portfolio.

The majority of utilities included a fixed amount of energy efficiency as an implicit or explicit demand modifier in the load forecast, without any analysis in the resource plans of how different levels or types of energy efficiency could impact the overall costs of a portfolio of resources. It appears that, in many cases, the amount of energy efficiency included in the plan is decided by a separate process and is taken as given by the resource planner. Unless the amount of energy-efficiency investment included in the utility's resource plan was intended to fully capture the cost-effective potential, this practice may lead utilities to under-invest in energy-efficiency resources.

Although utilities in the West have made significant progress in analyzing alternative resource portfolios under different risk scenarios, none explicitly analyzed the risk-mitigation benefits of energy-efficiency resources.

From our review of Western utilities' recent resource plans, it is clear that utilities are developing sophisticated methods to assess the performance of resource portfolios under a broad array of risks, including natural gas price risk, hydro variability, departing load, carbon regulations, and uncertainties in load growth and electricity spot prices (Barbose et al. 2006). Energy efficiency has valuable risk mitigation attributes for electric power systems, which have been highlighted in certain regional planning efforts (e.g., NPCC). However, the resource plans that we reviewed did not explicitly assess or discuss the risk-mitigation benefits of alternative energy-efficiency resource scenarios. In some cases, utilities may have deemed this unnecessary given an existing state policy on the role of energy efficiency (e.g. California's loading order). However, given structural changes in Western power markets, we urge utilities, particularly those that have made modest commitments to energy-efficiency programs, to analyze how varying levels of energy-efficiency resource commitments impact utility system costs under alternative scenarios that reflect major risks confronting utilities and consumers.

programmatic efficiency). Thus, the incremental effort required to track all energy-efficiency strategies in resource plans should be minimal.

4.2 Energy Efficiency in Utility Resource Plans: Support for Regional Resource Assessments and Policies

One of the goals of this study was to assess the extent to which information on energy efficiency included in current utility resource plans could be used to support regional resource assessments, resource adequacy determinations, and tracking of state/utility progress toward meeting the energy-efficiency goal stated in the WGA policy resolution (WGA 2004).[44] Based upon our review of a large sample of resource plans, we offer the following conclusions:

- We believe that systematic tracking of the impacts of energy-efficiency strategies in utility resource plans, using standardized reporting and counting conventions, would provide significant support for regional resource assessments and policy goals.
- Our comparative review of utility resource plans suggests that a "bottom-up" compilation of these plans' treatment of energy efficiency (and other demand-side resources) has the potential to support regional assessment efforts. However, significant limitations and challenges need to be addressed. Areas for improvement include: 1) explicit, long-term accounting for energy-efficiency strategies (programs, codes, and standards), 2) accounting for impacts in terms of both energy savings and summer-peak demand, over time and multiple resource plans, and 3) tracking the impacts of energy-efficiency measures over their economic lifetimes and reflecting this in "pre-plan" and "plan" effects.
- Improvements are needed in the transparency and consistency of reporting energy-efficiency effects in utility resource plans. There is a significant need for utilities and state regulators across the West to coordinate in developing and utilizing more consistent resource counting and reporting conventions. This would increase the ability of policymakers, regulatory staff, and other stakeholders to review and benchmark the relative utilization and projected impacts of energy-efficiency resources.

4.3 Specific Recommendations for Energy Efficiency in Resource Plans

In this section, we offer specific recommendations to assist utilities and state regulators in improving their tracking of and accounting for energy efficiency as a resource. Standardizing and improving the availability of information in future utility resource plans will facilitate comparative review and regional coordination.[45]

Figure 4-1 provides a conceptual overview of LBNL's recommendations for tracking energy-efficiency resources to support long-term, regional resource assessments. It is similar to Figure 2-3, but the reference dates (2006, 2020 and generic plan start and end

[44] Examples of regional assessments in the West include the WECC Power Supply Assessment for resource adequacy, sub-regional assessments of transmission system needs and alternatives, WGA CREPC assessments of electricity/gas inter-relationships and infrastructure needs, and the NPCC regional plans.
[45] Some resource plans already incorporate several of these recommendations; however, implementation of all recommendations by utilities (and public utility commissions) in the West would greatly facilitate comparative review and analysis on a regional basis.

dates) are tailored to future resource plans and the time period over which implemented strategies may count toward the WGA clean energy goal. Several of the recommendations relate to and are evident from Figure 4-1.

LBNL has developed a set of example spreadsheet forms that illustrate how utilities could implement these recommendations. We present a summary table in this section and more detailed data reporting tables in Appendix E, using a hypothetical utility's energy-efficiency resource and load-forecast data as an example. The blank forms are available for download in Excel workbook format at http://eetd.lbl.gov/ea/EMS/rplan-pubs.html.

