**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking Concerning Energy Efficiency Rolling Portfolios, Policies, Programs, Evaluation, and Related Issues	Rulemaking 13-11-005

COMMENTS OF RECURVE ANALYTICS, INC. ON POTENTIAL AND GOALS ANALYSIS RULING QUESTIONS

I. Introduction

Recurve is an industry leader in meter-based demand flexibility. Recurve tracks changes in consumption due to program interventions for both individual buildings and in aggregate in order to support resource planning and facilitate performance-based transactions. We encourage and support market-based solutions for decarbonization.[1] We appreciate the opportunity to answer the important questions posed in this ruling.

California is at a critical time of transition. The potential and goals framework for energy efficiency is an important link for meeting the state's decarbonization goals. However, the existing construct for establishing potential, setting goals, and implementing energy efficiency programs needs to be overhauled to meet these goals in an efficient, streamlined manner. California needs to recalibrate its myriad of historic policies and well-intentioned initiatives to ensure that all are properly valuing demand flexibility resources in order to support a reliable, decarbonized grid.

[1] M. Golden, A. Scheer, C. Best. Decarbonization of electricity requires market-based demand flexibility, The Electricity Journal Volume 32, Issue 7, August–September 2019, 106621 *Available at:* https://www.recurve.com/blog/the-secret-plan-for-decarbonization-how-demand-flexibility-can-save-our-grid

The need and desire to deploy demand flexibility to solve for decarbonization and grid optimization is clear across the program administrators and LSEs in the state and nearly all proceedings underway at the Commission. However, synchronization continues to be inhibited by the silos and legacy rules that govern each resource.[2] In the case of energy efficiency, the misalignment between the potential for dynamic, time-value resources to solve problems and the reality of a goal that targets only average annual savings is creating a no-win situation. Cost-effective savings appear to be declining, while real value is left on the table. Like other parts of the country, California is not sufficiently leveraging consumption data from AMI to reshape our policy frameworks or scale our investments in demand flexibility as expected or mandated.[3]

Recurve sees a robust path forward for the competitive procurement of demand flexibility resources that can deliver value to the grid to enable market-based decarbonization at scale. However, this path is contingent on a consistent valuation framework, meter-based impacts, and a market-driven structure with clear price signals and fair compensation to enable innovation and spur investment. The potential and goals framework for energy efficiency plays a critical role in setting the stage for this future success.

As California turns its focus to a 100 percent clean energy future, the 2019 California Energy Efficiency Action Plan[4] for achieving the state's energy efficiency and building decarbonization goals should be kept in close focus. This Action Plan, put forward by the California Energy Commission (CEC), charts progress toward doubling energy efficiency by 2030, explains where current efforts are falling short and makes important recommendations for how the state can achieve its goals.

The CPUC and CEC have a unique opportunity to collaborate on a clear vision for evolving energy efficiency from average kWh-based reductions to demand flexibility that can

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[2] This is as true in California as it is in other jurisdictions as highlighted in a recent paper by ACEEE: *Integrated Energy Efficiency and Demand Response Programs*. Dan York, Grace Relf, and Corri Waters, September 2019 U1906 https://www.aceee.org/sites/default/files/publications/researchreports/u1906.pdf

[3] Leveraging Advanced Metering Infrastructure To Save Energy. Rachel Gold, Corri Waters, and Dan York January 3, 2020. Revised January 27, 2020. Report U2001 https://www.aceee.org/sites/default/files/pdfs/u2001.pdf

[4] 2019 California Energy Efficiency Action Plan, Link available here: https://www.recurve.com/blog/californias-energy-efficiency-action-plan-moving-to-flexibility-and-achieving-our-goals

deliver the time and locational impacts needed to balance renewable energy and accelerate towards our 2045 zero carbon goals, using the potential and goals analysis, the demand forecast, and the system plans.

The CEC plan has a path for synchronizing the state's myriad efficiency policies and objectives through data and transparent measurement and forecasting. Exchange of information forms the backbone for coordination across agencies, between regulators and the regulated, and within the market. Data is the raw ore of the energy transition, especially at the grid edge. Making intelligent use of this data is critical to ensure that actions are coordinated, properly valued and aligned with the ultimate goal of decarbonization.

It is in the spirit of this vision of the future that Recurve recommends three long term systemic changes in the potential and goals framework and in the implementation of energy efficiency to drive toward state and CPUC goals:

> **Segmentation of the current portfolio** by resource, market, and equity categories to better optimize each type of efficiency investment and enable targeted resource acquisition.
>
> **Common Resource Valuation Methodology** is still needed to enable alignment with the Integrated Resource Plan (IRP), Resource Adequacy (RA) and Integrated Distributed Energy Resources (IDER). In the interim, cost-effectiveness approaches must reflect supply side resources and not penalize private investment.
>
> **Optimization** can be more effectively achieved with meter-based quantification of the potential, and greater autonomy for load serving entities (IOUs and CCAs) to competitively procure demand flexibility (including energy efficiency) within their own system plans.

Recurve also respectfully requests that the CPUC adopt the following immediate modifications to enable meaningful progress in this transition in 2020:

- Use the change in **normalized metered energy consumption (NMEC) as the foundation** for tracking impacts toward goals in accordance with SB350 and AB802.
- Update the reporting structures to accommodate **actual metered load shape impacts.**
- Maximize **competitive procurement of energy efficiency resources** from third parties as the primary pathway for meeting the goals established in 2020,

A copy of our informal comments on modifications to the Goals and Potential are attached to this filing as an important supplement to describe specific approaches to address these requests. We have crafted our answers to the questions posed to emphasize these main points and principles, and recognize that many details for execution may remain.

Recurve Responses to Questions in the Ruling:

ENERGY EFFICIENCY IN CALIFORNIA'S CLEAN ENERGY FUTURE

1. *In the context of California's shift toward clean energy and greenhouse gas (GHG) reductions, what should be the primary objective(s) for the energy efficiency portfolio (energy savings, GHG reductions, bill savings, avoided grid costs, resiliency, and/or others)? If you identify multiple primary objectives, describe potential tradeoffs and/or synergies posed by those multiple objectives.*

The primary focus of the energy efficiency portfolio should be to capture avoided costs and GHG reductions as valued in the CPUC's Avoided Cost Calculator (ACC). This focal point provides for the best alignment of energy efficiency with the IRP (to advance the objectives of both SB350 and SB100[5]), promotes the coupling of energy efficiency investments with other demand side strategies, and offers load serving entities the opportunity to directly capture the resource value in their system planning activities. The primary objectives of the potential and goals **study** should be to identify the potential for load serving entities and program administrators to capture the resource in their jurisdictions and to inform the load forecast, including contributions to long term system value and resource adequacy.

The ACC includes components for avoided energy and grid costs, as well as greenhouse gas benefits. The values in the ACC should reflect the proper balance between California's resource and environmental objectives. The adoption of the ACC in the integrated demand side energy resource (IDER) proceeding should continue to support consistency across resources and in lieu of a Common Resource Valuation Framework, the ACC is the best common valuation thread we have to consider the stream of benefits from energy efficiency and other DERs at this time.

[5] SB100 puts a focus on decarbonization of the electric system; SB350 has multiple objectives including integrated system planning based on carbon, as well as meter-based quantification of impact from energy efficiency as a primary pathway to doubling efficiency contributions.

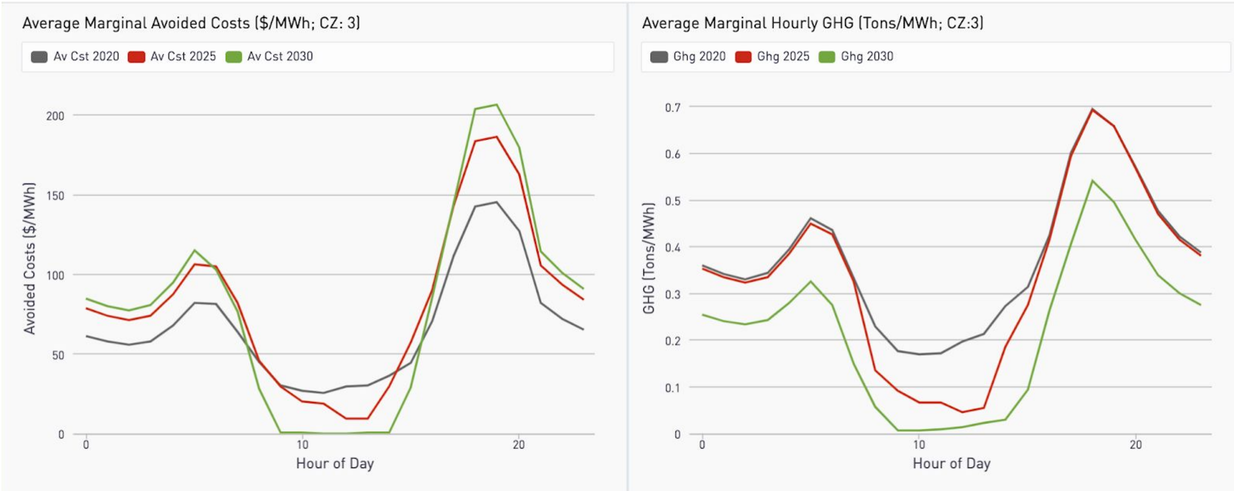
Focusing primarily on **average bill savings as the primary objective of a resource energy efficiency portfolio creates a large misalignment with the need to optimize programs for avoided costs and GHG reductions**. Instead, programs should strive to capture the value of customer energy management, which provides a more unified approach to deliver significant value to participants and ratepayers as a whole. This creates a more direct bridge between efficiency's value to the grid and its benefit to customers by encouraging load serving entities to optimize overall utility avoided costs. This approach has the added benefit of meeting decarbonization goals and, in the end, providing greater value for participating and non-participating customers.

Why should optimization of avoided costs be the primary objective?

A large degree of alignment already exists when making both utility avoided costs and GHG reduction the core areas of focus for the energy efficiency portfolio. Well-aligned time of use rates can further compliment efficiency's value proposition to customers by capturing the value of avoided costs. While in theory this value is embedded in cost-effectiveness tests, energy efficiency portfolios' true worth is muted by the use of deemed values that incentivize the installation of specific technologies or measures but not performance or demand management. Furthermore, current cost-effectiveness tests focus on averages and annual outcomes in the form of "savings" rather than on delivered load impacts that can be optimized.

Temporal trends in utility avoided costs are largely reflected in the marginal GHG forecast (Figure 1). Energy and grid avoided costs are becoming concentrated in the summer peak hours, which is also when the grid relies most on the most carbon-intensive peaker plants and imports. Meanwhile, midday avoided costs are trending toward zero, as increased saturation of solar creates frequent overgeneration. Saving electricity at these times yields no carbon benefit, and in fact exacerbates the need to curtail renewables.

Figure 1. Average Marginal Avoided Costs



Successful optimization hinges on a consistent valuation framework across resources and the ability for program administrators and implementers to integrate resources. Figure 1 demonstrates that load shifting from peak to midday is, increasingly, just as valuable as saving energy during peak. By not enabling or motivating effective load management in the efficiency portfolio, deemed approaches severely limit innovation and cost-effectiveness. For this reason, optimization also requires transparent, meter-based assessment and incentives tied to the results of measurement. The meter-based measurement must then serve as the basis for valuation - not only the determination of savings, but the hourly load impact.

Synergies and Tradeoffs of Multiple Objectives Included in ACC

There is no inherent issue in having multiple value streams reflected in the ACC. In fact, one could argue that many California policy objectives that are currently not valued in the ACC should be. Overall, **the ACC captures both utility avoided costs and GHG reduction**. The balance between elements and the specifics of how they are determined have been debated at length in the IDER proceeding. Instead of modifying the avoided cost framework for energy efficiency, we suggest that where key policy objectives[6] are not captured in the ACC, the

[6] Serving disadvantaged communities and hard-to-reach customers, workforce education and training, supporting emerging technologies, transforming markets etc.

question of how to support such goals is actually one of portfolio structure, which is addressed below.

ENERGY EFFICIENCY GOALS

2. *To date, the CPUC has set portfolio goals based on identifying all cost effective energy efficiency by first identifying all technical potential and then narrowing to potential that is economic and likely to be adopted by the market.*
    a. *Do you believe the CPUC should continue to set goals and assess portfolio costs and benefits in this manner, or should the CPUC set goals based on an entirely different approach (e.g., setting goals as a percent reduction of total demand)? For reference, Addendum A provides a summary of different valuation frameworks.*
    b. *How does your recommendation support planning needs where savings estimates are reasonably expected to occur?*

We believe that **the CPUC should adopt a new approach for setting goals.** Three main changes are necessary to establish potential and set goals:

Current Framework		Key Change needed
Individual measure assessments of incremental efficiency potential		**Integrated** demand flexibility assessment of **load shaping and shifting** potential
True up of incremental potential based on **parameter-based deemed evaluations** and choice modeling and adoption rate updates		True up of load shaping and shifting potential based on **meter-based changes in consumption** (loadshape impacts) for participant population per SB350 and AB802
Technical, economic and market potential define a **fixed annual goal** for kWh, kW and therms and lifetime projection based on EUL		Load shaping and shifting potential establish a **minimum demand flexibility requirement** to meet SB100 short and long term targets

Integrated Demand Flexibility Potential

Energy efficiency, demand response, and strategic electrification should all be included in the process of identifying the potential for reduction in GHG based on changes in consumption. This integration is important to ensure that the outcomes are aligned for efficient deployment of these resources. Funds, public and private, must be deployed in a complementary way to reach the desired outcome of a decarbonized grid within the timeframes expected. It is particularly important that strategic electrification is not isolated from the energy efficiency and demand response, given electrification's potential to increase load at the "dirtiest" times of the day.

The potential to **integrate existing studies (for EE and DR in particular) was evident at the CPUC workshop this fall.** The presentation by Andrew Satchwell from LBNL, the well-documented demand response potential study, and the CEC-sponsored analyses of consumption trends shown by Recurve demonstrate these possibilities. The use of hourly consumption data directly supports planning needs by allowing users to analyze historic trends, identify specific impacts and target future integrated interventions based on consumption patterns and the value of future avoided costs. In particular, multiple recent studies have shown that by targeting customers who exhibit specific usage characteristics that signal performance potential, programs can improve savings (and cost-effectiveness) significantly.[7] The current approach of assessing the average performance of a measure across a population, rather than assessing the population, therefore misses cost-effective potential that a program could achieve if it focused on the customers most in need of the intervention.[8]

Potential based on meter-based changes in consumption (loadshape impacts)

In addition to shifting away from isolated energy efficiency and toward integrated demand flexibility, **we need to take a different approach to the assessment of potential.[9]** The current construct of technology-specific potential and consumer choice modeling for technical, economic and market potential has had the unintended consequence of confining results to the prescriptive list of efficiency technologies in the potential study. We propose an inversion of this approach. Starting with an analysis of the current consumption profiles at a sub-sector level (office spaces, restaurants, grocery stores, single family homes etc.)[10], identify potential for

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[7] Frick, Natalie Mims, Ian M Hoffman, Charles A Goldman, Greg Leventis, Sean Murphy, and Lisa C Schwartz. Peak Demand Impacts From Electricity Efficiency Programs. 2019. http://eta-publications.lbl.gov/sites/default/files/cost_of_saving_peak_demand_20191106_final.pdf

[8] We are encouraged by the recent announcement by the LBNL DR Potential Study team that they will be collaborating with the energy efficiency potential study and we look forward to participating in the working group.

[9] Our proposed approach is closest to CPUC Staff's Option 1 in Attachment A of the Ruling.

[10] These sub-sectors would represent the equivalent of the "market sector building bundle" classifications suggested in the CPUC Staff White Paper

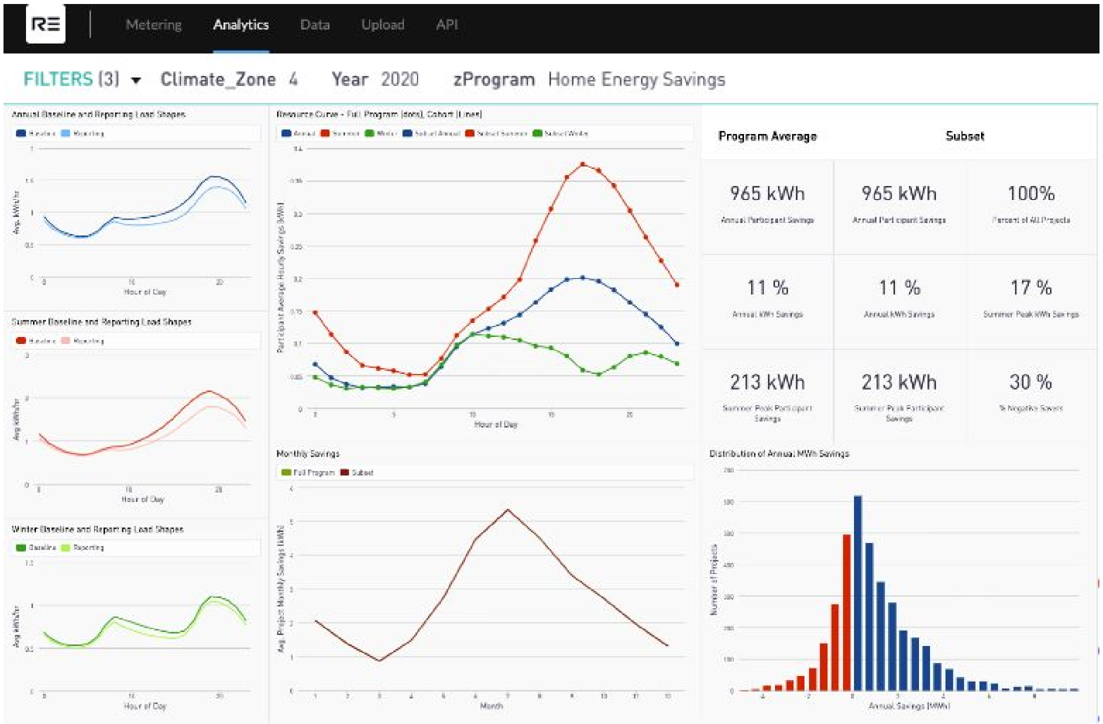
combined efficiency and load shift and shape resources (permanent or temporary) within market-building combinations.

