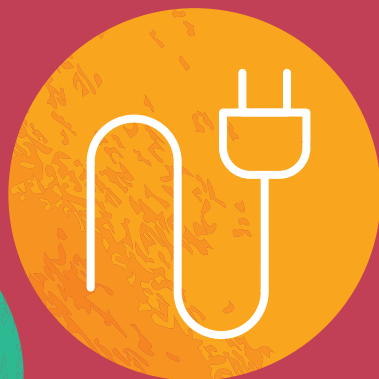
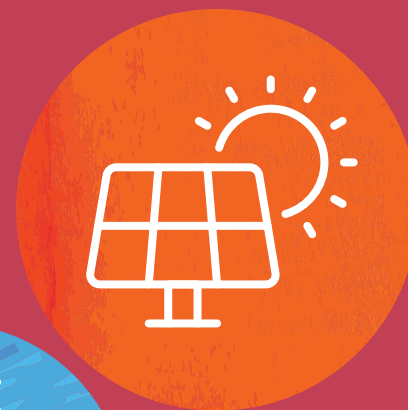


SINGLE-FAMILY HOME DECARBONIZATION CASE STUDY

# REDWOOD CITY TOWN HOME



OFFICE OF  
SUSTAINABILITY  
COUNTY OF SAN MATEO

FUNDED BY



Updated 3/1/2023

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# HOME ASSESSMENT





## REDWOOD CITY TOWN HOME

 **1,710 Square Feet**

 **5 Occupants**

 **Built in 1989**


 **3 Bedrooms**

 **2 Baths**

 **Part of Home Owners'  
Association (HOA)**

**The Homeowners are Interested in**  
Solar/Battery  
Electric Vehicle Charging  
Induction Cooktop  
Heat Pump Dryer  
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.

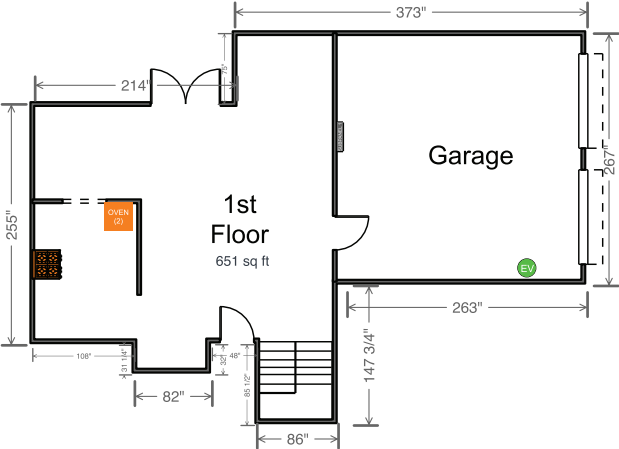


## INITIAL HOME ASSESSMENT/INTAKE

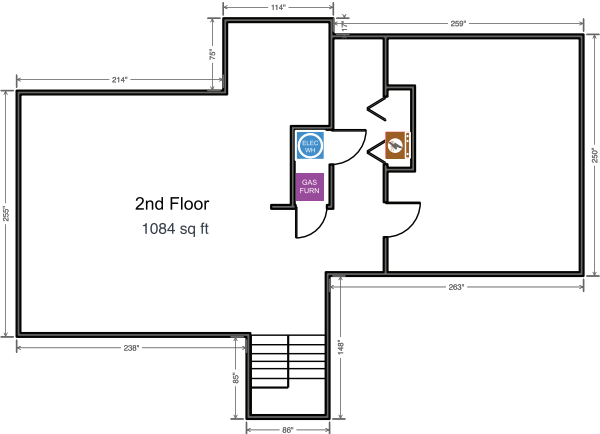
- Already has some electric appliances: electric resistance water heater, electric resistance dryer, electric double wall ovens, 50A/240V outlet for charging EV in garage
- Walls and attic are well insulated, due to relatively recent construction, slab foundation
- Roof small but good solar exposure
- 100A main panel difficult to access (HOA)
- EV charging demands: minimal at ~20 miles/day