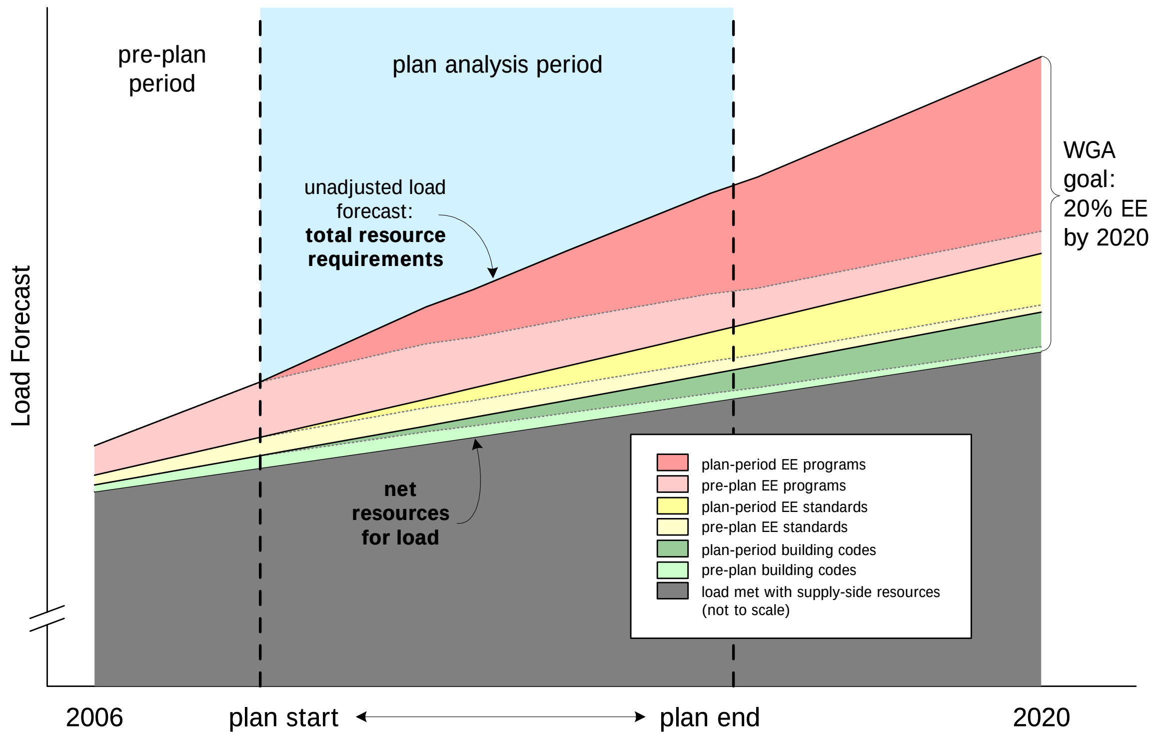

Figure 4-1. Tracking Energy Efficiency Resources in Load Forecasts to Support WGA and Resource Assessment Goals

1. **Provide information on all demand-side resources (energy efficiency and other demand-side resources) included in the resource plan, by type of resource.** DSM savings data should be reported separately for energy efficiency, demand response, fuel conversion, load management, and any other resources counted among the broader family of DSM.

2. **Clearly identify which types of energy efficiency strategies are included in the resource plan—i.e., ratepayer-funded energy efficiency programs, building energy codes, and appliance efficiency standards.** Resource plans should clearly indicate which types of energy-efficiency strategies are considered and addressed, and how they are addressed (see Figure 4-1). In Appendix E, this is demonstrated by the separate rows in Table E-1 for annual savings from energy-efficiency programs, efficiency standards and building codes.

A Real-World Example: Disaggregated Tracking of Demand-Side Resources

A historical example of recommendations 1 and 2 is the CEC's tracking of the impacts of energy efficiency resources, which are accounted for separately for appliance standards, building standards and efficiency programs, over almost thirty years (see Figure 4-2).

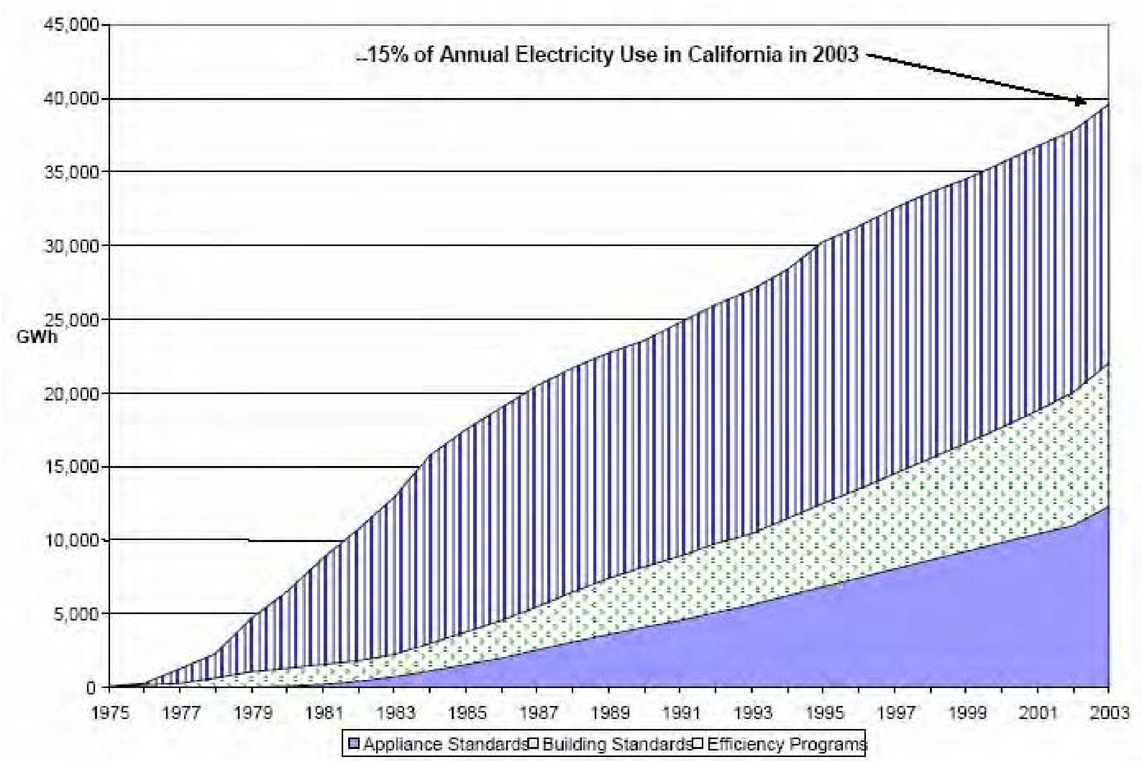

Figure 4-2. California Demand-Side Resources by Type: 1975–2003 (CEC 2005b)

3. **Treat energy efficiency as an explicit, load-modifying resource.** This recommendation embodies three related but distinct issues:

   a. *Energy-efficiency impacts on forecast load should be clearly and* ***explicitly*** *treated* in resource plans. It should be obvious whether a particular load forecast includes the impacts of energy-efficiency or not.[46]

   b. *Energy efficiency should be treated as a* ***load modifier*** in resource plans, meaning that planners should adjust the forecast load to account for reductions in load due to energy-efficiency resources (i.e., *net resources for load*) and should use this adjusted forecast as the basis for calculating planning margins. This practice

[46] If energy efficiency effects are included implicitly as part of the load forecast, the plan should, at a minimum, provide a separate, explicit accounting of the energy-efficiency effects incorporated in the forecast to support regional resource assessments and WGA goal tracking.

embraces the full **load-modification value** of energy-efficiency in the resource planning process.[47]

c. *Energy efficiency should be treated as a* ***resource***, even though it is represented as a load modifier. This can be accomplished by evaluating scenarios with different levels of energy-efficiency resources (i.e., different load forecasts based on different load reduction scenarios), and subsequently assessing various supply-resource scenarios designed to meet these levels of demand along key resource planning criteria (e.g., cost effectiveness, risk mitigation). In this way, the full **resource value** of energy efficiency is incorporated into the planning process.