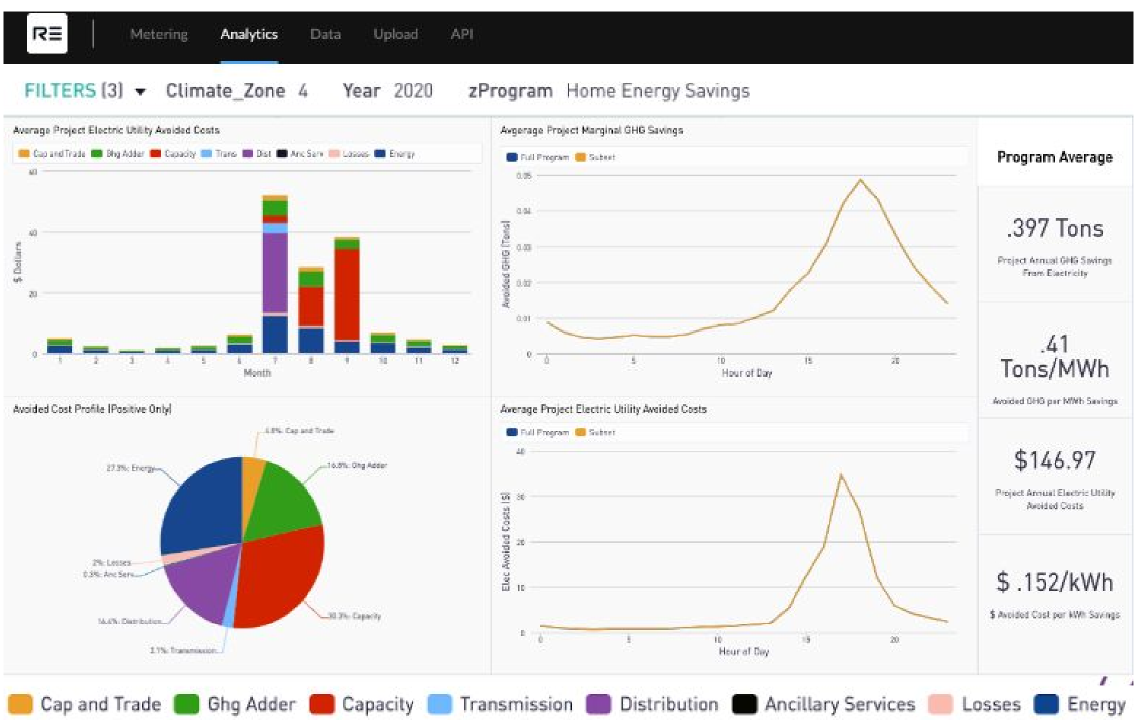
A typical question in presenting this alternative approach is: **how can you assess potential without quantifying the discrete physical interventions?** First, the actuarial feedback from assessing programs (past and future) on a metered basis will provide quantified outcomes for each hour of the year from programs with single measures or multi measure/behavior combination interventions. Second, the current deemed loadshapes for specific interventions are available from the eTRM and DEER to support forecasting and frame the expected outcomes from a wide variety of possible interventions. The key difference from the status quo is the focus on existing consumption patterns (loadshape) as the baseline, rather than a technology-specific average unit energy savings.

There are a wealth of **past programs that can serve as the foundation for an initial assessment of cost-effective potential via meter-based measurements** and most existing resource programs (even if not officially NMEC) can be tracked on a metered basis. While these programs may not fully represent future designs, assessing the scale of their impacts at varying times of day offers the best opportunity to optimize current (even non-NMEC) programs, identify targeted potential for the future, and inform the potential for demand impacts from demand-side interventions (needed for the CEC forecast)..

To establish an actuarial feedback loop for the future, the CPUC can start now by requiring (and accommodating in reporting) submission of pre-post meter-based analysis, and actual load shapes (resource curves), for every utility, CCA and REN portfolio. The figures below show the results of hourly savings and avoided cost assessment that Recurve completed on a recent California energy efficiency program with open-source CalTRACK methods and the OpenEEmeter code base. Using pre-program AMI data, Recurve was also able to identify usage patterns that were predictive of cost-effective potential. After having conducted many of these program “backcasts” for multiple program administrators, it is clear that cost-ineffective measures/programs almost always offer cost-effective potential -- and this potential can be identified ahead of time. So instead of suggesting that home retrofits, refrigerator recycling, or a host of other measures offer no cost-effective potential based on a population average, the P&G study should be looking to identify where predictable cost-effective savings have been delivered at the meter and establishing potential accordingly.

Figure 2. Backcast Results from Recurve Analysis of A Single Program





Use Load shaping and shifting potential to establish a minimum demand flexibility requirement

The **current construct of technical, economic and achievable potential should be replaced with a minimum demand flexibility procurement requirement** informed by a cross-resource potential analysis. Given that SB100 is driving toward a 100 percent renewable grid, the technical potential for demand side resources could be reframed under the construct of a fully decarbonized grid. The Potential study would then identify the short, medium, and long-term need for demand flexibility resources to make sufficient progress toward SB 100 targets. In this construct, a minimum procurement requirement would better reflect the practical need and timeline for demand flexibility resources relative to the alternatives for decarbonization. For example, to what degree is demand flexibility more cost-effective and practical than utility scale solar + storage? How does this assessment change as the grid reaches higher levels of decarbonization? Decarbonization strategies will need to change as the "easier" shorter term potential is captured. We must be prepared to deliver demand flexibility at the scale that will ultimately be necessary to compliment and enable utility-scale renewables and storage. Reaching that scale will not happen if the focus is only on the "low-hanging fruit" of what constitutes immediately cost-effective potential. A minimum procurement requirement is one mechanism to ensure that sufficient progress is being made now to ultimately succeed in reaching SB100 targets.

This modified framework for potential and goals supports planning needs in part because **it allows for a wider range of technology-agnostic interventions to be deployed and greater accountability around delivering on the value.** Instead of heady program designs coming from the LSEs and elaborate stakeholder review processes, price signals can lead the way for cost-effective interventions from innovation from a wide range of third party aggregators and streamline administration and deployment. This will also enhance the flexibility of the system to capture value now and as the grid value changes over time. Actuarial analysis derived from this experience can be used to inform future forecasts and enable ongoing capture of energy efficiency as part of overall decarbonization efforts.

3. *Optimizable energy efficiency:*
    a. *Do you agree that energy efficiency savings streams that can be optimized should be included in the development of optimal resource portfolios in IRP? Why or why not?*
    b. *If you answered yes to the previous question, how should the optimal resource portfolios from IRP be considered in the adoption of energy efficiency goals? Should energy efficiency goals be based solely on IRP portfolios for measures that can be optimized? Or should those portfolios be used to inform goals adoption in other ways, such as informing procurement directives (e.g., resource type, location, etc.)? Please provide justification for your recommendation.*

Yes, **energy efficiency savings streams that CAN be optimized should be included in development of the optimal resource portfolios in IRP**. However, Recurve believes energy efficiency/demand flexibility should only be incorporated into the IRP once three major elements are resolved.

1. The resource energy efficiency portfolio must be geared to the IRP needs and not saddled with other policy objectives that diminish cost-effectiveness.
2. The cost-effectiveness test applied within the IRP cannot penalize programs for motivating private investment. This cannot be achieved with a Total Resource Cost framework.
3. The IRP can only be expected to treat energy efficiency and demand side resources when they can clearly demonstrate that load impacts are delivered at the times and locations and magnitudes required.

In order for energy efficiency to be successfully incorporated as a competitive resource into the IRP, the Commission should **segment the energy efficiency portfolio into three dedicated sub-portfolios** as suggested in NRDC comments last year: 1. Resource EE/Demand Flexibility, 2. Long-Term Market Transformation (inclusive of most non-resource activities), and 3. Equity. Each of these categories should still have a predominant focus on delivering utility avoided costs and GHG reductions; but the timelines, intervention strategies, and constituencies of each sub-portfolio should be geared toward specific policy objectives. These three sub-portfolios align with the “Selectable” and “Load Modifying” branches that were outlined in the Staff EE/IRP Whitepaper as follows:

“Selectable” EE

1. **Resource EE/Demand Flexibility:** Programs designed to meet IRP needs in a competitive solicitation framework. Meter-based savings methods applied in a timely fashion will be essential to integrated programs that fulfill this role.

“Load-Modifying” EE

2. **Long-Term Market Transformation**: Programs and initiatives designed to deliver long-term load reduction and SB 350 doubling goals. This portfolio would include the C&S programs and market transformation initiatives.

3. **Equity EE**: Programs designed to address specific equity policy goals, including supporting underserved communities and customers and other non-resource objectives.

These three categories are also similar to those suggested by the joint electric IOUs in comments on the 2018 Staff EE/IRP Whitepaper and echo the structural changes suggested in comments by several other parties.[11] This organization of California’s energy efficiency framework would:

- Enable the Commission to **set realistic targets and expectations** for the resource portfolio and also empower load serving entities to use these resources as part of their system plans.[12]
- Allow the **resource portfolio to provide unencumbered support to the IRP** and synergize deployment with other DERs.
- Provide for a **dedicated focus on California’s non-resource policy priorities**, including supporting underserved customers.
- **Support long-term EE and climate goals** via dedicated market transformation and C&S.

The resource energy efficiency/demand flexibility sub-portfolio should be incorporated into the IRP under two additional conditions:

1. The **benefit/cost analysis used to weigh energy efficiency against other resources should incorporate only program spending** (administrative, implementation, and incentives). Private investment, which is largely motivated by participant health, safety,

[11] Informal Comments of Pacific Gas and Electric Company (U 39-E), San Diego Gas & Electric Company (U 902-E), and Southern California Edison Company (U 338-E) on the Staff Proposal for Incorporating Energy Efficiency into the SB 350 Integrated Resource Planning Process, 2019 https://pda.energydataweb.com/#!/documents/2083/comments/list?q=IRP

[12] *"In this context, LSEs may propose to meet their load and GHG requirements with both supply-side and demand-side investments, and must explain how these resources meet their assigned load levels and GHG targets."* D.20-03-028 https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M331/K772/331772681.PDF

equipment reliability and other non-energy benefits, is inappropriate to include in the IRP where the goal should be to procure clean energy resources at lowest cost to ratepayers. If the current Total Resource Cost framework is applied in the IRP, EE will not be able to compete as a resource.

2. Energy efficiency resources included in the IRP **must deliver grid impacts reliably and with a high degree of certainty and review should be technology neutral.**[13] Hourly load impacts, measured via open-source, transparent Normalized Metered Energy Consumption (NMEC) methods must be the basis for demand-side solutions to be incorporated as resources within the IRP.

Once these two criteria are met, energy efficiency should be procured on a competitive basis in the IRP. The Potential and Goals framework can be used as inputs into the Reference System Plan (RSP), which would bring energy efficiency more in line with supply side resources, even if they are utilized as load modifiers.[14] If the Commission believes that Load Serving Entities are not striking a balance between IRP procurement and the RSP, the Commission can order LSE's to adjust portfolios accordingly. This model also gives IOUs and CCAs the ability to demonstrate how energy efficiency is part of their resource plans and decarbonization goals, even if they are not part of the pooled programs in the centralized energy efficiency portfolio.

For procurement, **the base market value of demand flexibility can be established using the potential for changes in load and in relation to the marginal value of avoided costs.** This establishes a threshold for the competitive procurement of market-rate demand flexibility up to and including code. Above that line, the price is tied to the policy objectives that go above and beyond just procuring demand flexibility as a resource. For the "Equity" bucket

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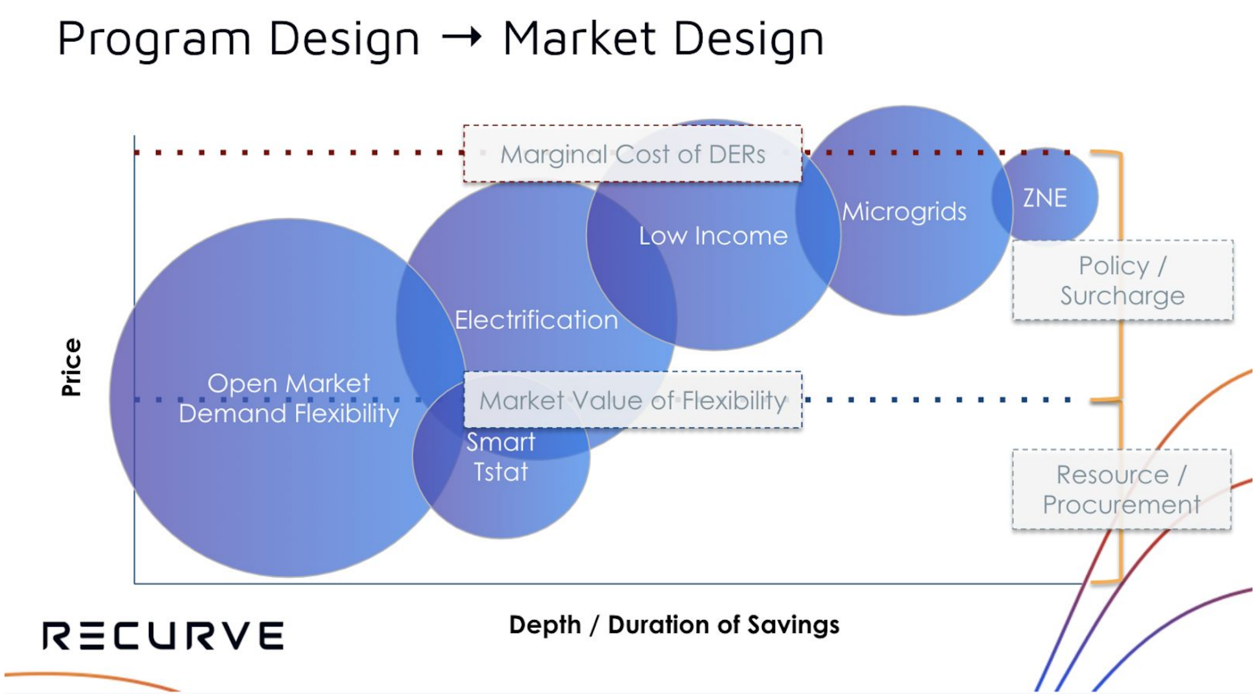
[13] *"The Commission intends to be technology-neutral with respect to the selection of individual resources within these broad categories designed to serve the overall needs of the electric grid."and "In this context, LSEs may propose to meet their load and GHG requirements with both supply-side and demand-side investments, and must explain how these resources meet their assigned load levels and GHG targets."* D.20-03-028 https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M331/K772/331772681.PDF

[14] *"In general, we expect that the LSEs will procure resources in the following broad categories defined by their attributes: long-duration storage, defined as able to provide 8-12 hours of storage; short-duration storage, defined as 4 hours or less; renewables; hybrid resources; and other resources. In addition, as stated above, LSEs may invest in resources that modify their load such as energy efficiency, demand response, or vehicle or building electrification."* D.20-03-028 https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M331/K772/331772681.PDF

defined by NRDC, for example, the funding streams could still be fungible to augment market rate programs and provide additional incentives for impacts achieved in disadvantaged communities or low income populations. They could be **funded without the extra burden of savings cost effectiveness but still amplify the effects of other resource programs**.



4. *Non-optimizable energy efficiency: The staff proposal concluded that not all energy efficiency savings streams are suitable for optimization. For instance, the staff proposal recommended that codes and standards, low income, and other savings streams with uncertain costs and benefits continue to function as load modifiers (i.e., fixed assumptions that cannot be optimized by the model) in the IRP process.*
    a. *If you recommend that goals for optimizable energy efficiency be set based on IRP, should the CPUC consider the savings potential for non-optimizable energy efficiency savings streams when setting goals? If yes, how?*
    b. *Should the CPUC set separate goals for non-optimizable savings streams? Why or why not?*

As we have noted, **optimizable demand flexibility resources should be the responsibility of the load serving entities** to enable optimized deployment and synergy within their system plans. Non-optimizable resources, even if they deliver savings, are generally driving at overarching policy objectives and are intended to support market adoption by overcoming systemic barriers in the market where no natural incentive exists. They are therefore more conducive to statewide goals and statewide implementation that discreetly reflects their policy objective and approaches that can meaningfully track outcomes. In the interim, existing budgets could be maintained until new metrics are established for prioritization.

The **CPUC should quantify savings and GHG impacts where possible, even if these metrics are not the primary objective for justifying funding**. Within the Equity portfolio in particular, there is still a vital need to hold program administrators and implementers accountable for saving impact results and to have an accurate measurement of the grid impacts of programs. Therefore, meter-based quantification (NMEC) approaches should be the default for understanding the grid and GHG impacts of low income and other equity programs.

5. *If you recommended that energy efficiency savings be based on IRP optimization in question 3, which covers only the electric sector, do you believe the assessment of savings potential and goal adoption for natural gas programs needs to be modified? If yes, how?*

Yes, the **assessment of potential and goals for natural gas needs to be modified**. The CPUC could create a goals and potential trajectory to zero in which LSEs can be taking advantage of building decarbonization programs (BUILD and TECH) and fuel switching rules to achieve those goals. Gas utilities could be eligible to get the credits (in part or in full) for reductions achieved in partnership with electric utilities, using a shared impact model.

The Commission must take care that **program benefits are treated holistically between gas and electricity**. A major focus in the coming years will be electrification. Therefore, even in the IRP, the Commission may need to ensure that the combination of both gas and electric benefits are included in the assessment of program cost-effectiveness on the path to zero.

Natural gas can still be considered in the context of the potential analysis. With new rules around fuel switching and the need to coordinate the energy efficiency portfolio with building decarbonization efforts, goals oriented toward GHG reductions and based on the avoided costs can help in motivating the transition. Potential should be framed around GHG reduction opportunities, not just savings.

If savings must be the goal, the Commission could **consider adopting an absolute consumption reduction value** as the natural gas goal (as opposed to improved efficiency). Regardless of which approach is used, the goal should be derived from meter-based data.

PORTFOLIO ASSESSMENT OF COST-EFFECTIVENESS AND BUDGET APPROVAL

6. *In assessing cost-effectiveness of energy efficiency portfolios where all benefits are measured against all costs, should the CPUC continue to use a portfolio-based approach, or one that requires cost-effectiveness at the individual measure or program level? Provide detailed rationale to support your recommendation.*

Yes, the CPUC should **continue to use a portfolio-based approach, but redefine the boundaries of the portfolios to resource acquisition by the LSE** and perhaps by market segment (residential, commercial, agricultural, industrial).

