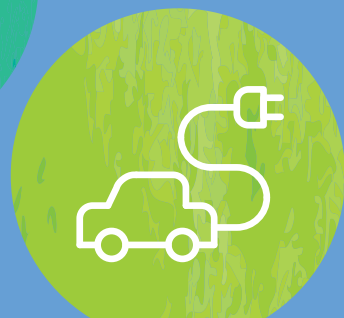
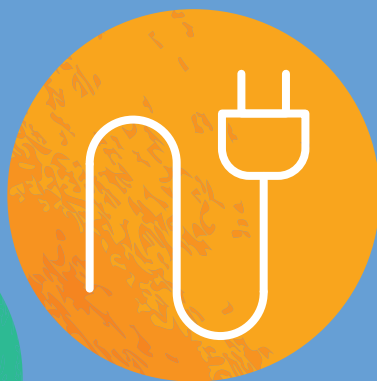
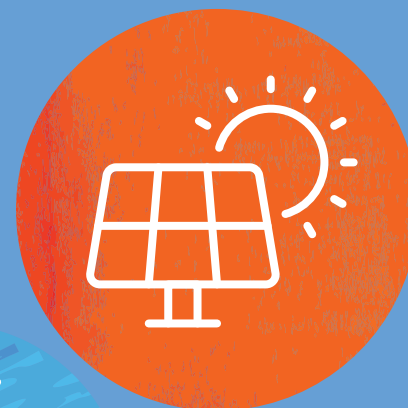


SINGLE-FAMILY HOME DECARBONIZATION CASE STUDY

SAN BRUNO 2-STORY HOME



OFFICE OF
SUSTAINABILITY
COUNTY OF SAN MATEO

FUNDED BY



Updated 3/1/2023.2

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HOME ASSESSMENT





SAN BRUNO 2-STORY HOME

 1,700 Square Feet

 2 Occupants


 Built in 1958

 4 Bedrooms

 2 Baths

 Hillside Lot

The Homeowners are Interested in
Solar/Battery
Electric Vehicle Charging
Induction Cooktop
Heat Pump Dryer
Heat Pump Water Heater
Heating/Cooling
Insulation



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.

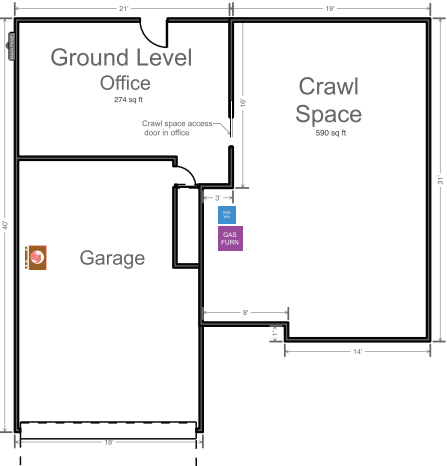


INITIAL HOME ASSESSMENT/INTAKE

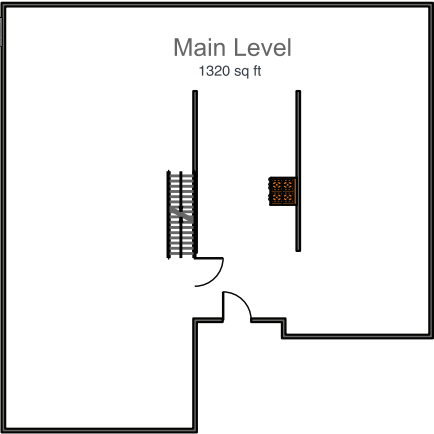
- Attic currently has some insulation
- Roof has decent solar exposure
- Kitchen has an electric wall oven
- Current gas usage is lower than typical for home size
- Homeowner qualifies for PG&E CARE program
- Walls and floors have no insulation
- Stove, dryer, water heater and furnace use natural gas

