# **Rewarding Efficiency: Lessons from California's Shareholder Incentive**

Julia Zuckerman, Climate Policy Initiative, San Francisco, Calif. Jeff Deason, Climate Policy Initiative, San Francisco, Calif. Sangeetha Chandrashekeran, University of Melbourne, Melbourne, Australia

# ABSTRACT

Utility shareholder incentives and other performance-based energy efficiency policies are gaining popularity in the United States. This paper examines California's experience with shareholder incentives between 2006 and 2012 as a case study of performance-based energy efficiency policy in action. While efficiency programs during this period achieved a large amount of cost-effective energy savings, the incentive structure ran into serious implementation difficulties and has been contentious among the utilities, regulators, and other stakeholders.

California's experience holds important lessons for other jurisdictions considering performancebased shareholder incentives and similar policies:

- Incentives based on measured performance place pressure on evaluation, measurement, and verification (EM&V) processes, tending to draw attention to their weakest points. Negotiation over incentive earnings can spill over into disputes over EM&V, and vice versa.
- For incentives to function effectively, they must be designed with a realistic view of EM&V. Incentives should be designed to allow for some uncertainty in measurement of program outcomes for example, avoiding high-stakes discontinuities in the calculation of incentive earnings.
- The challenge of measuring outcomes grows as policy goals become broader and more ambitious. Hard-to-measure goals, like long-term market transformation, cannot be easily incorporated into an incentive mechanism based on measured outcomes. Resolving this dilemma will require program evaluators to revise evaluation methods to more fully capture big-picture goals, and will also require policymakers to consider more flexible approaches to incentive structure in areas where precise, accurate measurement methods do not exist.

# Introduction

Utility shareholder incentives for energy efficiency have existed since the early 1990s and are gaining attention in the U.S. as a way to implement "pay for performance" principles in energy efficiency policy. Given that utility management is the predominant model for delivering energy efficiency programs in the U.S. (Sedano 2011), shareholder incentives have the potential to drive utility investment in efficiency and better align utilities' interests with policymaker and ratepayer interests in capturing cost-effective efficiency opportunities. To date, 21 states have adopted some form of utility incentive for energy savings (FERC 2011); 18 of these mechanisms are described in Hayes et al. (2011).

Performance-based governance of energy efficiency has also garnered attention at the federal level: The Obama administration has proposed a "Race to the Top" competitive grant to reward states that implement policies promoting energy efficiency and smart grid development. The "Energy 2030" coalition convened by the Alliance to Save Energy has advocated for both shareholder incentives and the efficiency Race to the Top grant (Alliance Commission 2013). As more policymakers express interest in performance-based efficiency policies, it is important that they understand the complex institutional dynamics these policies can create. On that point, California's experience with shareholder incentives between 2006 and 2012 carries some useful lessons. While energy efficiency programs implemented during this period have achieved a large volume of cost-effective energy savings, the incentive structure itself remains controversial. In particular, disagreements over program evaluation methods and results became so protracted that they forced the California Public Utilities Commission (CPUC) to suspend the incentive.

In this paper, we draw lessons from California's experience for policymakers in other jurisdictions considering shareholder incentives or other pay-for-performance schemes for energy efficiency, as well as for the program evaluation community.

# California's Shareholder Incentive and the Role of Evaluation

### The Risk/Reward Incentive Mechanism: An Effort to Align Utility and Ratepayer Interests

California policymakers expressed plans for a shareholder incentive for energy efficiency in 2003 and implemented the Risk/Reward Incentive Mechanism (RRIM) in 2007. CPUC stated the following objectives for the RRIM (CPUC 2007):

- Put energy efficiency on a level playing field with supply-side investment in the eyes of utilities,<sup>1</sup> or more generally focus utility management attention on efficiency
- Align utility incentives with California's policy objectives, including capturing all costeffective energy efficiency opportunities and reducing greenhouse gas emissions
- Share the risk of subpar program results between utility shareholders and ratepayers, and ensure that ratepayers are paying for actual performance

The RRIM provided an incentive for utilities to deliver cost-effective energy efficiency programs by allowing utility shareholders to keep a portion of the net economic benefits attributed to energy efficiency programs. This arrangement was referred to as a "shared savings" incentive, since the total amount of money saved through energy efficiency programs was shared between ratepayers and shareholders. Without the shared savings arrangement, money saved would go entirely to the ratepayers.

