Direct, incremental, meaningful impact of successful program:
+ positive
* neutral/small/not applicable
- negative

SVCE CPAG Program Evaluation Worksheet

		Residential Storage - reduce duck curve impacts	Connected Home Devices - customer understanding and load management	Residential & MF EV Charging - encourage vehicle electrification	MF Residence Energy Efficiency - GHG and customer cost reduction	Safety Preparedness & Resilience with Micro Grids	Incentives or Rebates for Used Electric Cars and Smart Chargers	Electricity Bill Explorer	Residential Electricity Monitoring	Residential BE Ready Program, SF + MF Variants	Pilot "Mass Produced" Zero Emission Retrofit Approach	Electrification Process "Survivorship Curve" Analysis	BE Smart Residential Water and Space Heating Upgrade
Poster 1	Increase customer energy literacy												
	Provide personalized customer engagement; promote active choices (e.g. upgrading to GreenPrime); increase SVCE awareness												
	Engage customers in their energy use through comparisons with peers, benchmarks, their own trends (gamification)												
	Improve transparency on decisions for customers												
	Provide customers more choices and local control												
Poster 2	Increase engagement and participation in energy programs for disadvantaged communities												
Poster 3	Provide customer services or programs not offered by PG&E and leverage services and programs offered by PG&E												
Poster 4	Reduce customer bills by reducing usage and shifting usage from peak price periods												
	Reduce customer costs in purchasing and using energy-consuming devices												

Direct, incremental, meaningful impact of successful program:
+ positive
* neutral/small/not applicable
- negative

SVCE CPAG Program Evaluation Worksheet

		Residential Storage - reduce duck curve impacts	Connected Home Devices - customer understanding and load management	Residential & MF EV Charging - encourage vehicle electrification	MF Residence Energy Efficiency - GHG and customer cost reduction	Safety Preparedness & Resilience with Micro Grids	Incentives or Rebates for Used Electric Cars and Smart Chargers	Electricity Bill Explorer	Residential Electricity Monitoring	Residential BE Ready Program, SF + MF Variants	Pilot "Mass Produced" Zero Emission Retrofit Approach	Electrification Process "Survivorship Curve" Analysis	BE Smart Residential Water and Space Heating Upgrade
Poster 5	Reduce demand during peak hours and increase demand during peak PV production (duck curve)												
	Reduce the need for/use of carbon-emitting peaker plants												
	Reduce GHG emissions through reduced electricity use												
Poster 6	Promote local jobs and economic development												
Poster 7	Provide customer backup power												
Poster 8	Transform markets (accelerate adoption of clean energy devices and practices)												
Poster 9	Alleviate climate change impacts (GHG reduction)												
	Increase readiness for expanded use of clean electricity												
	Improve indoor/outdoor air quality												
Poster 10	Increase SVCE sales of clean electricity												

Direct, incremental, meaningful impact of successful program:
+ positive
* neutral/small/not applicable
- negative

SVCE CPAG Program Evaluation Worksheet

		Residential Storage - reduce duck curve impacts	Connected Home Devices - customer understanding and load management	Residential & MF EV Charging - encourage vehicle electrification	MF Residence Energy Efficiency - GHG and customer cost reduction	Safety Preparedness & Resilience with Micro Grids	Incentives or Rebates for Used Electric Cars and Smart Chargers	Electricity Bill Explorer	Residential Electricity Monitoring	Residential BE Ready Program, SF + MF Variants	Pilot "Mass Produced" Zero Emission Retrofit Approach	Electrification Process "Survivorship Curve" Analysis	BE Smart Residential Water and Space Heating Upgrade

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	**Residential Storage Program** Expand the use of residential storage to reduce duck curve impacts.
Specific Elements	• Pre-engineered package • Residential • 3 – 5 KW • Pair with solar? • New construction and/or retrofit? • Single family or MUD? • Financial modeling tools • Group buy • Permit assistance
SVCE's Role *(possible partners or collaborators)*	• Promotion • Bulk purchase • Storage-friendly rate structure • Installer pre-qualification • Collaborate with installers, startups and established manufacturers
Success *(define success)*	• Number of deployments as a direct result of program offering • Kilowatt hours under management • Kilowatt peak reduction

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	Connected home for customer understanding and management of their loads and for load management
Specific Elements	• web connected thermostats (off the shelf) • web-connected pool pump controller (off the shelf?) • app for customers with device operation and consumption data • additional analytics • device/load management capability (with customer over-ride) - e.g. peak reduction or summer-only AC management • ability to move between solar production to grid and solar storage to optimize viz the Duck Curve for single family homes with solar.

SVCE's Role
(possible partners or collaborators)
	• rebates for new participants?
	  ○ rebates for thermostats
	  ○ rebates for storage
	• enlistment & customer permission
	• work with one or more 3rd parties (e.g. Nest) - really its their platform; downselect from proposals

Success *(define success)*	• participation rate (different targets for different devices) - find out how willing customers are to participate; maybe pilot 2,500 volunteer Nests with a history • customer feedback (are they willing to continue) • How much demand reduction there is (what does 2,500 participants map to in kW demand reduction); use control group

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	Electric Vehicle Residential Charging Station Incentive program in order to encourage vehicle electrification.
Specific Elements	• Financial assistance in the form of a rebate or reduced-interest loan to prepare for and install a vehicle charging station. Aimed to offset the split incentive problem.
SVCE's Role *(possible partners or collaborators)*	• SVCE would offer the program to residential home and multi-family residence owners and tenants. • Streamline the process with: 1) Reduced-cost of charging unit from bulk discount 2) Preferred contractors to carry out work 3) Streamlined permitting process • Tenant – educate on cost and benefits of EVs with recommended tariffs, $ benefits and GHG reduction. • Property owner – inform about benefits of having a charging station on-site. e.g. better occupancy rates. • Inform property owner about any incentives from city/state/government. • SVCE would process the administration and billing of the charging stations on behalf of the landowner.
Success *(define success)*	• Take up of program – measured vs a target based on installation and utilization of charging units at residences. • This program is a double win for SVCE. Reduced GHG from EV use vs gasoline-fueled cars and electricity sourced form carbon-neutral sources.

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	Multifamily (MF) residence energy efficiency program – program to reduce cost of living to residents and to reduce GHGs.
Specific Elements	• Incentives/financial assistance to increase energy efficiency at MF residences. • Suggested changes: solar panels, energy efficient appliances (e.g. washers and dryers), energy efficient AC and heating, switch from natural gas/propane to electric cookers. • EV Charging • Power storage to smooth demand • Ability for landowner to sell back excess electricity to reduce split incentive problem. • Either replace at end of life or retrofit energy efficient devices. • Energy rating scheme to incentivize landowners and inform tenants.
SVCE's Role *(possible partners or collaborators)*	• Financial assistance for work carried out. Either in the form of rebate, discount, or reduced interest-loan. • Streamlined permitting process with municipalities. • Inform end users and landowners on $ and environmental benefits of specific energy efficient appliances and equipment. • Pilot these benefits in an everyday-use scenario. • Model the acceptance rate of each recommendation and the actual GHG reduction. (e.g. which devices/appliances had the biggest GHG-reduction impacts in aggregate). • Measure the customer experience. • Provide an energy efficiency rating. Measure $ benefit to the landowner. • Inform about government rebates/tax benefits available to landowner. • Recommend energy tariffs to customers to maximize benefit. (e.g. solar or TOU tariff). • Partner with housing authorities, construction firms.
Success *(define success)*	• A numerical goal of customer monetary savings and GHG savings over 10 years balanced with a positive customer experience.