FLOOR PLANS WITHOUT UPGRADES

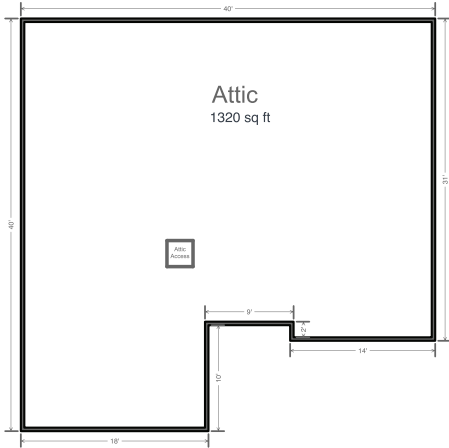
Current Condition



Current Condition

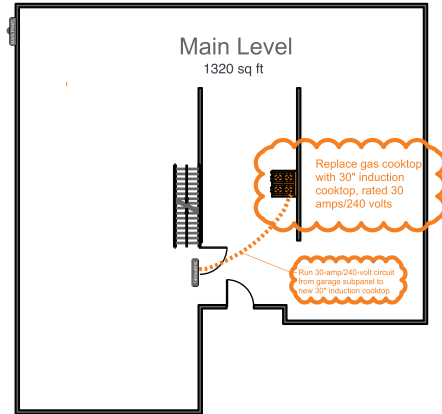


Current Condition

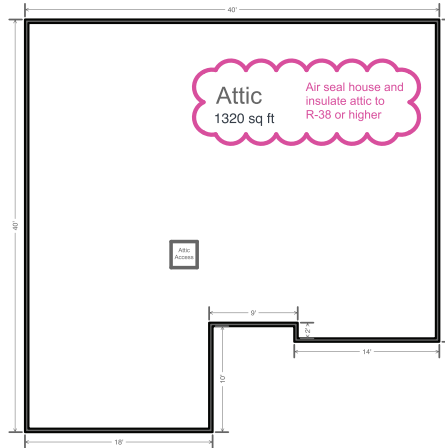


FLOOR PLANS WITH UPGRADES*

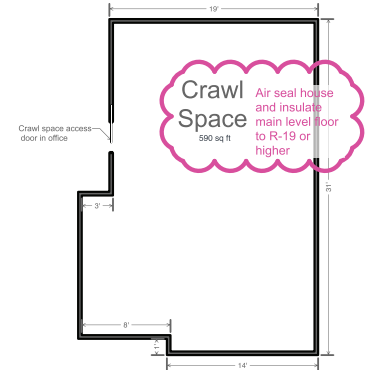
Kitchen Range Work



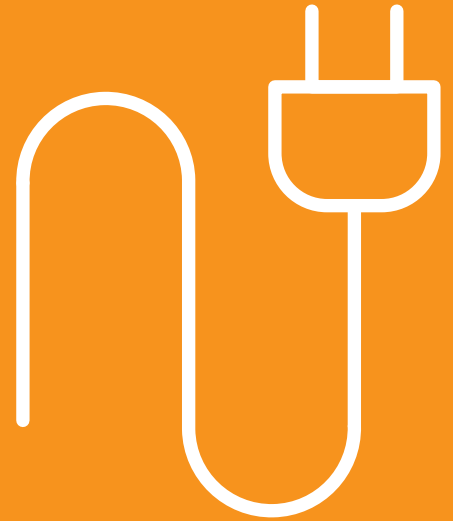
Attic Insulation Work



Floor Insulation Work



ELECTRICAL UPGRADES



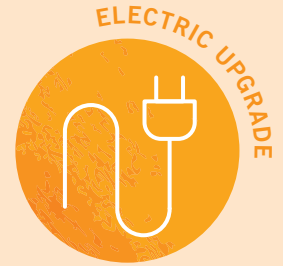
MAIN ELECTRICAL PANEL



Recommended



Existing
100-amp fuse box



RECOMMENDED

100-amp Electrical Panel



Lowest Bid

Cost without incentives..... \$4,959*

Cost with incentives \$2,859*

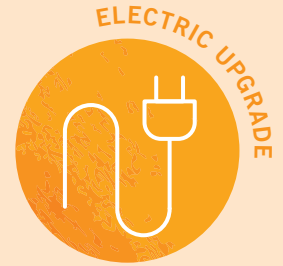
*Cost includes new garage subpanel

GARAGE SUBPANEL



⊗
Existing

Recommended



RECOMMENDED

100-amp Subpanel

Why

To solve a problem with circuit space when necessary. This also creates shorter wire runs.