For each utility, the "shared savings rate," or the percentage of net economic benefits awarded to utility shareholders, depended on the utility's progress toward quantified targets for electricity, peak demand, and/or gas savings (depending on whether the utility sold electricity, gas, or both). In order to earn an incentive payment, the utilities had to make progress toward all of their savings targets simultaneously. Penalties applied if a utility fell below 65% of any savings target. Figure 1 illustrates the RRIM earnings curve: a utility would move to a higher earnings tier (penalty, "deadband" with no earnings, 9% shared savings, 12% shared savings) as it made progress toward its energy savings targets.

Incentive earnings thus depended on two factors: the net economic benefits produced by the utility's energy efficiency programs, and the total quantity of energy saved. By tying the incentive to net economic benefits, CPUC intended to align the utilities' incentives with ratepayer interests and with California's broader goal to capture all cost-effective energy efficiency opportunities. Tying the incentive to the total amount of energy saved was also an effort to align utility interests with big-picture policy goals. It turned California's quantified energy savings goals — intentionally ambitious targets, originally based on a statewide study of technical potential (CPUC 2004) — into strict criteria for incentive earnings.

<sup>&</sup>lt;sup>1</sup> The RRIM applied to California's four investor-owned utilities: Pacific Gas and Electric (PG&E), Southern California Edison (SCE), San Diego Gas & Electric (SDG&E), and Southern California Gas (SoCalGas). Collectively, they serve 77% of the state's electricity customers (EIA 2012) and 98% of gas customers (CEC 2012).

#### **Evaluation as an Accountability Tool**

California is a national leader in energy efficiency program evaluation as well as program implementation; it spent \$144 million on EM&V between 2006 and 2008 (CPUC 2012b, 296). Under the RRIM as initially implemented, program evaluation results not only laid the groundwork for the next wave of programs, but also determined incentive earnings for existing programs. CPUC viewed this process as a way to ensure that ratepayers were paying for actual performance, not just for implementation of programs with uncertain outcomes.

Under the RRIM, incentive earnings were calculated based on *ex post* (post-implementation) estimates of energy savings. Utilities would receive interim payments during the first two years of the threeyear program cycle based on *ex ante* (pre-implementation) estimates of energy savings parameters. At the end of the program cycle, CPUC would update both installation numbers and estimates of energy savings parameters, including free ridership rates, based on final evaluation findings. CPUC would adjust the final payment to the utilities so that the total award paid over the three-year cycle corresponded to the amount calculated based on ex post evaluation; this process was referred to as a "true-up." If the final earnings calculation showed that the interim payments were not justified by program performance, the utilities would be obligated to return the interim payments. The EM&V process, both ex ante and ex post, was managed by the CPUC's Energy Division (part of the commission's professional staff). Utilities provided extensive input, particularly during the ex ante process.

Awarding incentives based on ex post evaluation was not a novel idea; it had been a goal of CPUC's for many years. In an earlier wave of shareholder incentives in the 1990s, CPUC had implemented an incentive with payments based on ex post EM&V results, but that incentive was interrupted by industry restructuring and never fully implemented (CPUC 2003). With the RRIM, CPUC finally had a chance to put this policy tool to work.

### **Implementation and Conflict**

Disputes over evaluation methods and processes brought the stakeholders into protracted conflict. This conflict undermined full implementation of the RRIM and has continued to hinder efforts to reform it.

Between 2006 and 2008, California's investor-owned utilities implemented a \$2.1 billion portfolio of efficiency programs that, according to CPUC's estimates, saved 6,000 GWh of electricity (3.2% of total electricity sales), 1,100 MW of peak demand, and 80 million therms of natural gas (1% of gas sales) (CPUC 2010a). The utilities claimed actual savings were much larger.