SVCE CPAG —Beneficial Electrification Subgroup—Not on Original List
April 16, 2018

Safety Preparedness and resilience with micro grids	Assuring functional government and community safety in massive emergencies by assuring communications and functionality with micro grids for civic centers/Public Safety. Providing resilience with a distributed grid and power system.
Specific Elements	• Separable from PGE grid in emergencies • Critical civic emergency response • Minimal renewables and storage on site for generation • Critical crisis response for regional governments • Critical services for residents and displaced people • Business continuity and disaster recovery • Possible connection to Electrification Readiness program
SVCE's Roles and possible partners or collaborators	• SVCE with PGE as regional support and resources for grid assessment and design requirements especially as cities update their Civic Government buildings Other potential collaborators: • Cities • School Districts • Regional communications systems
Success as defined by…	• Emergency command centers up and running within 5 minutes • Functional government communication systems Benefits • Local and regional resilience • Community services including phone and computer charging availability in micro-grid areas • Enhanced local safety for government, residents, and businesses • Faster more efficient and effective emergency response • Fewer lives lost

SVCE CPAG —Beneficial Electrification Subgroup
April 16, 2018

SVCE modified Sonoma Clean Power EV and Charger Program	Incentives or rebates for Used Electric Cars and Smart Chargers…
Specific Elements	• Reduce GHG emissions • Help Grid balancing • Move from fossil fuels to clean electricity
SVCE's Roles and possible partners or collaborators	• Provide Smart chargers to EV Customers • Possible rebates for used electric cars Incentives: Purchased Electric Vehicles qualify for government tax credits and state rebate programs: • Federal Income Tax Credit for up to $7,500. Learn more at fueleconomy.gov • California Rebates: $1,500 to $2,500 depending on the vehicle type. Learn more at cleanvehiclerebate.org • Carpool Lane Access: A limited number of single-occupancy carpool lane stickers are available for EV drivers. Learn more at dmv.ca.gov Collaborators: • Sellers of new and used EVs • Shared economy providers of things like Zip car services • Companies like Lyft
Success as defined by…	• Quantity of purchasers = GHG reduction • Thanks to Silicon Valley Clean Power's clean electricity mix, charging an EV significantly reduces greenhouse gas emissions. An EV charged with our Green Prime product has 96%+ fewer emissions than a Toyota Prius Hybrid.

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	**Electricity Bill Explorer** Make bills easy to understand and show how customers can reduce their bills and/or reduce carbon emissions

Specific Elements	• Import bill data (GreenButton standard or direct from PG&E) • Show how different rate plans would impact customer bill • Show how much money & CO2 emissions SVCE saves • Show how little it would cost to switch to GreenPrime (if not already a GreenPrime customer)

SVCE's Role *(possible partners or collaborators)*	• Develop system

Success *(define success)*	• Number of customer bills analyzed by system • Number of customers upgrading to GreenPrime after using system • Customer feedback

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	**Residential Electricity Monitoring** Facilitate appliance-level (disaggregated) electricity monitoring to increase energy literacy and reduce electricity use
Specific Elements	• RFP process to select appropriate monitoring vendor • Facilitate installation of devices • Study to follow up on energy literacy and electricity usage after installation
SVCE's Role *(possible partners or collaborators)*	• Conduct RFP for monitoring solution • Bulk purchase and/or rebate for devices • Connect customers to approved electricians able to install devices • Provide online forum for customers to discuss project among themselves • Possible partners: Sense Labs, Bidgely
Success *(define success)*	• Number customers participating in program • Increased energy literacy for participants • Reduced electricity usage for participants (lower bills & reduced carbon emissions)

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	**Residential BE Ready Program *(SF + MF variants)*** Increase readiness for planned, economic migration from fossil-fuel use to efficient, clean electricity ("**B**eneficial **E**lectrification") use in residential homes. *(Two variants to address both Single-Family and Multi-Family homes.)*

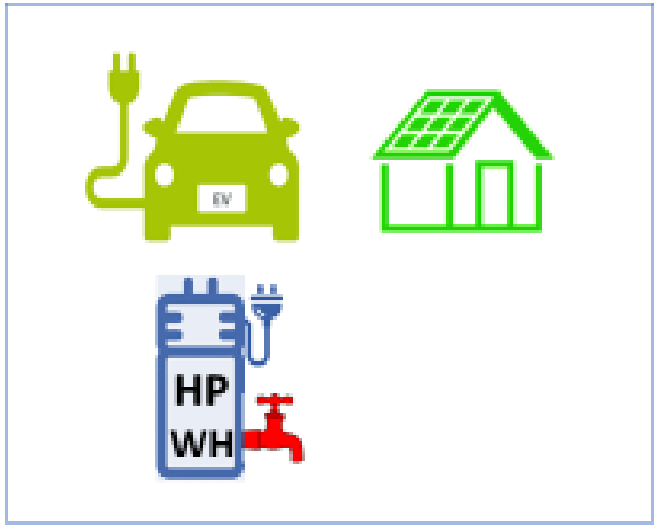
Specific Elements	• Stand-alone program or combine as companion program to any Electrification Migration program.
	• Combine with Green Lease program for rental homes (SF & MF) that aligns cost-benefit interests of renters and landlords.
	• Promote pre-planning for a retrofit migration to a more-efficient and cleaner/safer electric home.
	• Promote an economic and ecological bundle of Beneficial Electrification technologies
	  ○ Various applicable combinations of electric car/charger, heat-pump water heater, solar PV, heat-pump heat & cool, energy efficiency measures and energy storage.
	  ○ Press the bundle/package concept since savings from EVs, solar and/or EE more than cover added expense over business-as-usual for heat-pumps until costs get lower.
	• Standard and simple BE Ready Assessment form, which would lead to educated customer, cost estimate and electrification migration Plan. (See attached examples of Assessment and Plan; focus on biggest impact items, but can lead to a complete all-electric plan.)
	• Pre-engineered best standard options for panel/sub-panel needs for going all-electric.
	• Promote that trade allies (electricians, solar contractors, HVAC contractors, others?) pitch and conduct a BE Ready Assessment of home as desired and whenever any electric-related work is to be done. (See attached draft BE pitch slide – with draft BE talking points.)
	• Draft program design research survey (attached) can morph into lead generation survey form.

SVCE's Role *(possible partners or collaborators)*	• Recruit, qualify? and train trade ally "participating" contractors to make BE Ready pitch and Assessments, leading to increased business opportunities for them.

