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AVOIDING COUNTERFACTUALS IN PERFORMANCE INCENTIVE MECHANISMS: CALIFORNIA AS A CASE STUDY

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INTRODUCTION

When designing performance incentive mechanisms, regulators may consider using counterfactuals as a way of vetting utility claims. These counterfactuals may take different forms. For example, in energy efficiency performance mechanisms, counterfactuals may require regulators to estimate how much energy *would* have been used absent a utility's efficiency program. Alternatively, avoided cost counterfactuals require regulators and utilities to agree on how much investment was deferred by investment in alternative resources.

While counterfactuals may be appropriate as an adjustment mechanism, they can also lead to unfair outcomes and unnecessary regulatory conflict, especially when the earnings incentive mechanism itself is poorly designed. This white paper examines California's Risk-Reward Incentive Mechanism (RRIM) as a case study, and distills lessons on incentive design.

THE CALIFORNIA RISK-REWARD INCENTIVE MECHANISM

The Risk Reward Incentive Mechanism was California's first iteration of an energy efficiency shareholder incentive program after restructuring its electric and gas utilities. The RRIM, first implemented in 2006 for the 2006-2008 program cycle, was designed to allow utilities to earn a portion of the net economic benefits of their efficiency programs commensurate with the level of performance relative to efficiency targets. These targets were published by the CPUC and included kilowatt-hour (kWh), kilowatt (kW), and Therms reductions which the utilities were expected to meet on a portfolio-wide basis.[1] Based on their performance in meeting these targets, the utilities could receive a penalty, nothing, nine percent of net economic benefits or 12 percent of net economic benefits, with the bonus being split between the utility shareholders and customers.

[1] Chandrashekeran, Sangeetha, J. Zuckerman, and J. Deason. "Raising the Stakes for Energy Efficiency - California's Risk/Reward Incentive Mechanism." *Climate Policy Initiative*. 2014. (http://climatepolicyinitiative.org/wp-content/uploads/2014/01/Raising-the-Stakes-for-Energy-Efficiency-Californias-Risk-Reward-Incentive-Mechanism.pdf).

To evaluate the utilities' performance in meeting the savings targets, the CPUC required them to submit data showing the savings achieved by each installed measure. This required the utilities to track every installed measure[2] as well as calculate estimated savings for each measure. Savings calculations were based on numerous assumptions such as the hours of use per year, the useful life of each new energy-using component and those being replaced, and the degree to which the purchasing of new efficient equipment would have happened independent of the utility efficiency programs, all of which have "significant levels of uncertainty as well as annual variation."[3] In essence, the CPUC was requiring the utilities to estimate counterfactuals: how much energy would have been used absent the utility programs? These estimates could then be used to calculate the utilities' performance relative to their targets.

The CPUC planned to evaluate the utility estimates during the third year of each three-year program cycle. In the first two years, the utilities would be awarded or penalized based on their ex ante estimates of savings. During the final year, the CPUC would conduct an ex post analysis using the final payment to correct for any discrepancies with the ex ante estimates.[4] As designed, "it was assumed that the major difference between ex ante IOU claims and ex post evaluated results would be primarily attributed to the difference between estimated and actual measure installations."[5]

However, even early on the CPUC expressed concern with some of the assumptions being used by the utilities to develop their ex antes estimates.[6] When conducting the ex post analysis, the CPUC planned not only to verify the number of installed measures, but also to make sure the utilities' calculations of savings were in line with its expectations. Under this approach, the CPUC examined *all* the inputs used to calculate the efficiency savings estimates, not just the total number of installed measures. The result was a dramatic adjustment in the estimated amount of

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[2] A measure is a single installation type, which includes unique information on the technology, the type of unit in which it is being installed, net-to-gross ratio, type of rebate/incentive program, etc… For example, a CFL replacement is broken into dozens of specific measures based on the wattage of the bulb, the type of socket (screw-in versus fixture), whether or not is has a reflector, residential versus commercial, etc… For a full list of all measures, see the Remote Ex-Ante Database Interface (READI), available at www.deeresources .com.

[3] "Proposed Energy Efficiency Risk-Reward Incentive Mechanism and EM&V Activities." *California Public Utilities Commission, The Energy Division.* April 1, 2009.

[4] Chandrashekeran, Sangeetha, J. Zuckerman, and J. Deason. "Raising the Stakes for Energy Efficiency - California's Risk/Reward Incentive Mechanism." *Climate Policy Initiative*. 2014. (http://climatepolicyinitiative.org/wp-content/uploads/2014/01/Raising-the-Stakes-for-Energy-Efficiency-Californias-Risk-Reward-Incentive-Mechanism.pdf).

[5] "Proposed Energy Efficiency Risk-Reward Incentive Mechanism and EM&V Activities." *California Public Utilities Commission, The Energy Division.* April 1, 2009.