A dispute over EM&V methods and findings became evident early on. The largest single component of the utilities' energy efficiency portfolios was an upstream buy-down program under which tens of millions of discounted compact fluorescent light bulbs (CFLs) were sold to consumers. CPUC expressed concern early in the 2006-2008 program cycle that the ex ante estimates of free ridership were too low for the CFL program (CPUC 2010c, 35–38; CPUC 2010d). The CFL program was so large that changes to the free ridership rate could make the difference between incentive earnings and penalties for the utilities. However, the new free ridership estimates would not be finalized until later in the program cycle.

Early in the implementation process, utilities objected to the possibility of CPUC's forcing them to return interim payments based on the results of the ex post true-up. They argued that investors would not value an incentive payment that could be "clawed back" by CPUC in future years. In an effort to increase predictability, CPUC took steps to increase the frequency of updates to energy savings parameters, but left in place the true-up provision.

In 2010, CPUC's Energy Division released its final evaluation report, intended to inform calculation of the final true-up payment for the 2006-2008 program cycle. CPUC's findings were dramatically different

from the utilities' claimed savings levels. Based on the final evaluation, the true-up would have swung the utilities from a total of nearly \$400 million in earnings based on utility-reported performance and ex ante estimates to a net penalty of \$45 million.

The utilities disputed the methods used to estimate energy savings in CPUC's evaluation report. The more contentious estimates included free ridership rates for the CFL program; the number of CFLs actually installed, rather than stockpiled for later use; and how to account for interactive effects, when installing efficient lighting results in increased gas usage. CPUC undertook a multiple-scenario analysis that illustrated that the earnings calculation was very sensitive to these assumptions: Based on a range of assumptions about parameters, total earnings for the four utilities varied from nearly \$400 million to a penalty of over \$100 million (CPUC 2010b, 36, 57).

After vigorous and unresolved debate over the evaluation findings, CPUC decided in December 2010 to abandon the true-up (CPUC 2010c). Abandoning the true-up was a major change to the incentive mechanism: It eliminated a critical component of CPUC's rationale for creating the RRIM, and essentially changed the RRIM from a risk/reward proposition to a bonus payment for successful implementation of energy efficiency programs. Commissioners disagreed on whether to abandon the true-up, and the final vote was 3-2, with two commissioners dissenting. However, the majority of commissioners concluded that the RRIM was simply not workable as originally designed.

Figure 1 shows where the utilities fell on the RRIM earnings curve under the three scenarios — the utilities' own reports on their performance, using ex ante assumptions about energy savings parameters; the CPUC-led evaluation of the utilities' performance; and the values actually used in the final payment.





This diagram shows two performance metrics — electricity and demand savings — for the three electric utilities. To fit on this two-dimensional graph, this graphic omits gas savings; adding gas savings does not significantly change the illustrated pattern for the combined electric and gas utilities. (Sources: utility performance, CPUC 2010b, 36; CPUC-evaluated performance, CPUC 2010b, 52; final payment, CPUC 2010c)

The RRIM was originally intended to remain in place for two three-year program cycles: 2006-2008 and 2009-2011. In 2009, however, CPUC decided to suspend the RRIM due to the continued dispute over the 2006-2008 RRIM. While debate over the 2006-2008 incentive continued, CPUC extended existing efficiency programs from 2008 into 2009. It later extended the incentive (without the ex post true-up) to 2009 as well.

Debate over the design of the incentive mechanism for programs between 2010 and 2012 was not resolved until the end of the program cycle, with CPUC approving a simplified incentive in December 2012 in another 3-2 decision. The 2010-12 incentive was primarily based on a percentage of approved program spending; it was not based on energy savings. As a way to combat what it sees as utility overestimation of ex ante savings estimates, CPUC also based a component of the 2010-12 incentive on utility compliance with CPUC's process for reviewing ex ante energy savings estimates (CPUC 2012b). As of June 2013, CPUC is still deliberating over what incentive to put in place for energy efficiency activities in 2013 and 2014.

### **Lessons Learned**

Incentives tied to measured performance place considerable pressure on the measurement process. California's experience with the RRIM joins many examples from other policy areas, such as high-stakes testing in education or determining emissions baselines for carbon trading. In this section, we draw some specific lessons from the RRIM experience for policymakers in other jurisdictions considering shareholder incentives or other performance-based energy efficiency policies.

