How to Reform Cost-Effectiveness for Modern DSM

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Today’s Presenters

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We Need to Get Cost-Effectiveness Right

- Aspire to apply energy efficiency to meet energy system needs and attain our climate goals in a least-cost and equitable manner.

- Cost-effectiveness is the tool to accomplish this objective.

- Cost-effectiveness test needs to be correctly applied and formulated
  - First application then formulation.
The Many Asks of EE

• Meet immediate load growth
• Research on emerging technologies
• Administer low- and middle-income
• Workforce training
• Long-term market transformation efforts
• Codes-and Standards
• Other recent policy requirements (SB350, SB100, AB793, AB802...)
Many Policy Objectives

- Meet immediate load growth
- Research on emerging technologies
- Administer low- and middle-income
- Workforce training
- Long-term market transformation efforts
- Codes-and Standards
- Other recent policy requirements (SB350, SB100, AB793, AB802...)

System resource
Market development
Equity
Market transformation through workforce training
Market transformation
Market transformation
Misalignment Between Goals, Application and Valuation

• EE is asked to attain objectives but only valued as an energy system resource; c/e application broken

• And incorrectly at that; c/e formulation broken

• No wonder California energy efficiency portfolios struggle to meet regulatory cost-effectiveness requirements
Three Facets of Energy Efficiency

• Resource Programs

• Market Transformation Programs

• Equity Programs

Cooperate to bring out the best in each other
Drag each other down when made to compete
Three Facets of Energy Efficiency

• Resource Programs (today’s focus)
• Market Transformation Programs
• Equity Programs

Require their own policy aligned cost-effectiveness, planning, and evaluation metrics
Principles to Develop the Right Test

• **Comprehensive**: account for all relevant benefits

• **Balanced**: account for costs incurred to attain said benefits

• **Applicable**: can practically and fairly apply it for all resources

**Will guide planners to select the best mix of resources**
The Right Resource Test Maximizes Return on Utility Spending

• **Comprehensive**: all energy system benefits (energy, capacity, T&D etc.) and carbon reduction

• **Balanced**: utility spending/program admin. cost to attain said benefits

• **Applicable**: yes! Can apply these benefits and costs for all resources
The California TRC Does Not Meet these Criteria

- Imbalanced: accounts for all participant costs but incompletely considers participant benefits

- Application leads in wasted utility (ratepayer) money

- Many TRC myths, will myth-bust prominent ones
Example: CA Utility Considers 2 Bids

- Bid A: $100,000
- Bid B: $70,000

Both Meet all Utility Energy System Needs
Utility Considering Two Bids

• Bid A: $100,000
  – Friendly neighborhood gas fired peaker-plant

• Bid B: $70,000
  – Energy efficiency and demand response program for very efficient heat pumps
  – Targets homes with aging baseboards, window A/C
  – Provide incentive$$$, educate customers
  – In aggregate, customers willingly spend $70,000 of their own money
Unfortunately, Utility Applies TRC Logic

• Values Bid A at $100,000
  – ratepayer funds

• Values Bid B at $140,000
  – $70,000 ratepayer funds + $70,000 participant funds

• Utility picks Bid A
... And everyone Loses Out

• Utility spends $30,000 extra for acquiring same energy services
  – \textit{Ratepayer loss!}

• Customers don’t learn about new heat pumps and/ or can’t afford to buy them
  – Would be participants continue living uncomfortably
  – \textit{Participant loss!}

• More carbon emissions
  – Utility pays into cap and trade; \textit{shareholder loss!}
  – More emissions, \textit{environmental loss!}
Our Challenge in Charting a New C/E Course:

Let Go of Old Arguments

Net-to-Gross is too low!

But...Non-Energy Benefits!

Evaluators are missing the point!
Our Opportunity to Change the Conversation

A modern DSM cost-effectiveness test should:

1. Have symmetry between benefits and costs
2. Not penalize private investment
3. Take into account policy goals
4. Be supported with up-to-date documentation and tools
Thought Experiment: Estimate the TRC of an EV Rebate

Costs

EV Price $40,000
- Rebate $2,000

Customer Cost = $38,000

Benefits

114 Tons Avoided CO₂ x $27 / Ton + $20,500 avoided gas = $23,500

TRC = \frac{Benefits}{Total Costs} = \frac{$23,500}{\$40,000} = 0.59

References, assumptions, and math given in the Appendix. This analysis assumes no Free Ridership.
“Americans who are likely to buy an electric vehicle would do so out of **concern for the environment** (74%), **lower long-term costs** (56%), **cutting edge technology** (45%), **access to the car pool lane** (21%).”

Fact Sheet - Consumer Attitudes - Electric Vehicles, AAA, 2019
So this Analysis is Not Symmetric – Either Missing Benefits or Over-Counting Costs

Costs

EV Price $40,000
- Rebate $2,000

Customer Cost = $38,000

Non-Energy Costs Should Be Removed

Benefits

114 Tons Avoided CO$_2$ x $27 / Ton + $20,500 avoided gas = $23,500

Or

Non-Energy Benefits Should be Included

References, assumptions, and math given in the Appendix. This analysis assumes no Free Ridership
EE Analogy: Why Do People Retrofit their Homes?

