Developing a toolkit to optimize community choice energy programs

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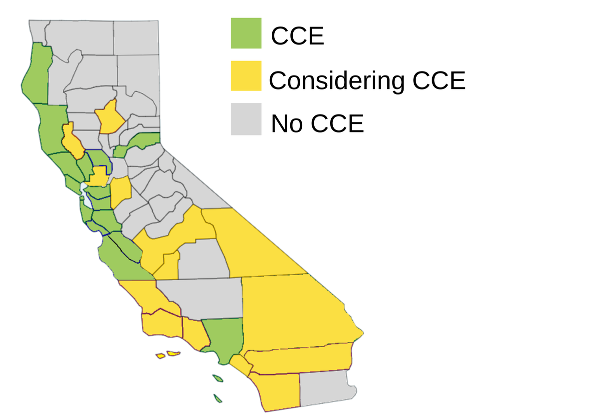
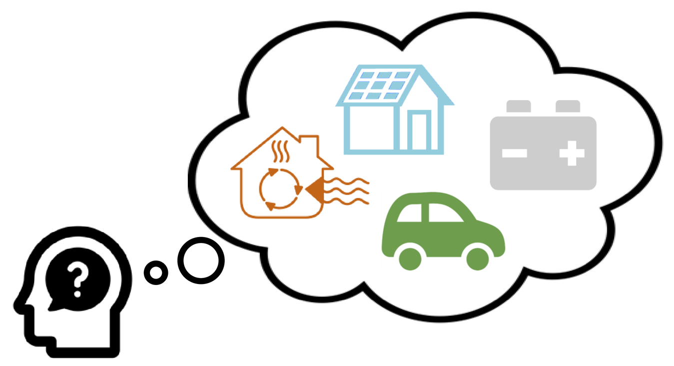
INTRODUCTION

Community Choice Energy (CCE) agencies are local government agencies that supply electricity to their residents, as an alternative to investor-owned utilities (IOUs). IOUs still handle transmission, distribution, grid maintenance and billing services. CCE agencies typically provide a greater content of renewable energy at lower rates compared to IOUs.





There are currently 11 operational CCE agencies and half of California is expected to use CCE by 2020.

PROBLEM: CCE Agencies lack rigorous decision making frameworks for deciding between different programs and lack tools to optimize programs they choose to implement.