### **Agreement on Metrics is Crucial**

For an incentive based on program performance to work, there must be some agreement between parties over how to measure performance. If there is significant controversy around measurement, tying a financial incentive to measured performance can add fuel to the fire. In the context of a performance-based incentive, negotiation over payments can spill over into conflict over evaluation methods — or vice versa.

In the context of uncertain measurement, basing an incentive payment on ex post evaluation can turn it into a flashpoint for conflict. There are few examples of other jurisdictions adjusting shareholder incentive payments based on ex post evaluation of energy savings (Hayes et al. 2011), although "lost revenue" proceedings in other jurisdictions have also dealt with ex post true-up processes.

Moving to ex post evaluation provides an updated look at market conditions, but it cannot remove all the underlying uncertainty in measuring energy savings. In the case of the RRIM, the ex post true-up gave the utilities an incentive to dispute the evaluation findings. By the time the evaluation was completed, the utilities could no longer change their programs. Their only way of increasing their earnings under the RRIM was to contest the evaluation. This is not to say that the utilities' objections were not sincere — only that the incentive existed for them to dispute the evaluation findings regardless. CPUC's own scenario analysis demonstrated that different reasonable judgments about energy savings parameters could have a dramatic impact on savings estimates.

Basing final payments on ex post evaluation was an attempt to shift the risk of underperformance from ratepayers onto the utilities. This principle of paying for performance was critical to CPUC. It was part of the original justification for the RRIM, and it was highlighted by the two commissioners who dissented from the final decision to abandon the true-up. But CPUC's ultimate decision to forgo the true-up demonstrated that a regulator may not have the ability to fully allocate risk to the utilities, even if that is the regulator's intent. When faced with an unfavorable outcome under the incentive mechanism, the utilities were able to negotiate a resolution that pushed some of the risk back to ratepayers.

Freezing energy savings parameters at the time utilities are designing their efficiency program portfolio could allow evaluation results to more effectively inform future program planning, rather than focus attention on negotiating over past performance. Of course, sticking with ex ante parameters does not eliminate the possibility of conflict, and some stakeholders remain concerned that this arrangement gives utilities an incentive to inflate ex ante estimates of program performance. But disagreement about ex ante parameters can at least serve a more constructive purpose than disagreement ex post.

**The feasibility of performance-based policies depends in part on the institutional arrangements for EM&V.** The conflict over EM&V in California is in part an institutional one that pre-dates the RRIM. CPUC assumed responsibility for overseeing EM&V processes in the early to mid-2000s during the restructuring of California's electricity markets. Prior to that, EM&V was overseen by a committee with representation from the utilities, CPUC, and other stakeholders (CEC 2011). Since this shift, the gap between utility and CPUC estimates of energy savings has widened, and the dispute over EM&V during the RRIM's implementation has only exacerbated the distrust between CPUC and the utilities.

At the other extreme, sole utility oversight of EM&V in the context of a shareholder incentive would pose obvious problems. Kaufman and Palmer (2012) argue that utilities are likely to overstate the performance of their energy efficiency programs in the presence of a shareholder incentive and that independent evaluation of program performance provides an important role in preventing overpayments. But third-party or collaborative models for EM&V may be better-placed to support performance-based efficiency policies. Beyond differences in institutional arrangements for energy efficiency programs, states differ widely in their institutional arrangements for evaluation of efficiency program impacts (Kushler, Nowak, and Witte 2012) — perhaps implying that a similarly designed incentive would play out very differently in different states. While CPUC retains control of the EM&V process in California, CPUC's Energy Division has made changes to its EM&V processes to enable more prompt feedback and communication of results to stakeholders.

#### **Design Incentives to Allow for Uncertainty**

Incentive design should account for the limits of existing evaluation methods and processes and should not ask more of these methods and processes than is possible. This means designing incentives with room for uncertainty in measuring energy savings and with a realistic view of program evaluation timelines.

Uncertainty in measured energy savings is a fundamental problem for performance-based policies to address. Even with high-quality EM&V, it is not possible to observe the energy use that would have occurred without the efficiency program; actual savings can only be estimated. Attributing quantified energy savings to specific programs is a particular challenge because of the difficulties of accurately and precisely measuring free ridership and spillover.