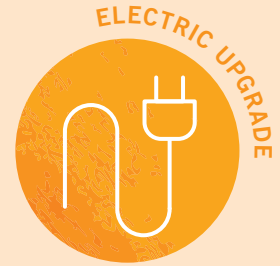
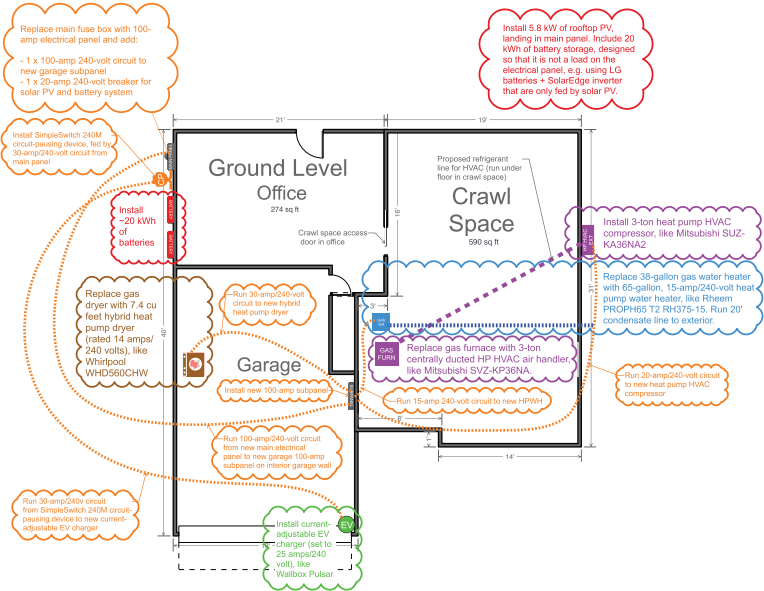
Lowest Bid