The **full LSE portfolio based approach, wherein resource and non-resource programs, savings and costs are balanced out to achieve >1.0 TRC can be retired**. A new concept of portfolio can be used to demonstrate "selectable energy efficiency" for a given LSE (IOU or CCA). A "portfolio" of load-modifying energy efficiency can also be developed to meet the needs of the non-resource, market transformation and codes and standards objectives at the statewide level.

The **cost effectiveness test should not be used to screen technologies** within the goals and potential study, nor should it be used for an individual program application that is too limiting. A new definition of "portfolio" would be the full suite of resource acquisition interventions needed to reach the minimum demand flexibility procurement requirement.

LSEs and program administrators can propose to the CPUC how they will achieve the minimum demand flexibility requirement through a technology-agnostic procurement of demand side resources to meet the obligations and/or exceed them if cost effective resources remain. This approach is in alignment with the March IRP decision (D.20-03-028) as it already exists and would help synergize these activities.[15]

The key rationale for this proposal is to support the **alignment of proceedings, the consistency of valuation, and focusing the accountability of delivering grid resources on load serving entities**. The current approach of bundling all energy efficiency activities into one portfolio and balancing costs and benefits across it taxes administrators, muddles distinct value

[15] D.20-03-028. March 26, 2020 2019-2020 ELECTRIC RESOURCE PORTFOLIOS TO INFORM INTEGRATED RESOURCE PLANS AND TRANSMISSION PLANNING https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M331/K772/331772681.PDF

propositions, and prevents optimizable EE resources from playing a meaningful role in resource planning alongside other decarbonization options.

More detail on the need for the potential study to be accessible, based on common data, and designed to help synergize information across the multiple administrators and agencies is provided in our December comments (attached).

7. *Should the CPUC consider modifying the assessment of portfolio cost effectiveness, where all portfolio benefits are assessed against all portfolio costs,3 to a paradigm in which different costs and benefits are used to set goals and budgets for different types of interventions (such as market transformation, general resource programs, resource programs that target hard-to-reach customers, non-resource programs, codes and standards, etc.)? If not, why not? If so:*
    a. *Please provide recommendations and rationale for categorizing the different types of energy efficiency interventions and which costs, benefits or other metrics should be assessed for each one of the categories proposed.*
    b. *Please identify which methods (e.g., Avoided Cost Calculator, IRP optimization results, a combination of both) should be used to assess budget requests for your recommended types of energy efficiency interventions.*
    c. *If any of the types of interventions cannot be assessed based on the Avoided Cost Calculator and/or IRP optimization:*
        i. *Which methods should the CPUC consider for assessing reasonableness of budget requests (e.g., if you propose that budget requests to fund non-resource programs be assessed separately from resource programs, how should the CPUC assess the reasonableness of non-resource programs budget requests)?*
        ii. *What would be the appropriate metrics, goals and any other necessary method to assess the reasonableness of interventions and associated budget requests?*

It is vital that **the CPUC move away from a portfolio-level legacy Total Resource Cost framework for all types of energy efficiency activities in order to enable the kinds of innovation and scale envisioned by SB 350 and SB 100**. By counting private investment as a cost akin to utility bill surcharges, the TRC rewards light touch, incremental interventions and inhibits the scaled demand flexibility that will be needed to balance an increasingly renewable grid. Program administrators and implementers should be rewarded, not penalized for using ratepayer dollars to maximize private investment where it is available. In short, the portfolio-level application of TRC poses an existential roadblock to the ability of efficiency to contribute to California's clean energy future in the ways clearly envisioned by SB 350. We tackle the TRC in more detail in question 9.

The **Avoided Cost Calculator should be the foundation for assessing budgets for each load serving entity or program administrator.** The analysis should be grounded in the current load shapes of their customer base and their ability to reduce, shape, or shift load in the short and long term. Analysis of past interventions (i.e. HVAC programs' meter based outcomes), or known measure-specific load shapes, can inform an actuarial feedback loop. The LSE is responsible for demonstrating how their planned interventions deliver value in relation to the avoided costs as noted in question #6.

The **Commission review of the plans would focus on budgets presented by the program administrators that would be:**

a.) within the **marginal costs of procurement** other resource options and reasonable compared to past experience

b.) are tied to a **competitive procurement framework and performance** expectations so expenditures will reflect competitive costs and

c.) **align with the LSE's reference system plan**.

For the portions of the existing portfolio that cannot fit into avoided costs or the IRP optimization, the Commission has a wide berth to decide how to justify these expenditures. Performance based regulation principles should be employed to ensure that accountability is straightforward and transparent and not subject to significant gaming. Where possible, the GHG and energy impacts should continue to be quantified (e.g. codes and standards and low income). Stakeholder groups and CPUC staff, like CAEEC, can be exclusively focused on these metric development processes, whereas the review of resource procurement plans for resources can be the direct responsibility of CPUC staff (across the Energy Division) to ensure compliance with SB100 and SB350 obligations. In this transition period, we think that budgets from prior cycles could be maintained until a prioritization process is established for non-optimizable segments of the existing portfolio.

8. *Independent of whether the CPUC continues to use a portfolio-based approach or makes any of the modifications implied in Questions 6 and 7, what role do non-resource programs play in achieving the goals assessed in the potential and goals study? Are they still necessary for achieving resource savings (and if so, please reference any research or studies that support this conclusion)?*

Non Resource programs may advance a myriad of policy goals beyond direct resource acquisition. These investments should be tracked and monitored based on cost-effectiveness metrics appropriate for them and amplify, rather than hold back, resource acquisition investments.

9. *If the CPUC does not adopt any of the approaches considered in questions 7-8 and continues to set a portfolio cost-effectiveness target, is a target total resource cost of 1.25 for portfolio approval an "aggressive yet achievable" approach?4*

The **TRC of 1.25 is aggressive and may not be achievable with existing participant cost burden, and more importantly does not reflect the intended outcomes of energy efficiency as a meaningful resource for LSE investment.** A cost test for optimizable energy efficiency as a resource needs to recognize the value of leveraging external capital (including participant contributions), not penalize it. The Program Administrator Cost test (aligned with the avoided cost calculator) is the more appropriate test to understand the costs and benefits to the load serving entity to capture and invest in demand side flexibility as a resource.

As **the concepts of demand flexibility and the role of distributed energy resources matures, the limits of current costs tests to meet the objectives are revealed**. Last fall, a comprehensive paper on the issues of the total resource cost test was published[16] and since then other articles[17] are making compelling arguments and practical suggestions for updating this stalwart framework for the future. California is not an exception to these suggestions, but a prime candidate for adoption.

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[16] Evolving Cost-Effectiveness Policy and Tools to Enable Modern Energy Efficiency and Demand-Side Management, Adam Scheer, 2019. Available at this link: https://www.recurve.com/blog/rethinking-cost-effectiveness-to-meet-the-needs-of-the-modern-grid

[17] Why a Bandage Fix for Cost-Effectiveness Testing Isn't Enough, Posted by Adam Scheer, Jake Millette, Olivia Patterson, and Julie Michals, Advanced Energy Perspectives https://blog.aee.net/why-a-bandage-fix-for-cost-effectiveness-testing-isnt-enough

In considering **a long-term consistent resource valuation framework, the CPUC should carefully weigh the distinction between private investment and ratepayer charges with the recognition that private clean energy capital must be encouraged**. A new common valuation framework is fundamental to the success of distributed energy resources. The simple adoption of a common cost effectiveness test across resources is insufficient to synchronize decision making among DERs for decarbonization resource planning.

While we continue our vigil for the Commission to take up the issue of comprehensive reassessment of the valuation structures, the **CPUC should immediately retire the TRC for energy efficiency and utilize the PAC as the primary cost-effectiveness test for resource DSM programs.** Customers can make their own decisions on participation, and regulators can continue to screen programs to protect against predatory program designs via a Participant Cost Test (PCT). While rate-payer protection is commonly cited as a key reason for maintaining the TRC, we have no evidence that predatory program designs have proliferated in jurisdictions that use the PAC as a primary test and remedies like a participant cost test are readily available to address this concern.[18]

The **TRC's biggest flaw is that it discourages co-investment in energy efficiency**. Straightforward, logical programs like on-bill financing or home upgrades that leverage external capital are hobbled within utility programs because they illogically hamper portfolio cost effectiveness. As economic recovery initiatives emerge after the COVID-19 pandemic, the importance of leveraging external resources for investments in infrastructure will be essential. A cost test that discourages this kind of collaboration will mean California's customers (participant ratepayers and non-participant ratepayers) will miss out on an important opportunity.

This situation, **the weight of participant costs, is particularly acute for emerging NMEC programs. Since the projects that make up an NMEC portfolio include below code savings, full measure cost must be included for the project.** Parties initially expected that additional savings would make up for this additional cost, but this has not turned out to be the case, largely because customers are buying value beyond energy savings in the course of

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[18] Cost-Effectiveness Adjustments: How Effective Have States Been At Recreating the PAC? Luke Nickerman and Richard Aslin, Pacific Gas and Electric 2014 ACEEE Summer Study on Energy Efficiency in Buildings https://www.aceee.org/files/proceedings/2014/data/papers/8-1084.pdf

upgrades.[19] This has a chilling effect on the nascent NMEC programs (as they prepare savings claims) which are intended to enable SB350 and explicitly intended to capture to-code savings. NMEC is also the way to reflect hourly grid impacts and relative impacts on avoided costs, as well as to shift risk to pay for savings achieved as opposed to lofty program budgets. Ratepayers are left to fully fund programs that may or may not deliver on their savings projections.

PRIORITIZATION

10. *How should the Commission prioritize the various policy questions above? Are there issues that you recommend the CPUC decide on before new IOU Business Plans and 2021 annual budget advice letters are submitted (i.e., before September 2020)?*

The **Commission must fix the issues with valuation so energy efficiency can play a meaningful role in the procurement processes**. In lieu of the full re-consideration of valuation across DERs, we urge the Commission to use the Program Administrator Cost test as the primary test to remove the dis-incentive for private (including customer) investments in energy efficiency as a response for the 2021 Business Plans. This will better align energy efficiency as a procurable resource and enable the capture of all cost effective energy efficiency in the procurement processes as well as tap into near term opportunities for external COVID-19 recovery investment.

The Commission should adopt a segmentation plan for the portfolio to be included in the 2021 Business plans. This will enable clear pathways for each part of the current portfolio to achieve its intended objective(s) and be valued properly based on its primary objectives.

The Commission should optimize resource efficiency by providing a clear, unencumbered path, via a minimum procurement threshold, for the resource acquisition components of the energy efficiency portfolio to be captured with competitive demand flexibility procurements hosted by load serving entities.

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[19] Impact Evaluation Report: Home Upgrade Program – Residential Program Year 2017, DNV GL, 2019 https://pda.energydataweb.com/api/view/2171/CPUC%20GroupA%20Res%20PY2017%20HUP%20-%20Final%20Report.pdf

OTHER

11. *Are there any new or modified rules or processes that the CPUC should consider, to support your recommendations? Please be specific in your answer.*

The specific recommendations for the goals and potential study in our December comments are still pending. The following recommendations are for the energy efficiency potential and goals processes and framework:

NMEC programs should be allowed to claim incremental measure cost if the TRC continues to be the primary metric to allow this program model to demonstrate value. This exception will allow the other benefits of NMEC, meter-based impacts, detailed avoided cost valuation, and risk reallocation to be tested and demonstrated as the Commission reconsiders valuation on the whole. If this exception is not made, the deemed paradigm will continue to be the default and compliance with SB350 to capture to-code savings and grid optimization with demand flexibility is at stake.

Reporting requirements should be modified to accommodate actual load shapes for resource programs. Optimizing avoided costs is currently muted by the deemed savings infrastructure for claiming savings. If utilities and implementers can deliver more avoided cost value, they should be able to claim that additional value. Without alignment of these incentives and motivators, the system will continue to deliver the minimum value at the maximum cost.

Local procurements of energy efficiency should have precedent over the statewide portfolio. In the LCR or IDER competitive procurements, energy efficiency projects have had to demonstrate incrementality to the statewide energy efficiency portfolio, which was difficult or impossible to do given available information. In the interest of aligning energy efficiency with local resource needs, this requirement should be removed. If LSE's can capture DER resources directly for addressing system needs they should be strongly encouraged to do so. The general energy efficiency portfolio should provide value incremental to local needs, not vice versa.

The **CAEEC should be solely focused on market transformation (including non-resource) and equity program plans and initiatives** because of the variable metrics that may be necessary to track progress. Resource acquisition initiatives can be more cleanly and clearly monitored based on outcomes at the meter through transparent, consistent M&V and evaluation.[20] Flexibility and accountability can be achieved to scale activities, and CPUC staff that are responsible for resource planning across the Energy Division (IDER, RA, IRP), CEC, and CAISO can constitute the compliance review body.

The Energy Savings Performance Incentive (ESPI) is currently under consideration. If the ESPI is continued, **delivery of cost effective GHG should be foundational to the shareholder incentive payments and procured through competitive means.** Additional subjective metrics could include due diligence of data provision, use of consistent transparent quantification to enable successful bidders and efficiency of the procurement process. CPUC staff should be responsible for ensuring the process proceeds, not CAEEC or ancillary contract review bodies.

12. *Is there anything else you would like to propose or add that has not been addressed in the questions above? Please provide rationale for your proposal, actionable implementation steps and timing.*

We have no further proposals at this time.

IV. Conclusion

Recurve Analytics, Inc. appreciates the opportunity to comment and respectfully requests the Commission take into consideration the concerns raised herein.

Dated: May 22, 2020

Respectfully submitted,

/s/ Carmen Best

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[20] *The Promise of Performance* Zondits - Program Evaluation, Programs & Policy June 6, 2018 http://zondits.com/article/15763/the-promise-of-performance

Attachment A:

Comments on Potential & Goals 2021 Study

Submitted by Recurve, 12/10/2019

RECURVE
SHAPE THE FUTURE OF ENERGY

Comments on Potential & Goals 2021 Study

Submitted by Recurve, Carmen Best 12/10/2019

Overview

California is at a critical time of transition. The Potential and Goals study for energy efficiency is an important link for meeting the state's decarbonization goals. However, the existing construct for establishing potential, setting goals, and implementing energy efficiency programs needs to be overhauled to meet these goals in an efficient, streamlined manner. California needs to recalibrate its myriad of historic policies and well-intentioned programs to ensure that all are properly valuing demand flexibility resources in order to support a reliable, decarbonized grid.

Recurve appreciates the opportunity to submit comments on the potential and goals analysis, and limits our comments to the resource acquisition components of the portfolio. As recognized in the staff white paper in 2018, not all resources are appropriate to consider in the Integrated Resource Plan. We wish to see a robust path for the competitive procurement of demand flexibility resources that can deliver value to the grid to enable market-based decarbonization at scale.

With some important modifications, energy efficiency has a new opportunity to support the grid as a demand flexibility resource. However, efficiency's position as "first in the loading order" must be earned - increasingly, the when and where demonstrates a resource's value. Value for efficiency and other resources should be determined using a common valuation structure applicable across resources and procured first at the local level, rather than statewide. Separately, efficiency that is intended to reach objectives beyond resource acquisition should be funded and valued on a different track.

The potential and goals study needs to evolve to meet these new objectives for energy efficiency as part of the demand flexibility paradigm through the following core changes:

1. Focus on quantifying the potential to reduce GHG emissions through changes in metered energy consumption (NMEC) and on a least cost basis compared to other resources, to align with the load forecast (IEPR) and with the IRP.
    - Include all demand-side opportunities for reducing GHG emissions
    - Integrate the EE / DR potential studies at a minimum
    - Include combined potential from EE + decarbonization programs (BUILD/TECH)

2. State Agencies, Load Serving Entities and other Program Administrators should be the primary audience for the analysis and consulted in its development.

- The California Public Utilities Commission (CPUC), the California Energy Commission (CEC), California Air Resources Board (CARB) and the California Independent System Operator (CAISO) are all responsible for meeting the state's decarbonization goals, and the potential analysis must provide a common view of the potential to cost-effectively reduce GHG emissions and enable a transparent means of tracking progress.
- Methods to identify potential should be consistently and transparently quantifiable at the local (REN, CCA, IOU) level to provide actionable information for deploying and tracking demand flexibility resources.
- Load serving entities and other program administrators should have the ability to plan and track their own portfolios to capture potential and not be dependent on the CPUC consultant analysts for fixed outputs.
- Specific locations and value of distribution system needs should be key inputs into the potential modeling if not already captured in the avoided cost calculator.

3. RENs, CCAs, and IOUs should propose their own goals based on identified potential and system needs and procure that potential at the least cost.
    - Return to a model in which program administrators propose the budget to capture the potential.
    - Modify the Energy Savings Performance Incentive (ESPI) to focus on incentives for least cost capture of greatest GHG potential.
    - Adopt a market procurement requirement rather than a cost-effectiveness test. Resource acquisition procured via auction and GHG reductions paid via performance is a path to ensure cost-effective impacts for ratepayers without the pitfalls of over-prescription.
4. Leverage centralized consumption data sets across agencies (CEC-CPUC) to avoid duplication of IT resources and enhance transparency, consistency and accessibility of the demand forecast IEPR (CEC) and the IRP (CPUC) as well as enable visibility for CAISO and CARB to track impacts of the interventions.

Answers to the specific questions posed by the CPUC Staff are provided in the following pages. We welcome comments and discussion on our recommendations.

Respectfully Submitted,

Carmen Best
Director of Policy & Emerging Markets
RECURVE

CPUC posed Questions for Consideration

1. What should be the primary objectives of the Potential and Goals study?

The primary objective of the potential and goals study should be to identify the potential for load serving entities and program administrators to capture the resource in their jurisdictions, and inform the load forecast including contributions to resource adequacy. It should do so in a consistent manner that is accessible to all stakeholders for their own planning purposes and grounded in changes in consumption.

The potential study should be geared toward supporting competitive markets for procurement of demand-side carbon reductions. Consumption-based analytics, including identification of heating and cooling loads, as opposed to technology-specific analytics, can be used to estimate potential for the load forecast (IEPR) and by the IRP to define long term planning needs.

The actual procurement of those resources should then be in the hands of load serving entities. Load serving entities and program administrators should have the ability to leverage third party aggregators to procure a wide range of technology-agnostic solutions to decarbonize the grid through demand side investments that complement grid operations. The potential study should provide the initial projections; metered changes in energy consumption should form the basis for tracking progress.