4. **Clearly and separately identify the effects of energy-efficiency measures installed during the resource plan analysis period, and the residual effects of measures installed in the pre-plan period.** Energy-efficiency resources that materialize during the plan period may derive from both measures proposed for implementation during the plan period, and residual savings from measures installed prior to the plan period. For each energy-efficiency strategy included in the resource plan, both sources of savings should be clearly documented (see Figure 4-1).

Energy Efficiency as a Load-Modifying Resource in PSE's Plan

Puget Sound Energy (PSE)'s resource plan provides a good example of how energy efficiency can be treated as an explicit resource. PSE's analysis pitted energy-efficiency (combined with fuel conversion) against supply-side resources to determine the optimal levels of investment in each. It was conducted as follows:

- A study of the technical and achievable potential for energy efficiency (and other demand-side resources) was conducted;
- The achievable potential results were used to group specific measures into resource "bundles" based on their type and cost, and a "supply curve" was developed for each bundle;
- Several supply resources were analyzed to determine the least cost supply mix to meet expected demand *without* conservation; and
- The energy-efficiency "bundles" were analyzed against this least-cost supply portfolio to determine the amount and types of energy efficiency that would produce the least costly overall resource mix.

5. **Describe the relationship between near-term energy-efficiency program plans and long-term goals/targets for energy efficiency.** Utility resource plans typically include both a long-term (10–20 year) forecast of load and resources and a short-term (2–5 year) Action Plan. Energy-efficiency resources may be expressed both as a high-level, long-term goal or forecasted resource addition in the portfolio, and as specific activities proposed in the Action Plan. Particularly where inconsistencies arise (e.g., where the level of energy-efficiency activity in the short-term Action Plan implies a significant resource gap compared to a long-term goal), we recommend that utilities describe and document the relationship between energy-efficiency programs included in the Action Plan and the longer-term goals or resources to be acquired.

6. **Provide both energy savings (MWh or GWh) and summer coincident peak demand reductions (MW) for energy-efficiency resources.** Both energy and peak

[47] Table E-2 in Appendix F demonstrates this practice.

capacity data are necessary to support region-wide assessments. To support comparative studies, dual-peaking and winter-peaking utilities should report capacity values in both system (i.e., winter)-peak and summer-peak terms.

7. **Provide annual effects of energy-efficiency resources by program year and by calendar year.** To facilitate tracking of pre-plan and plan resources (see recommendation 4 above), we recommend documenting the effects of energy-efficiency strategies separately for each "program year" (i.e., the measures installed in a specific year in association with a specific program or strategy) that materialize in each calendar year. This information can then be aggregated to develop plan and pre-plan effects relevant to the specific resource plan start date.[48]

8. **Provide energy-efficiency savings data for all years of the resource plan analysis period.** To support regional analyses, complete information at key reference dates (e.g., 2010, 2015, and especially 2020) is needed. Because utilities across the West have different schedules for issuing resource plans, providing information in all years of the plan, rather than just at specific dates relevant to the individual utility, enables comparisons across utilities.

9. **Include key metrics describing the relationship between the energy-efficiency resources and key resource issues in the resource plan.** Specifically, we recommend the following three primary metrics:

    d. *Energy-efficiency effects as a share (%) of the growth in total resource requirements*—this provides a basis for evaluating the extent to which utilities plan to meet projected load growth with energy-efficiency resources in a given year or over a defined time period.

    e. *Energy-efficiency effects as a share (%) of total resource requirements*—this measures how much load is projected to be met with energy efficiency in a given year.

    f. *Energy-efficiency effects as a share (%) of total resource requirements* ***in 2020***—this measures the ability of forecast resources to meet the WGA goal of 20% energy efficiency in 2020.[49]

    Table 4-1 is a summary table calculated from the data in Table E-1 and Table E-2 (see Appendix E). It includes all three of the above metrics, as well as information on load growth with and without energy efficiency, and could be included in a resource plan as a high-level summary of state and utility energy-efficiency resources.[50]

[48] See Table E-1 in Appendix F.
[49] See section 3.3 for a discussion of how the WGA goal is defined.
[50] Table E-3 is a similar summary that only addresses energy-efficiency programs, and may be of interest in analyzing programs administered by the utility separately (see Appendix F).

Table 4-1. Summary of Long-Term Effects of Energy Efficiency Strategies

Energy Efficiency Strategy Summary
Cumulative Impacts of EE Strategies Implemented Starting in 2006

	2010		2015		2020		
	GWh	MW*	GWh	MW*	GWh	MW*	
EE Strategy Impacts							
Cumulative EE Strategy Impacts[1]	4,579	254	11,953	664	22,914	1,273	
Forecast Total Resource Requirements (TRR)[2]	106,136	5,307	114,339	5,717	123,176	6,159	
EE Strategies as Percent of TRR	4%	5%	10%	12%	**19%**	**21%**	← **WGA goal**
EE Strategies as Percent of TRR Growth (since 2006)	75%	83%	83%	93%	99%	110%	
Impact of EE strategies on forecast load growth							
Average Annual growth in TRR (since 2006)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	
Net Resources for Load (NRL)[3]	101,558	5,052	102,386	5,053	100,262	4,886	
Average Annual Growth in NRL	0.6%	0.5%	0.3%	0.2%	0.1%	-0.1%	
Percentage reduction in growth rate	62%	69%	77%	86%	95%	107%	

*** summer-peak capacity**

NOTES:
(1) EE strategy savings include EE programs, EE standards and building codes, are cumulative since 2006, and include losses.
(2) Total Resource Requirements include system losses, but do not include demand reductions from energy-efficiency strategies or reserve margins.

(3) Net Resources for Load includes demand reductions from all EE strategies. Reserve margins are not included.

10. **Clearly identify the basis or criteria for determining the level of investment in energy-efficiency resources in the plan.** In several of the resource plans reviewed for this study, it appeared that the amount of energy-efficiency investment proposed by the utility was influenced or constrained by factors other than cost-effectiveness, such as parallel regulations (e.g., electric industry restructuring), rate cases, and settlements or stakeholder agreements about the amount of DSM to invest in. Resource plans should document the factors that influence proposed energy efficiency investment levels and savings goals.[51]

11. **As the new NERC reliability standards are implemented[52], work with appropriate NERC and WECC committees and subcommittees to ensure that demand-side management data reporting protocols and definitions are consistent across NERC, WECC and state/regional assessments as well as utility resource plans.** Implementation of this recommendation would not only allow for consistency of information, transparency of analysis and ease of comparing DSM programs and achievements, but should also ease the reporting burden for utilities.