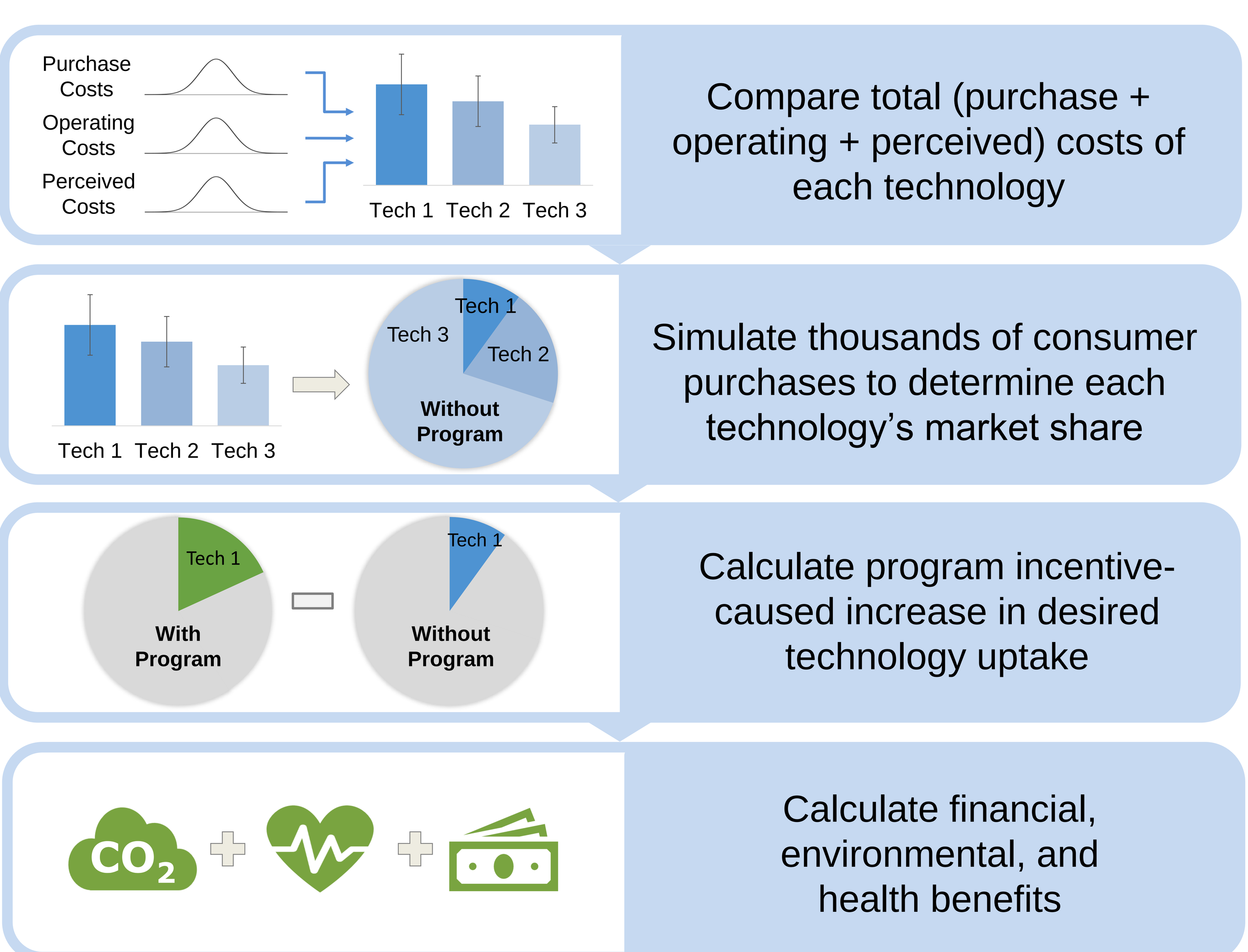
OBJECTIVE 1: Build an interactive toolkit that CCE agencies can use to predict the costs and benefits of two potential programs:

- **Electric Vehicle (EV) Rebates:** Agencies offer their customers monetary incentives to subsidize EV purchases.
- **Residential Solar Financing:** Agencies offer financing to their customers seeking to install a solar photovoltaic (PV) system for their homes.

OBJECTIVE 2: Create a guide containing successful practices and recommendations for implementing effective programs

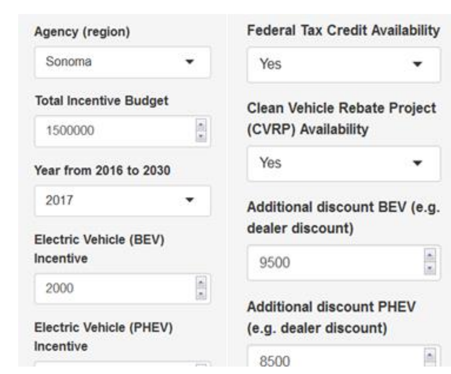
APPROACH

We used technology choice models[1] to create a toolkit that will enable CCE agencies to predict how consumers will respond to various EV incentive levels or solar panel interest rates. These models account for how consumer behavior and preferences influence purchase decisions.

