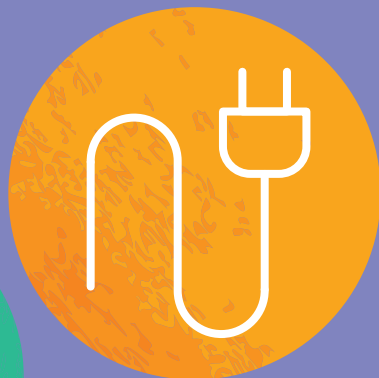
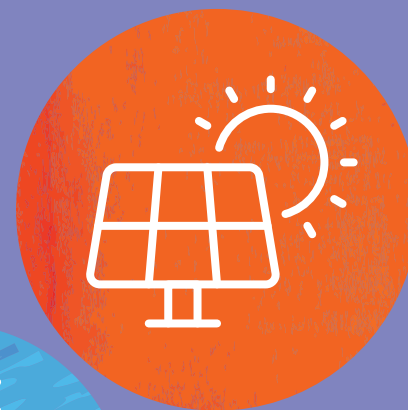


SINGLE-FAMILY HOME DECARBONIZATION CASE STUDY

HALF MOON BAY 2-STORY HOME



OFFICE OF
SUSTAINABILITY
COUNTY OF SAN MATEO

FUNDED BY



Updated 3/1/2023

CONTENTS

HOME ASSESSMENT 3

Specs	4
Initial Home Assessment/Intake	6
Floor Plans With and Without Upgrades	7
Floor Plans With Upgrades.....	8

ELECTRICAL UPGRADES 10

Main Electric Panel	11
Laundry Room Subpanel	12
Wiring	13
EV Charging	14
Cooking	15
Clothes Drying.....	16
Contractor Quotes	17

PLUMBING UPGRADE18

Water Heater.....	19
Contractor Quotes	20

HVAC UPGRADE21

Space Heating/Cooling	22
Contractor Quotes	23

INSULATION UPGRADES 24

Building Shell Improvements.....	25
Contractor Quotes	26

OPTIONAL SOLAR & BATTERY UPGRADES 27

Solar & Battery.....	29
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COST SUMMARY30

CONTACT31

HOME ASSESSMENT





HALF MOON BAY 2-STORY HOME

 2,244 Square Feet


 3 Occupants

 Built in 1979

 3 Bedrooms

 3 Baths

The Homeowners are Interested in
Solar/Battery
Electric Vehicle Charging
Electric Wall Oven
Heat Pump Dryer
Heat Pump Water Heater
Heating/Cooling



All recommendations are made to eliminate carbon emissions, increase energy efficiency, and optimize the electric panel.

Panel optimization calls for fitting all the new electric appliances on the panel without having to upgrade the panel and adequately using unused panel space. This is done by careful selection of appliances based on amps and efficiency.