[51] If the utility supplements a cost-effectiveness analysis with additional criteria or relies on an alternative method or approach, then it should include information on the legislative or regulatory support for these approaches (e.g., a Public Good Charge or System Benefits Charge requirement, other legislation or goals) in the resource plan.
[52] NERC standards MOD-016-0 and MOD-021-0 require that DSM be explicitly included in load forecasts.

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Glossary of Terms

Time Periods

(LBNL study) analysis period—The time period from 2004 through 2013 adopted as the period of analysis for this study.

Pre-analysis (period)—The time period prior to the *LBNL analysis period* (i.e., from some earlier year through 2003) for which some of the reviewed utility resource plans included energy-efficiency program savings that were expected to contribute to overall energy-efficiency resources during the *analysis period*.

Plan period—The time period over which a given utility resource plan forecasts L&R information. Typically, this begins in the first consecutive year after the plan's publication date (e.g., a resource plan issued in 2006 might have a *plan period* of 2007–16).

Pre-Plan (period)—The time period prior to a utility's *plan period* for which energy-efficiency savings are expected to contribute to overall energy-efficiency resources during the *plan period*.

Energy-Efficiency Quantities

Plan program effects—The savings, in a specific year, from energy-efficiency program measures implemented during the plan period up to the year in which effects are measured (e.g., in this study, the savings in 2008 from program measures implemented in 2004–08 and the savings in 2013 from program measures implemented in 2004–13).

Plan and pre-plan program effects—*Plan program effects* in a specific year plus residual savings occurring in that same year from program measures implemented in the pre-plan period.

Plan effects of strategies—The savings, in a specific year, from energy-efficiency measures associated with all energy-efficiency strategies (i.e., energy-efficiency programs, energy-efficiency standards and building codes) implemented during the plan period up to the year in which effects are measured.

Plan and pre-plan effects of strategies—*Plan effects of strategies* in a specific year plus residual savings occurring in that same year from energy-efficiency strategies implemented in the pre-plan period.

Total plan period effects—*Plan effects of strategies* in a specific year plus "naturally occurring" energy efficiency that materializes during the plan period up to the year in which effects are measured.

Total plan and pre-plan period effects—*Plan and pre-plan effects of strategies* in a specific year plus residual savings occurring in that same year from "naturally occurring" energy-efficiency materialized during the pre-plan period.

Load Forecast Terms

Total resource requirements—A load forecast that does not include the effects of projected energy-efficiency resources or reserve margins; losses are included.

Total energy requirements—A load forecast, measured in energy terms, that does not include the effects of projected energy-efficiency resources or reserve margins; losses are included.

Total (summer- or winter-peak) capacity requirements—A load forecast, measured in peak capacity terms, that does not include the effects of projected energy-efficiency resources or reserve margins; losses are included.

Net resources for load—A load forecast that includes the demand-modifying impacts of projected energy-efficiency resources, but does not include reserve margins; losses are included.

Net energy for load—A load forecast, measured in energy terms, that includes the demand-modifying impacts of projected energy-efficiency resources, but does not include reserve margins; losses are included.

Net (summer- or winter-peak) capacity for load—A load forecast, measured in peak capacity terms, that includes the demand-modifying impacts of projected energy efficiency resources, but does not include reserve margins; losses are included.

Adjusted load forecast—A load forecast that has been adjusted to include the demand-modifying impacts of some, but not all, energy-efficiency resources (e.g., a *program-adjusted forecast* includes the effects of energy-efficiency programs, but not other energy-efficiency strategies). Reserve margins are not included; losses are.

Appendix A. Energy Efficiency Data

Table A-1 provides the specific location of the energy-efficiency data obtained for each utility and the specific data included in each utility's *plan program effects* and *plan and pre-plan program effects*. We adopted the following general rules in extracting energy-efficiency savings data from the resource plans:

- For utilities that explored scenarios with different levels of energy-efficiency investment, we report savings from the preferred or adopted scenario;
- Where possible, we report energy-efficiency savings including losses (i.e., at the generator, or busbar).

Table A-1. Energy Efficiency Data

Utility	Plan Program Effects		Plan and Pre-plan Program Effects	
	Data Source(s)	Data Included	Data Source(s)	Data Included
Avista	IRP, Fig. 3.2 for 2004–5; Table 7.5 for 2007–11 ("conservation" and "new conservation" combined); App. G, pg.12 for 2012–13	Actual conservation program savings for 2004–05, combined with proposed "existing" and "new" conservation program savings for 2006–13.	IRP, pg. VII, for historical program savings, combined with *plan program effects*	Conservation program savings from prior to 2004 through 2013—starting program year is unspecified.
BC Hydro	IEP, Part 2, Table 6.1 for data up to 2012 (PS-2); Part 3, Appendix B, Table B.1 for 2013–15 (PS-3)	"Powersmart-2" savings for 2004–12, combined with "Powersmart-3" savings for 2013	IEP, Part 7, pg. 4, for historical program savings, combined with *plan program effects*	"Powersmart-2" programs from 2002–12, and "Powersmarrt-3" programs for 2013.[1]
Idaho Power	IRP Tech. App., PDF pg. 98	DSM program savings for 2004–13	——	——
Nevada Power	IRP, Vol. V, Figure DSM-3, pg. 8	2004 DSM savings levels assumed for each year for 2004–08. New programs were discussed in the plan, but no savings values were specified.	——	——
NWE	EDPP Volume 1, Table 5, pg. 19	Utility DSM and Universal System Benefits (USB) program savings for 2004–13.	——	——
PacifiCorp	IRP, Table 3.4, pg. 45 for 2006–13; 24 aMW/yr assumed for 2004 & 2005 per note on p.31	"Class 2" DSM, including utility and Energy Trust of Oregon programs: 2004–13	IRP, pg. 31, for historical program savings[2], combined with *plan program effects*	"Class 2" programs from 1992 onward
PGE	IRP, Table 23, pg.92 of final action plan for 2006–11 (busbar savings); 10 aMW/yr assumed for 2004 & 2005 and 15 aMW/yr for 2012–13 based on Energy Trust estimation (Final Action Plan, p. 385)	PGE's share (based on load) of "Conservative" Energy Trust of Oregon program savings: 2004–13	IRP, Table 22, pg.92 of final action plan, combined with *plan program effects*	Energy Trust of Oregon programs from 1991 onward.