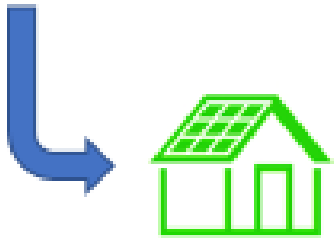
	• Finalize program documents/outputs for Pitch, Assessment/Plan, Lead-Generation survey and standard set of best panel/sub-panel configs.
	• Education and Outreach to customers.
	• Possible nominal participation incentive, depending on how well the bundled-savings pitch works.
	• Coordinate integrated BE-favorable local policies of SVCE member jurisdictions (for remodels and new)
	  ○ Green building codes
	  ○ Permit fee and inspection streamlining
	• PG&E partner on local distribution service needs and energy efficiency savings programs/promotion
	• For Multi-family program variant, partner with union labor organizations, and apprenticeship programs (e.g. from NOVA).
	• For Multi-family variant, consider program design and partner collaboration options for different types of MF buildings, landlords and potential HOA partners.
	• Potential partnership/collaboration with BAAQMD and/or local water districts on grants, incentives.
	• Extend outreach and education via allied non-profit and climate advocacy groups, as well as members.

Success
(define success)
	• Number of participating customers.
	  ○ # with completed Assessments/plans
	  ○ # of BE Ready work projects completed
	  ○ # of Electrification-related technologies adopted (total and per home)
	• Kilowatt hours per customer.
	• Number and engagement level of participating trade allies.
	• Number of aligned policies among SVCE members.
	• Number of new Green Leases adopted.
	• Estimated total $ savings for participants
	• Estimated total GHG reductions for participants

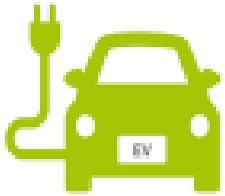
My BE Bundle Plan



- Get multiple quotes from these or other vetted contractors
- Check for financial aids & rebates (state & Federal)
- Financing help



Clean Solar (888) 551-7652
Cobalt Solar (650) 383-3931
Modernize Solar (855) 562-0485



Tesla (650) 342-1176
Volvo (650) 558-5679
Chevy (650) 364-0100

Altai Heating & Air (650) 423-0200
Lowe's (408) 470-1680
Heat Pump Estimates (877) 844-6777

BE Ready Assessment Form - DRAFT

BE Ready Assessment Form (for exploring the future electrification of home water heating, space heating and car charging)

Property owner name _____ Date _____

Property Address _____

Property occupied by owner or rented? (circle one) Owned Rented

Type of Residence (circle one) (Single Family detached, Multi-family attached, other describe)

Other description _____

Number of stories controlled by occupant _____ Stories

Approx. square footage _____ Sq. ft.

Beneficial Electrification Readiness Assessment to be filled out by **any** one of the below:

	Name of person filling out form:	Phone # or email of person
Electrician		
Solar Installer		
EV Charger Installer		
HVAC contractor		
Home Inspector		
Handy-person or Home Owner		

Customer already has:

- [ ] EV plug or EV charger
- [ ] Solar
- [ ] Heat Pump
- [ ] Air Conditioner
- [ ] Electric Water heater

Location of main electrical panel e.g. in garage on side wall, or outside of house back wall) _____

Main panel rating in Amps _____

How many circuit breaker spaces are empty _____

Can lighting circuits be combined (now that lighting uses 10 X less than before) _____

Can some fat breakers be replaced with sandwich breakers? _____

Now how many 240 V available spaces does that provide? _____

Maximum Additional load amps that can be accomodated _____ Amps

Location of any sub-panels _____ Amps size connected to _____ Amp breaker in main

Now how many 240 V available spaces does that provide? _____ Spaces For a total of _____ new load Amps in sub

Electrification assessment to Heat Pump Water Heater

For a common HPWH with compressor on tank cylinder

Current water heater type and size and age e.g. 50 gal. Gas tank WH, 8 years _____ Installed in year _____

Location of current Water heater. _____ approx. size of room (or closet) it is in _____ feet by _____ feet

Is it along any external wall? (perhaps it could be vented through the wall if desirable.)

Route designed for Required conduit run from an electrical panel (e.g. down to crawl space and up into laundry room.)

_____

BE Ready Assessment Form - DRAFT

Length of route and suggested material for 12 gauge conductors
e.g. 12 gauge romex down wall cavity and across crawl space and up into Laundry room wall e.g. 45 feet
Route suggestion and material _____ _____ feet
Wall mounted junction box with 3 feet of unsupported flexible metal conduit to reach top of water heater location.

Cost estimate including breaker $_____ Or do one cost estimate of the package

Electrification assessment to good Electric Vehicle Charger location (e.g. in garage near door)

Route designed for Required conduit run from an electrical panel (e.g. from main panel through wall and along inside garage wall.)
end with a xxxx plug mounted about yy inches above floor
Length of route and suggested Cu or Al for four 40 Amp conductors
e.g. 10 gauge Cu wires in 3/4" smooth metal conduit through wall an along inside of garage wall to within 3 feet of garage door. e.g. 20 feet
Route suggestion and material _____ _____ feet

Cost estimate including breaker $_____ Or do one cost estimate of the package

Electrification assessment to good Heat Pump Space heating location (e.g. to an outside wall near current furnace location.)
A good outdoor location would be along a wall where the fan and compressor noise (about 10-15 dBa above background) would not be problematic and where 24" of space occupation can be accommodated
Route designed for Required conduit run from an electrical panel (e.g. from main panel through wall and along inside garage wall.)
end with a xxxx AC shutoff switch about yy inches above ground
Length of route and suggested material for 4 20 Amp conductors
e.g. 12 gauge wires in 3/4" smooth metal conduit through wall an along outside of garage wall to shutoff location. e.g. 45 feet
Route suggestion and material _____ _____ feet
Shutoff not needed if breaker is visible from heat pump location.
Cost estimate including breaker $_____ Or do one cost estimate of the package

Total cost of BE ready branches $_____ = cost estimate of doing the whole package

Include a picture of main panel (door open) and of any sub panels (door open)
Include a picture of water heater area
Include a picture of EVSE potential area
Include a picture of furnace area or other heating device area
Include a picture of area where a Heat Pump condenser may fit outside (e.g. 1 foot from a sidewall of house).