Cost without incentives*\$0

Cost with incentives\$0

*Cost included with main panel work

WIRING



RECOMMENDED

4 240-volt Circuits to Cooktop, Water Heater, Dryer, and HVAC Compressor

Lowest Bid

Cost without incentives.....\$3,125

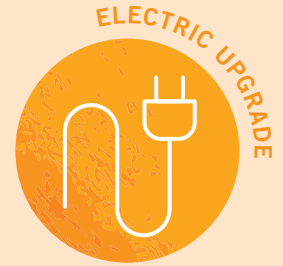
Cost with incentives\$625

EV CHARGING



Recommended



Existing



RECOMMENDED

EV Charger

Energy Management System

 **Lowest Bid**

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

Cost with incentives\$1,200

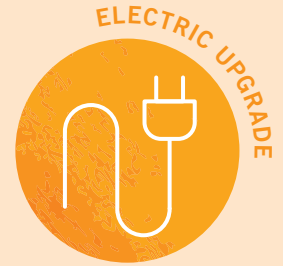
COOKING



Recommended



Existing
4-burner
30" gas cooktop



RECOMMENDED

4-burner 30" Induction Cooktop

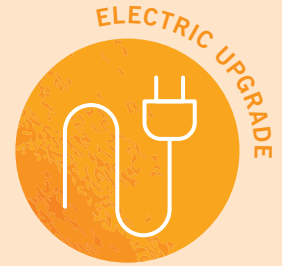


Lowest Bid

Cost without incentives.....\$828

Cost with incentives\$0

CLOTHES DRYING



Recommended



Existing

7.5 cu ft gas dryer

RECOMMENDED

7.4 cu ft Hybrid Heat Pump Dryer



Lowest Bid

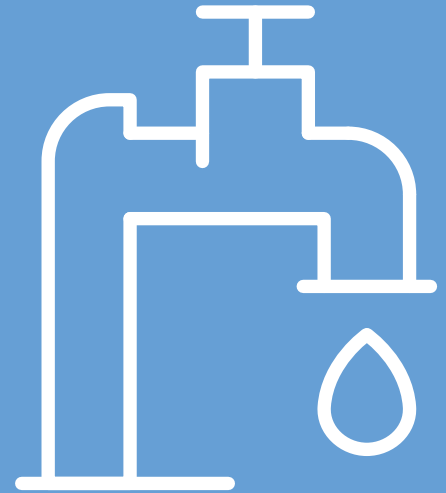
Cost without incentives.....\$1,394

Cost with incentives\$254

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 fuse box	100-amp main electrical panel and new subpanel in garage	\$0	\$4,959	\$2,859	\$4,959	\$2,859	\$6,867	\$4,767	\$9,422	\$7,322
No 240-volt circuits to water heater, HVAC, range, dryer	4 240-volt circuits to water heater, HVAC compressor, cooktop, dryer	\$0	\$3,125	\$625	\$3,125	\$625	\$6,967	\$4,467	\$7,325	\$4,825
No at-home fueling for 2 gas cars: 15k miles/year	EV charger and energy management system	\$0	\$2,200	\$1,200	\$2,200	\$1,200	\$3,217	\$2,217	\$4,516	\$3,516
4-burner 30" gas cooktop	4-burner 30" induction cooktop	\$598	\$828	\$0	\$828	\$0	\$828	\$0	\$828	\$0
7.5 cu ft gas dryer	7.4 cu ft hybrid heat pump dryer	\$1,079	\$1,394	\$254	\$1,394	\$254	\$1,394	\$254	\$1,394	\$254
Total		\$1,677	\$12,506	\$4,938	\$12,506	\$4,938	\$19,273	\$11,705	\$23,485	\$15,917

PLUMBING UPGRADE



WATER HEATER



Existing
40-gallon gas
water heater



Recommended



RECOMMENDED

65-gallon, Heat Pump Water Heater

Why

Uses 1/3 the energy of a gas water heater



Lowest Bid

Cost without incentives.....\$5,182

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
40-gallon gas water heater	65-gallon heat pump water heater	\$2,849	\$3,809	\$0	\$5,182	\$0	\$7,909	\$2,727	\$8,365	\$3,183
Total		\$2,849	\$3,809	\$0	\$5,182	\$0	\$7,909	\$2,727	\$8,365	\$3,183

HVAC UPGRADE



SPACE HEATING/COOLING



Recommended



Existing

80% efficient centrally ducted gas furnace

RECOMMENDED

36,000 BTU Centrally Ducted Heat Pump HVAC System with MERV 13 Filter

Why

Uses 1/3 the energy of a gas furnace



Lowest Bid

Cost without incentives.....\$13,855

Cost with incentives\$795

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	36,000 BTU centrally ducted heat pump HVAC system with MERV 13 filter	\$7,690	\$4,982	\$0	\$13,885	\$795	\$15,053	\$1,962	\$18,700	\$5,609
Total		\$7,690	\$4,982	\$0	\$13,885	\$795	\$15,053	\$1,962	\$18,700	\$5,609