The primary audience for the potential analysis should be load serving entities, the California Public Utilities Commission (CPUC), the California Energy Commission (CEC), California Air Resources Board (CARB) and the California Independent System Operator (CAISO). In line with the joint accountability for decarbonization that these entities share, the potential analysis should provide a common view of the opportunity to cost-effectively reduce GHG emissions and a common view of progress. The Joint Agency Steering Committee (JASC) and the Demand Analysis Working Group should play a core role in ensuring this analysis is aligned with forecasting needs and tracking impacts across the agencies.

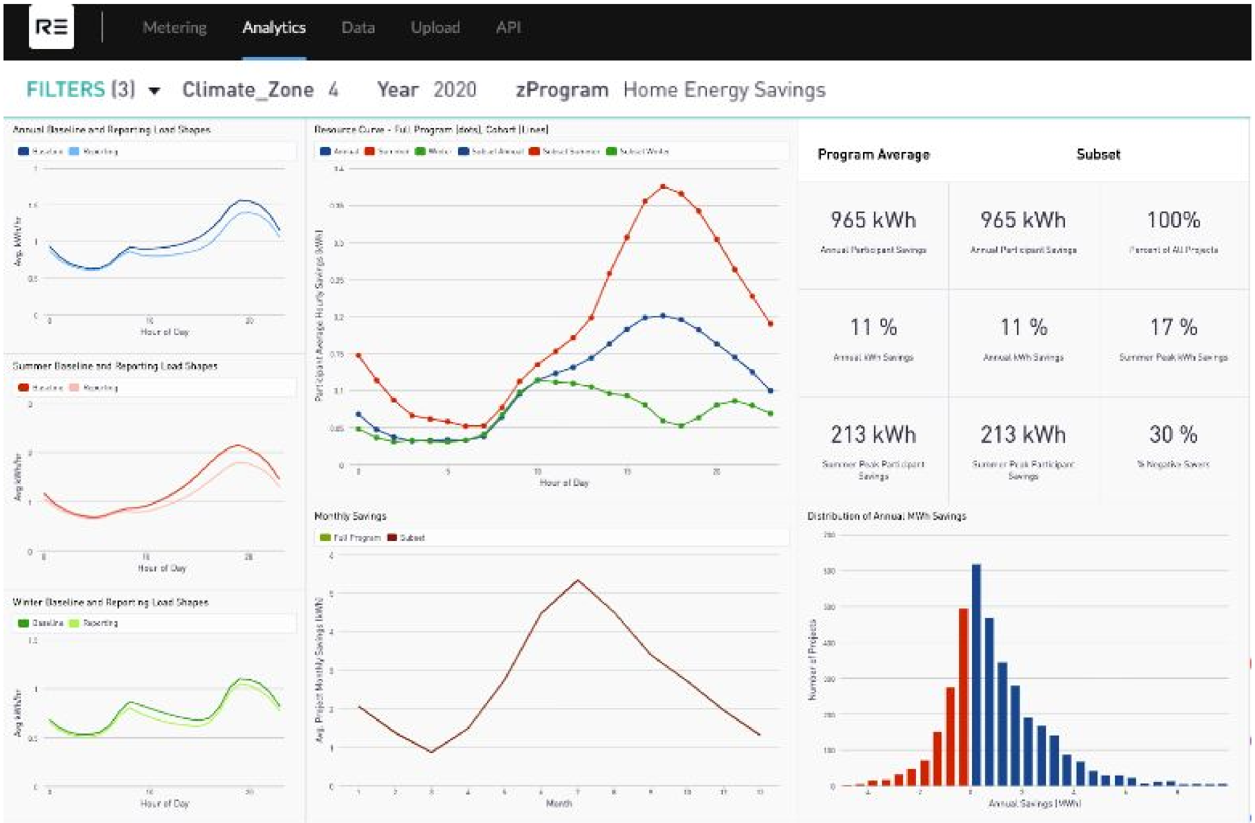
2. Topic-specific considerations: Do you agree with the considerations discussed at the workshop regarding the issues below? Why or why not? Please propose specific methodological improvements if you feel any are needed. Please refer to the Navigant-produced abstracts including the methodological considerations, key questions and data needs described for each topic.
    1. Energy efficiency-demand response analysis

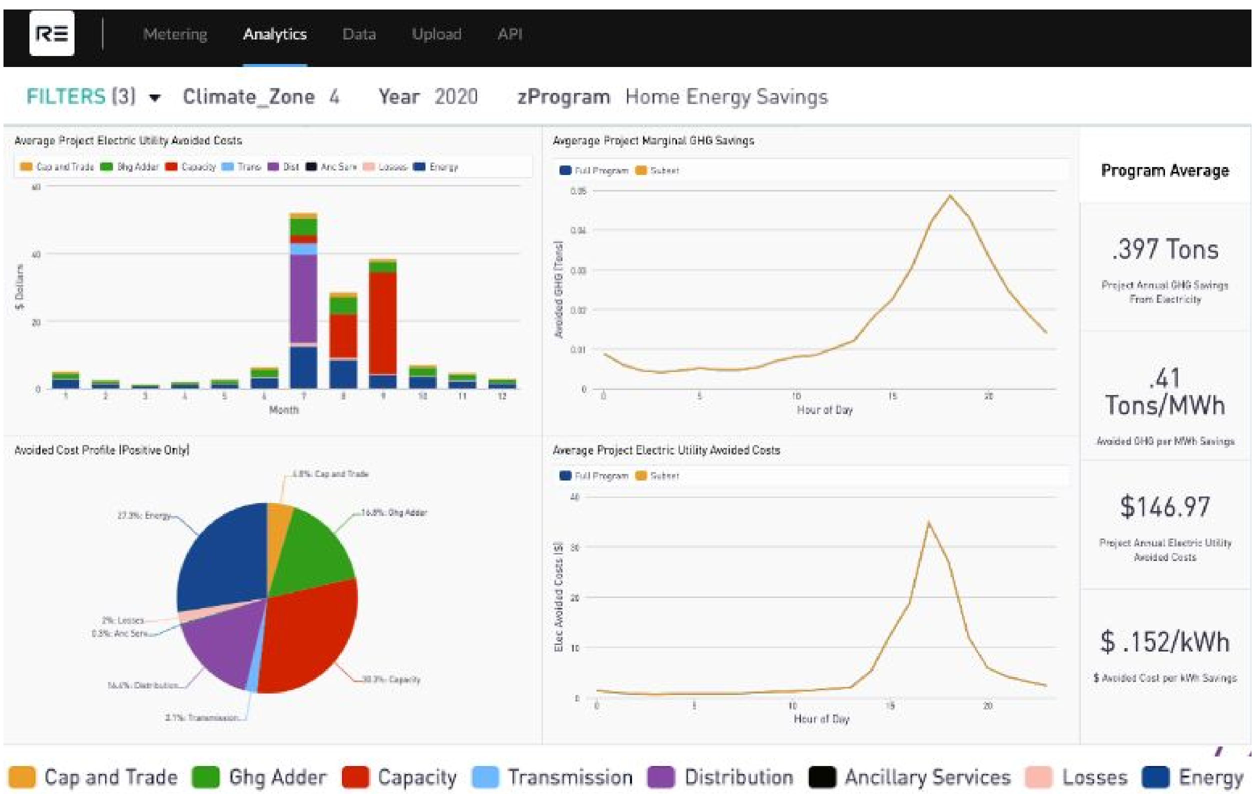
Energy efficiency, demand response, and strategic electrification should all be included in the process of identifying the potential for reduction in GHG based on changes in consumption. This integration is important to ensure that the outcomes are aligned for efficient deployment of these resources. Funds, public and private, must be deployed in a complementary way to reach the desired outcome of a decarbonized grid within the timeframes expected. It is particularly important that strategic electrification is not isolated from the EE and DR potential given its potential to increase load at the "dirtiest" times of the day.

The potential to integrate existing studies (for EE and DR in particular) was evident at the CPUC workshop this fall. The presentation by Andrew Satchwell from LBNL, the well-documented demand response potential study, and the CEC-sponsored analyses of consumption trends shown by Recurve demonstrate these possibilities. The 2021 potential study should have a dedicated track for refining approaches to using hourly consumption data to analyze historic trends and impacts and target future integrated interventions based on consumption patterns and the value of future avoided costs. In particular, multiple recent studies[1] have shown that when programs are targeted at customers who exhibit specific usage characteristics that signal performance potential, savings (and cost-effectiveness) can be significantly improved. The current approach of assessing the average performance of a measure across a population therefore misses cost-effective potential that a program could achieve if focused on the customers most in need of the intervention.

In the 2021 potential analysis, the CPUC should conduct meter-based analysis of load reductions and time-sensitive savings from past programs to inform potential for long-standing programs. While these programs may not fully represent future designs, the scale of impacts at varying times of day are the best available data to inform the potential for demand impacts from demand-side interventions and provide valuable information for identifying targeted potential for the future. To establish an actuarial feedback loop for the future, the CPUC should require (and accommodate in reporting) submission of pre-post meter-based analysis, and actual load shapes (resource curves), for every utility, CCA and REN portfolio. (See the example below, which shows results of CalTRACK hourly measurements of a program's load impacts and the corresponding marginal avoided costs and emissions reductions.)

[1] a.) *Customer Targeting for Residential Energy Efficiency Programs: Enhancing Electricity Savings at the Meter*, A.M. Scheer, S. Borgeson, K. Rosendo, 2017; b.) *Energy Efficiency Program Targeting: Using AMI Data Analysis to Improve At-the-Meter Savings for Small and Medium Businesses*, S. Borgeson, A.M. Scheer, R. Kasman et. al. 2018; c.) *Customer Targeting via Usage Data Analytics to Enhance Metered Savings*, 2018 ACEEE Summer Study, A.M. Scheer, S. Borgeson, R. Kasman et al.


Metering
Analytics
Data
Upload
API
FILTERS (3)
Climate_Zone 4
Year 2020
zProgram Home Energy Savings
Annual Baseline and Reporting Load Shapes
Summer Baseline and Reporting Load Shapes
Winter Baseline and Reporting Load Shapes
Monthly Savings
Program Average
Subset
965 kWh
965 kWh
100%
11 %
11 %
17 %
213 kWh
213 kWh
30 %
Distribution of Annual MWh Savings


Metering
Analytics
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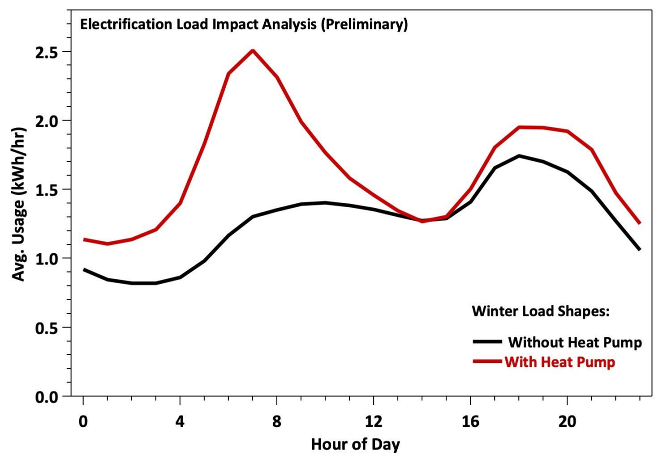
Upload
API
FILTERS (3)
Climate_Zone 4
Year 2020
zProgram Home Energy Savings
Average Project Electric Utility Avoided Costs
Avgerage Project Marginal GHG Savings
Program Average
.397 Tons
.41 Tons/MWh
$146.97
$ .152/kWh
Avoided Cost Profile (Positive Only)
Average Project Electric Utility Avoided Costs
Cap and Trade
Ghg Adder
Capacity
Transmission
Distribution
Ancillary Services
Losses
Energy

The **current construct of technical, economic and achievable potential should be replaced with a minimum demand flexibility procurement requirement** informed by a cross-resource potential analysis. Given that SB100 is riving toward 100 percent renewable grid, the technical potential for demand side resources could be reframed under the construct of a fully decarbonized grid. The Potential study would then identify short, medium, and long-term need for demand flexibility resources to make sufficient progress toward SB 100 targets. In this construct, a minimum procurement requirement could better reflect the practical need and timeline for demand flexibility resources relative to the alternatives for decarbonization. For example, to what degree is demand flexibility a more cost-effective and practical option compared to utility scale solar + storage? This question should be considered in both the short term and long term as demand flexibility will ultimately be required due to technical limitations of utility-scale alternatives.

2. Fuel Substitution

Fuel substitution must be considered in the context of the potential analysis. The new opportunity to put energy efficiency funds to fuel substitution further emphasizes the need to frame potential around GHG potential not just savings. It is also important that the opportunities for fuel switching are synchronized with general building electrification initiatives (BUILD and TECH), as opposed to creating another silo of customer interactions.



Electrification must be paired with effective demand flexibility to manage new system peaks and achieve cost-effective carbon reduction.

Accurately calculating metered reductions in GHGs across all fuels, plus quantification of grid avoided costs supports a common valuation principle that puts gas savings, electrification load impacts, and complementary demand flexibility all on the same footing.

Quantifying both decarbonization and grid avoided cost is essential, as the increased load from electrification will create new grid dynamics such as a winter morning peak and increased evening usage driven by heat pump space heating.

To fully decarbonize the grid, electrification must, therefore, be complemented by an increased supply of wintertime optimized renewables, energy storage, and behind the meter demand flexibility.

Tracking and procurement of demand flexibility at the meter will allow load serving entities and the CPUC to accelerate decarbonization through beneficial electrification combined with the full range of generation, storage, and load-balancing tools required to decarbonize the grid.

Metered pay-for-performance (P4P) is the programmatic mechanism by which load serving entities and the CPUC can cultivate markets, leverage AMI data, and integrate demand-side resources--all foundational elements of an electrification strategy built for long-term success. In short, the Potential and Goals study should contemplate holistic, integrated, performance-based programs (efficiency, demand response, and fuel switching) where metered load impacts and corresponding marginal GHG reduction are the objectiv

3. Data and analysis for RENs and CCAs (including which items are critical to be included in the Potential and Goals Study itself).

The potential study's primary audience should be load serving entities and the state agencies responsible for decarbonization goals. IOUs and CCAs clearly have direct responsibilities as load serving entities, and RENs have overlapping customer-bases for both CCAs and IOUs. Harmonizing operations across these entities requires a common access to data, transparent approaches, and the ability to optimize their own efforts while synchronizing across the jurisdictional boundaries.

The **potential analysis should be accessible to RENs and CCAs (and IOUs) to conduct their own analysis of optimizing potential**. This requires location-specific results for sector and building type bundles. The information should be aligned with the distribution system plans in their areas, and with an intent for opening local procurement opportunities and targeted programs in those locations.

RENs, CCAs, and IOUs should have access to the consumption data in a user friendly manner or analytic platform. This information would be foundational for transparent and data-driven

Business Plans, Budget Advice Letters, and local procurements, as well as the review of these plans by the CPUC and other stakeholders.

4. Industrial and/or agricultural market sector characterization and analysis

No Comment

3. Overall Methodology:
    1. What are the opportunities and challenges of a "top down" assessment of energy efficiency in comparison to the current "bottom up" widget-based approach? Please provide evidence to support your answer.

The "top down" consumption-based analysis is **better aligned with potential expected via SB350 and AB802 calling for normalized metered energy consumption (NMEC)** to guide the portfolios. As the need for integrated solutions becomes more urgent to meet decarbonization goals, the range of measure combinations and innovative market solutions surpass the assessment capabilities of a centralized planning model. Price signals and market-based deployment to capture decarbonization potential is more readily reflected in a top-down analytical framework and coupled with an on-going actuarial feedback loop.

In addition, this approach can **better align with the CEC forecast, which ultimately tracks and forecasts trends in consumption**. When derived from a site-specific calculation and rolled up in aggregate (rather than earlier top down approaches of statewide regression analysis) the outputs can be used in a myriad of planning applications from local procurements to assessing contributions to resource adequacy to the IRP - all with actual consumption data as the foundational analytical input and instrument.

As the range of possible interventions expands to reach the scale needed for decarbonization, a top-down method **provides the necessary simplicity and flexibility to adapt approaches over time**. Cross-jurisdictional synchronization is essential as the breadth of load serving entities expands. Aggregated analysis is compatible with tracking at any given jurisdictional level, down to the site and up to the state - and everywhere in between. This kind of analysis captures the range of possible impacts without overcomplicating the ideation of every technical intervention possible.

The current bottom-up, technology specific approach **is no longer in line with the state objectives to decarbonize or quantify changes in meter-based consumption**. The current approach is limiting opportunities for cross-technology solutions and carbon optimization. It also provides no incentive to market actors to deliver more than the deemed predefined value, even with an ex post savings incentive mechanism for the utilities.

2. If staff were to consider using "top down" methods to assess energy efficiency savings potential, how could the study transition? Please identify areas/topics

> that could be incorporated in the 2021 study and areas/topics that may need further study and data collection.

There are three key elements to transition in the 2021 Potential study:

First - meter everything. Compile all of the hourly historic consumption data for 2019 and 2020 if it is not already available from the demand response potential study. Collaborate with the California Energy Commission to resurrect the 2014-15 analysis/interface for natural changes in energy consumption for year on year for non-participants and update to include hourly analysis capabilities of the OpenEEmeter.

Identify participants in energy efficiency programs and demand response programs in the data set, and also identify customers for IOU, REN and CCA jurisdictions.

Make the analytical tool(s) accessible to all stakeholders with proper screens for data privacy.

Second - integrate analysis of resources. Analyze meter-based past performance of programs, naturally occurring trends in consumption and GHG reductions, and identify the potential for time-valued impacts of energy efficiency and demand response based on current consumption. Use this as the basis for informing updates to the potential analysis.

Design an analysis for demand flexibility potential for carbon redux. It may be reasonable to conduct a demonstration in 2021 with a utility, CCA and REN with overlapping service territories that are already tracking meter-based consumption. Analyze the potential to reduce carbon through demand response, energy efficiency and strategic electrification and allow these entities to utilize the analysis in formulating updates to their business plans.

In addition to the analysis presented by Andrew Satchwell of LBNL at the workshop, two other studies recently released by LBNL on the time value of energy efficiency further illustrate the need for integrated valuation and may offer some interim strategies for integrated analysis.[2]

Third - establish a data feedback loop for future analysis. The CEC is projected to have a consistent flow of statewide AMI data ready for web access by next year. The CPUC can complement this data set by establishing (in collaboration with the CEC) submission of actual load shape changes (or resource curves) by all program administrator portfolios in 2021. These submissions should include impacts from EE, DR and strategic electrification interventions.