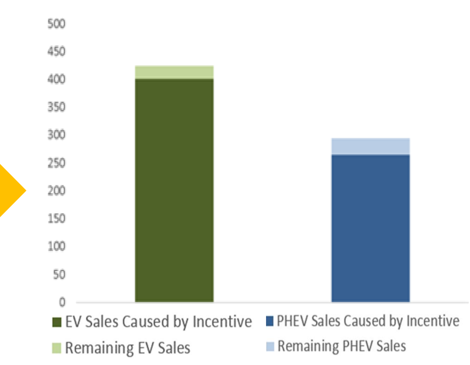


TOOLKIT OVERVIEW

User Interface



Technology Uptake

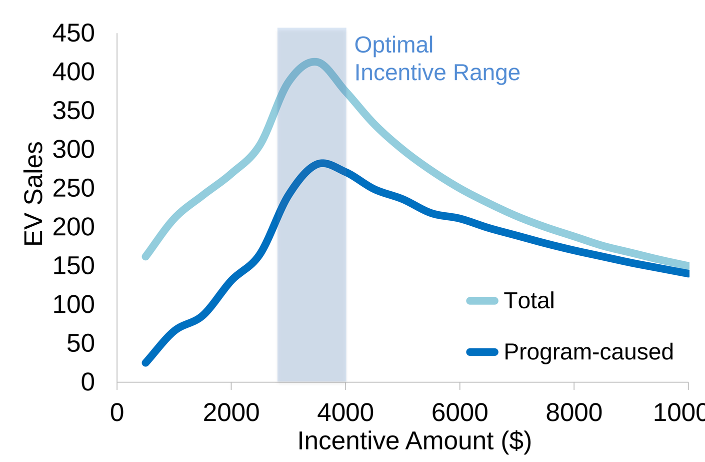


Summary Results

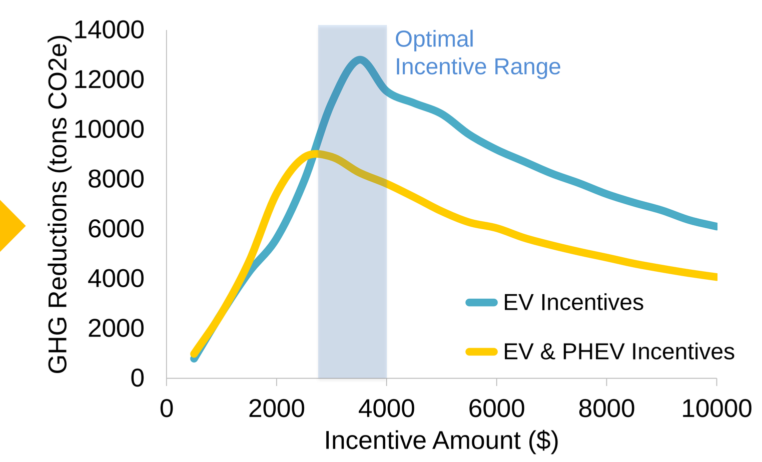
EV/PHEV Sales Caused	401 / 265
Total Program Cost	$1.26 Million
GHG Reductions	21,620 tons CO_2e
Health Benefits	$141,177
Cost of GHG Reductions	$127/ton CO_2e

ELECTRIC VEHICLE REBATE

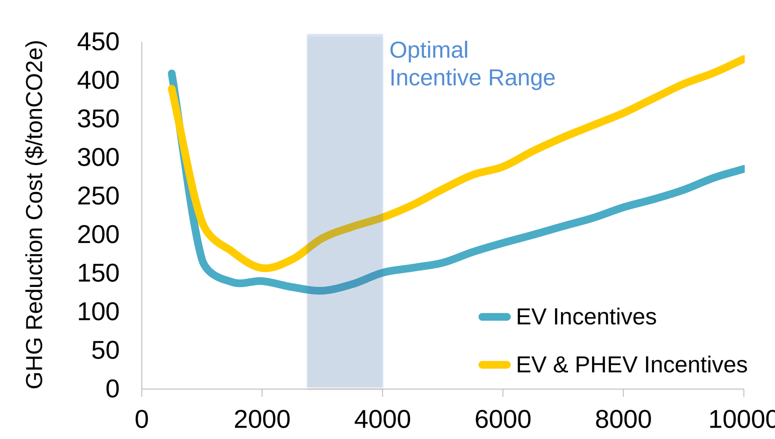
The EV toolkit module allows users to adjust program parameters until they find the optimal incentive level given their budget limitations. The graphs below show the results over a range of incentive amounts for a sample set of parameters.



Small incentives cause few new EV purchases. $500 incentives primarily subsidize individuals who would have purchased an EV even without an incentive.