Shareholder incentives or other performance-based policies cannot reduce this uncertainty, but they can be designed to be more robust to it. The RRIM example suggests some specific guidance about program design, and also suggests the need for program evaluation experts to play a larger role in advising on incentive design.

**High-stakes discontinuities in the incentive calculation make an incentive mechanism sensitive to fluctuation in uncertain savings parameters.** The tiered structure of the RRIM created multiple points where a small change in energy savings parameters could dramatically change a utility's earnings, even from deadband to penalty. This structure assumes that regulators know with confidence that a utility achieved (for example) 65%, rather than 64%, of a savings metric. In fact, this is not likely to be the case, even in high-quality evaluation of efficiency programs.

Making a single reward contingent on meeting multiple targets also raises the stakes for evaluation. Under the RRIM, California's utilities had to meet multiple earnings targets in order to earn any incentive payment at all. This meant that small fluctuations in one metric had an outsize effect on the incentive payment: If one target was not met, the utilities received no reward for meeting other targets. For example, PG&E fell just short of 65% of its demand savings target in CPUC's ex post evaluation of savings. This caused it to swing from reward to penalty in the proposed true-up, even though PG&E achieved over 70% of its other energy savings targets.

Separate financial rewards for different performance metrics could more effectively motivate utilities to continue pursuit of other objectives even if they expect to fall short on some fronts, and could alleviate some of the pressure on the evaluation process by lowering the stakes for any single estimate.

**Incentive mechanism design should account for the timing of the program evaluation process.** Energy efficiency programs intervene in markets that are constantly changing. Evaluation takes time, and it is not possible to have real-time updating of all relevant parameters. The original timeline for the RRIM interim and true-up payments depended on immediately incorporating new data from the program evaluation process. As a result, any delay in completing program evaluations or vetting results caused problems for the RRIM payment schedule. The timeline for determining performance metrics and payment calculation methods should account for the existing timelines for program evaluation, in order to strike a workable balance between incorporating up-to-date information and giving utilities enough time to react to new information.

More frequent updates to estimates of energy savings parameters provide an updated look at market conditions and reduce the risk that estimates of utility performance are overestimated because of outdated data. Greater availability of data from smart meters could improve this situation in the future, by providing timely data on energy consumption that could be used in program evaluation.

**The threat of a penalty also heightens conflict around measurement.** In discussions about RRIM reform, utilities have indicated that they are highly averse to penalties. Utility energy efficiency managers have stated that the presence of a penalty focuses management attention on avoiding the penalty rather than maximizing the reward — and thereby undermines the ability of the incentive to drive toward ambitious goals.

A penalty can help ensure that risks and potential rewards are appropriately shared between utilities and ratepayers, and it can be a powerful tool for discouraging outcomes regulators specifically do not want. The National Action Plan for Energy Efficiency (2007) also notes that penalties can be important to align utility incentives with regulators' objectives. However, penalties may not be a good fit in all circumstances — for example, they may be better suited to guard against a bad outcome (e.g., a system failure) than to drive toward greater levels of a good outcome (e.g., efficiency). Most other shareholder incentives for energy efficiency do not include penalties. Moreover, in states whose mechanisms do include a penalty, Hayes et al. (2011) found no instances where one has actually been imposed.

#### **Match Performance Metrics to Goals**

When incentives are based on measured performance, the quality of measurement is paramount; without good-quality measurement, the incentive cannot do its job. As policy goals get bigger and broader, they also get harder to measure, posing challenges to both policymakers and program evaluators.

For policymakers, the desire to set big, bold goals competes with the desire to measure and reward performance. Since the introduction of the RRIM, California has significantly expanded its energy efficiency goals, with the passage of comprehensive climate change legislation and a new strategic plan for energy efficiency. CPUC has struggled to design a new incentive to suit California's increasingly ambitious objectives, which do not lend themselves well to precise measurement.

With the 2006 passage of AB32, the Global Warming Solutions Act, California elevated energy efficiency as a policy priority — efficiency became not only the state's energy resource of choice but also a primary factor in achieving California's emissions reduction targets. In 2008, CPUC issued a long-term strategic plan for energy efficiency and replaced its earlier, narrower set of energy-saving goals with market-wide goals focusing on market transformation. The strategic plan articulated the goal of rebalancing utility energy efficiency portfolios to include more comprehensive, long-term savings (CPUC 2008, 4).