Item 2
Programs Brief
ADDED

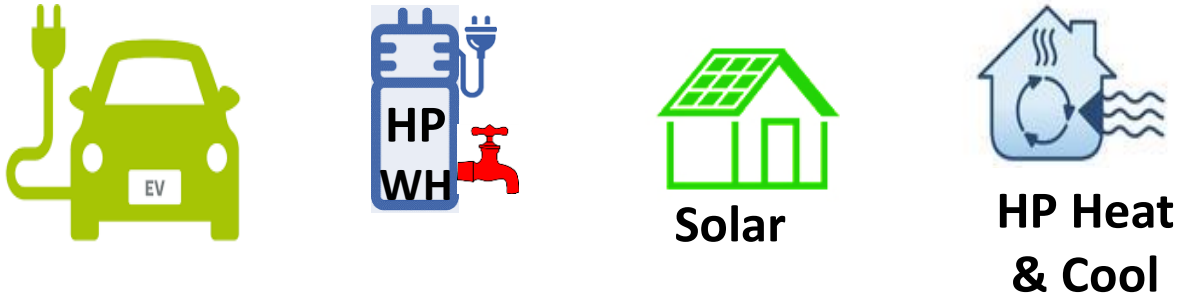
BE = Beneficial Electrification

Economic & Ecological

SAVE
$$* &
Our PLANET

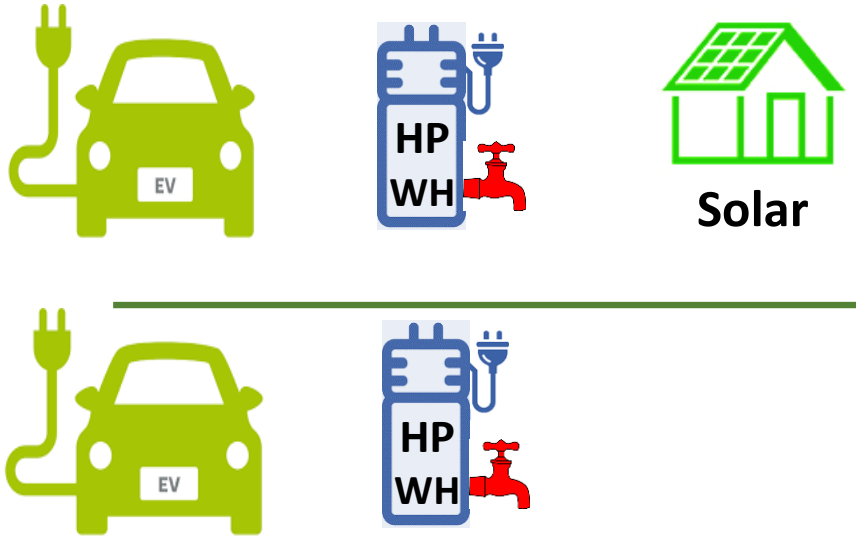
*estimated based on a working family of 4 excluding costs and incentives over 10 year life

10 year $ Savings & Carbon Savings



$36,000 Savings
101 Tons CO2

Bundle
and
Save



$31,700 Savings
66 Tons CO2

$12,200 Savings
58 Tons CO2

BE Ready = Thinking ahead and Bundling to save $

1 **Ecology… gas vs. electricity**

Electric generation is now CLEAN and renewable from the CCE. Natural Gas is now much dirtier than we thought. The science on Natural Gas is pointing to its decline as a home fuel.

A) Natural Gas' Global Warming Potential (GWP) increased from "no concern" to 26, then 84, and now 94 times as damaging as a pound of CO_2.

B) The known gas leakage rate is increased from only 1% (self reported by the corporations) to 5.1% average measured by scientists and engineers.

C) The combined effects make natural gas 2.8 times as bad as tailpipe estimates had been. ((1 + .03 (for transmission consumption) *.051 * 94 * 16/44) = 32.5 lb. per therm. A therm of natural gas is little worse than burning a gallon of gasoline [28 lb. of CO_2/gallon when you include upstream emissions]

A HPWH could cut your GHG emissions by 28 lb. per day (5 tons/year).

Since utilities provides bulk solar electricity and other renewables on the grid, you can now drive a "solar car" and have "solar water heating" with nothing on your roof. Or you can easily put up cost effective solar PV to power things at an even lower cost. **And switching over to electric devices protects your family from gas toxics in the breathing space.**

2 Economics

During the short 10 year span that most homeowners consider, these bundles can save you $13,000 to $26,000 plus earning you tax credits and incentives. Plus, the savings will grow as rates grow and the units last longer than 10 years and enhance resale value. **Also, when you put in a heat pump, you get Air Conditioning for Free!**

3 You may be already EV ready!

In some cases your house is already EV ready since the EVs come can be charged from regular 110 Volt household plugs or on 220 Volt dryer plugs.

4 EV Range Anxiety:

There are charging facilities everywhere! Charge Point.com among others has a huge network with their chargers up front at most public parking lots.

5 Rooftop solar can further improve energy independence

Solar has dropped so far in price that it is less than half the cost of grid power. So we should include the EV charging and HPWH charging in your solar sizing.

6 An EV or a home battery can power you through an outage.

You can be ready for emergencies with an EV and a HPWH since one stores electricity, the other stores heat and water.

7 Be a Good Gridizen

These new EVs, HPWHs and heat pumps help you live large, safe, clean and healthy while helping the grid absorb more renewable generation.

8 Get incentives for doing this

Tax credits can now extend to home batteries and HPWHs that get their energy from rooftop solar systems (Check with your tax preparer to see if you qualify) Utilities offer incentives too.

9 This gets you ready so you can do a single-day Water Heater upgrade.

The BE Ready Assessment is the first free step in smoothing the path to a better life with clean energy and low bills. It makes sense to get the wires installed now even if you want to delay converting your water heater until it craps out unexpectedly. With the wires installed, your plumber can easily upgrade your water heater to a clean HPWH whenever you want. But don't wait until your old water heater floods you. Schedule a replacement by your water heater's 10th birthday. If you replace it when it's young, you can even donate the gas one to Rebuilding Together.

Please help us understand your thinking about Clean Electric Homes. 2 minutes, tops! Thanks!

Zip code_____ Do you live in a single family home ___, or multifamily ___. Do you own ___, or rent ___.

I have	Appliance	Estimated Item Age	*Use this space to add comments. All comments help us. Thanks!*	
	Gas Water Heater	Tank / Tankless		
	Gas Heater	years		
	Gas Clothes Dryer	years		
	Gas Stove	years		
	Other for example: AC	years	**I want to have**	**What holds you back from getting these?** Circle all that apply
	Heat Pump Water Heater	years	Want soon Maybe Not yet	Don't know about them. Too much $. Water heater is in middle of house. Would like to know more. Other
	Heat Pump Heat & Cool	years	Want soon Maybe No	Don't know about them. Too much $. Would like to know more. Other.
	Electric Car	years	Want soon Maybe No	Don't know about them. Too much $. Charging worries. I don't like clean, fast, quiet cars. I'd miss my mechanic. Other
	Efficiency Upgrades	years	Want soon Maybe No	Don't know about them. Too much $. Other Afraid they won't help. I like being cold and wasting energy.
	Solar Panels	years	Want soon Maybe No	Don't know about them. Too much $. Trees blocking the sun. I didn't know they beat all other tax-free investments. Other, please write in space above

---

Please help us understand your thinking about Clean Electric Homes. 2 minutes, tops! Thanks!

Zip code_____ Do you live in a single family home ___, or multifamily ___. Do you own ___, or rent ___.