Energy Upgrade California participants: Value of their retrofit

1PG&E Whole House Program: Marketing and Targeting Analysis. ODC, 2014. CALMAC ID: PGE0302.05
Same Story Different Resource

Why would we treat Energy Efficiency differently than Electric Vehicles?

Principal: A C/E Test Should be Symmetric Between Benefits and Costs.
PG&E 2017 Portfolio TRC Costs

$292M in Ratepayer Spending Matched by $225M in Net EE Private Investment ➞ $458M in Benefits

TRC = 0.88
The TRC: No Distinction between Ratepayer Surcharge and Private Capital
Is it better to spend $100 ratepayer dollars or leverage $10 ratepayer dollars to motivate a $100 clean energy investment?

**Principal:** A C/E Test Should Not Penalize Private Investment.

This is now our problem
What do We Need Out of Modern DSM?

– Engage markets (financing, partnerships, and scalable program models) for demand flexibility

– Use limited incentive dollars to garner private investment

– Rapid deployment of new technologies

– Integration with other distributed energy resources

– Investment to grow and train the workforce

We know these are the goals – So what is the right C/E test?
A Modern C/E Test Should:

1. Treat benefits and costs symmetrically

2. *Encourage* private clean investment and market-based delivery mechanisms

3. Take into account policy goals

A modified program administrator cost framework can achieve these principals.
What Can You Do?

Get up-to-speed on the issues

Organize advocacy around modern principals

Make your constructive voices heard
Resources

CEDMC C/E Whitepaper

Adam’s Article and Whitepaper

Recent AEE Article on C/E Principles
https://blog.aee.net/why-a-bandage-fix-for-cost-effectiveness-testing-isnt-enough

National Standard Practice Manual for DERs
(Forthcoming)
TRC Myth #1: “Considers Participants”

“The TRC test represents the broadest range of perspectives, including the utility and participant costs and benefits”

• Untrue. The CA TRC only considers participant costs, it does not account for non-energy benefits to participants

• Participants consider both energy and non-energy benefits when purchasing
TRC Myth #2: “Participant Protection”

The TRC protects participants; utility cost tests leave the participant vulnerable.

• Participant protection best achieved through program oversight and evaluation.

• One “on-average” portfolio-wide metric cannot protect participants:
  – Average TRC for a noble program and a nefarious program may be greater than 1.
  – But participant still vulnerable to nefarious program.
TRC Myth #3: “Resource Parity”

TRC considers full costs of supply side resources, so it rightly accounts for full costs of demand side resources

• Misleading; supply side resources only provide energy system services; energy efficiency provides many additional services while saving energy and helping the system

• Correct question: how much should ratepayers pay for additional energy service from both demand and supply side resources?

• E.g., the Hoover Dam is an electricity source and tourist attraction
  – Tourism money pays for the visitor’s center
  – Not included in electricity costs
Q&A

• We’ll unmute the lines so you can ask your questions verbally
• You may also post your questions in the Chat Box

• Suggestions for Future Events
  – Seeking ideas & topics for future events
  – For additional SIP lunchtime webinars & beyond
  – Post your ideas & comments in the Chat Box
Appendix
Gasoline Car Lifecycle Emissions = 
200,000 miles / (30 miles / gallon) x 19.4 lbs CO$_2$/gallon$^1$ x 1 ton / 2,000 lbs = 129.3 Tons CO$_2$

Electric Car Lifecycle Emissions (CA) =
200,000 miles / (4 miles / kWh)$^2$ * 1 MWh / 1000 kWh * 0.312 tons CO$_2$/ MWh$^3$ = 15.6 Tons CO$_2$

129.3 Tons CO$_2$ - 15.6 Tons CO$_2$ = 113.7 Tons CO$_2$ Savings

$^1$Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel, US EPA, EPA420-F-05-001, 2005
$^2$https://cars.usnews.com/cars-trucks/what-is-mpge
$27/MWh is the average avoided cap-and-trade + GHG Adder benefit from 2020 - 2029, taken from the 2019 CPUC Avoided Cost Calculator, discounted at an annual rate of 7.5%. (This discount rate is close to the historical utility weighted average cost of capital)

Avoided cost of gas = \(\frac{200,000 \text{ miles}}{(30 \text{ miles} / \text{gallon})} \times 3.50 \text{ / gallon} = \$20,500^4\)

*This value is figured by discounting the avoided gas costs by 3% per year over 10 years, and assuming the customer drives 20,000 per year

The EV cost of $40,000 is well below the 2019 average EV cost^5

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^4 [https://ww2.energy.ca.gov/almanac/transportation_data/gasoline/retail_gasoline_prices2.cms.html](https://ww2.energy.ca.gov/almanac/transportation_data/gasoline/retail_gasoline_prices2.cms.html) The Average cost of a gallon of gas in California is about $3.50

^5 [https://qz.com/1695602/the-average-electric-vehicle-is-getting-cheaper-in-the-us/](https://qz.com/1695602/the-average-electric-vehicle-is-getting-cheaper-in-the-us/) (the average cost of an EV in 2019 is reported to be $55,600
## Common Cost-Effectiveness Tests

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<th>Benefits</th>
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<sup>a</sup> Includes avoided costs of fuel, capacity, T&D, ancillary services, Cap-and-Trade, and GHG adder

<sup>b</sup> Includes Administration, Marketing and Implementation and other portfolio costs

<sup>c</sup> NTG x Measure costs. This term also represents non-free rider participant investment without incentives