[6] Chandrashekeran, Zuckerman, and Deason, "Raising the Stakes for Energy Efficiency - California's Risk/Reward Incentive Mechanism."

savings achieved by the utilities.[7] For example, while all three utilities estimated that they achieved greater than 100 percent compliance with the savings reduction goals, CPUC staff estimates placed compliance closer to 65 percent for SDG&E, 70 percent for PG&E, and 80 percent for SCE.[8] The impact of these adjustments was an enormous swing in the incentive payments.

This issue was compounded by the use of tiered incentive levels in the RRIM, meaning minor differences in the total amount of savings could result in huge swings in penalties and bonuses.[9] For example, not only did the CPUC's adjustment propose to eliminate a $180 million bonus for PG&E, but it also claimed that PG&E fell just short of meeting 65 percent of its savings target, thereby incurring a $75 million penalty. Had the CPUC's estimate increased only slightly, pushing PG&E above the 65 percent threshold, this penalty would have been eliminated altogether.[10]

The disagreement over actual savings ultimately led the CPUC to ignore its staff's estimates,[11] abandon its approach, and instead used ex ante savings estimates combined with a lower incentive rate. The CPUC used this modified approach, which relied on the utilities' ex ante savings estimates combined with ex post confirmation of the number of installed measures (but not on the total savings), in the following program cycle as well, rewarding utilities with a seven percent rate of return on net economic benefits.[12,13]

Since then, the CPUC has switched to a new incentive mechanism, known as the Efficiency Savings and Performance Incentive (ESPI), which was first implemented in 2013 for the 2013-2014 program cycle. The ESPI is a hybrid model of previous CPUC incentive mechanisms and is being used today.

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[7] Ibid.

[8] Ibid.

[9] As an aside, this is why it is preferable to avoid using tiered incentive mechanisms. Small differences in actual savings should not result in large swings in incentive payments.

[10] Chandrashekeran, Zuckerman, and Deason, "Raising the Stakes for Energy Efficiency - California's Risk/Reward Incentive Mechanism."

[11] The CPUC staff cannot officially represent the CPUC unless specifically authorized; the CPUC only "speaks" through formal orders.

[12] Net economic benefits are equal to the total avoided resource cost less than cost to administer the programs.

[13] Chandrashekeran, Zuckerman, and Deason, "Raising the Stakes for Energy Efficiency - California's Risk/Reward Incentive Mechanism."

ISSUES HIGHLIGHTED BY THE CALIFORNIA EXAMPLE

1. COUNTERFACTUALS REQUIRE ASSUMPTIONS THAT ARE LIKELY TO BE CONTROVERSIAL

One of the primary issues in California was the use of differing underlying assumptions by the utilities and the CPUC in calculating efficiency savings. As outlined above, the calculations required under the RRIM included numerous assumptions, many of which have a high degree of uncertainty and variability, as noted by the CPUC:[14]

> *[t]he implementation of the IOU energy efficiency portfolios largely involve[d] the installation of millions of individual measures across the state. Each of these installations can be any one of thousands of individual measures, each with an equipment cost, an installation cost, an estimated life, an energy impact estimate (kWh and/or Therm), and an annual impact load profile that must all be known or estimated… For each measure that is installed, it must be determined if the installation can be attributed to the IOU portfolio or if the installation would have happened without the IOU activity in order to determine the free-ridership level, or the net-to-gross ratio. Measure load impacts can vary by geographic location of the installation as well as the type and age of the facility where the installation takes place. Finally, program effectiveness and savings persistence have behavioral dimensions that are difficult to predict and measure.*

In the ESPI, the CPUC tried to get around this issue somewhat by publishing "approved" assumptions for some measures that the utilities were instructed to use in developing ex ante estimates. However, even in cases where assumptions may be relatively straightforward or published officially, if a large amount of money is tied to a utility's performance, there is still an incentive for a utility to challenge the "approved" assumptions if doing so may result a significant increase in revenue. At the same time, regulators also have leeway to revise the counterfactual if the incentive achieved doesn't comport with their expectations. As the CPUC noted in the case of the RRIM, "the results of the […] calculations will always be highly contentious when large dollar payments or penalties are based on such calculations."[15]

2. COUNTERFACTUALS CAN BE ADMINISTRATIVELY COSTLY AND BURDENSOME TO ESTIMATE

Counterfactuals can be very costly and administratively burdensome to develop when they are focused on achieving the highest degree of accuracy possible. In California, the IOUs were required to estimate savings on a measure-by-measure basis, which required tracking each installed measure, as well as detailed calculations of estimated savings for each of these measures.

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[14] "Proposed Energy Efficiency Risk-Reward Incentive Mechanism and EM&V Activities." *California Public Utilities Commission, The Energy Division*. April 1, 2009.