INITIAL HOME ASSESSMENT/INTAKE

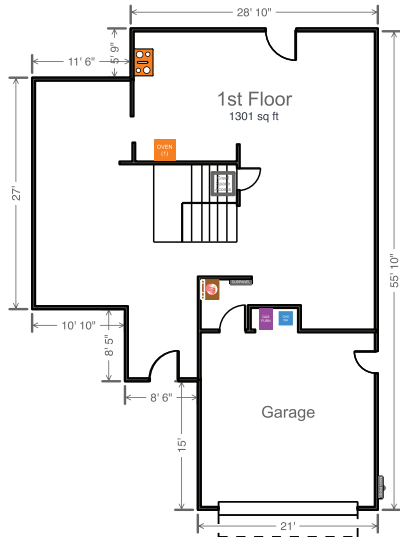
Ducts are in good shape

Good attic insulation

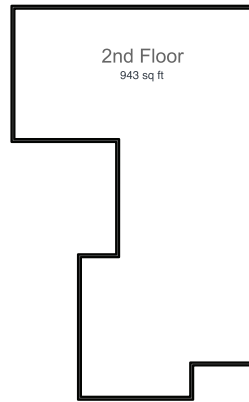
New rubber tiled roof needed
for solar

FLOOR PLANS WITH AND WITHOUT UPGRADES*

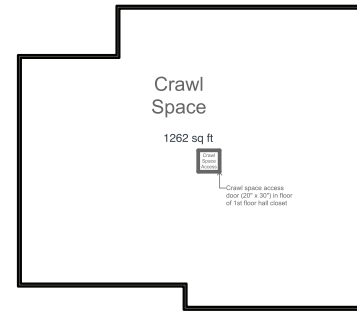
Current Conditions



Current Conditions



Current Conditions

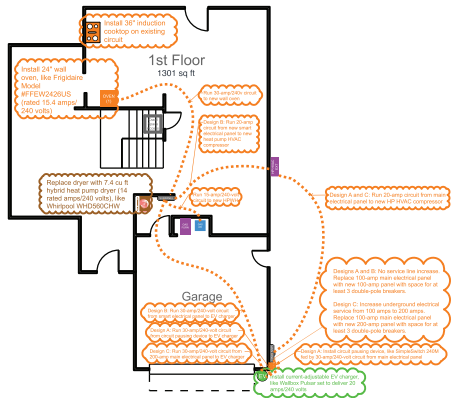


*Information for contractors

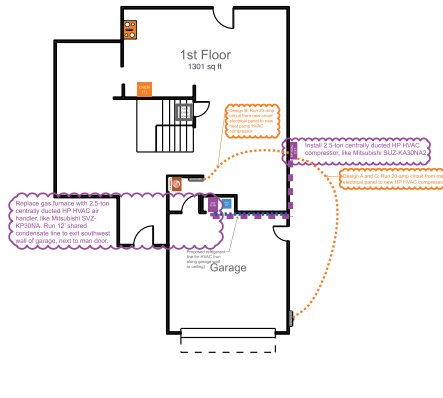


FLOOR PLANS WITH UPGRADES*

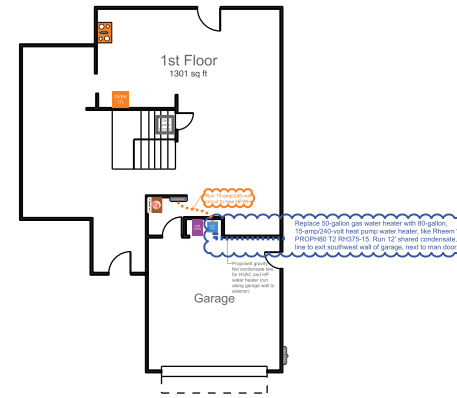
All Electrical Work



HVAC Work

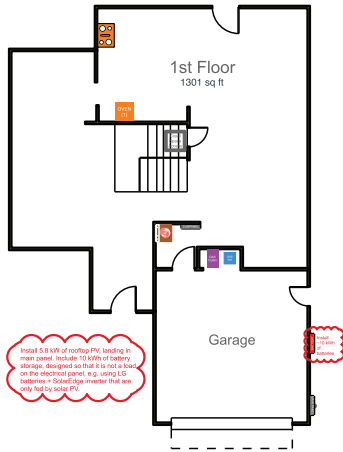


Water Heater Work