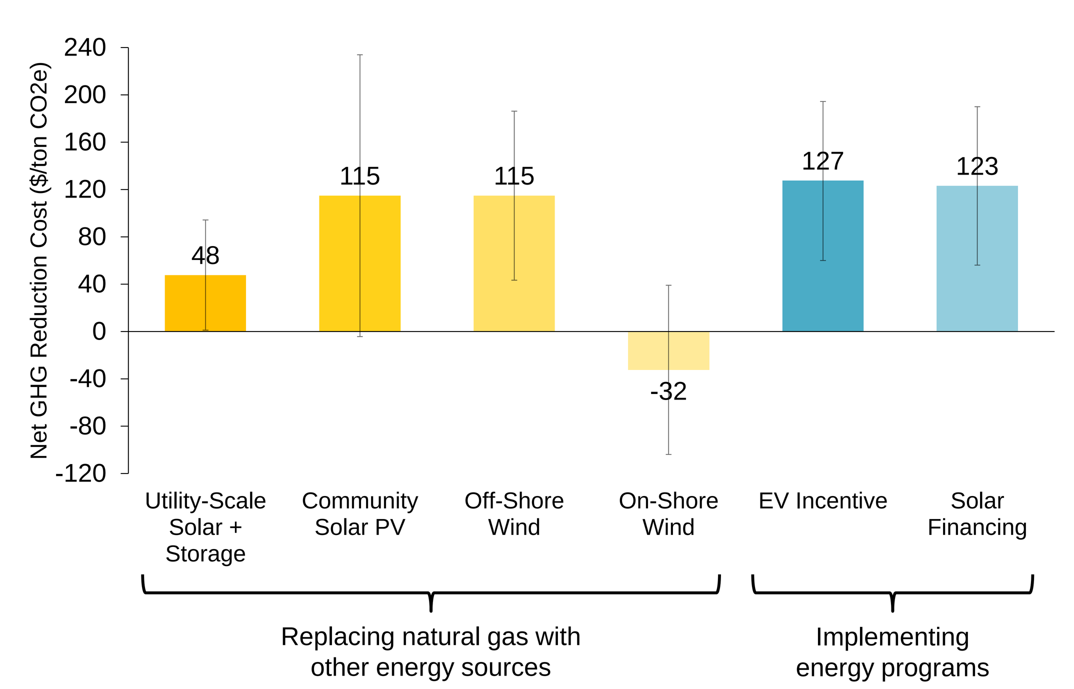
Incentives for only EVs are more cost-effective overall for reducing GHG emissions than offering incentives to both EVs and PHEVs.



Mid-range incentives ($3000-$4000) were the most cost-effective for reducing GHG emissions given current federal and state incentives, in the test scenarios we modeled. The optimal incentive level will vary depending on program-specific inputs.

The present cost to reduce GHG emissions decreases as the energy mix becomes increasingly cleaner than the gas used by internal combustion vehicles.