# FLOOR PLANS WITHOUT UPGRADES

Current Condition

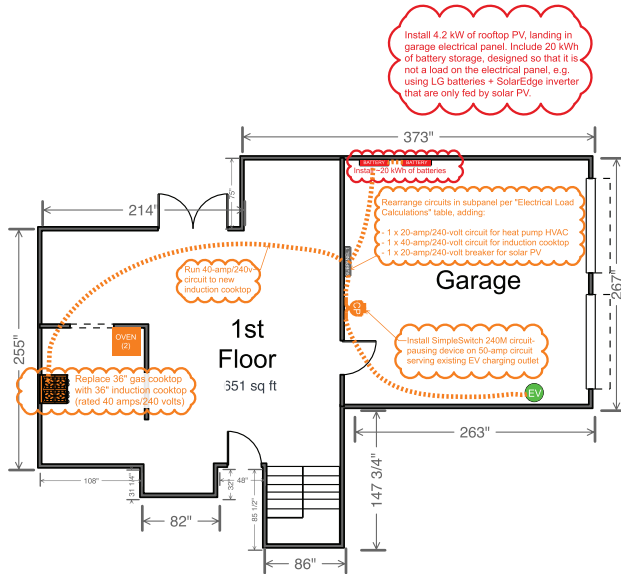


Current Condition

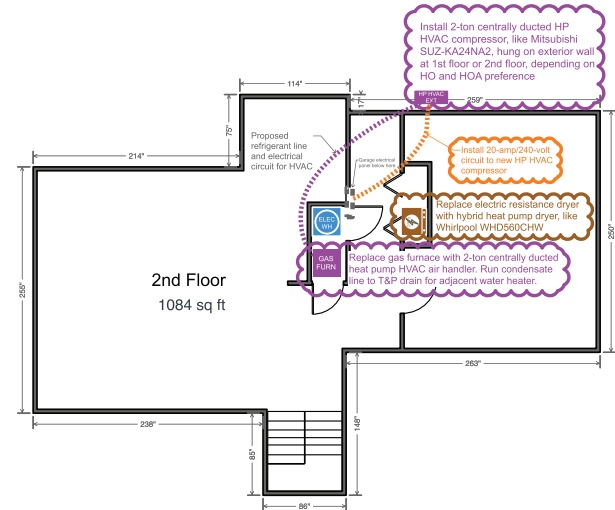


# FLOOR PLANS WITH UPGRADES\*

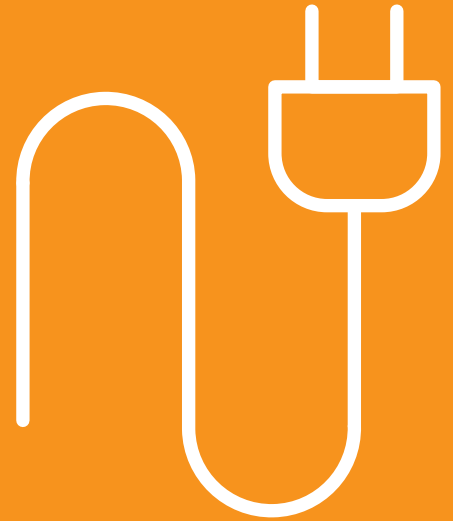
## All Electrification Projects



## All Electrification Projects



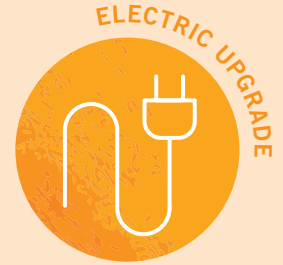
# ELECTRICAL UPGRADES



# MAIN ELECTRICAL PANEL



Existing  
100-amp main  
electrical panel



## RECOMMENDED

### 100-amp Electrical Panel



#### Lowest Bid

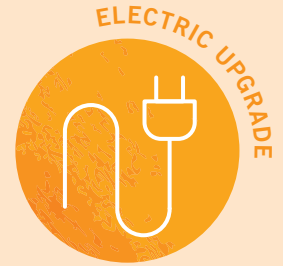
Cost without incentives.....\$300

Cost with incentives .....\$0

# GARAGE SUBPANEL



Existing  
100-amp subpanel



## RECOMMENDED

### No Change

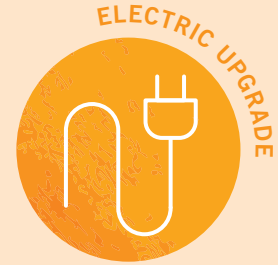
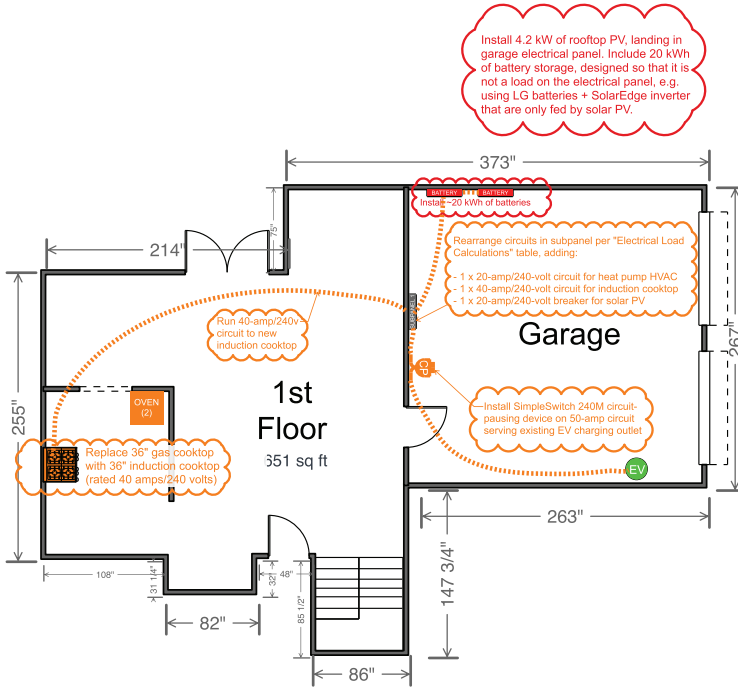