Utility	Plan Program Effects		Plan and Pre-plan Program Effects	
	Data Source(s)	**Data Included**	**Data Source(s)**	**Data Included**
PSCO	December 2004 Comprehensive Settlement Agreement, p. 19 for 2006–13; actual program savings for 2004–05 from Geller (2006)	Utility programs for 2004–13.	——	——
PNM	——	——	——	——
PSE	LCP, Appendix G, pg. 26 for 2006–13; pg. VII-2 for 2004–05 (actual energy-efficiency program savings for 2004 and balance of 2004–5 target for 2005)	Energy-efficiency program savings for 2004–05 and energy-efficiency and residential fuel conversion savings for 2006–13[3]	——	——
PG&E	CPUC 2004, Table 1A for 2004–05 and 2009–13 savings; Advice Letter 2704-G/2786-E, Attachment III for 2006–08 programs	PG&E administered energy-efficiency programs offered to retail and direct access customers: 2004–13	——	——
SCE	CPUC 2004, Table 1B for 2004–05 and 2009–13 savings; Advice 1955-E, Attachment II for 2006–8 programs	SCE-administered energy-efficiency programs offered to retail and direct access customers: 2004–13	——	——
SDG&E	CPUC 2004, Table 1C for 2004–05 and 2009–13 savings; Advice Letter 1769-E/1591-G, Attachment 4 for 2006–08 programs	SDG&E administered energy-efficiency programs offered to retail and direct access customers: 2004–13	——	——
Sierra Pacific	Vol. 1, Figure S-6, pg. 13.	2005 DSM savings levels assumed for each year for 2004–08. New programs were discussed in the plan, but no savings values were specified.	——	——

[1] BC Hydro’s resource plan mentions “Powersmart-1” programs beginning in 1989, but does not provide residual savings data for these earlier energy-efficiency programs.

[2] PacifiCorp’s historical program savings were only reported in aMW, while *plan program effects* were reported in both aMW and MW. To report *plan and pre-plan program effects* in capacity units, historical program savings were converted to MW. For 2008, the average ratio of aMW to MW savings from *plan program effects* in 2006–08 was used as the conversion factor. For 2013, we used the average

[3] PSE’s plan did not provide separate savings for energy efficiency and residential fuel conversion programs on an annual basis.

Appendix B. Load Forecast Data

Table B-1 provides the specific location of the load forecast data obtained for each utility and any adjustments made to the data to obtain *total resource requirements*. *Plan program effects* were subtracted from *total resource requirements* to calculate an *adjusted forecast*. We adopted the following general rules in extracting load forecast data from the resource plans:

- We report the "base case" or "normal weather" load forecast scenario for each utility;
- Where possible, we report only forecasted retail sales—wholesale requirements are omitted;
- Where possible, we report load forecasts including losses (i.e., at the generator or busbar);
- Where possible, planning and reserve margins are not included in the reported load forecasts.

Table B-1. Utility Load Forecast Data and Adjustments

Utility	Load Forecast Data Source	Adjustments/Assumptions Made to Forecast to Obtain "Total Resource Requirements"
Avista	Energy: Appendix J, p.2: Base-case system-load forecast: 2006–13; Peak demand: Appendix J, p.3: Base-case native load forecast: 2005–13	Extrapolated 2004 and added back energy-efficiency program savings from 2004–2006; "existing" program savings from 2007 onward were also added back to the load forecast; "new" program savings were not included as a demand modifier in the forecast, so were not added back. Winter-peak demand forecast converted to summer-peak using utility-specific load factor (FERC 2004)
BC Hydro	Energy : Part 2, p.39, Table 6.1; Peak demand: Part 2, p.40, Table 6.2	Winter-peak demand forecast converted to summer-peak using utility-specific load factor (FERC 2004)
Idaho Power	Energy: Appendix B, p.47: Company System Load; Peak demand: Appendix B, p.47: Company System Peak (1 hour)	None—energy efficiency does not appear to be explicitly accounted for in the load forecast.
Nevada Power	IRP, Vol. IV, Fig. LF-7, pg. 12	None. IRP does not state whether or not efficiency is included in the forecasts.
NWE	Energy: Table 1, p.6 of 6 in Chapter 3 Sources file for energy load forecast. No peak-demand forecast provided.	Added back 2004–05 energy-efficiency program savings that were included in the forecast.
PacifiCorp	Energy: Table 2.1, p. 27: 2004. Table C.2, p. 30 of technical appendix: 2006–13 Peak demand: Table I.5, pg. 135 of tech appendix: 2006–15	2004–05 energy and peak demand forecast data were not available in the IRP; they were extrapolated from the 2006–07 growth rate. Added back *plan program effects* that were included in forecasts.
PGE	Energy: Final Action Plan, Figure 9, p. 52: 2005–12 Peak demand: Final Action Plan, Figure 10, p. 53: 2005–12	Data for 2004 and 2013 extrapolated using the growth rates from 2005–06 and 2001–12 respectively. Winter-peak demand forecast converted to summer-peak using utility-specific load factor (FERC 2004)
PSCO	Energy: Vol. 4, Table 1.6.A-2, p. 5: "Total Annual Energy Sales" minus "Annual Energy Sales to Other Utilities" in Vol. 4, Table 1.6.B-4, p. 30. Peak demand: Vol. 4, Table 1.6.A-1, p 3: "Total Summer Firm Load Peak Demand", minus "Coincident Summer Demand" of Sales to Other Utilities in Vol. 4, Table 1.6.B-4, p. 30.	Added back program effects included in forecast (2004–05).

Utility	Load Forecast Data Source	Adjustments/Assumptions Made to Forecast to Obtain "Total Resource Requirements"
PSE	Energy: Exhibit VI-6, p. 10: 2004–05, 2010 & 2015 Peak demand: Exhibit VI-9: 2004–05, 2010 & 2015	Interpolated data for 2006–09 and 2011–12 using average annual growth rates from closest years of available data. Added back 2004–05 energy-efficiency program savings included in forecasts. Winter-peak demand forecast converted to summer-peak using utility-specific load factor (FERC 2004)
PG&E	CEC (2005a), Chapter 2, Form 1.9 to which net losses from Form 1.4a were applied	2005 energy load forecast data interpolated from 2004 & 2006 data. Added back adjustments for energy-efficiency programs, building & appliance standards, and market & price impacts provided by the CEC (2006).
SCE	CEC (2005a), Chapter 3, Form 1.9, to which net losses from Form 1.4a were applied	2005 energy load forecast data interpolated from 2004 & 2006 data. Added back adjustments for energy-efficiency programs, building & appliance standards, and market & price impacts provided by the CEC (2006).
SDG&E	CEC (2005a), Chapter 4, Form 1.3, to which net losses from Form 1.4a were applied	Added back adjustments for energy-efficiency programs, building & appliance standards, and market & price impacts provided by the CEC (2006).
Sierra Pacific	Energy: Vol. 1, Fig S-4, pg. 7: 2005–13 Peak demand: Vol. 1, Fig S-8, pg. 15: 2004–13	Extrapolated energy load forecast for 2004 using growth rate from 2005–06. No energy efficiency included in forecast per Vol IV, p. 3