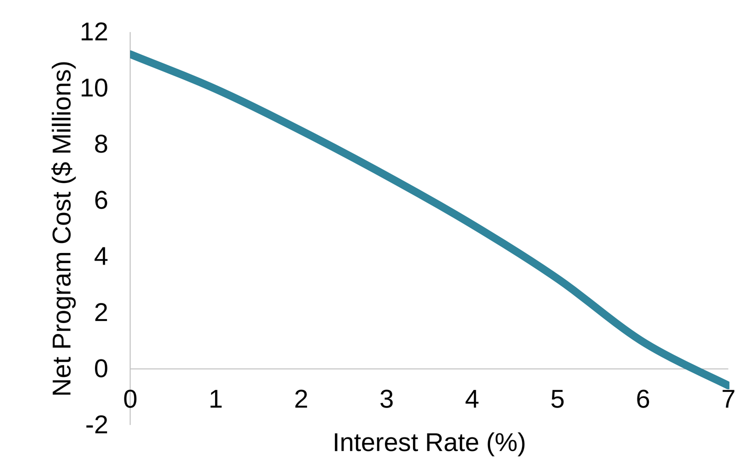
COST EFFECTIVENESS



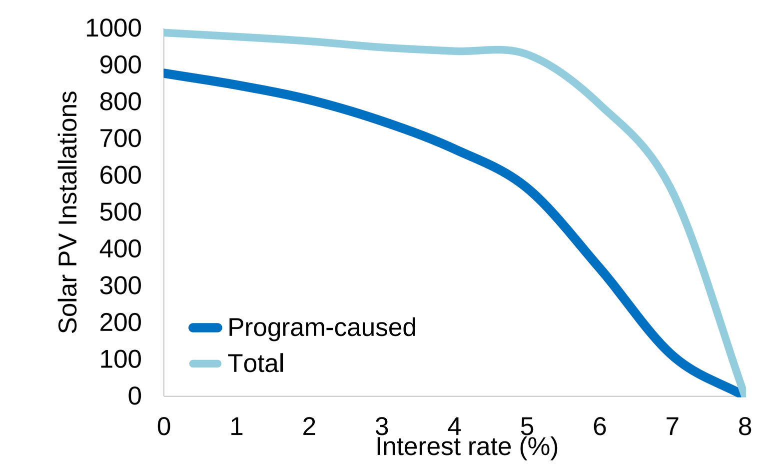
Agencies can compare the GHG reduction cost of the energy program versus that of greening their electricity mix. Note that the values shown for the energy programs are for a sample set of parameters and are not representative of all energy programs.

SOLAR FINANCING

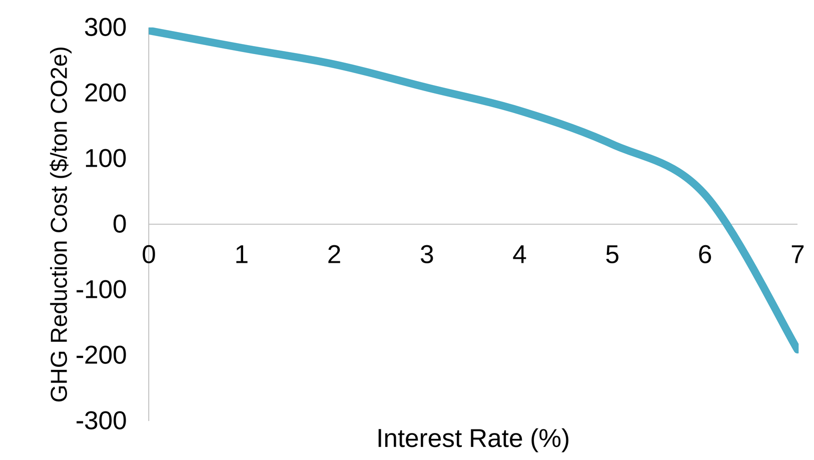
The PV toolkit module allows users to adjust program parameters until they find the optimal incentive level given their budget. The graphs below show the net present value of the program and expected solar PV uptake for a sample set of parameters, over a range of interest rates.



Agencies can use predicted program costs to choose a feasible interest rate. Over a certain rate, revenue exceeds cost.



The lower the agency interest rate, the more solar is installed as PV becomes increasingly cheaper than grid electricity.



The cost to reduce GHG emissions is higher at low interest rates. An agency must evaluate the tradeoffs between protecting or increasing its financial resources and reducing GHG emissions. Agencies can also increase uptake by reducing credit requirements, but doing so may increase the risk of customer defaults on financing commitments.

CONCLUSION

CCE agencies are looking for effective ways to decide what programs to implement and how to best design them. Our toolkit allows users to adjust key program parameters to optimally design two potential programs: EV incentives and residential solar financing.

Our models capture non-monetary values to predict how people will respond to economic incentives. As a result, the toolkit modules can accurately gauge expected uptake of an incentivized technology and calculate the resulting financial, environmental, and health impacts. Agencies can then compare the toolkit outputs to the benefits and costs of other programs or ways to green their energy mix to decide which programs to ultimately implement.

Both programs we studied result in GHG reductions, although the impact depends on the agency's energy mix. Based on our findings, agencies should continue to green their energy mixes to maximize the programs' environmental and health benefits.

If an agency decides to implement one of the modeled programs, its staff can refer to the successful practices guide we have created through literature research, case studies, and interviews for recommendations on designing the program to increase its success and impact.

ACKNOWLEDGEMENTS

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Learn more at: https://ccetoolkit.weebly.com

References: Kätelhön, A., Bardow, A., & Suh, S. (2016). Stochastic Technology Choice Model for Consequential Life Cycle Assessment. *Environmental Science & Technology*, 50(23), 12575-12583. doi:10.1021/acs.est.6b04270
Images: Center for Climate Protection, Clean Power Exchange, The Noun Project