I have	Appliance	Estimated Item Age	*Use this space to add comments. All comments help us. Thanks!*	
	Gas Water Heater	Tank / Tankless		
	Gas Heater	years		
	Gas Clothes Dryer	years		
	Gas Stove	years		
	Other for example: AC	years	**I want to have**	**What holds you back from getting these?** Circle all that apply
	Heat Pump Water Heater	years	Want soon Maybe Not yet	Don't know about them. Too much $. Water heater is in middle of house. Would like to know more. Other
	Heat Pump Heat & Cool	years	Want soon Maybe No	Don't know about them. Too much $. Would like to know more. Other.
	Electric Car	years	Want soon Maybe No	Don't know about them. Too much $. Charging worries. I don't like clean, fast, quiet cars. I'd miss my mechanic. Other
	Efficiency Upgrades	years	Want soon Maybe No	Don't know about them. Too much $. Other Afraid they won't help. I like being cold and wasting energy.
	Solar Panels	years	Want soon Maybe No	Don't know about them. Too much $. Trees blocking the sun. I didn't know they beat all other tax-free investments. Other, please write in space above

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	**Pilot "Mass Produced" Zero Emission Retrofit Approach** Run pilot program that attempts to locally replicate approach pioneered by "EnergieSprong" (http://energiesprong.eu/) in the Netherlands, to reduce hassle and upfront cost of Zero Emission housing retrofits using combination of financing techniques and demand aggregation that makes robust project coordination and more economical manufacturing (offsite prefabrication) feasible. 3-minute overview video: https://youtu.be/gm_ElE99W0o

Specific Elements	Coordinate energy-efficiency+electrification retrofit project that aims to address all housing units in a defined area (e.g. a housing tract, or a single block within one) at once. Project has following characteristics:
	• Financing
	  ○ Costs financed rather than paid up-front, using "Pay as you save" (PAYS) model – savings from increased efficiency cover monthly finance cost
	• Timing
	  ○ Everything that's aging out and/or
	  ○ Strategically phased implementation
	• Single solution provider
	  ○ One party designing, coordinating, installing and financing
	• Minimize Disruption to Homeowners' Lives
	  ○ Fast installation due to pre-fabricated components made possible by similar housing stock (e.g. a housing tract)
	  ○ Desirable improvements make it worthwhile

SVCE's Role *(possible partners or collaborators)*	• Provide on-bill financing mechanism • Identification of potential vendors • (Potentially) Project Management • Identification of potential pilot sites: institution/company that owns large amount of

	existing housing stock (e.g. university, large-scale private landlord)
Success *(define success)*	• Pilot site retrofits completed; GHG emissions reduced at pilot site • Vendors identified for similar future projects (assuming they performed well) • SVCE gains knowledge/experience about how to facilitate these retrofit projects • Successful pilot gives later potential project sites example that "shows it can be done"

SILICON VALLEY CLEAN ENERGY

Title & Use Case (Do "x" *for* "y".)	**Electrification Process "Survivorship Curve" Analysis** Identify current "theoretical maximum" number of existing homes that are potentially ready to fuel switch key fossil fuel end uses to electricity, and which prerequisites for electrification form the biggest barriers to increasing that pool of electrification-ready homes. *NOTE: This program is not an end in itself, rather it is intended to create a clear decision-making tool that SVCE's policymakers can use over time to consider tradeoffs and effectively prioritize potential programs being considered for driving fuel switching from fossil fuels to electricity.*
Specific Elements	• Identify bundle(s) of end uses to be converted (there may be several, e.g. "EV only," "EV+Water Heater" etc.) • Map out key criteria that must be met before a home is ready to electrify the target set of end uses in each bundle (sufficient utility service connection, large enough panel for that bundle, etc.). Note that the definition of a criterion can vary depending on the bundle, e.g. the power requirements for a "sufficient" service connection go up as you attempt to electrify more end uses. • Identify logical sequence in which those criteria would be addressed (e.g. a homeowner would not enlarge electrical panel if service connection cannot supply enough power) • Starting with "all homes" (100%), graph for each successive criterion (for each bundle) how many homes in SVCE service area (or relevant sub-geography or sub-set of customers) meet that criterion, to produce a graphical depiction of where the current biggest opportunities are for SVCE's programs.
SVCE's Role *(possible partners or collaborators)*	• Gather data for each criterion and update over time

	• Partners: PG&E, member cities (sources of needed data)
Success *(define success)*	• Clearly identify where the current opportunities are so that programs may be targeted appropriately. • Allow consideration of tradeoffs between depth of electrification (more electrified end uses at a site) vs. breadth (more sites electrified but with fewer end uses converted to electricity)

SILICON VALLEY CLEAN ENERGY

Based on a proposal by Carbon Free Palo Alto in collaboration with Carbon Free Silicon Valley for potential adoption by SVCE, PCE, City of Palo Alto Utility and other CCEs, Munis.

Title & Use Case (Do "x" *for* "y".)	**BE Smart Residential Water & Space Heating Upgrade Program** Mass **B**eneficial **E**lectrification for residential buildings
Specific Elements	• *See also attached presentation & context slides.* • Per UC Berkeley study conducted for BAAQMD, 86% of GHGs from natural gas use in the average Bay Area home is from water and space heating. • Key design elements are broadly applicable to all customers, eliminating major barriers, so maximizes opportunity to replace all residential natural gas water heaters and furnaces over the time of their expected useful lives of 13 and 20 years, respectively. • Proactive approach, based on learnings of past heat-pump electrification pilot program in Palo Alto • On-bill financing of extra upfront costs: Customer still pays what would have paid for otherwise Business as Usual (BAU) case of a just another new natural gas (NG) unit, but extra up-front costs associated with new efficient electric heat pump water heaters or HVAC systems is financed on the customer bill to eliminate key barrier to adoption. Only about $13/month extra, not including potential program rebate options. • Planned proactive replacement of units before usual failure at end of useful lives. Eliminates usual emergency replacement scenario that often prevents a switch from fossil-fuel to electric units. • Concierge service: Managed by third-party contracted to SVCE – made easy for customers. Otherwise process too complex for most customers. Just check a box to participate. • SVCE rebates optional. May create more interest in program and make customer case even more attractive, but financing already reduces the main up-front cost barrier sufficiently. • Some details to decide on how to handle sale of home or other possible exceptions – customer may need to pay off remainder of financed amount. • Can integrate with potential BE Ready electrification readiness program. • SVCE benefits: deep carbon reductions, enables rapid smart-grid infrastructure behind the meter that can integrate with grid innovation programs, increased electricity revenue.