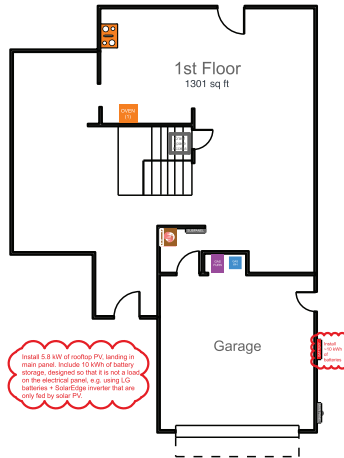


FLOOR PLANS WITH UPGRADES*

Solar PV Work



Battery Storage Work



All Electrification Projects



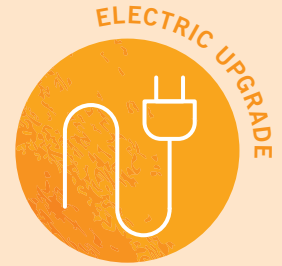
ELECTRICAL UPGRADES



MAIN ELECTRICAL PANEL



Existing
100-amp main
electrical panel



RECOMMENDED

100-amp Electrical Panel



Lowest Bid

Cost without incentives*\$2,900

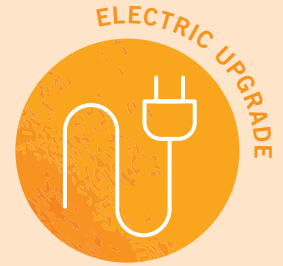
Cost with incentives*\$0

*Cost includes new laundry room subpanel

LAUNDRY ROOM SUBPANEL



Existing
100-amp subpanel



RECOMMENDED

100-amp Subpanel



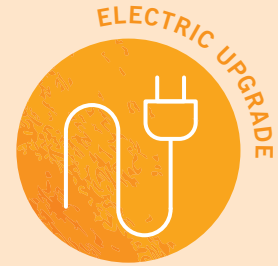
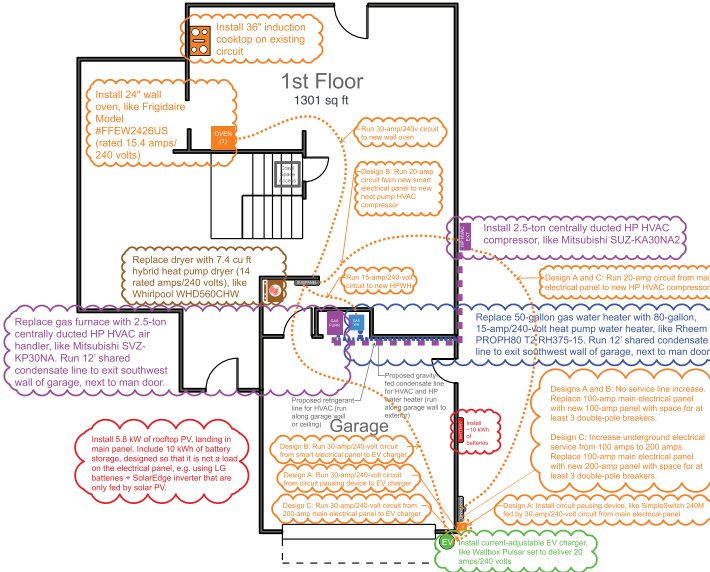
Lowest Bid