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[2] Frick, Natalie Mims, Ian M Hoffman, Charles A Goldman, Greg Leventis, Sean Murphy, and Lisa C Schwartz. ***Peak Demand Impacts From Electricity Efficiency Programs***. 2019. Report PDF

Frick, Natalie Mims, and Lisa C Schwartz. ***Time-Sensitive Value of Efficiency: Use Cases in Electricity Sector Planning and Programs***. 2019. Report PDF

3. Are there process changes or any additional rule-setting the CPUC must consider in order to support this transition?

The primary process change that the CPUC needs to consider is **taking quick action on developing a common valuation framework** for all behind the meter resources. This should not impede the transitions described above. It is essential to harmonize the myriad of policies intended to drive to a decarbonized future into a clear price signal and appropriate procurement mechanisms. California will not achieve our goals through the balkanized silos of our historic efforts.

A related process change would be to **recalibrate program administrator business plans for carbon optimization rather than cost-effective energy savings defined by the total resource cost test**. More incremental adjustments could include shifting to the program administrator cost test to better align the resources with their grid value and not penalize co-investments by participants or other entities.[3] It is imperative that the Commission modify its approaches to cost-effectiveness to enable market-based programs that can drive the necessary scale of investment needed to decarbonize the grid.

In addition, **moving to a meter-based paradigm** (and opening reporting opportunities for actual load shapes) will help reduce uncertainty from DEER load shapes in determining cost effectiveness. Based on Recurve internal analysis, using the DEER Res AC load shape, and 2025 avoided cost projections for Climate Zone 4 as a basis, shifting the hour by - 1 would reduce total avoided costs by -19%; but shifting the hour +1 would increase the avoided costs by + 7%. This high degree of sensitivity illustrates the uncertainty in using DEER load profiles and the need to report actual 8760 metered results. In addition, this analysis demonstrates the need for the Potential and Goals study to contemplate demand response and load shifting strategies as critical elements that energy efficiency programs must deploy in order to achieve cost-effectiveness, maximize grid value and achieve decarbonization targets.

4. Please identify any specific data sources that should be considered for incorporation into future potential and goals studies, and explain the value of incorporating each data source, either in addition to or as a replacement to an existing data source.

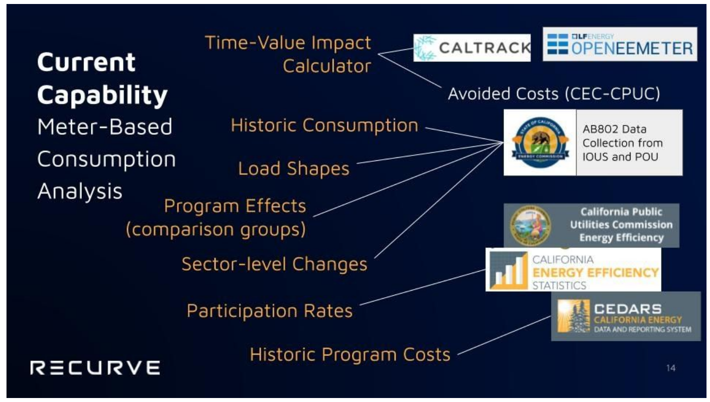
Most of the data sources that are needed to incorporate into the future potential and goals study are available but need to be integrated into the analysis:

- **Historic consumption data and program data** (CPUC/IOU); allows for tracking of naturally occurring changes in consumption as well as the meter-based influence of

[3] *Rethinking Cost Effectiveness to Meet the Needs of the Modern Grid*, https://www.recurve.com/blog/rethinking-cost-effectiveness-to-meet-the-needs-of-the-modern-grid

discrete interventions/programs that can start forming actuarial feedback loops to improve performance and target interventions.

- **Distribution resource plan data** (CPUC/IOU) supports targeting potential to constrained areas and include location appropriate value (if not already included in avoided cost calculators) to identify highest value economic potential.



- **Building Type / Geographic bundles:** Identifiers by zip code, service territory, NAICs, building type, rate class, program administrator eligible participant will help disaggregate the potential analysis to make it most useful to load serving entities to incorporate demand flexibility resource into their plans.

The following table provides an overview of the basic information "trade" that an alternative potential analysis would have compared to the current approach:

Status Quo:	**Market Optimized**
Measure-based choice analysis Technology adoption costs - driver - Savings goals - Measure-based - Portfolio default	Actuarial consumption analysis Marginal price of avoided alternative + Carbon goal + Meter-based / TSV + Procurement default
INPUTS: Cost-effectiveness Calculator Technology Adoption Rates DEER Work Papers Incremental Cost Participation Rates	INPUTS: Time-Valued Savings Calculator Load Shapes Program Effects Historic Consumption Sector-level Changes in consumption Historic Program Costs Participation Rates

4. Energy Efficiency – Integrated Resource Planning Incorporation Opportunities:
    1. Should staff consider optimization of energy efficiency in the Integrated Resources Planning (IRP) process in the 2021 Potential and Goals study? If yes, how? If not, why not?

With a valuation framework that is not rooted in the TRC, but instead allows program administrators and implementers to engage markets and leverage private capital, we strongly support inclusion of resource acquisition energy efficiency in the IRP planning process. The adjustments necessary for the common valuation across resources and an integrated meter-based potential analysis should be a top priority to enable inclusion as soon as possible.

2. The EE-IRP Staff Whitepaper identified areas where process modifications and further rule development may be necessary for optimization of energy efficiency in the IRP. Do you agree with staff's proposal? Why or why not?

RECURVE, formerly OpenEE, submitted detailed comments on the staff proposal in 2018 along with many other stakeholders. Our positions on the staff white paper have not changed. We agree with the staff proposal to integrate the potential analysis with the IRP as well as the need to separate the portfolio into the resource acquisition portions that are appropriate for the IRP from the many other objectives of the current energy efficiency portfolio.

3. What role should IRP optimization of energy efficiency resources play in the development of the Study and energy efficiency goal setting?

The **IRP optimization of demand flexibility resources, including energy efficiency, should be central to the potential study** and the deployment of resources by load serving entities to use demand flexibility as a true resource. This is a key pathway to scale demand flexibility as a meaningful resource, not a siloed effort with constrained funding and siloed implementation.

The primary objective for the potential study should be to identify potential for carbon optimization through demand flexibility to inform the IRP, IEPR (addressing both demand reductions and resource adequacy opportunities). This potential should be used to drive local procurements by identifying the least-cost opportunities for decarbonization at the margin.

5. The Evolving Energy Efficiency Portfolio:
    1. What policy-level changes (if any) should the CPUC begin to consider related to energy efficiency goal setting, to best align energy efficiency programs with the needs of California's clean energy future?

The Commission should pursue new comprehensive performance based regulations to recalibrate the myriad of policies toward tangible, traceable outcomes and enable harmonization of resources to decarbonize through market signals and engagement. Three key policy changes enable this transition:

1. Establishment of a **common valuation structure** that encourages private clean energy investment and allows for comparison of resources and integrated delivery solutions (discussed above).

2. An i**ntegrated approach for establishing potential** for demand flexibility (also discussed above).

3. **Integration of the incentives and targets around GHG reductions**. By returning to a model in which program administrators (utilities, CCAs and RENs) propose their own goals for optimizing GHG reductions. Their incentives for delivering would be based on the scale of reductions they can achieve and the associated marginal cost. The incentive structures could be incorporated into the general rate case as performance-based metrics or in the interim to modify the Energy Savings Performance Incentive structure to focus on these metrics.

Demand flexibility needs to be the focus for load serving entities to optimize their resources around decarbonization. California has too many silos for delivery that are already coming into conflict or operating at cross-purposes. We risk wasting significant amounts of ratepayer and other resources if the delivery mechanisms are not simplified and synchronized. Data infrastructure and analysis should be grounded in opportunities for changes in normalized metered energy consumption (NMEC).

2. What processes should the CPUC use to explore these changes?

The CPUC should put **common valuation on a fast track** in the IDER proceeding to have a meaningful comparison across resources that can also be used in the IRP and IPER. Workshops or staff white papers to explore alternatives could be a first step.

Integrated potential for all resources can begin in the 2021 Potential analysis with a dedicated track to consider methods for combined potential for energy efficiency and demand response. Include strategic electrification potential (via BUILD and TECH) in the potential analysis alongside EE and DR.

A re-assessment of **performance based regulations to harmonize all proceedings** may require legislation or higher level Commission action. In lieu of that longer term request, the CPUC could re-open the Energy Savings Performance Incentive structure (ESPI). The Commission could include a carbon intensity "kicker" in the incentive mechanism and simplify or remove other metrics that are focused on individual technology deployment. Greater incentives should be provided for the achievement of maximum potential, incorporating time-sensitive meter-based tracking (to support feedback loops), and demonstrating grid value.

6. What other topics related to the Potential and Goals Study need consideration leading to the 2021 P&G Study, aside from those discussed at the October workshop and in the

Navigant abstracts? Would you prioritize those topics above those discussed at the workshop? If yes, why?

Integration of BUILD and TECH in the potential analysis should be discussed and should be prioritized as part of a holistic potential analysis for decarbonization.

The Potential and Goals Study should also **address the urgency of inter-agency collaboration** among the CPUC, CEC, CAISO and CARB to develop a potential analysis that clearly integrates into forecasting, planning, resource adequacy, and decarbonization.

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https://www.recurve.com/blog/rethinking-cost-effectiveness-to-meet-the-needs-of-the-modern-grid

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Frick, Natalie Mims, and Lisa C Schwartz. ***Time-Sensitive Value of Efficiency: Use Cases in Electricity Sector Planning and Programs***. 2019.   Report PDF

Customer Targeting for Residential Energy Efficiency Programs: Enhancing Electricity Savings at the Meter, A.M. Scheer, S. Borgeson, K. Rosendo, 2017;

Energy Efficiency Program Targeting: Using AMI Data Analysis to Improve At-the-Meter Savings for Small and Medium Businesses, S. Borgeson, A.M. Scheer, R. Kasman et. al. 2018;

Customer Targeting via Usage Data Analytics to Enhance Metered Savings, 2018 ACEEE Summer Study, A.M. Scheer, S. Borgeson, R. Kasman et al.

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SHAPE THE FUTURE OF ENERGY

Demand Flexibility as a Resource

Rethinking Goals & Potential
CPUC Presentation September 2020

Carmen Best
carmen@recurve.com

The Grid Has Changed

New Problems Require New Solutions

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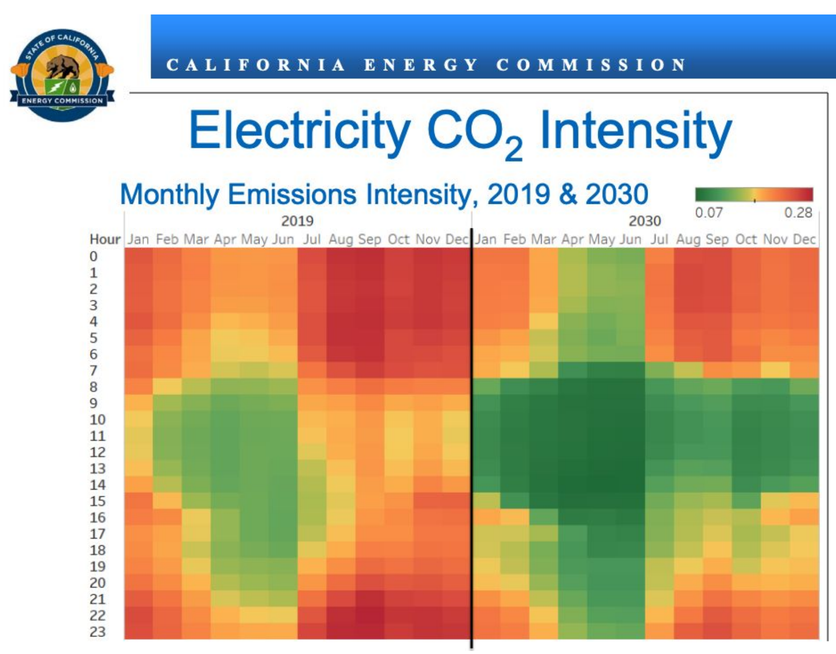
California has constructed a crazy quilt of policies:

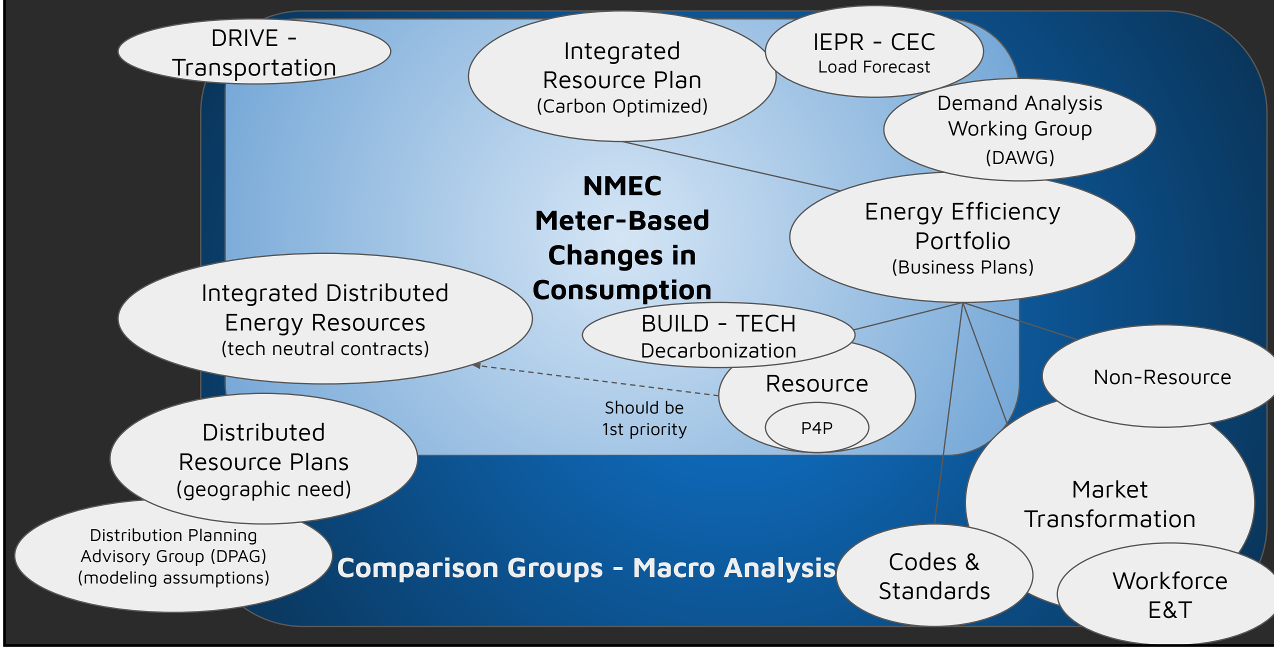
Time to Reconcile

Our Goal is Decarbonization:

Hourly Data Enables Tracking of Carbon Reductions



Meter-Based Quantification Ties it All Together



Load Shapes & Avoided Cost

Valuing the right things at the right time

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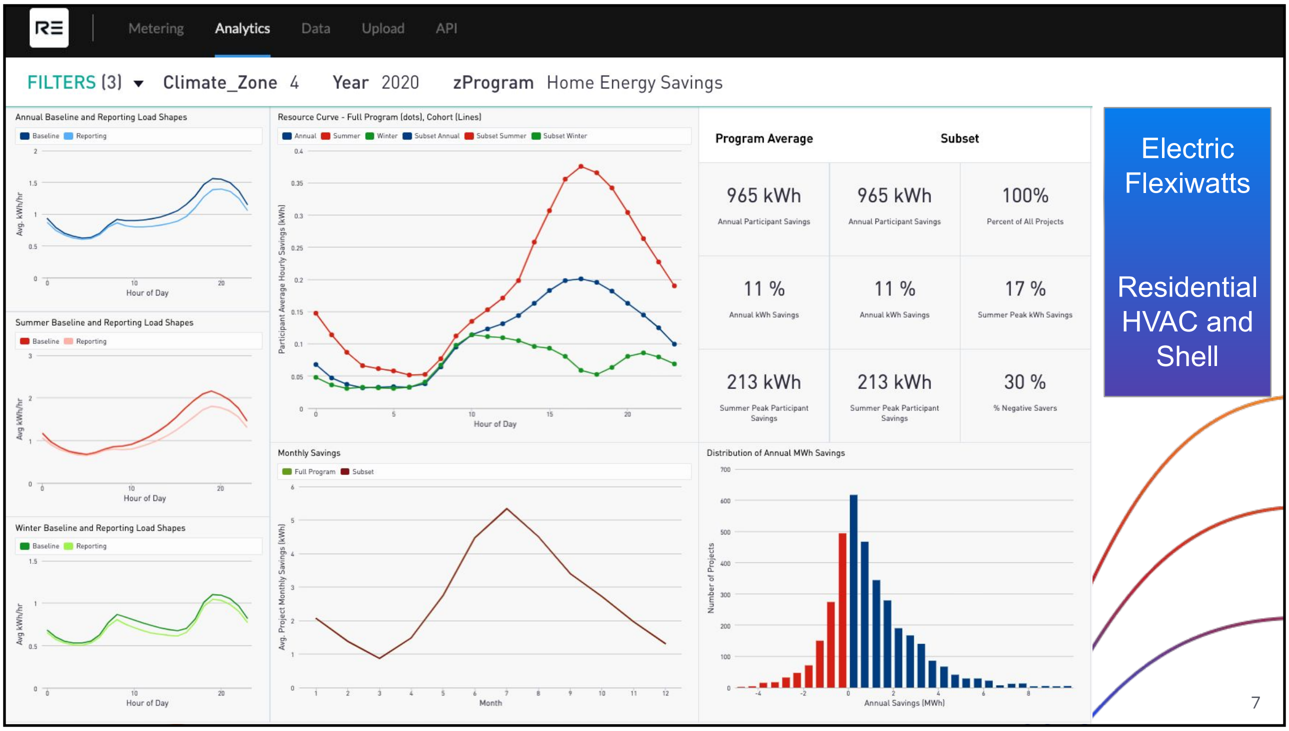
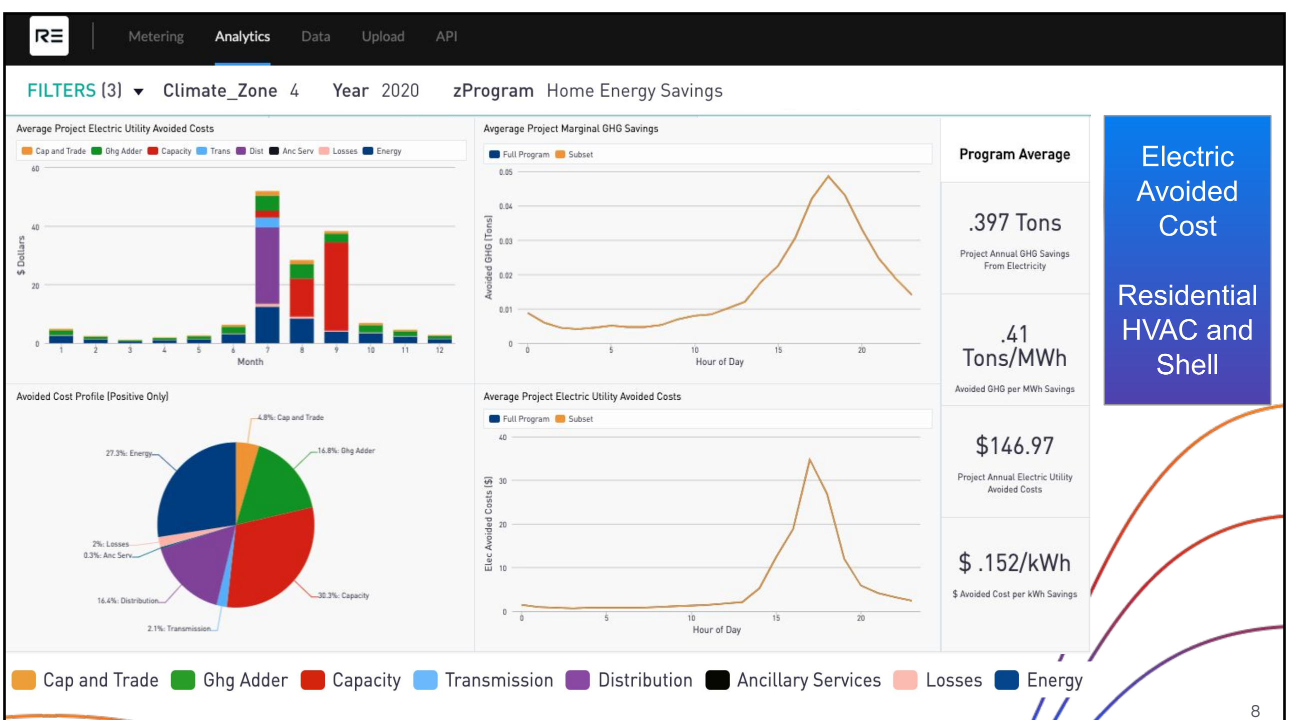
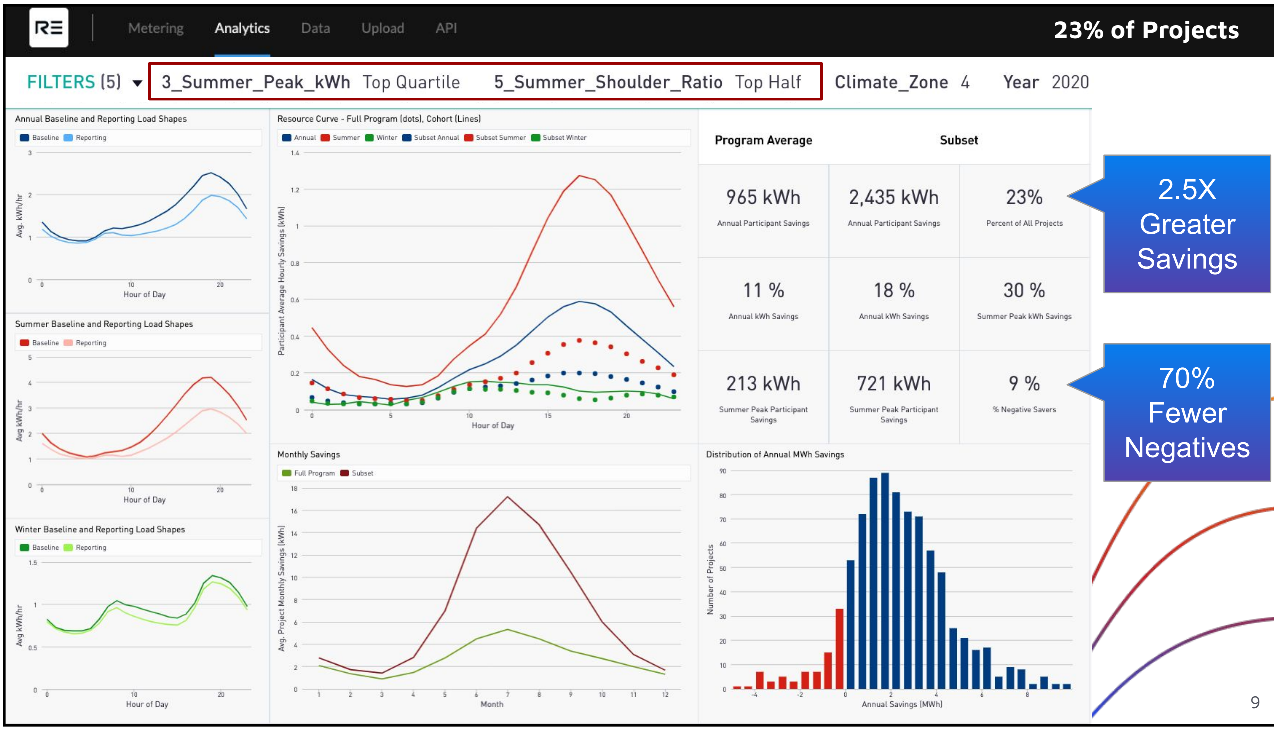
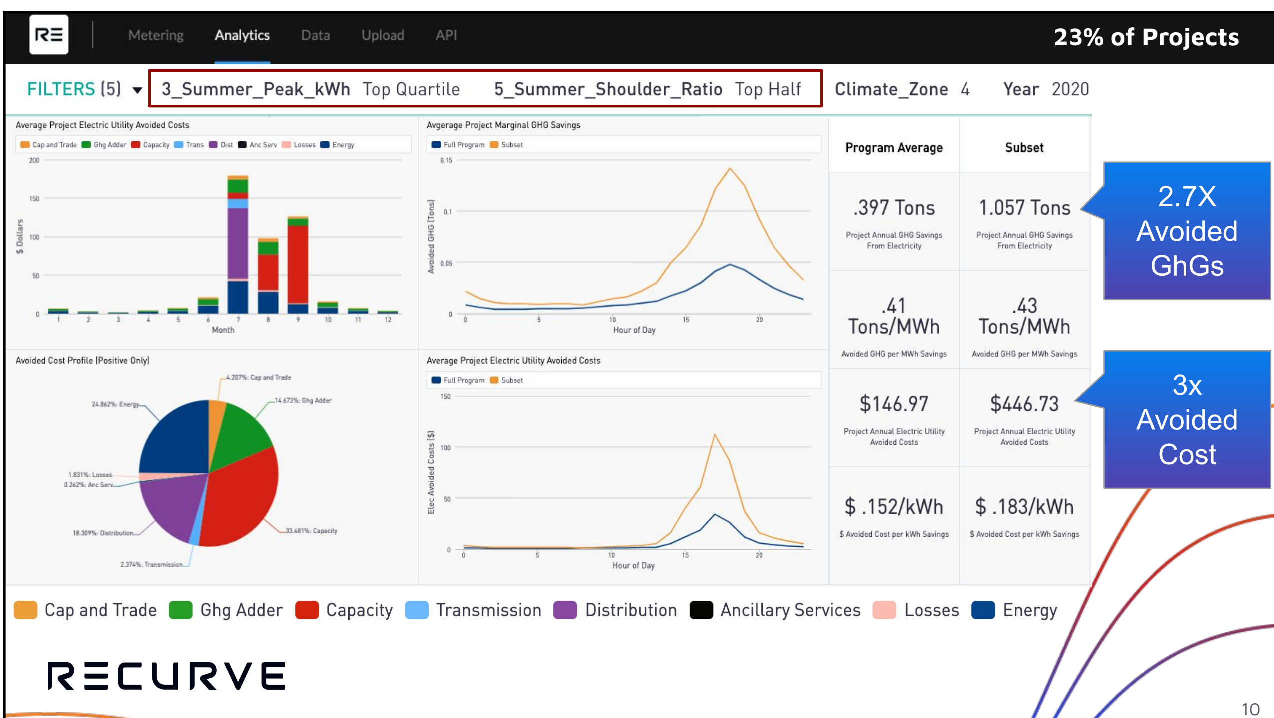


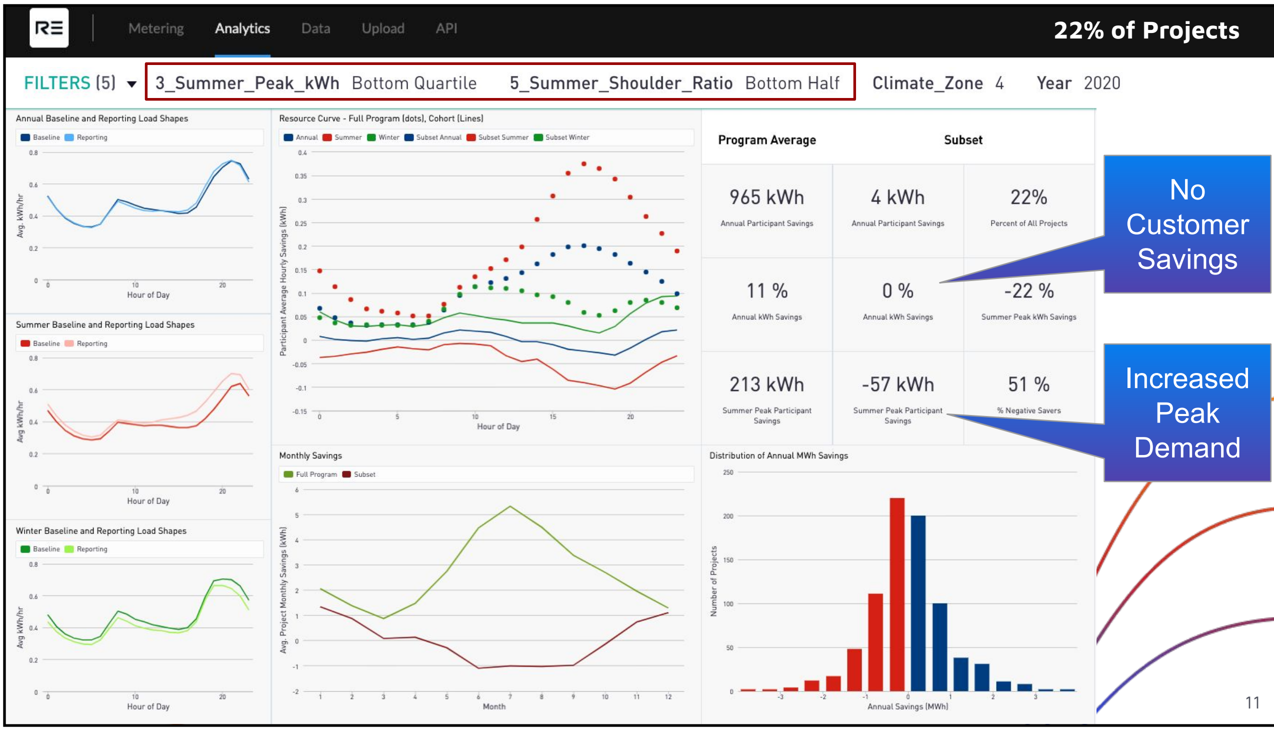
RE
Metering
Analytics
Data
Upload
API
FILTERS (3)
Climate_Zone 4
Year 2020
zProgram Home Energy Savings
Annual Baseline and Reporting Load Shapes
Baseline
Reporting
Avg. kWh/hr
Hour of Day
Summer Baseline and Reporting Load Shapes
Winter Baseline and Reporting Load Shapes
Resource Curve - Full Program (dots), Cohort (lines)
Annual
Summer
Winter
Subset Annual
Subset Summer
Subset Winter
Participant Average Hourly Savings (kWh)
Program Average
Subset
965 kWh
Annual Participant Savings
965 kWh
Annual Participant Savings
100%
Percent of All Projects
11 %
Annual kWh Savings
11 %
Annual kWh Savings
17 %
Summer Peak kWh Savings
213 kWh
Summer Peak Participant Savings
213 kWh
Summer Peak Participant Savings
30 %
% Negative Savers
Monthly Savings
Full Program
Subset
Avg. Project Monthly Savings (kWh)
Month
Distribution of Annual MWh Savings
Number of Projects
Annual Savings (MWh)
Electric Flexiwatts
Residential HVAC and Shell
7



RE
Metering
Analytics
Data
Upload
API
FILTERS (3)
Climate_Zone 4
Year 2020
zProgram Home Energy Savings
Average Project Electric Utility Avoided Costs
Cap and Trade
Ghg Adder
Capacity
Trans
Dist
Anc Serv
Losses
Energy
$ Dollars
Month
Avgerage Project Marginal GHG Savings
Full Program
Subset
Avoided GHG (Tons)
Hour of Day
Program Average
.397 Tons
Project Annual GHG Savings From Electricity
.41 Tons/MWh
Avoided GHG per MWh Savings
$146.97
Project Annual Electric Utility Avoided Costs
$ .152/kWh
$ Avoided Cost per kWh Savings
Avoided Cost Profile (Positive Only)
4.8%: Cap and Trade
16.8%: Ghg Adder
27.3%: Energy
2%: Losses
0.3%: Anc Serv
16.4%: Distribution
2.1%: Transmission
30.3%: Capacity
Average Project Electric Utility Avoided Costs
Elec Avoided Costs ($)
Hour of Day
Cap and Trade
Ghg Adder
Capacity
Transmission
Distribution
Ancillary Services
Losses
Energy
Electric Avoided Cost
Residential HVAC and Shell
8


Metering
Analytics
Data
Upload
API
23% of Projects
FILTERS (5)
3_Summer_Peak_kWh Top Quartile
5_Summer_Shoulder_Ratio Top Half
Climate_Zone 4
Year 2020
Annual Baseline and Reporting Load Shapes
Resource Curve - Full Program (dots), Cohort (Lines)
Program Average
Subset
965 kWh
Annual Participant Savings
2,435 kWh
Annual Participant Savings
23%
Percent of All Projects
11 %
Annual kWh Savings
18 %
Annual kWh Savings
30 %
Summer Peak kWh Savings
213 kWh
Summer Peak Participant Savings
721 kWh
Summer Peak Participant Savings
9 %
% Negative Savers
Summer Baseline and Reporting Load Shapes
Winter Baseline and Reporting Load Shapes
Monthly Savings
Distribution of Annual MWh Savings
2.5X Greater Savings
70% Fewer Negatives
9


Metering
Analytics
Data
Upload
API
23% of Projects
FILTERS (5)
3_Summer_Peak_kWh Top Quartile
5_Summer_Shoulder_Ratio Top Half
Climate_Zone 4
Year 2020
Average Project Electric Utility Avoided Costs
Avgerage Project Marginal GHG Savings
Program Average
Subset
.397 Tons
Project Annual GHG Savings From Electricity
1.057 Tons
Project Annual GHG Savings From Electricity
.41 Tons/MWh
Avoided GHG per MWh Savings
.43 Tons/MWh
Avoided GHG per MWh Savings
$146.97
Project Annual Electric Utility Avoided Costs
$446.73
Project Annual Electric Utility Avoided Costs
$ .152/kWh
$ Avoided Cost per kWh Savings
$ .183/kWh
$ Avoided Cost per kWh Savings
Avoided Cost Profile (Positive Only)
Average Project Electric Utility Avoided Costs
2.7X Avoided GhGs
3x Avoided Cost
Cap and Trade
Ghg Adder
Capacity
Transmission
Distribution
Ancillary Services
Losses
Energy
RECURVE
10



Actuarial Consumption Analysis

Liberate Potential to Reflect Carbon and Avoided Cost Optimization

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Current Capability

Meter-Based Consumption Analysis

Time-Value Impact Calculator

CALTRACK

LF ENERGY OPENEEMETER

Avoided Costs (CEC-CPUC)

Historic Consumption

Load Shapes

AB802 Data Collection from IOUS and POU

Program Effects (comparison groups)

California Public Utilities Commission Energy Efficiency

Sector-level Changes

CALIFORNIA ENERGY EFFICIENCY STATISTICS

Participation Rates

CEDARS CALIFORNIA ENERGY DATA AND REPORTING SYSTEM

Historic Program Costs

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Meter Everything

CEC Consumption Analysis Video

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Market-Based
Behind the Meter
Demand Flexibility

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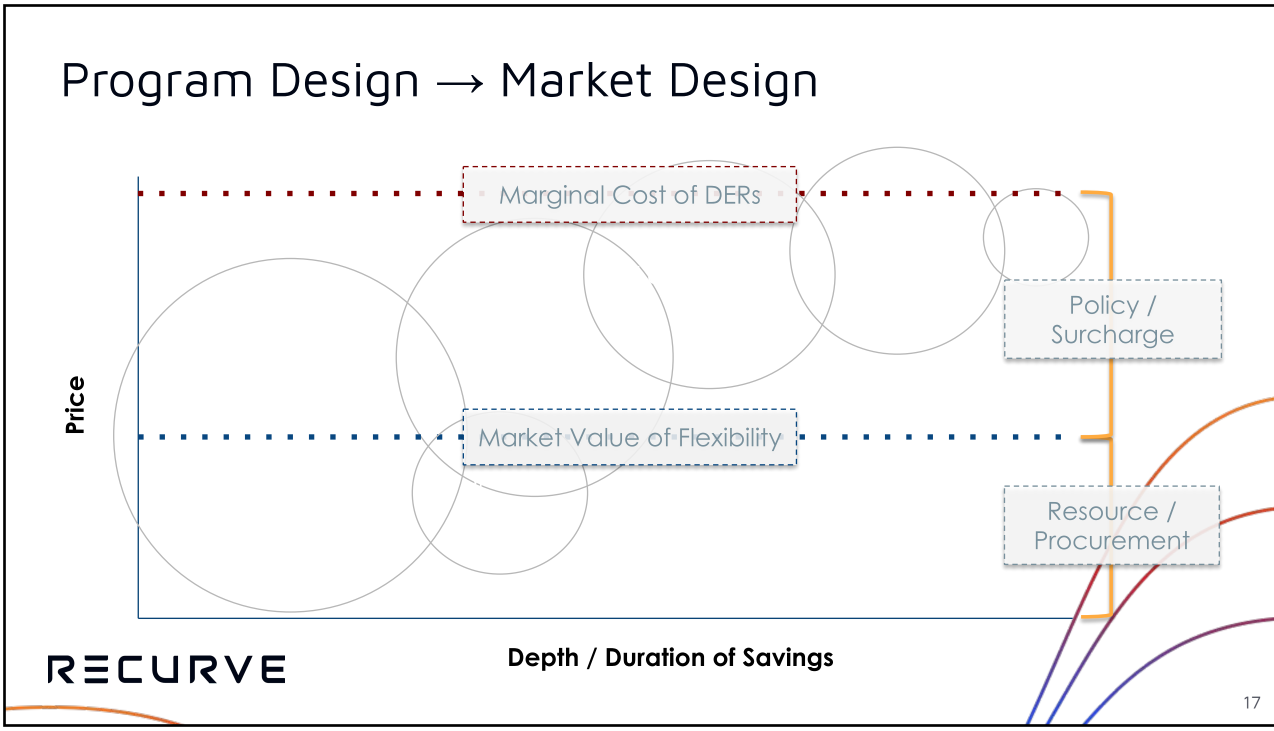