SILICON VALLEY CLEAN ENERGY

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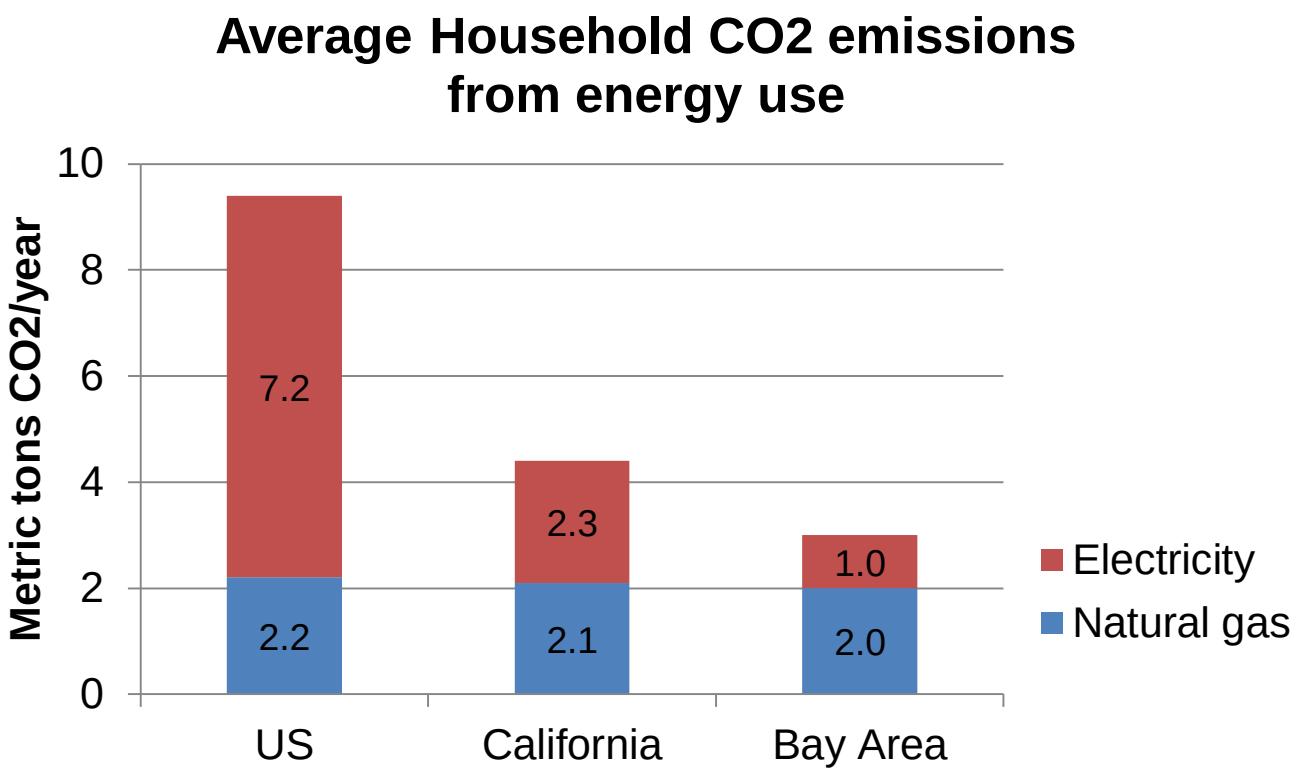
SVCE's Role
(possible partners or collaborators)
	• Contract with third-party program manager to implement program details.
	• Possibly combine with Green Lease program for rental homes (SF & MF) that aligns cost-benefit interests of renters and landlords.
	• Arrange with PG&E for line item on bill for financing.
	• Education and Outreach to customers.
	• Possibly add rebate to make even more attractive to customers, although reduces budget available for other programs.
	• Coordinate integrated BE-favorable local policies of SVCE member jurisdictions (for remodels and new)
	  ○ Permit fee and inspection streamlining
	  ○ Green building codes, including, but not limited to:
	  ▪ Add BE conduits/wires for HP water heater and EV charger, and possibly HP Heat/Cool, as a required component of solar PV installations.
	  ▪ Other specific green codes to add?
	• Potential partnership/collaboration with BAAQMD and/or local water districts on grants, incentives.
	• Extend outreach and education via allied non-profit and climate advocacy groups, as well as members.

Success *(define success)*	• Estimated total GHG reductions for participants • Number of participating customers. • # of Electrification-related technologies adopted (total and per home) • Kilowatt hours per customer. • Number and engagement level of participating trade allies. • Number of aligned policies among SVCE members. • Number of Green Leases adopted by participants.

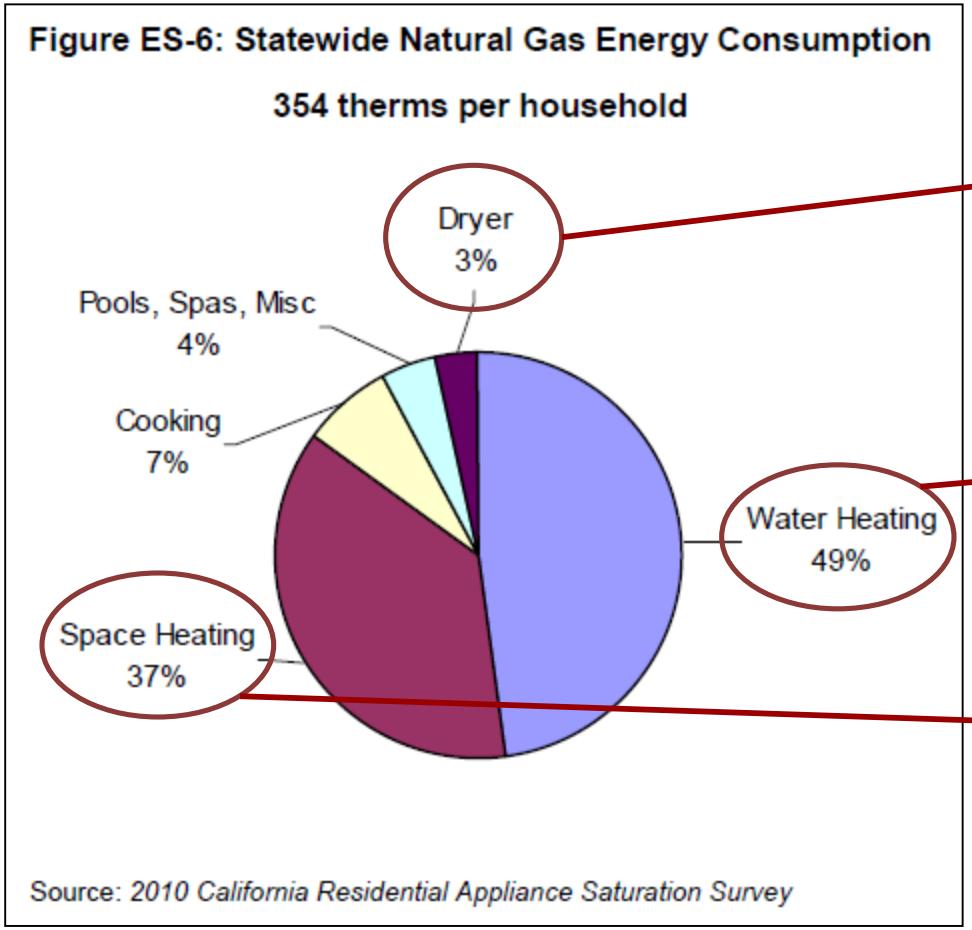
As electricity is getting cleaner, emissions from burning natural gas are becoming the majority of energy-related emissions from buildings



- Jones C., Kammen D., "Bay Area Consumption-Based Greenhouse Gas Emissions Inventory", Jan. 2016, http://www.baaqmd.gov/research-and-data/emission-inventory/consumption-based-ghg-emissions-inventory
- Note including emissions from methane and other high global warming potential gases