Cost without incentives*\$0

Cost with incentives*\$0

*Cost included with main panel work

WIRING



RECOMMENDED

3 240-volt Circuits to Water Heater, HVAC compressor, Wall Oven



Lowest Bid

Cost without incentives.....\$2,200

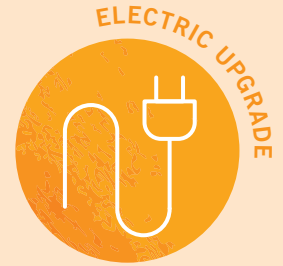
Cost with incentives\$950

EV CHARGING



Recommended


⊗
Existing



RECOMMENDED

EV Charger

Energy Management System

 **Lowest Bid**

Cost without incentives.....\$2,800

Cost with incentives\$2,800

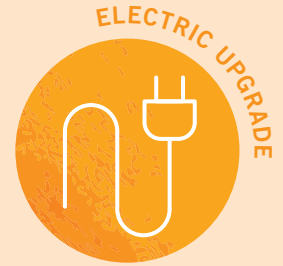
COOKING



Recommended



Existing
5-burner 36" electric
radiant cooktop and no
wall oven



RECOMMENDED

24" Electric Wall Oven



Lowest Bid

Cost without incentives.....\$2,239

Cost with incentives\$1,069

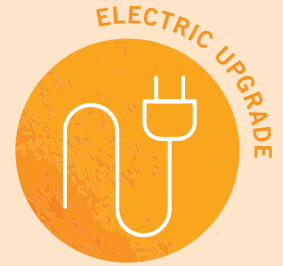
CLOTHES DRYING



Existing
7.5 cu ft electric
resistance dryer



Recommended



RECOMMENDED

7.4 cu ft Hybrid Heat Pump Dryer



Lowest Bid

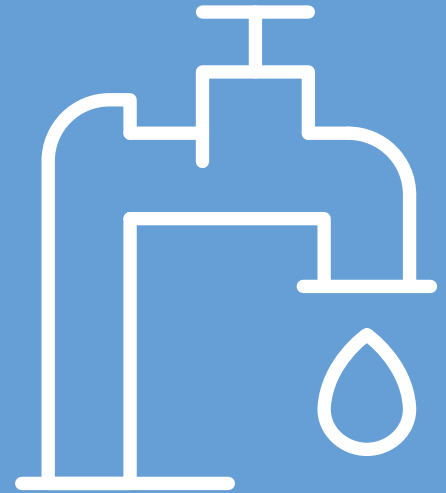
Cost without incentives.....\$1,394

Cost with incentives\$674

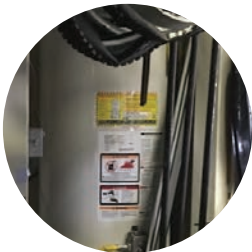
CONTRACTOR QUOTES

Existing Condition	Proposed Electrification	Replace Existing (gas)	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives	Mid Bid	Mid Bid With Incentives	High Bid	High Bid With Incentives
100-amp main electrical panel and 100-amp laundry room subpanel	New 100-amp main electrical panel and 100-amp laundry room subpanel	\$0	\$2,900	\$0	\$2,900	\$0	\$3,760	\$860	\$6,075	\$3,175
No 240-volt circuits to water heater, HVAC, wall oven	3 240-volt circuits to water heater, HVAC compressor, wall oven	\$0	\$2,200	\$950	\$2,200	\$950	\$2,260	\$1,010	\$6,655	\$5,405
At-home fueling for 1 EV: 12k miles/year	EV charger and energy management system	\$0	\$2,800	\$2,800	\$2,800	\$2,800	\$2,940	\$2,940	\$3,544	\$3,554
5-burner 36" electric radiant cooktop and no wall oven	24" electric wall oven	\$2,239	\$2,239	\$1,069	\$2,239	\$1,069	\$2,239	\$1,069	\$2,239	\$1,069
7.5 cu ft electric resistance dryer	7.4 cu ft hybrid heat pump dryer	\$1,079	\$1,394	\$674	\$1,394	\$674	\$1,394	\$674	\$1,394	\$674
Total		\$3,318	\$11,533	\$5,493	\$11,533	\$5,493	\$12,593	\$6,553	\$19,907	\$13,877

PLUMBING UPGRADE



WATER HEATER



Existing
50-gallon gas
water heater



Recommended

RECOMMENDED

80-gallon Heat Pump Water Heater

Why

Uses 1/3 the energy of a gas water heater



Lowest Bid

Cost without incentives.....\$5,934

Cost with incentives\$741

CONTRACTOR QUOTES

Existing Condition	Proposed Electrification	Replace Existing (gas)	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives	Mid Bid	Mid Bid With Incentives	High Bid	High Bid With Incentives
50-gallon gas water heater	80-gallon heat pump water heater	\$2,754	\$4,400	\$0	\$5,934	\$741	\$7,476	\$2,283	\$8,565	\$3,372
Total		\$2,754	\$4,400	\$0	\$5,934	\$741	\$7,476	\$2,283	\$8,565	\$3,372

HVAC UPGRADE



SPACE HEATING/COOLING



Recommended



Existing

80% efficient centrally ducted gas furnace



RECOMMENDED

30,000 BTU Centrally Ducted Heat Pump HVAC System with MERV 13 Filter



Lowest Bid

Cost without incentives.....\$12,586

Cost with incentives\$2,685

CONTRACTOR QUOTES

Existing Condition	Proposed Electrification	Replace Existing (gas)	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives	Mid Bid	Mid Bid With Incentives	High Bid	High Bid With Incentives
80% efficient centrally ducted gas furnace	30,000 BTU centrally ducted heat pump HVAC system with MERV 13 filter	\$4,448	\$5,500	\$0	\$12,586	\$2,685	\$14,753	\$4,852	\$17,830	\$7,929
Total		\$4,448	\$5,500	\$0	\$12,586	\$2,685	\$14,753	\$4,852	\$17,830	\$7,929