Appendix C. Converting Energy Data to Summer-Peak Capacity Units

Because several utilities either did not report energy-efficiency savings in capacity terms, or reported winter-peak capacity values, we converted energy savings data to summer-peak capacity as follows:

- For the Pacific Northwest utilities and BC Hydro, we used conversion factors derived from the average summer load factor and coincident peak factors for the NPCC's regional conservation target of 700 aMW by 2009 (Eckman 2005).[53] This applied to Avista, BC Hydro, NWE, PSE and PGE.[54]
- The remaining seven utilities—Idaho Power, Nevada Power, PacifiCorp, PSCO, PG&E, SCE, SDG&E and Sierra Pacific—are summer peaking and reported energy savings in both energy and capacity units. We made the assumption that the reported capacity savings are coincident with these utilities' peak demand, and reported these values without adjustment.

For the winter-peaking utilities, it was also necessary to convert load forecast data to summer-peak demand in order to express energy-efficiency impacts as a proportion of summer-peak demand. We used each utility's ratio of summer- to winter-peak demand in 2004 to make this conversion (FERC 2004).

[53] The weighted average summer load factor (ratio of annual average MW to July/August hourly maximum MW) is 0.63 across the full 700 aMW of energy savings and the coincidence factor is 0.86 (ratio of end use peak MW to system peak MW).

[54] A few of the winter-peaking utilities reported energy-efficiency program savings in MW as well as energy units, but as we had no way of converting from winter-peak to summer-peak MW, we converted the energy savings to summer-peak demand units using the region-wide conversion factor described above.

Appendix D. Progress toward the WGA CDEAC Energy Efficiency Goal

Table D-1 reports the underlying energy-efficiency savings and *total energy requirements* data used to develop the metrics reported in Table 3-5.

Table D-1. Plan Program Effects as Percent of Total Energy Requirements

Utility	2008			2013		
	Plan Program Effects (GWh)	Total Energy Requirements (GWh)[7]	Plan Program Effects as % of Total Energy Requirements[7]	Plan Program Effects (GWh)	Total Energy Requirements (GWh)[7]	Plan Program Effects as % of Total Energy Requirements[7]
Avista	261	10,304	2.5%	563	11,766	4.8%
BC Hydro[1]	2,190	57,977	3.8%	3,751	62,504	6.0%
Idaho Power	70	16,171	0.4%	158	17,949	0.9%
Nevada Power[2]	*165*	22,207	*0.7%*	——	——	——
NWE	187	6,462	2.9%	406	6,891	5.9%
PacifiCorp	1,244	64,099	1.9%	2,348	69,013	3.4%
PGE[3]	618	22,250	2.8%	1,280	24,665	5.1%
PSCO	413	29,193	1.4%	913	33,092	2.8%
PSE[4]	1,217	21,255	5.7%	2,401	23,081	10.4%
PG&E[5]	4,777	94,930	5.0%	10,397	102,973	10.1%
SCE[5]	5,272	99,173	5.3%	11,092	106,703	10.4%
SDG&E[5]	1,529	22,747	6.7%	2,784	24,733	11.3%
Sierra Pacific[6]	*131*	9,715	*1.4%*	——	——	——

LBNL made assumptions in calculating Italicized values—values in regular font are compiled directly from resource plan data.

[1] BC Hydro's plan only commits to implementing its PowerSmart-2 program through 2012; possible continued savings from PowerSmart-3 are included for 2013.
[2] Nevada Power only reported annual savings for 2004; this level of savings was assumed for each year from 2004 through 2008.
[3] PGE identifies *plan program effects* for 2005–11; the 2013 value was extrapolated.
[4] PSE values include residential fuel conversion programs—standalone energy-efficiency program savings were not available.
[5] The energy savings goals for the California utilities include all programs administered by the utilities, including those offered to direct access customers. Some portion of savings from energy-efficiency standards is included in these goals, as the utilities administer programs to support their implementation.
[6] Sierra Pacific only reported annual savings for 2005; this level of savings was assumed for each year from 2004 through 2008.
[7] *Total energy requirements* do not include load reductions from *plan program effects* or reserve margins.

Appendix E: Detailed Data Reporting Tables

Section 4.3 of this report makes recommendations for standardized reporting of energy-efficiency and load forecast data in future resource plans. The summary table demonstrated in Table 4-1 would be developed from more detailed energy-efficiency and load-forecast data, reported in annual increments over an extended time horizon (e.g., 2006–20).

Table E-1 and Table E-2 provide example energy-efficiency and load-forecast data reporting forms, with a hypothetical utility's resource data shown for demonstration purposes. Table E-3 is an alternate version of the summary table that is only applicable to energy-efficiency programs administered by utilities (no energy-efficiency standards or building codes are included). These, and Table 4-1, are snapshots from a linked Excel workbook that is available for download at http://eetd.lbl.gov/ea/EMS/rplan-pubs.html.

A utility or state using these forms to report data would insert annual, incremental energy savings data, by type of resource (energy efficiency programs vs. efficiency standards vs. building codes) and by program year into Table E-1. Load forecast data, in terms of *total resource requirements*, would be entered into row 1 of Table E-2. In both forms, the data would be entered in the yellow-shaded cells; all other cells, including all the data in the summary tables (shown in Table 4-1 and Table E-3) are calculated in formulas derived from the data in the yellow cells.

In Table E-1, cumulative savings, starting from 2006, are calculated in each year at the bottom of the table (light-blue cells). In Table E-2, these data are used to develop a *program-adjusted forecast* (row 6 in Table E-2), used as the basis for the metrics in the program summary table (Table E-3), and *net resources for load* (row 7 in Table E-2), from which the metrics in Table E-3 are calculated.

All data are reported and calculated in both energy (GWh) and summer-peak capacity (MW). Utilities that experience their peak demand during the winter will need to report the capacity values in winter-peak terms, to support their own resource assessment needs, and summer-peak terms, to support West-wide resource assessment. Losses should be included in both the energy-efficiency and load-forecast data (i.e., energy savings at the customer meter should be adjusted to provide generation-equivalent values).