Excerpts from May, 2017 presentation by NRDC Pierre Delforge

Heat pump technology can electrify over 90% of thermal end uses



Heat-pump clothes dryer

Heat-pump water heater

Heat pump space heating

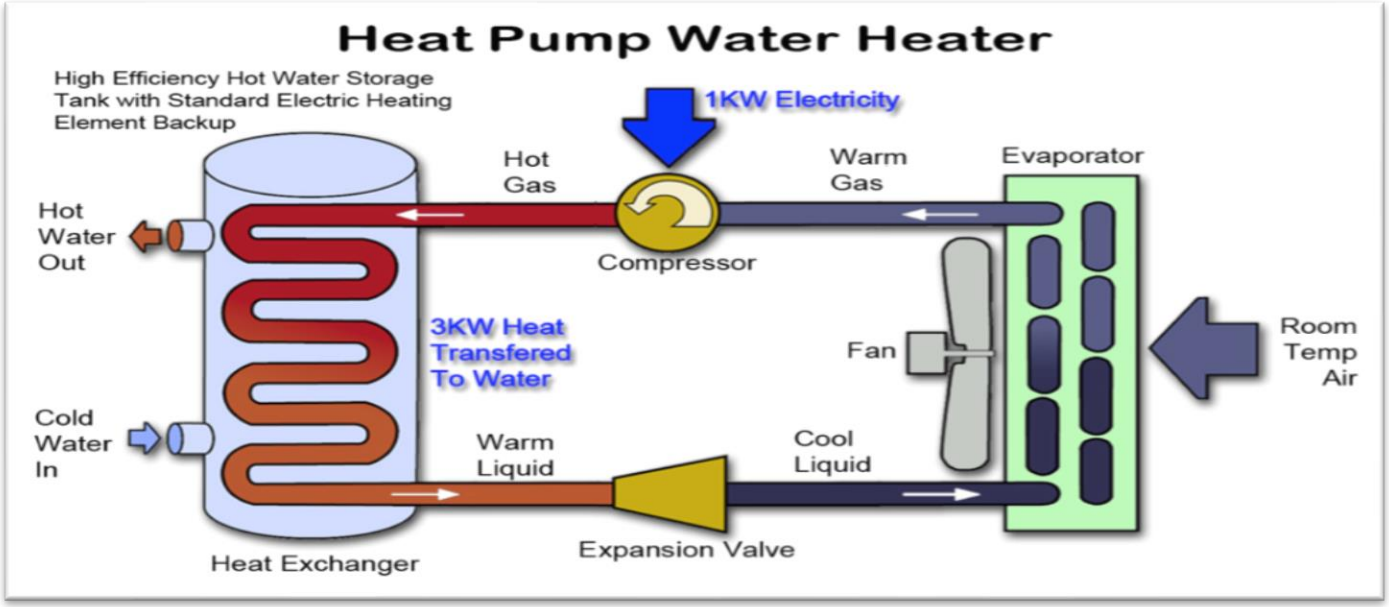
Excerpts from May, 2017 presentation by NRDC Pierre Delforge

Heat pumps 101

Moves (or "pumps") heat from ambient air into the tank or building, instead of generating it with a resistive element

Like a fridge or A/C in reverse

250-400% efficient!



Excerpts from May, 2017 presentation by NRDC Pierre Delforge

Heat pump water heating

Heat pump water heaters are a mature technology with a wide range of affordable models in the market

Popular models:

AO Smith

Bradford White

Rheem

Stiebel Eltron

Sanden

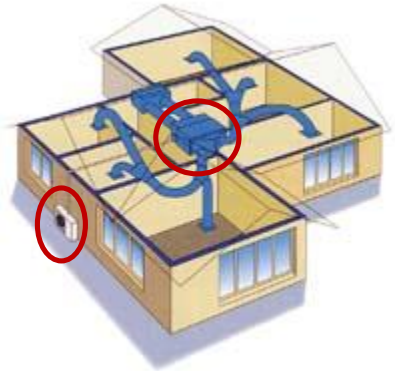
100+ ENERGY STAR models

Excerpts from May, 2017 presentation by NRDC Pierre Delforge

Heat pump space heating

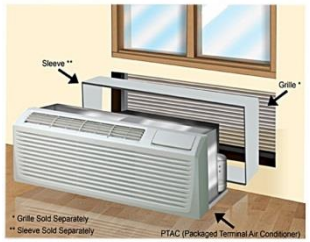
Heat pumps provide both heating and cooling (replace A/C)

Three main types of heat pumps for residential space heating and cooling:



Central heat pump

Ductless heat pump
(“Mini-split”)



Packaged terminal
heat pump (PTHP)

Excerpts from May, 2017 presentation by NRDC Pierre Delforge

Multi-family and commercial too!

Water heating:

- ❑ Unitary, as in single family
- ❑ Centralized: larger tank, shared between multiple units

Space heating:

- ❑ Central heat pump
- ❑ Mini-split
- ❑ Packaged-terminal

Excerpts from May, 2017 presentation by NRDC Pierre Delforge

Benefits: high-five for heat pumps!

Efficiency
- 250-400% efficient

Emissions
- Much lower CO2, CH4, NOx…

Safety
- No gas combustion and explosion risks

Bills
- Lower utility bills*

Grid
- Deep renewables integration

* Depending on local utility rates and appliance efficiency

Excerpts from May, 2017 presentation by NRDC Pierre Delforge

Item 2
Programs Brief
ADDED

BE Smart

A program design for mass beneficial electrification for existing residential buildings

Carbon Free Palo Alto

What is BE Smart?

Proactive approach to implementing beneficial electrification of existing residential buildings

Replaces natural gas devices with much more efficient electric counterparts

A unique combination of marketing, finance and operational components break down barriers to accelerate adoption

Implementation driven by utilities or CCAs

Timeline and Goals

Replace 100% of NG devices by expected expiration

100% conversion of water heating by 2030 (7%/year, 13 year life)

100% conversion of space heating by 2037 (5%/year, 20 year life)

Program Design Requirement: Remove the Key Barriers to Adoption

High up-front cost

Split incentives - renters vs owners

Complexity of the buying process

Emergency replacement practices that favor business as usual

Gas and electricity rates misprice carbon and fuel switching efficiencies

California building codes favor NG devices over electric

BE Smart: Two essential elements

Tariffed on-bill financing (TOB)

Proactive device replacement before end-of-life by utilities/CCAs

Essential #1: Tariffed on-bill financing (TOB)

Owner contributes initial outlay equal to BAU

Amount over BAU is financed w/ low interest rates over equipment life

Projected fixed monthly charges in the $13/month range (without rebates)

Monthly charges decline as the market develops

TOB is inclusive financing - everyone qualifies!