Policymaker interest in market transformation has combined with changes in other policies to shift the landscape for utility efficiency programs. Consumer awareness and interest in energy savings is increasing. New codes and standards, including new lighting efficiency standards, have removed some of the "low-hanging fruit" of efficiency measures (Dunsky, Boulanger, and Mathot 2012; Neme and Kushler 2010). These factors seem geared to drive future energy efficiency portfolios toward more whole-building approaches, new technologies, and other programs with harder-to-measure outcomes

The RRIM did not provide a strong incentive for programs believed to produce longer-lived, more comprehensive savings — indeed, in some cases it penalized utilities for pursuing these programs. Because the RRIM awarded utilities a percentage of net economic benefits, it provided the greatest reward for the programs deemed to be the most cost-effective, such as lighting programs. More comprehensive measures, like whole-home retrofits, tend to fare poorly on cost-effectiveness tests. Under the RRIM, these programs would lower a utility's earnings by lowering the net economic benefits of the energy efficiency portfolio, and thereby the basis for the shared savings calculation.

Designing a performance-based incentive to support resource acquisition goals is more feasible than designing one to target broader market transformation goals. Market transformation itself is difficult to measure. Efficiency programs have complex and long-lasting impacts on energy usage. Markets for efficiency-related products can change rapidly and span multiple jurisdictions. Broad policies such as marketing, education, and outreach may increase general public awareness of efficiency and lead to energy savings, but it is difficult to quantify the impact of these programs. And as more efficiency programs are pursued over time and in multiple jurisdictions, the influences of these programs overlap, making it hard to discern the sources of influence on consumer behavior (Skumatz 2009).

For evaluators, policymakers' expanding ambition and emphasis on performance create the need for better methods to track big-picture efficiency goals. As state and national energy efficiency policies become more ambitious, they will need better ways to define and measure big-picture outcomes, such as market transformation and large-scale emissions reductions. Some of the tools commonly used in standard program evaluations are not a good fit for these bigger, bolder goals (see for example Mahone 2011; Neme and Kushler 2010; Vine et al. 2012; Peters and McRae 2008).

California policymakers have found it difficult to incentivize market transformation in the past. In the late 1990s, California implemented an incentive mechanism that tied utility payments to a set of

"milestones" related to program activity or market outcomes. Parties do not consider this attempt a success; most conclude that there were too many milestones and that they were not sufficiently connected to meaningful market transformation outcomes (Nadel et al. 2000).

CPUC is currently working to develop a revised set of market transformation indicators (CPUC 2012a, 356). Further progress on this front, in California or elsewhere in the program evaluation community, could make incentives for market transformation more feasible.

To support broader and more ambitious energy efficiency objectives, policymakers may need to use an alternate incentive design or complement the incentive with other policies. When policy goals change, incentives must change to accommodate them. The design of the RRIM, which was originally intended to run from 2006-2011, fell out of step with California's expanding energy savings goals, and CPUC is still working to identify an alternate incentive that can drive toward those expanded goals.

Incentives function best when their goals are concrete, measurable, and limited (Blumstein 2010). But hard-to-measure goals, like long-term market transformation, cannot be easily incorporated into an incentive mechanism based on measured outcomes. If policymakers have ambitious goals for efficiency programs that are not well-captured under current evaluation methods, they may need to be more flexible about how to define and track indicators of success. For example, since market transformation is not easily measured, policymaker may need to use simpler metrics — such as installation of particular efficiency technologies or spending on particular programs that policymakers believe are well-aligned with their goals — as the basis for incentives.

California is not the only state struggling to reconcile increasingly ambitious policy goals with the need to track measurable outcomes (Vine et al. 2012). Its experience during the RRIM period — particularly post-2008 — demonstrates that if goals change, the incentive should change as well, or should be coupled with other policy tools that can drive toward achievement of hard-to-measure goals.

### Conclusion

California's experience demonstrates both the promise and the potential pitfalls of shareholder incentives, and of performance-based governance of energy efficiency more generally.