Program Design → Market Design
Marginal Cost of DERs
Policy / Surcharge
Market Value of Flexibility
Resource / Procurement
Price
Depth / Duration of Savings
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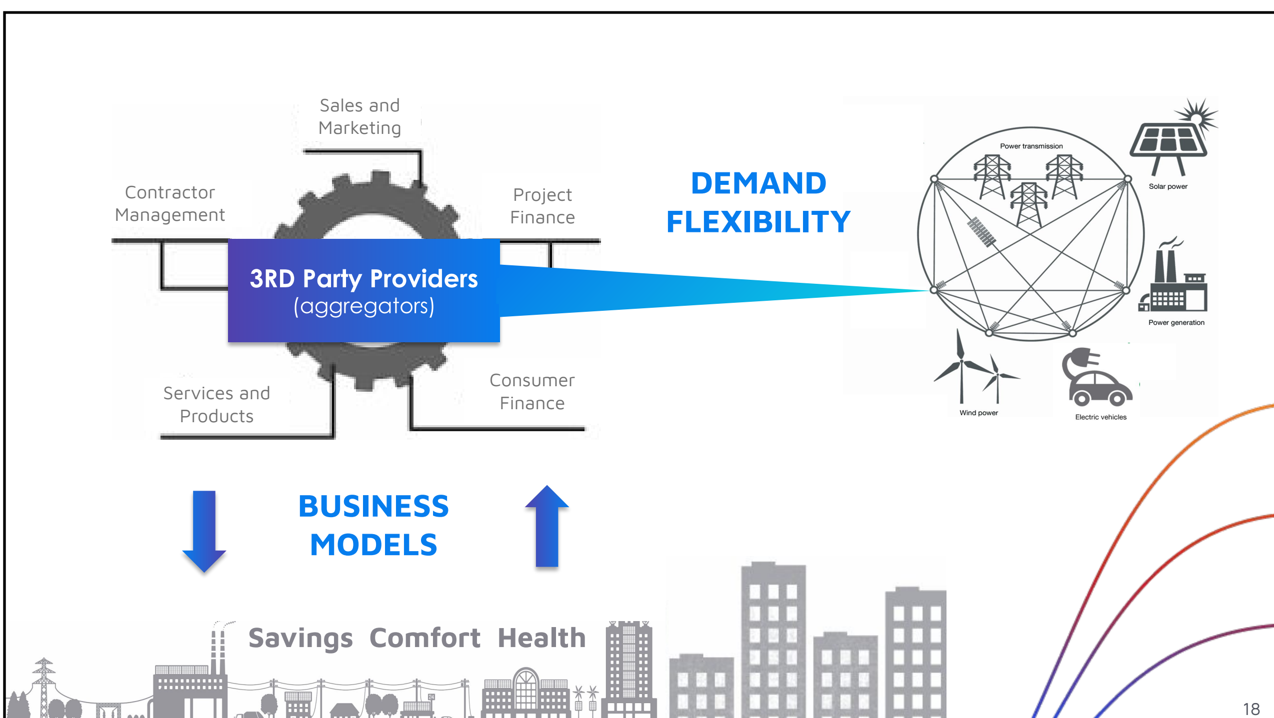
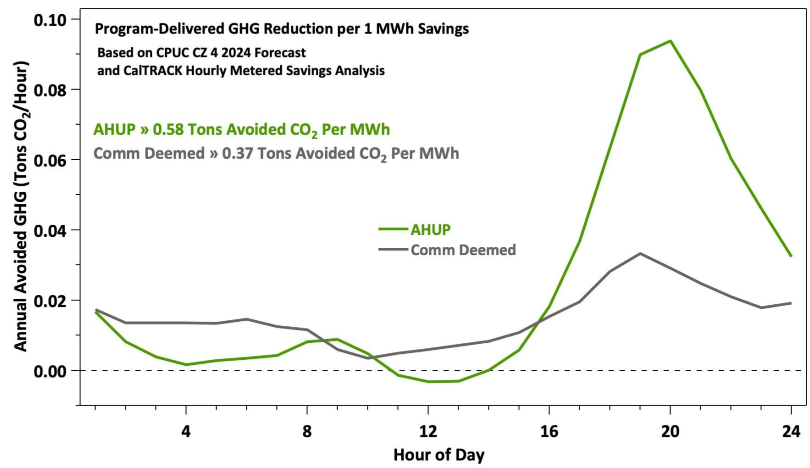
17



Sales and Marketing
Contractor Management
Project Finance
3RD Party Providers
(aggregators)
Services and Products
Consumer Finance
DEMAND FLEXIBILITY
Power transmission
Solar power
Power generation
Wind power
Electric vehicles
BUSINESS MODELS
Savings Comfort Health
18

The day of KWH averages is officially over in California

AHUP Delivers 59% More Avoided CO_2 Per MWH



No Regrets Next Steps

1. **CPUC** - Fast track Common Valuation Structure for DERs
2. **Program Administrators** - Optimize programs and plans around time valuation to improve CE
3. **CPUC** - Include actual load shapes as part of reporting
4. **CPUC & CEC** - coordinate on shared data resource to include consumption analysis in 2021 potential study.

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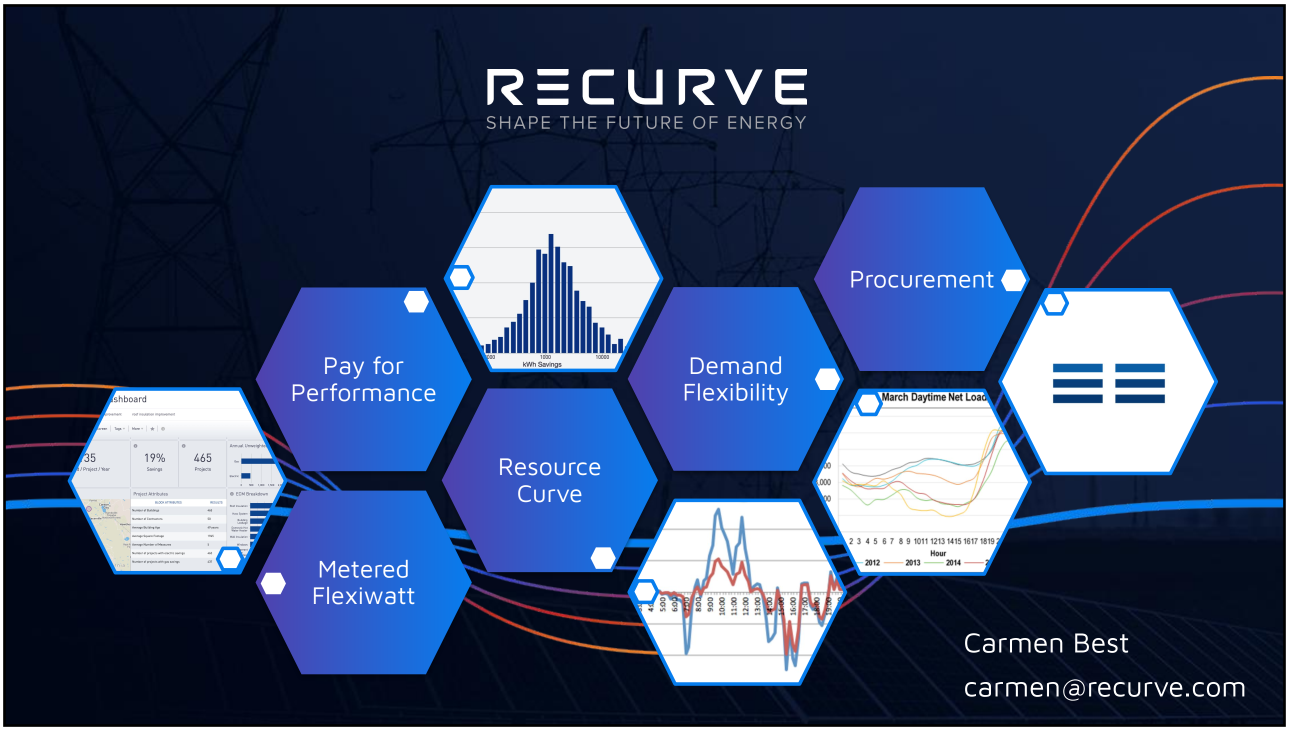

Appendix

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Appendix - Cost Effectiveness

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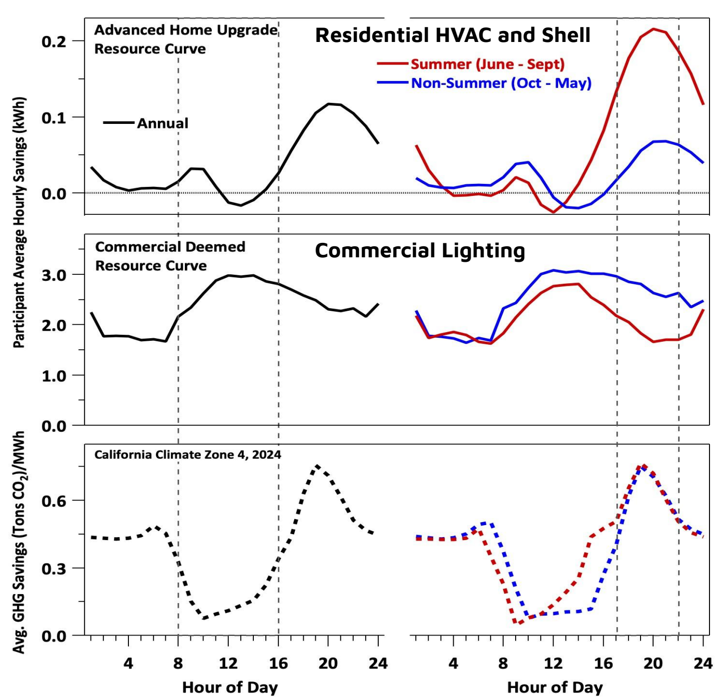
Not All Energy Efficiency is of Equal Carbon Value



RE

Myth: The Total Resource Cost Test is a Comprehensive, Balanced Test

Two Residential Programs in PG&E's 2017 Portfolio[1]:

Program	$ Net Private Invest. per $ Program Spend	$ Benefits* per $ Program Spend
A	$2.85	$1.56
B	$0.03	$0.68

*Utility Avoided Costs

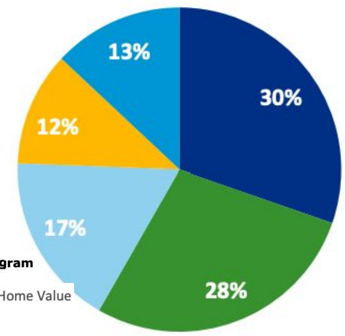


Figure 5-15. Point allocation for benefits experienced on the HUP/AHUP program

■ Increase Comfort ■ Reduce Bill ■ Save Energy ■ Help Environment ■ Home Value

Impact Evaluation Report: Home Upgrade Program – Residential Program Year 2017, DNV GL, 2019.

Which program is more cost-effective?

A = Advanced Home Upgrade
B = Residential Energy Fitness
[1]Data from PG&E's 2017 CEDARS Annual Filing

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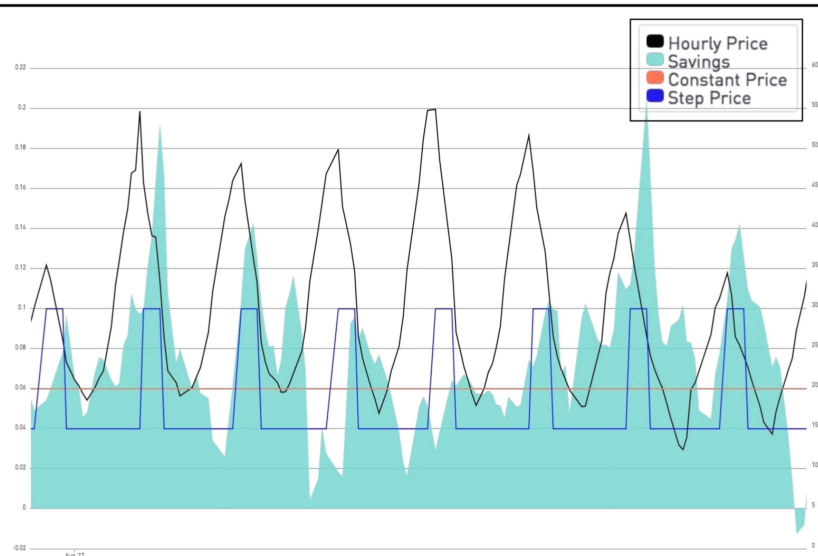
Paying for Performance When it Matters Most



- Savings Purchase Agreement (SPA)
- 3x Kicker for summer savings from 4pm to 9pm
- Payments based on CalTRACK / OpenEEmeter

Appendix - Data Systems and Feedback Designed for the Future

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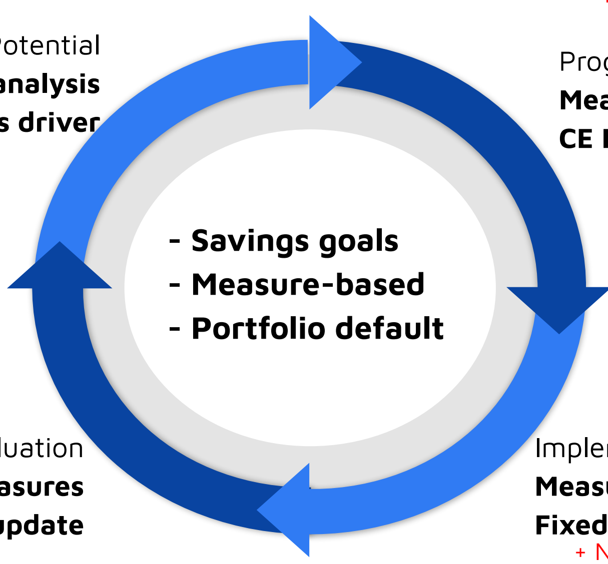
Efficiency Feedback loop - Status Quo

+SB350 tweeks are not enough

Goals & Potential
Measure based analysis
Technology costs driver

Program / Business Plans
Measure Based Programs
CE Portfolio optimization

+ Meter-based
+ Pay for Performance
+ Third party %



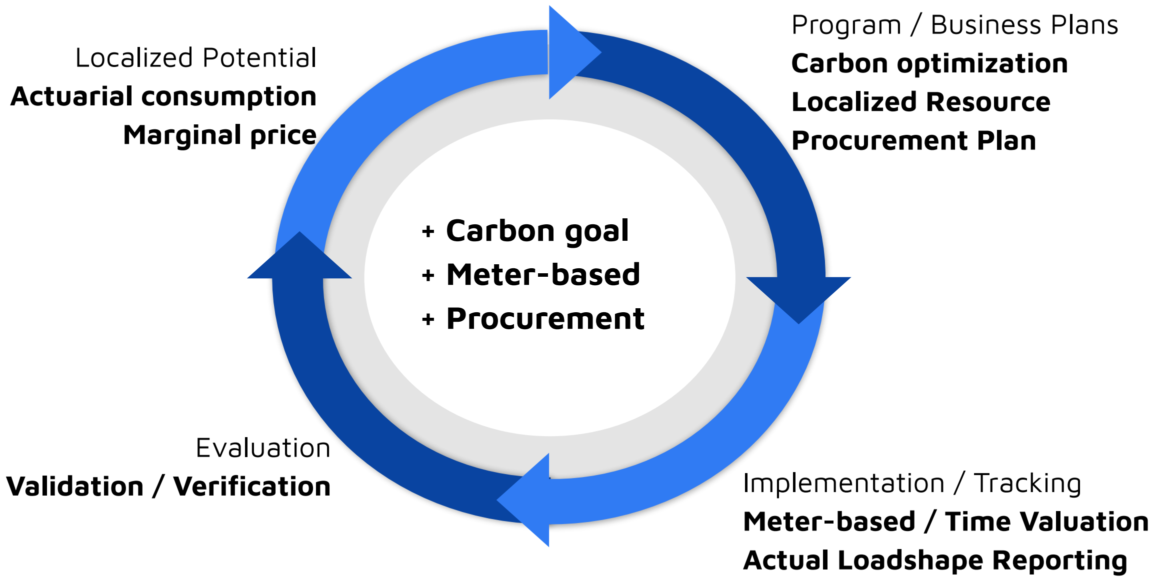
Evaluation
High impact measures
Deemed estimate update

+ Holistic analysis
+ Faster turn around

Implementation / Tracking
Measure based deployment
Fixed Loadshape

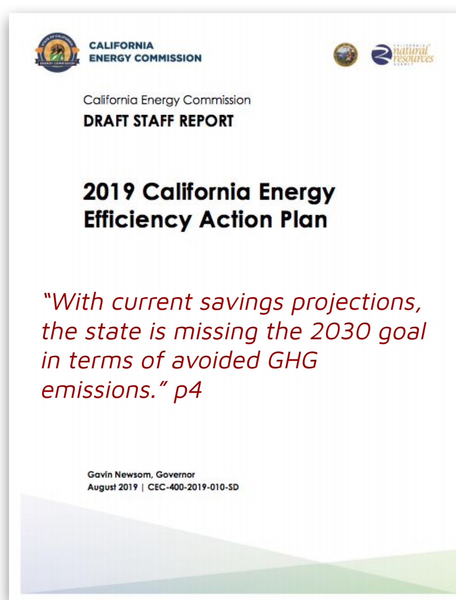
+ Non-Utility programs
+ Decarbonization
+ Market transformation

Efficiency Feedback loop - Reinvisioned



2019 Energy Efficiency Plan - Doubling Efficiency

- "Develop hourly and locational aggregated energy consumption **datasets**"
- "Develop hourly energy efficiency savings estimates from interval meter data to **verify and forecast SB350** targets."
- "State agencies should **collaborate**...data analytics, warehouses, modeling methods, etc."
- "develop ability to incorporate **aggregations** of energy efficiency and demand response programs into **long term planning**"
- "incorporate **meter-based analysis** into potential studies to identify cost effective savings potential."