Essential #2: Proactive, concierge service for device upgrade provided through utility

Utility employs third party to manage deployment of device upgrades

Easy for customers: check a box for a complete solution managed by utility

Customer net monthly cost is low - $10/month (includes operational savings)

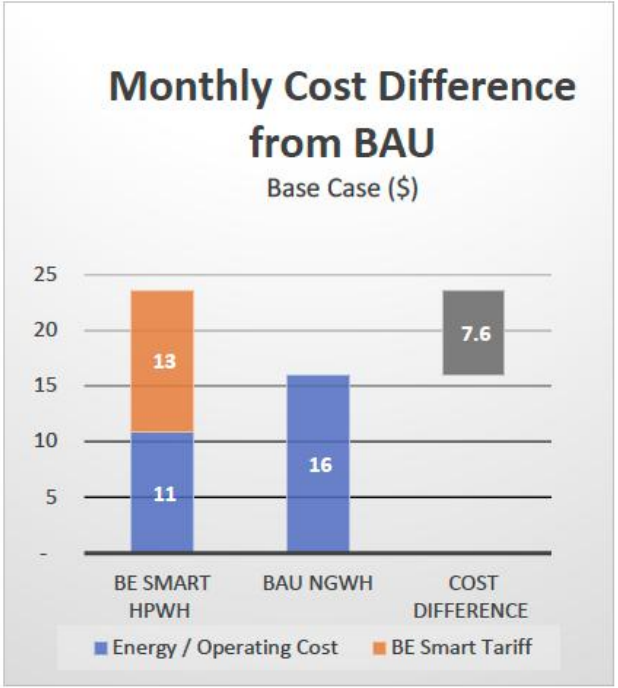
Benefits over BAU: GHG reduction, safety, health, efficiency, controllability

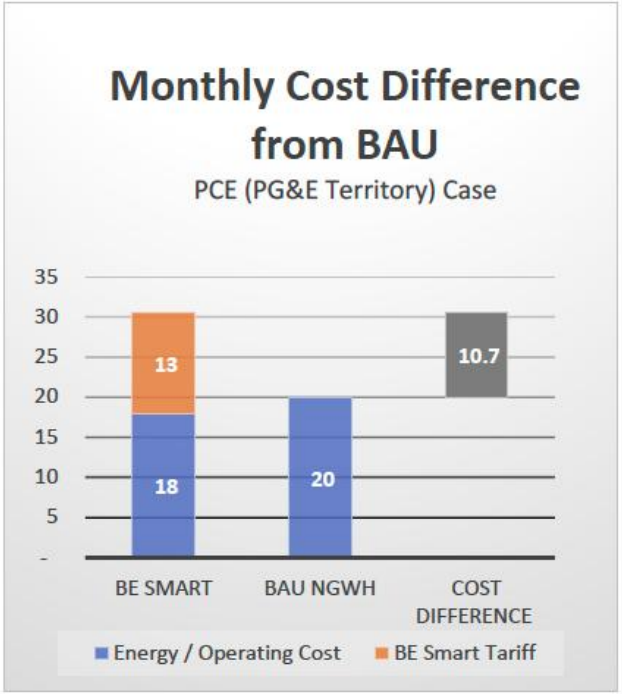
Customer Economics Model

BAU ~$1,300

Elect: $0.13

NG: $1.13





BAU ~$1,300

Elect: $0.22

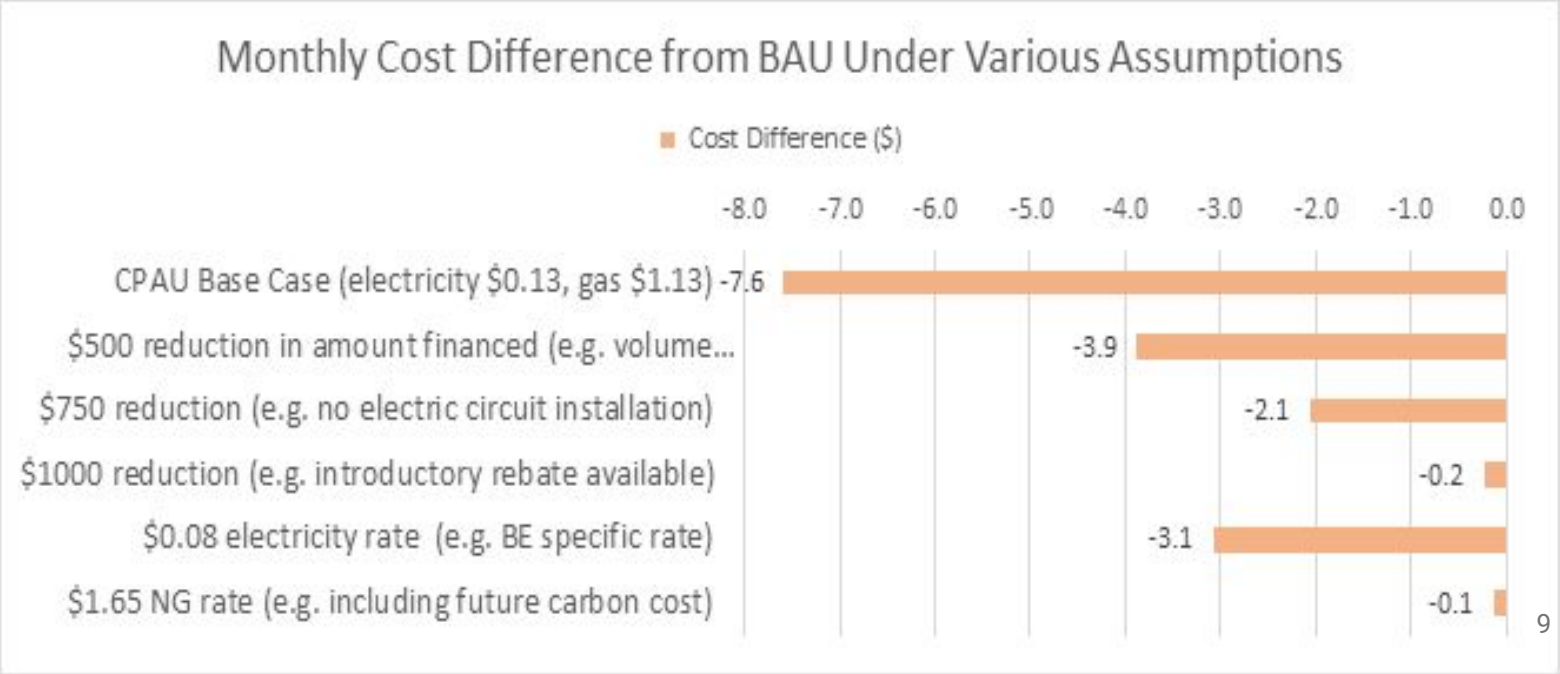
NG: $1.41

Model Sensitivity

Electricity rates

Natural gas rates

Installation costs



Utility perspective

Opportunity to play leading role in deep carbon reductions

Enables rapid smart grid infrastructure buildout behind the meter

Increased electricity revenue

New opportunities for distributed energy resource management

Conclusion

BE Smart uniquely addresses all major barriers to adoption

It extends the public infrastructure financing model to serve building efficiency and decarbonization efforts

It pays back by spreading costs over lifetime of device

BE Smart is scalable to mass deployment within required time-frame!

Thank You

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Carbon Free Palo Alto

Model Sensitivity - PCE