Performance-based incentives place significant pressure on the institutions and processes that measure energy efficiency performance. Incentive mechanisms will be easier to operate and will engender less conflict if they are designed to handle the inherent uncertainty in estimating energy savings — for example, ensuring that small changes in estimated savings do not produce large swings in reward amounts. Moving forward, planning for performance-based efficiency initiatives — be they shareholder incentives in other states or a federal Race to the Top initiative — should ensure that incentives are being designed with a realistic view of what type of information evaluation can provide and when.

As policy goals become broader and more ambitious, measuring performance becomes more challenging, and policymakers run the risk that an incentive based on measured performance will end up discouraging desired activities, if those activities are difficult to evaluate. Resolving this dilemma will require creative approaches on the part of both policymakers and program evaluators.

# References

- [Alliance Commission] Alliance Commission on National Energy Efficiency Policy. 2013. "Energy 2030: Doubling U.S. Energy Productivity by 2030." Alliance to Save Energy. http://ase.org/sites/default/files/full commission report.pdf.
- Blumstein, Carl. 2010. "Program Evaluation and Incentives for Administrators of Energy-efficiency Programs: Can Evaluation Solve the Principal/agent Problem?" *Energy Policy* 38 (10) (October): 6232–6239.
- [CEC] California Energy Commission. 2011. "Efficiency Programs: Incorporating Historical Activities into Energy Commission Demand Forecasts." http://www.energy.ca.gov/2011publications/CEC-200-2011-005/CEC-200-2011-005-SD.pdf.
  - ------. 2012. "California Natural Gas Data and Statistics." http://energyalmanac.ca.gov/naturalgas/overview.html.
- [CPUC] California Public Utilities Commission. 2003. "History of Shared-Savings Incentive Mechanisms For Energy Efficiency Programs (Interim Opinion on Whether to Reopen the Shared-Savings Mechanism Adopted in Decision 94-10-059 for Energy Efficiency Programs, Attachment 2)." http://docs.cpuc.ca.gov/word\_pdf/COMMENT\_DECISION/29794\_att2.pdf.
- ------. 2004. "Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond (Decision 04-09-060)." http://docs.cpuc.ca.gov/published//FINAL\_DECISION/40212.htm.
- 2007. "Interim Opinion on Phase 1 Issues: Shareholder Risk/Reward Incentive Mechanism for Energy Efficiency Programs (Decision 07-09-043)." http://docs.cpuc.ca.gov/word\_pdf/FINAL\_DECISION/73172.pdf.
- 2008. "California Long Term Energy Efficiency Strategic Plan." http://www.cpuc.ca.gov/NR/rdonlyres/D4321448-208C-48F9-9F62-1BBB14A8D717/0/EEStrategicPlan.pdf.
- ———. 2010a. "2006-2008 Energy Efficiency Evaluation Report." http://www.calmac.org/publications/2006-2008\_Energy\_Efficiency\_Evaluation\_Report.pdf.
- ———. 2010b. "2006-2008 Energy Division Scenario Analysis Report." ftp://ftp.cpuc.ca.gov/gopherdata/energy%20efficiency/Final%20Energy%20Division%20Scenario%20Analysis%20Report\_ 070910.pdf.
  - 2010c. "Decision Regarding the Risk/Reward Incentive Mechanism Earnings True-Up for 2006-2008 (Decision 10-12-049)." http://docs.cpuc.ca.gov/word\_pdf/FINAL\_DECISION/128879.pdf.
- ———. 2010d. "Dissent of Commissioner Dian M. Grueneich: Energy Efficiency Risk Reward Incentive Mechanism True-Up for Program Years 2006-2008." http://docs.cpuc.ca.gov/word\_pdf/FINAL\_DECISION/128882.pdf.
- 2012a. "Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012
  2013 International Energy Program Evaluation Conference, Chicago

Marketing, Education, and Outreach (Decision 12-05-015)." http://docs.cpuc.ca.gov/word\_pdf/FINAL\_DECISION/166830.pdf.

 2012b. "Alternate Decision Approving 2010-2012 Energy Efficiency Incentive Mechanism and Disbursing 2010 Incentive Awards (Decision 12-12-032)." http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M039/K604/39604336.PDF.