[15] Ibid.

Collectively, the complex calculations needed to estimate savings became a "diversion that… consumed too much valuable and limited staff time within the IOUs, other stakeholders, and the CPUC."[16] In terms of budgeting, for the 2006-2008 program cycle, the CPUC authorized $163 million in spending for evaluation, measurement, and verification (EM&V). The EM&V funding amounted to 7.6 percent of funding for the state's whole efficiency portfolio spending, which, relative to a U.S. average of 3 percent, is extraordinarily high.[17]

LESSONS FOR DESIGNING COUNTERFACTUALS IN OTHER REGIONS

BEST: AVOID COUNTERFACTUALS AND MOVE TO AN OUTCOME-ORIENTED METRIC WITH TRANSPARENT ADJUSTMENT MECHANISMS

The CPUC concluded that California's "EM&V process, at least as it [was] designed and administered, [could not] serve as a tool to simultaneously determine incentive award of penalties and produce accurate estimates of energy savings without protracted disputes."[18] This finding was primarily due to the controversial counterfactual and the rigorous measure-by-measure process that was used to validate utility claims.

The CPUC suggested one way to address this issue was a shift to an outcome-based consumption or energy intensity target, with incentive earnings tied to the measurable level of real-world performance relative to the "macro" targets.[19] This approach is attractive given the rapid development of new energy efficiency technologies and the length of time required to develop ex ante input values (for example, during review it was discovered that no "CPUC-approved" ex ante values were published for roughly half of each utility's portfolio, leading those measures to be classified as "highly uncertain," requiring ex post analysis).[20]

In its analysis of the flaws with the RRIM, the CPUC concluded that, "if the Commission policy is intended to provide IOUs with the opportunity to earn regular and predictable earnings, as the utilities frequently maintain, then the earnings mechanism should not be dominated by a formula that is known to embody a high degree of uncertainty and variability, elements of which

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[16] Ibid.

[17] "2014 State of the Efficiency Program Industry: Budgets, Expenditures, and Impacts." *Consortium for Energy Efficiency*. May 1, 2015.

[18] "Proposed Energy Efficiency Risk-Reward Incentive Mechanism and EM&V Activities." *California Public Utilities Commission, The Energy Division.* April 1, 2009

[19] Ibid.

[20] 55 percent for PG&E, 53 percent for SCE, 45 percent for SDG&E, and 35 percent for SCG. See: "Decision Adopting Efficiency Savings and Performance Incentive Mechanism." *California Public Utilities Commission.* Decision 12–01–005, Dec. 27, 2012.

are not fully manageable by the utilities."[21] Relying primarily on a macro metric may result in more uncertainty with regard to the exact level of energy savings achieved, but may deliver greater savings at lower cost by allowing utilities to more confidently invest in energy efficiency.[22]

An outcome-oriented consumption or energy intensity metric—for example, kWh per customer—could provide a clear long-term trajectory that can be tied both to energy savings and greenhouse gas goals while avoiding measure-by-measure estimation of savings.[23] There is, of course, some degree of adjustment required when using this type of metric to account for changes in the economy, weather, and other inputs to energy demand. However, these adjustments are much more transparent than the assumptions underlying measure-by-measure estimates (e.g. heating and cooling degree days are easily measured) and are therefore less controversial.

SECOND BEST: IMPROVE COUNTERFACTUAL DEVELOPMENT

If a measure-by-measure approach is unavoidable, the following actions can improve counterfactual development and avoid controversy and spending on ex post analysis.

Publish "approved" ex ante values

One way to avoid controversy over ex ante values is to publish "approved" values for utilities to use in estimating savings. Some regions, including California,[24] have moved to this approach by instituting or approving independent bodies that publish official or quasi-official[25] values for utilities to use. The Regional Technical Forum (in the Pacific Northwest) and the California Technical Forum are examples of institutions that are tasked with publishing "approved" values that are used by utilities and PUCs. These groups are made of up a range of stakeholders who

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[21] "Proposed Energy Efficiency Risk-Reward Incentive Mechanism and EM&V Activities." *California Public Utilities Commission, The Energy Division*. April 1, 2009.

[22] Eric Gimon, Robbie Orvis, and Sonia Aggarwal. "Trending Topics in Electricity Today - Efficiency: Can We Accept Less Stringent Oversight If It Means Better Outcomes?," *America's Power Plan*. February 2015. (http://americaspowerplan.com/2015/02/trending-topics-in-electricity-today-efficiency-can-we-accept-less-stringent-oversight-if-it-means-better-outcomes/).

[23] See generally, Robbie Orvis, Sonia Aggarwal, & Michael O'Boyle. "Metrics for Energy Efficiency: Options and Adjustment Mechanisms." *Energy Innovation LLC*. April 2016.