INSULATION UPGRADES



BUILDING SHELL IMPROVEMENTS



Existing
Attic,
some insulation



Existing
Ductwork,
fair condition



RECOMMENDED

Attic: Air Seal, R38 Insulation

Ductwork: Seal and Insulate or Replace



Lowest Bid

Cost without incentives.....\$9,596

Cost with incentives\$5,750

BUILDING SHELL IMPROVEMENTS



Existing
Floor,
no insulation



Existing
Walls,
no insulation



RECOMMENDED

Floors: No Change

Walls: No Change



Lowest Bid

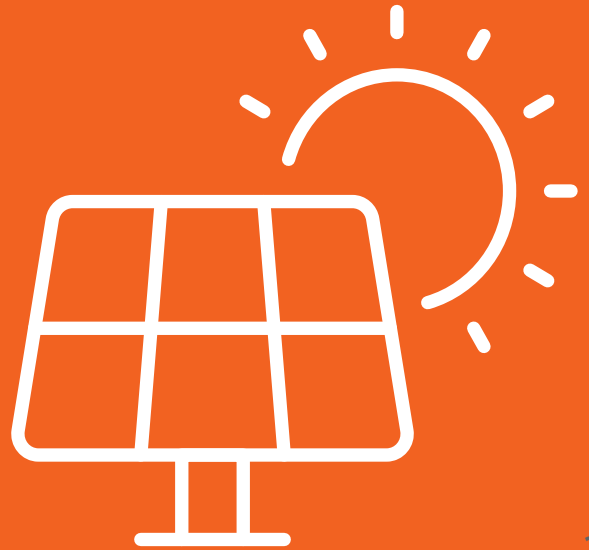
Cost without incentives.....\$0


Cost with incentives\$0

CONTRACTOR QUOTES

Existing Condition	Proposed Electrification	Replace Existing (gas)	Replace Existing (gas) With Incentives	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	Insulation: attic – R38	\$0	\$0	\$1,007	\$178	\$2,446	\$0	\$2,550	\$104	\$3,168	\$722
Ductwork: fair condition	Ductwork: seal and insulate	\$7,150	\$5,750	\$7,150	\$6,550	\$7,150	\$5,750	\$7,150	\$5,750	\$8,025	\$6,625
Insulation: floor – none	Insulation: floor – none	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Insulation: walls – none	Insulation: walls – none	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total		\$7,150	\$5,750	\$8,157	\$6,728	\$9,596	\$5,750	\$9,700	\$5,854	\$11,193	\$7,347

OPTIONAL SOLAR & BATTERY UPGRADES



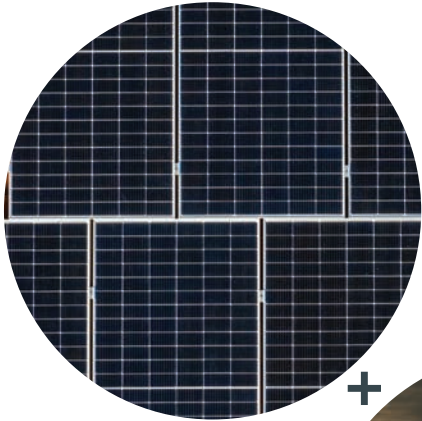


Decarbonizing a home does not require adding solar or batteries, since the electricity in San Mateo County is 100% carbon emissions free.

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



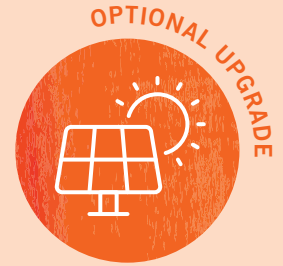
SOLAR & BATTERY



Recommended



Existing



RECOMMENDED

5.8 kW Rooftop Solar System 10 kWh Battery System



Lowest Bid Solar

Cost without incentives.....\$11,600

Cost with incentives\$8,120

Lowest Bid Battery

Cost without incentives.....\$12,400

Cost with incentives\$8,680

COST SUMMARY

ELECTRIFICATION COSTS

Subtotals of Upgrade by Trade	Replace Existing (gas)	Replace Existing (gas) With Incentives	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives	Mid Bid	Mid Bid With Incentives	High Bid	High Bid With Incentives
Electrical	\$1,677	\$1,677	\$12,506	\$4,938	\$12,506	\$4,938	\$19,273	\$11,705	\$23,485	\$15,917
Plumbing	\$2,849	\$2,849	\$3,809	\$0	\$5,182	\$0	\$7,909	\$2,727	\$8,365	\$3,183
HVAC	\$7,690	\$7,690	\$4,982	\$0	\$13,885	\$795	\$15,053	\$1,962	\$18,700	\$5,609
Insulation	\$7,150	\$5,750	\$8,157	\$6,728	\$9,596	\$5,750	\$9,700	\$5,854	\$11,193	\$7,347
Total	\$19,366	\$17,966	\$29,454	\$11,666	\$41,169	\$11,483	\$51,935	\$22,248	\$61,743	\$32,056

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	\$11,600	\$8,120	\$11,600	\$8,120	\$13,833	\$9,683	\$18,500	\$12,950
Home battery: none	Home battery: 10 kWh	\$0	\$12,400	\$8,680	\$12,400	\$8,680	\$14,675	\$10,272	\$18,500	\$12,950
Total		\$0	\$24,000	\$16,800	\$24,000	\$16,800	\$28,508	\$19,955	\$37,000	\$25,900

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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OFFICE OF
SUSTAINABILITY
COUNTY OF SAN MATEO

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