Table E-1. Detailed Energy Efficiency Resource Data Reporting Form

* summer-peak capacity savings

Incremental Savings (including losses) in Calendar Year… NOTE: Savings measured at the customer meter should be adjusted to produce "generation-equivalent" values.

Program Year	Strategy	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
		GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*
2006	EE Programs	500	28	500	28	500	28	500	28	500	28	500	28	500	28	500	28	500	28	500	28	400	22	400	22	400	22	400	22	400	22
	Building codes	175	10	175	10	175	10	175	10	175	10	175	10	175	10	175	10	175	10	175	10	140	8	140	8	140	8	140	8	140	8
	EE standards	75	4	75	4	75	4	75	4	75	4	75	4	75	4	75	4	75	4	75	4	60	3	60	3	60	3	60	3	60	3
	Total	750	42	750	42	750	42	750	42	750	42	750	42	750	42	750	42	750	42	750	42	600	33	600	33	600	33	600	33	600	33
2007	EE Programs			550	31	550	31	550	31	550	31	550	31	550	31	550	31	550	31	550	31	550	31	440	24	440	24	440	24	440	24
	Building codes			193	11	193	11	193	11	193	11	193	11	193	11	193	11	193	11	193	11	193	11	154	9	154	9	154	9	154	9
	EE standards			83	5	83	5	83	5	83	5	83	5	83	5	83	5	83	5	83	5	83	5	66	4	66	4	66	4	66	4
	Total			825	46	825	46	825	46	825	46	825	46	825	46	825	46	825	46	825	46	825	46	660	37	660	37	660	37	660	37
2008	EE Programs					605	34	605	34	605	34	605	34	605	34	605	34	605	34	605	34	605	34	605	34	484	27	484	27	484	27
	Building codes					212	12	212	12	212	12	212	12	212	12	212	12	212	12	212	12	212	12	212	12	169	9	169	9	169	9
	EE standards					91	5	91	5	91	5	91	5	91	5	91	5	91	5	91	5	91	5	91	5	73	4	73	4	73	4
	Total					908	50	908	50	908	50	908	50	908	50	908	50	908	50	908	50	908	50	908	50	726	40	726	40	726	40
2009	EE Programs							666	37	666	37	666	37	666	37	666	37	666	37	666	37	666	37	666	37	666	37	532	30	532	30
	Building codes							233	13	233	13	233	13	233	13	233	13	233	13	233	13	233	13	233	13	233	13	186	10	186	10
	EE standards							100	6	100	6	100	6	100	6	100	6	100	6	100	6	100	6	100	6	100	6	80	4	80	4
	Total							998	55	998	55	998	55	998	55	998	55	998	55	998	55	998	55	998	55	998	55	799	44	799	44
2010	EE Programs									732	41	732	41	732	41	732	41	732	41	732	41	732	41	732	41	732	41	732	41	586	33
	Building codes									256	14	256	14	256	14	256	14	256	14	256	14	256	14	256	14	256	14	256	14	205	11
	EE standards									110	6	110	6	110	6	110	6	110	6	110	6	110	6	110	6	110	6	110	6	88	5
	Total									1,098	61	1,098	61	1,098	61	1,098	61	1,098	61	1,098	61	1,098	61	1,098	61	1,098	61	1,098	61	878	49
2011	EE Programs											805	45	805	45	805	45	805	45	805	45	805	45	805	45	805	45	805	45	805	45
	Building codes											282	16	282	16	282	16	282	16	282	16	282	16	282	16	282	16	282	16	282	16
	EE standards											121	7	121	7	121	7	121	7	121	7	121	7	121	7	121	7	121	7	121	7
	Total											1,208	67	1,208	67	1,208	67	1,208	67	1,208	67	1,208	67	1,208	67	1,208	67	1,208	67	1,208	67
2012	EE Programs													886	49	886	49	886	49	886	49	886	49	886	49	886	49	886	49	886	49
	Building codes													310	17	310	17	310	17	310	17	310	17	310	17	310	17	310	17	310	17
	EE standards													133	7	133	7	133	7	133	7	133	7	133	7	133	7	133	7	133	7
	Total													1,329	74	1,329	74	1,329	74	1,329	74	1,329	74	1,329	74	1,329	74	1,329	74	1,329	74
2013	EE Programs															974	54	974	54	974	54	974	54	974	54	974	54	974	54	974	54
	Building codes															341	19	341	19	341	19	341	19	341	19	341	19	341	19	341	19
	EE standards															146	8	146	8	146	8	146	8	146	8	146	8	146	8	146	8
	Total															1,462	81	1,462	81	1,462	81	1,462	81	1,462	81	1,462	81	1,462	81	1,462	81
2014	EE Programs																	1,072	60	1,072	60	1,072	60	1,072	60	1,072	60	1,072	60	1,072	60
	Building codes																	375	21	375	21	375	21	375	21	375	21	375	21	375	21
	EE standards																	161	9	161	9	161	9	161	9	161	9	161	9	161	9
	Total																	1,608	89	1,608	89	1,608	89	1,608	89	1,608	89	1,608	89	1,608	89
2015	EE Programs																			1,179	65	1,179	65	1,179	65	1,179	65	1,179	65	1,179	65
	Building codes																			413	23	413	23	413	23	413	23	413	23	413	23
	EE standards																			177	10	177	10	177	10	177	10	177	10	177	10
	Total																			1,768	98	1,768	98	1,768	98	1,768	98	1,768	98	1,768	98
2016	EE Programs																					1,297	72	1,297	72	1,297	72	1,297	72	1,297	72
	Building codes																					454	25	454	25	454	25	454	25	454	25
	EE standards																					195	11	195	11	195	11	195	11	195	11
	Total																					1,945	108	1,945	108	1,945	108	1,945	108	1,945	108
2017	EE Programs																							1,427	79	1,427	79	1,427	79	1,427	79
	Building codes																							499	28	499	28	499	28	499	28
	EE standards																							214	12	214	12	214	12	214	12
	Total																							2,140	119	2,140	119	2,140	119	2,140	119
2018	EE Programs																									1,569	87	1,569	87	1,569	87
	Building codes																									549	31	549	31	549	31
	EE standards																									235	13	235	13	235	13
	Total																									2,354	131	2,354	131	2,354	131
2019	EE Programs																											1,726	96	1,726	96
	Building codes																											604	34	604	34
	EE standards																											259	14	259	14
	Total																											2,589	144	2,589	144
2020	EE Programs																													1,899	105
	Building codes																													665	37
	EE standards																													285	16
	Total																													2,848	158
Cumulative Effects In Each Year	EE Programs	500	28	1,050	58	1,655	92	2,321	129	3,053	170	3,858	214	4,744	264	5,718	318	6,790	377	7,969	443	9,166	509	10,482	582	11,930	663	13,523	751	15,276	849
	Building codes	175	10	368	20	579	32	812	45	1,068	59	1,350	75	1,660	92	2,001	111	2,376	132	2,789	155	3,208	178	3,669	204	4,176	232	4,733	263	5,347	297
	EE standards	75	4	158	9	248	14	348	19	458	25	579	32	712	40	858	48	1,018	57	1,195	66	1,375	76	1,572	87	1,790	99	2,029	113	2,291	127
	Total	750	42	1,575	88	2,483	138	3,481	193	4,579	254	5,787	321	7,115	395	8,577	476	10,185	566	11,953	664	13,748	764	15,723	874	17,896	994	20,285	1,127	22,914	1,273