[24] The Energy Savings Performance Incentive calls for the use of "deemed" values in ex ante estimates. However, many measures, including some of the most common (e.g. CFLs) are considered too uncertain and still rely on ex-post evaluation.

[25] In California, the CPUC is not allowed to endorse a third-party, so technically they cannot officially accept the CTF's published values. However, the CPUC has stated its confidence in these values, thereby awarding a de facto endorsement.

collaborate to produce research-based input assumptions that can be used by the utilities and PUCs.

Once "approved" ex ante values are published, ex post analysis can be used primarily as a way of confirming the amount of installed measures (as was originally intended by the CPUC), rather than as an opportunity to recalculate a great deal of the savings. When combined with "approved" ex ante values, this approach can streamline savings estimates and temper disagreement over specific savings estimates.

However, while switching to an approach that uses published, "approved" values and relies wholly on ex ante estimates may alleviate some of the contention in estimating savings, it "simply moves the disputes to the front end of the process of developing accurate ex-ante values."[26] Furthermore, the rapid pace of new energy efficiency technology development combined with the time and research required to develop "approved" values for ex ante estimates means utilities will likely always have to rely on at least some unapproved values when generating savings estimates.[27]

Therefore, even when moving to an approach relying on "approved" ex ante values, the simple fact remains that, in composing counterfactuals, PUCs and utilities must ultimately agree on common assumptions. Some of these assumptions, however, are unlikely to be approved by the PUC, and in most cases each party is incented to pursue assumptions at odds with the other party.

Use a lower incentive when relying on ex ante values to reflect lower risk

One of the purposes of using different incentive levels for different measures is to reflect a higher degree of risk associated with pursuing a greater number of energy efficiency projects and the uncertainty around translating these projects into estimated savings. For example, if utilities are subject to rigorous ex post review that is likely to change their incentive payment, they will require a higher potential incentive to go after more uncertain measures because they are exposed to the risk of those savings being revised downward. Conversely, if shareholders are exposed to less risk in savings estimates due to the use of "approved" ex-ante estimates, then their reward should reflect this lower risk.

California took this approach when it decided to abandon the ex post evaluation in the RRIM and move from a nine or 12 percent return on ex post verified savings to a seven percent return

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[26] "Proposed Energy Efficiency Risk-Reward Incentive Mechanism and EM&V Activities." *California Public Utilities Commission, The Energy Division.* April 1, 2009.

[27] As discussed earlier, under the ESPI, which is meant to rely on utility ex ante estimates, roughly half of the utility portfolios are composed of measures for which no "approved" ex ante estimates exist.

based on ex ante savings: "the 7 percent rate reflected reduced shareholder risk associated with basing final earnings on ex ante values, adjusted for actual installations."[28]

Use a third party to conduct ex post analysis primarily to verify installation claims

Another way to address conflict over savings estimates is to rely on third parties, e.g. consulting groups, to estimate savings. However, policymakers should be cautious of this approach, as it appears not to be completely neutral. An examination of the California program revealed that, even when vetted by a third party contractor, "the particular contractor chosen to conduct the evaluation… appear[ed] to be an important determinant of the level of the evaluated savings estimates when compared to both the ex ante projections and the utility reported results."[29] Moving ex post evaluation to third parties may simply result in moving disagreements about savings to the third parties rather than eliminating this issue.

CONCLUSION

California's experience with the RRIM provides valuable insight on issues that can arise when using counterfactuals and ex post assessments. As regulators think about ways to design earnings incentive mechanisms, it is valuable to consider lessons from past programs.

Any energy efficiency program that relies on measure-by-measure estimation of savings is prone to controversy, especially when a large amount of revenue is tied to the assumptions underlying these estimates. Regulators can reduce the potential for disagreement by using a third-party to publish approved values for utilities and other market participants to use when conducting ex ante savings estimates. And to the extent ex post evaluation is used in conjunction with ex ante estimates, it should be used primarily to vet utility installations rather than an opportunity to completely re-evaluate ex ante savings estimates.

Utilities should shift away from a measure-by-measure program that relies on a counterfactual to a program that uses a measurable outcome-oriented metric. Moving to this approach eliminates the controversy and overhead of measure-by-measure inputs, and focuses on the overall performance of a utility. While an outcome-oriented metric requires some adjustment to account for exogenous factors, these adjustments tend to be based observable real-world data and are less prone to controversy than ex ante estimate inputs. Similarly, these overall targets can be more readily linked to other policy goals, for example greenhouse gas targets.

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[28] "Decision Adopting Efficiency Savings and Performance Incentive Mechanism." *California Public Utilities Commission.*

[29] Kaufman, Noah and Karen Palmer. "Energy-Efficiency Program Evaluations." *Resources for the Future*. 2010.