CALIFORNIA ENERGY COMMISSION

California Energy Commission
DRAFT STAFF REPORT

2019 California Energy Efficiency Action Plan

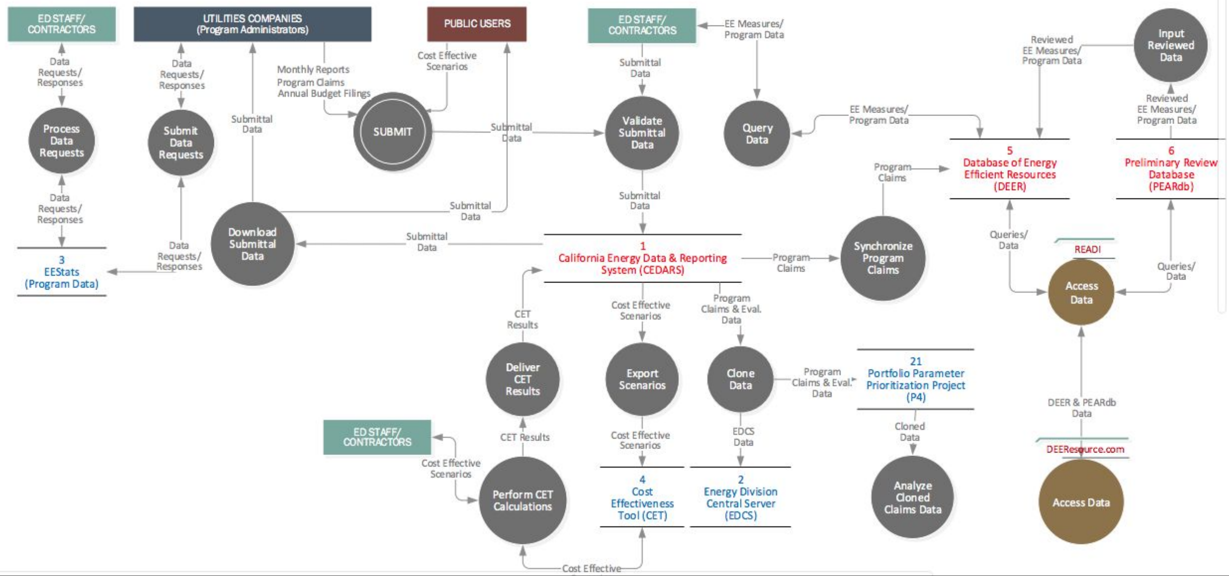
"With current savings projections, the state is missing the 2030 goal in terms of avoided GHG emissions." p4

Gavin Newsom, Governor
August 2019 | CEC-400-2019-010-SD

https://ww2.energy.ca.gov/2019_energypolicy/documents/#08272019

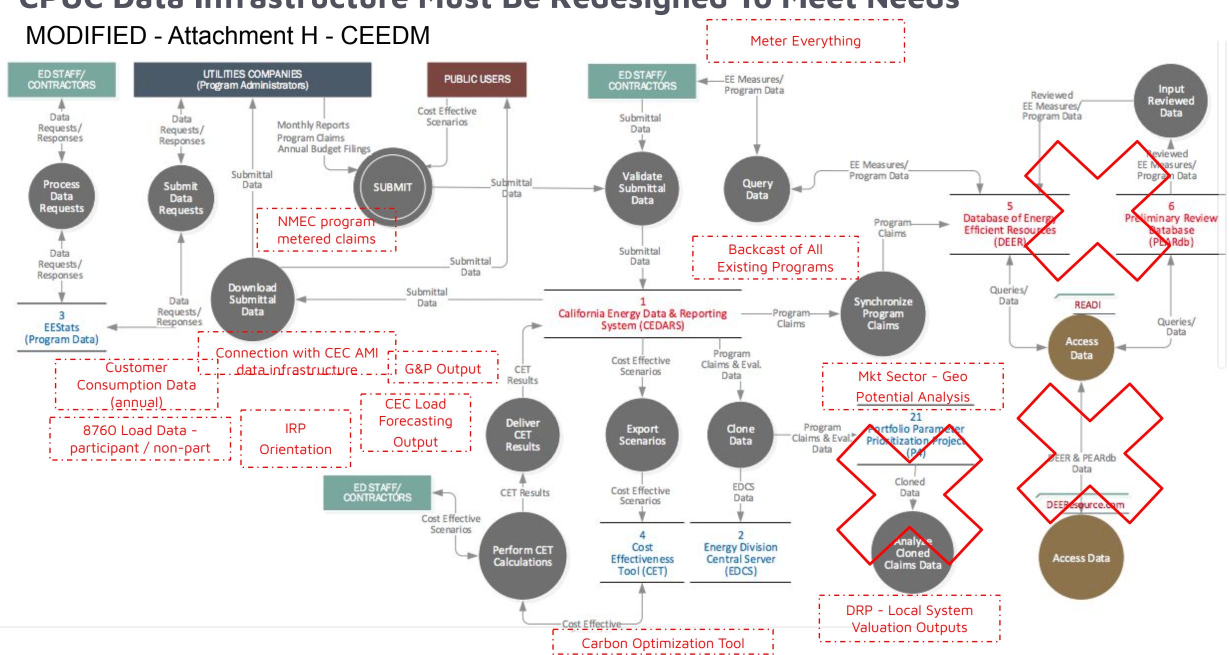
CPUC Data Infrastructure Must Be Redesigned To Meet Needs

Attachment H - CEEDM https://drive.google.com/drive/folders/18mOFz0Na51hlQw0TVcFuTJ9O9xQ8_nOJ



CPUC Data Infrastructure Must Be Redesigned To Meet Needs

MODIFIED - Attachment H - CEEDM



Appendix - Consistent Standard for Potential Analysis

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One of These Things is Not Like the Other…

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Markets Need Standard Weights and Measures

CALTRACK

- Hourly Standard M&V Methods
- Monthly, Daily, and Hourly
- Public Stakeholders Empirical Process
- www.CalTRACK.org

LF ENERGY OPENEEMETER

- Python CalTRACK Engine
- Open Source Apache 2.0
- How It Works: https://goo.gl/mhny2s
- Code Repo: https://goo.gl/qFdW4P

LF ENERGY

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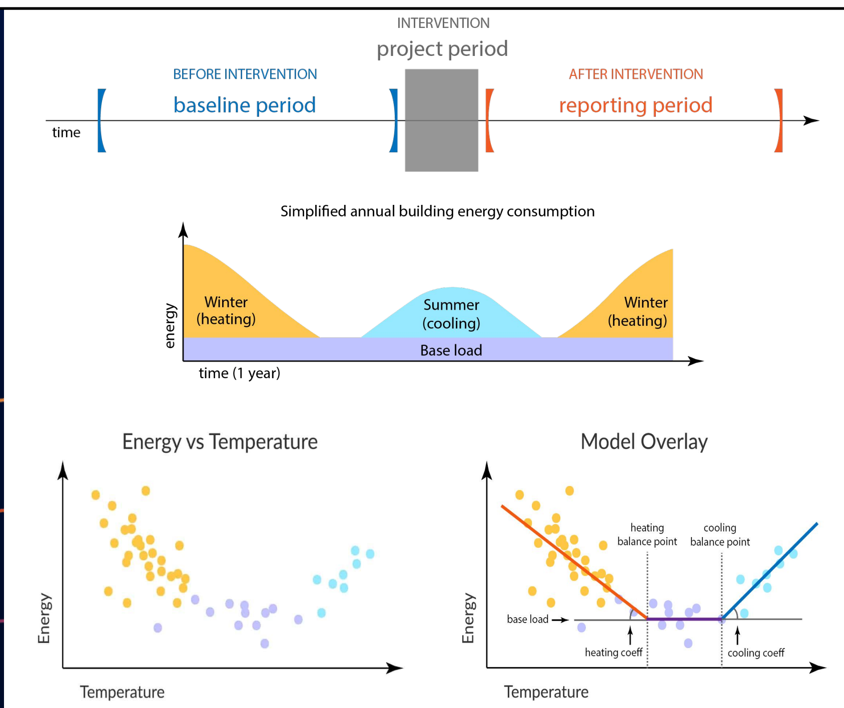
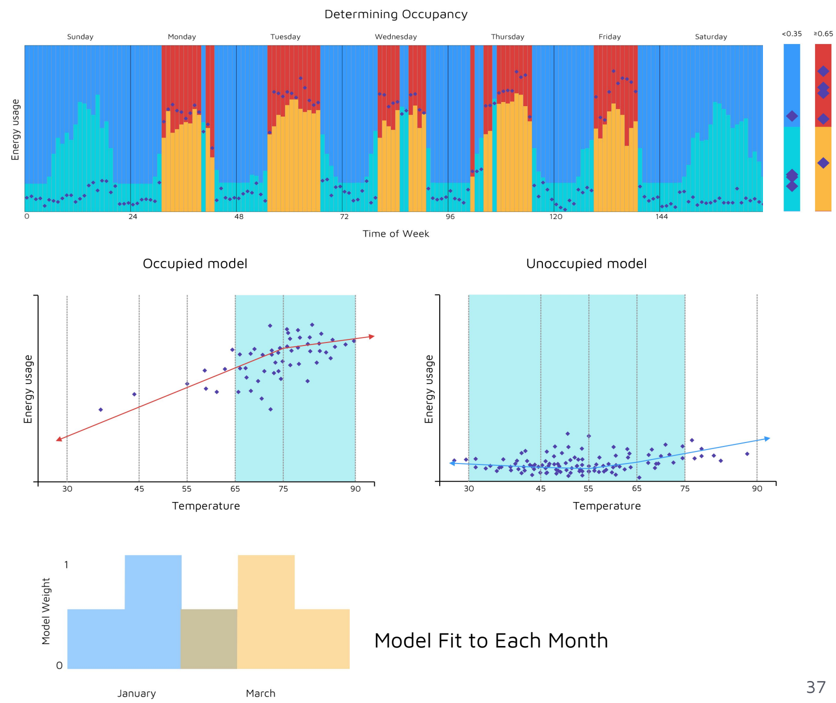
CalTRACK Monthly Model

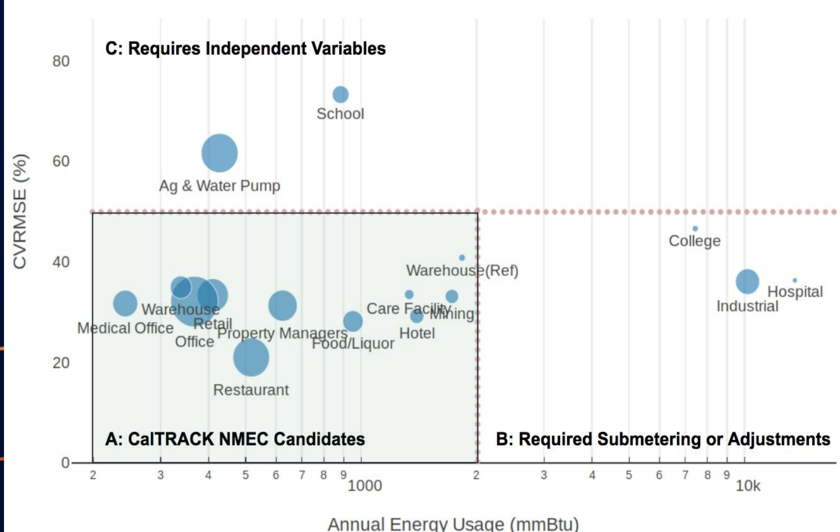


RE

CalTRACK Hourly Time of Week Temperature (TOWT) Model

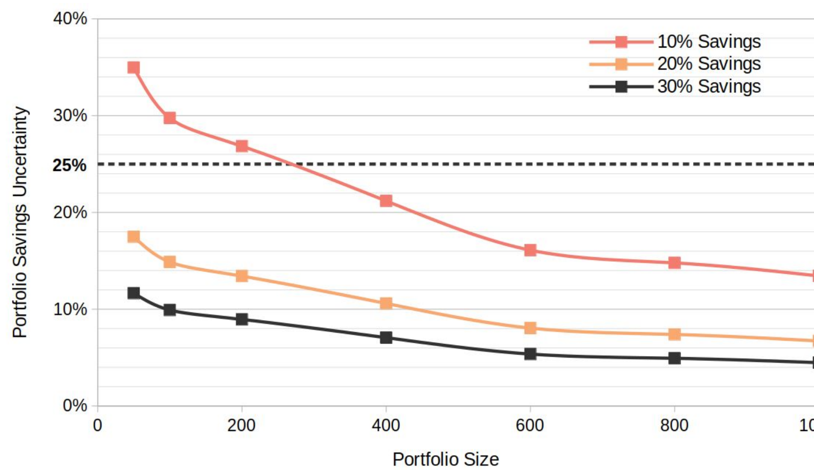


CVMRSE Results from CalTRACK Monthly Model on 50 Million California Meters



*Based on out of sample test on 50 Million IOU meters in California through the CEC using 2014 and 2015 data.

Aggregation Confidence Intervals



Appendix - Impact Evaluations Need to Evolve

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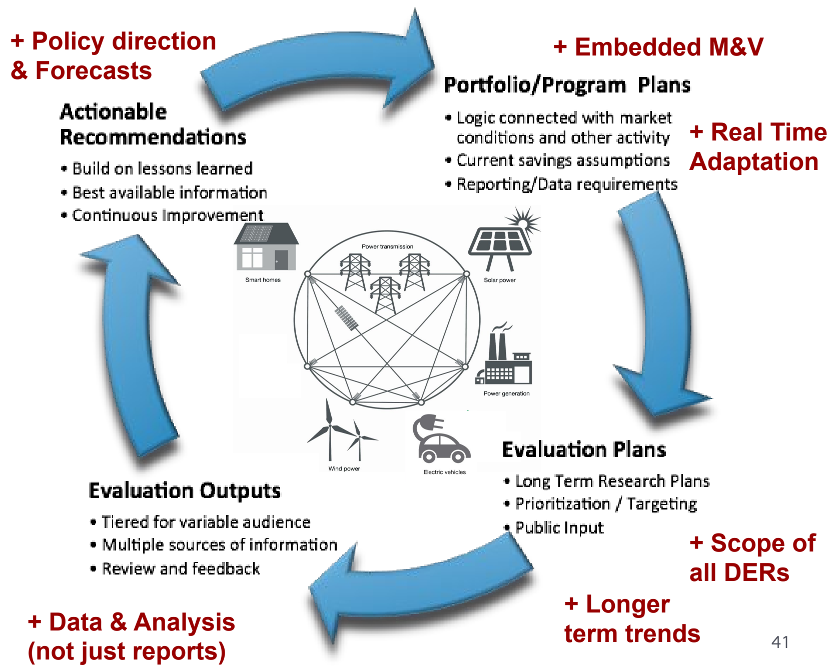
EM&V Cycle

Providing value alongside savings

Informing planning and targeting and demand forecast

Shift in placement and revenue streams



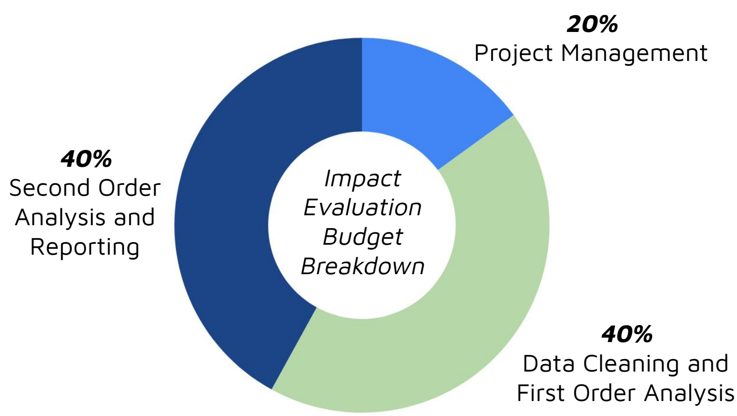
The Status Quo does not help solve our problems

6-18 Months

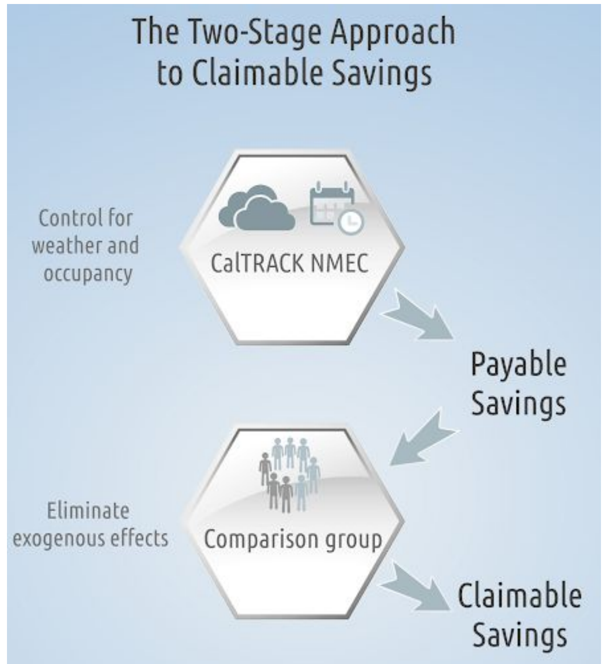
Average completion time for one impact evaluation

∞

Number of potential evaluation methods



Standardized, Automated Impact Evaluations are faster, better and cheaper



Real-time comparison group assignment for tracking net grid impact