Table E-2. Detailed Load Forecast Data Reporting Form

Load Forecast

		2006		2007		2008		2009		2010		2011		2012		2013	
		GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*
1.	Total Resource Requirements[1]	100,000	5,000	101,500	5,075	103,023	5,151	104,568	5,228	106,136	5,307	107,728	5,386	109,344	5,467	110,984	5,549
2.	EE Programs	500	28	1,050	58	1,655	92	2,321	129	3,053	170	3,858	214	4,744	264	5,718	318
3.	Building codes	175	10	368	20	579	32	812	45	1,068	59	1,350	75	1,660	92	2,001	111
4.	EE standards	75	4	158	9	248	14	348	19	458	25	579	32	712	40	858	48
5.	Total EE Strategies (2+3+4)	750	42	1,575	88	2,483	138	3,481	193	4,579	254	5,787	321	7,115	395	8,577	476
6.	Program-adjusted forecast (1-2)[2]	99,500	4,972	100,450	5,017	101,368	5,059	102,247	5,099	103,084	5,137	103,871	5,172	104,601	5,204	105,267	5,232
7.	Net Resources for Load (1-5)[3]	99,250	4,958	99,925	4,988	100,540	5,013	101,087	5,035	101,558	5,052	101,942	5,065	102,229	5,072	102,408	5,073
8.	Planning Reserve Multiplier[2]	--	15%	--	15%	--	15%	--	15%	--	15%	--	15%	--	15%	--	15%
9.	Planning Reserves (6x7)	--	744	--	748	--	752	--	755	--	758	--	760	--	761	--	761
10.	Capacity Requirements (6+8)[3]	--	5,702	--	5,736	--	5,765	--	5,790	--	5,810	--	5,825	--	5,833	--	5,834

		2014		2015		2016		2017		2018		2019		2020	
		GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*	GWh	MW*
1.	Total Resource Requirements[1]	112,649	5,632	114,339	5,717	116,054	5,803	117,795	5,890	119,562	5,978	121,355	6,068	123,176	6,159
2.	EE Programs	6,790	377	7,969	443	9,166	509	10,482	582	11,930	663	13,523	751	15,276	849
3.	Building codes	2,376	132	2,789	155	3,208	178	3,669	204	4,176	232	4,733	263	5,347	297
4.	EE standards	1,018	57	1,195	66	1,375	76	1,572	87	1,790	99	2,029	113	2,291	127
5.	Total EE Strategies (2+3+4)	10,185	566	11,953	664	13,748	764	15,723	874	17,896	994	20,285	1,127	22,914	1,273
6.	Program-adjusted forecast (1-2)[2]	105,860	5,255	106,370	5,274	106,888	5,294	107,313	5,307	107,631	5,315	107,832	5,316	107,900	5,310
7.	Net Resources for Load (1-5)[3]	102,465	5,067	102,386	5,053	102,306	5,039	102,072	5,016	101,666	4,984	101,070	4,941	100,262	4,886
8.	Planning Reserve Multiplier[2]	--	15%	--	15%	--	15%	--	15%	--	15%	--	15%	--	15%
9.	Planning Reserves (6x7)	--	760	--	758	--	756	--	752	--	748	--	741	--	733
10.	Capacity Requirements (6+8)[3]	--	5,827	--	5,811	--	5,795	--	5,769	--	5,731	--	5,682	--	5,619

*** summer-peak demand**

NOTES:

(1) Total Resource Requirements include system losses, but do not include demand reductions from energy-efficiency strategies reported in the "annual EE detail" worksheet. Reserve margins are also not included.

(2) The Program-adjusted Forecast is Total Resource Requirements, net of energy-efficiency program effects (generator-level, including losses).

(3) Net Resources for Load is Total Resource Requirements, net of all energy-efficiency strategies (generator, level, including losses). Planning reserves are calculated based on this EE-strategy-adjusted load forecast.

(4) The planning reserve multiplier shown is illustrative and should be adjusted to match specific system needs.

(5) Capacity Requirements is the amount of forecast load, including planning reserves, that must be met with supply-side resources.

Table E-3. Summary of Long-Term Energy Efficiency Program Effects

Energy Efficiency Program Summary
Cumulative Impacts of Programs Implemented Starting in 2006

	2010		2015		2020	
	GWh	MW*	GWh	MW*	GWh	MW*
EE program Impacts						
Cumulative EE Program Impacts[1]	3,053	170	7,969	443	15,276	849
Forecast Total Resource Requirements (TRR)[2]	106,136	5,307	114,339	5,717	123,176	6,159
EE Programs as Percent of TRR	3%	3%	7%	8%	12%	14%
EE Programs as Percent of TRR Growth (since 2006)	50%	55%	56%	62%	66%	73%
Impact of EE programs on forecast load growth						
Average Annual growth in TRR (since 2006)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Program-adjusted foreast (PAF)[3]	103,084	5,137	106,370	5,274	107,900	5,310
Average Annual Growth in PAF	0.9%	0.8%	0.7%	0.7%	0.6%	0.5%
Percentage reduction in growth rate	41%	45%	50%	56%	61%	69%

*** summer-peak capacity**

NOTES:

(1) EE program savings are cumulative since 2006 and include losses.

(2) Total Resource Requirements include system losses, but do not include demand reductions from energy-efficiency strategies or reserve margins.

(3) The program-adjusted forecast includes demand reductions from EE programs, but not other EE strategies. Reserve margins are not included.