INSULATION UPGRADES



BUILDING SHELL IMPROVEMENTS



Existing
Attic,
some

Existing
Duckwork,
fair condition

Existing
Floor,
some

Existing
Walls,
some



RECOMMENDED

No Change



Lowest Bid

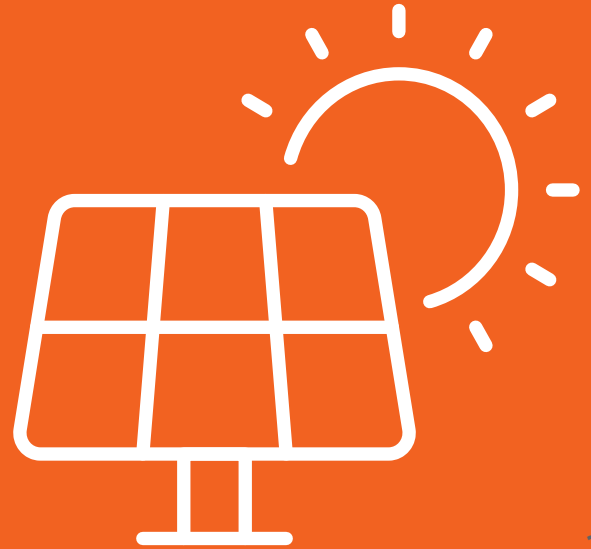
Cost without incentives.....\$0


Cost with incentives\$0

CONTRACTOR QUOTES

Existing Condition	Proposed Electrification	Replace Existing (gas)	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives	Mid Bid	Mid Bid With Incentives	High Bid	High Bid With Incentives
Insulation: attic – some	No Change	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Ductwork: fair condition	No Change	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Insulation: floor – some	No Change	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Insulation: walls – some	No Change	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

OPTIONAL SOLAR & BATTERY UPGRADES



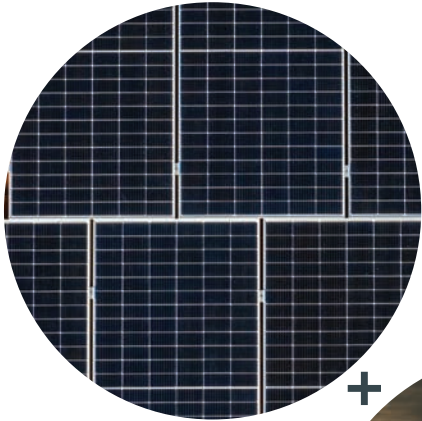


Decarbonizing a home does not require adding solar or batteries, since the electricity in San Mateo County is 100% carbon emissions free.

Instead, solar panels can make electrification more affordable and batteries provide resiliency during power outages.



SOLAR & BATTERY



Recommended



Existing



RECOMMENDED

5.8 kW Solar System

10 kWh Battery System



Lowest Bid Solar

Cost without incentives.....\$12,000

Cost with incentives\$8,400

Lowest Bid Battery

Cost without incentives.....\$12,006

Cost with incentives\$8,404

COST SUMMARY

ELECTRIFICATION COSTS

Subtotals of Upgrade by Trade	Replace Existing (gas)	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives	Mid Bid	Mid Bid With Incentives	High Bid	High Bid With Incentives
Electrical	\$3,318	\$11,533	\$5,493	\$11,533	\$5,493	\$12,593	\$6,553	\$19,907	\$13,877
Plumbing	\$2,754	\$4,400	\$0	\$5,934	\$741	\$7,476	\$2,283	\$8,565	\$3,372
HVAC	\$4,448	\$5,500	\$0	\$12,586	\$2,685	\$14,753	\$4,852	\$17,830	\$7,929
Insulation	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$10,520	\$21,433	\$5,493	\$30,053	\$8,919	\$34,822	\$13,688	\$46,302	\$25,178

OPTIONAL SOLAR & BATTERY INVESTMENT*

Existing Condition	Proposed Electrification	Replace Existing (gas)	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives	Mid Bid	Mid Bid With Incentives	High Bid	High Bid With Incentives
Rooftop solar PV: none	Rooftop solar PV: 5.8 kW	\$0	\$12,000	\$8,400	\$12,000	\$8,400	\$20,875	\$14,613	\$22,600	\$15,820
Home battery: none	Home battery: 10 kWh	\$0	\$12,006	\$8,404	\$12,006	\$8,404	\$14,675	\$10,272	\$18,500	\$12,950
Total		\$0	\$24,006	\$16,804	\$24,006	\$16,804	\$35,550	\$24,885	\$41,100	\$28,770

For more information about incentives, please visit www.smcsustainability.org/energy-water/decarbonizing-homes/incentives

*Solar and batteries are not required for home and vehicle electrification. Peninsula Clean Energy already provides carbon-free electricity for its customers. Solar and batteries are an investment opportunity for any home to save on the electric bill and to increase electricity resilience.

CONTACT

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WWW.SMCSUSTAINABILITY.ORG



OFFICE OF
SUSTAINABILITY
COUNTY OF SAN MATEO

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