- Dunsky, Philippe, François Boulanger, and Patrick Mathot. 2012. "Screening DSM: When the TRC Blocks Efficiency, What's Next?" 2012 ACEEE Summer Study on Energy Efficiency in Buildings. http://www.aceee.org/files/proceedings/2012/data/papers/0193-000199.pdf.
- [EIA] Energy Information Administration. 2012. "Electric Sales, Revenue, and Average Price (Table 10: Class of Ownership, Number of Consumers, Sales, Revenue, and Average Retail Price by State and Utility; All Sectors, 2011)." http://www.eia.gov/electricity/sales\_revenue\_price/.
- [FERC] Federal Energy Regulatory Commission. 2011. "Renewable Power & Energy Efficiency: Energy Efficiency Resource Standards (EERS) and Goals." http://www.ferc.gov/marketoversight/othr-mkts/renew/othr-rnw-eers.pdf.
- Hayes, Sara, Steven Nadel, Martin Kushler, and Dan York. 2011. "Carrots for Utilities: Providing Financial Returns for Utility Investments in Energy Efficiency." American Council for an Energy-Efficient Economy. http://www.aceee.org/sites/default/files/publications/researchreports/U111.pdf.
- Kaufman, Noah, and Karen Palmer. 2012. "Energy Efficiency Program Evaluations: Opportunities for Learning and Inputs to Incentive Mechanisms." *Energy Efficiency* 5 (2): 243–268.
- Kushler, Martin, Seth Nowak, and Patti Witte. 2012. "A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs." American Council for an Energy-Efficient Economy. http://www.aceee.org/sites/default/files/publications/researchreports/u122.pdf.
- Mahone, Douglas. 2011. "Free-Ridership as a Way to Kill Programs How Evaluation Policies Can Frustrate Efficiency Goals" presented at the 2011 International Energy Program Evaluation Conference, August, Boston, Mass. http://www.iepec.org/2011PapersTOC/papers/054.pdf#page=1.
- Nadel, Steven, Dave Hewitt, Noah Horowitz, and Lauren Casentini. 2000. "Performance Metrics for Market Transformation Programs: Incentivizing Progress Without Strangling Creativity." ACEEE Summer Study Proceedings. http://eec.ucdavis.edu/ACEEE/2000/PDFS/PANEL06/344.pdf.
- National Action Plan for Energy Efficiency. 2007. "Aligning Utility Incentives with Investment in Energy Efficiency." Prepared by Val R. Jensen, ICF International. http://www.epa.gov/cleanenergy/documents/suca/incentives.pdf.
- Neme, Chris, and Marty Kushler. 2010. "Is It Time to Ditch the TRC? Examining Concerns with Current Practice in Benefit-Cost Analysis." 2010 ACEEE Summer Study on Energy Efficiency in Buildings.

http://neep.org/uploads/EMV%20Forum/Steering%20Committee%20Notes/CNeme\_ACEEE\_Pa per\_for\_SC%20Notes.pdf.

- Peters, Jane S., and Marjorie McRae. 2008. "Free-Ridership Measurement Is Out of Sync with Program Logic... or, We've Got the Structure Built, but What's Its Foundation?" 2008 ACEEE Summer Study on Energy Efficiency in Buildings. http://www.aceee.org/sites/default/files/publications/proceedings/SS08 Panel5 Paper20.pdf.
- Sedano, Richard. 2011. "Who Should Deliver Ratepayer Funded Energy Efficiency? A 2011 Update." Regulatory Assistance Project. http://www1.eere.energy.gov/seeaction/pdfs/rap\_sedano\_whoshoulddeliverratepayerfundedee\_2 011\_%2011\_15.pdf.
- Skumatz, Lisa. 2009. "Lessons Learned and Next Steps in Energy Efficiency Measurement and Attribution: Energy Savings, Net to Gross, Non-Energy Benefits, and Persistence of Energy Efficiency Behavior." California Institute for Energy and Environment. http://ucciee.org/downloads/EEM\_A.pdf.
- Vine, Edward, Nick Hall, Kenneth Keating, Martin Kushler, and Ralph Prahl. 2012. "Emerging Issues in the Evaluation of Energy-efficiency Programs: The US Experience." *Energy Efficiency* 5 (1): 5– 17.