#### Lowest Bid

Cost without incentives.....\$0

Cost with incentives .....\$0

# WIRING



## RECOMMENDED

# 2 240-volt Circuits to HVAC Compressor, Cooktop

## Lowest Bid

Cost without incentives.....\$3,685

Cost with incentives .....\$2,435



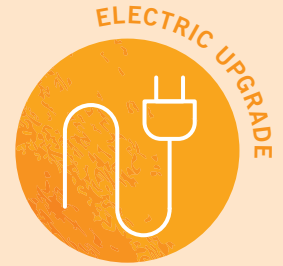
# EV CHARGING



Recommended



Existing  
50A Outlet



RECOMMENDED

## EV Charger Energy Management System



### Lowest Bid

Cost without incentives.....\$1,200

Cost with incentives.....\$1,200

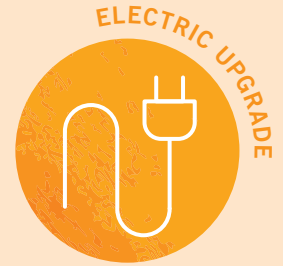
# COOKING



Recommended



Existing  
5-burner 36" gas cooktop



RECOMMENDED

## 5-burner 36" Induction Cooktop



**Lowest Bid**

Cost without incentives.....\$1,308

Cost with incentives .....\$138

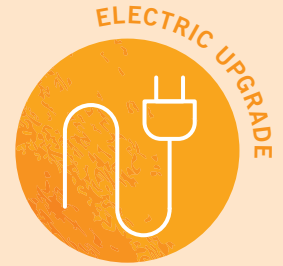
# CLOTHES DRYING



Existing  
7.4 cu ft electric  
resistance dryer



Recommended



## RECOMMENDED

### 7.4 cu ft Hybrid Heat Pump Dryer



#### Lowest Bid

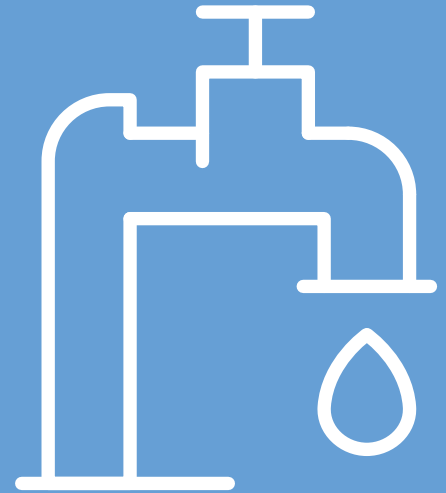
Cost without incentives.....\$1,394

Cost with incentives .....\$674

# CONTRACTOR QUOTES

Existing Condition	Proposed Electrification	Replace Existing (gasing)	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 garage subpanel	Low Bid: 100-amp main electrical panel and existing garage subpanel. Mid & High Bid: 100-amp main electrical panel and 100-amp smart garage subpanel	\$0	\$300	\$0	\$300	\$0	\$300	\$0	\$300	\$0
No 240-volt circuits to HVAC, cooktop	2 240-volt circuits to HVAC compressor, cooktop	\$0	\$3,685	\$2,435	\$3,685	\$2,435	\$4,300	\$3,050	\$4,420	\$3,170
At-home fueling for 2 EVs: 12k miles/year	EV charger and energy management system	\$0	\$1,200	\$1,200	\$1,200	\$1,200	\$1,640	\$1,640	\$3,671	\$3,671
5-burner 36" gas cooktop	5-burner 36" induction cooktop	\$1,380	\$1,380	\$138	\$1,308	\$138	\$2,470	\$1,300	\$2,692	\$1,522
7.4 cu ft electric resistance dryer	7.4 cu ft hybrid heat pump dryer	\$0	\$1,394	\$674	\$1,394	\$674	\$1,394	\$674	\$1,394	\$674
<b>Total</b>		<b>\$1,380</b>	<b>\$7,959</b>	<b>\$4,447</b>	<b>\$7,887</b>	<b>\$4,447</b>	<b>\$10,104</b>	<b>\$6,664</b>	<b>\$12,477</b>	<b>\$9,037</b>

# PLUMBING UPGRADE



# WATER HEATER



Existing  
50-gallon electric resistance  
water heater



## 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
50-gallon electric resistance water heater	No Change	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Total</b>		<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

# HVAC UPGRADE





# SPACE HEATING/COOLING



Recommended



Existing

80% efficient centrally ducted gas furnace



## RECOMMENDED

### 24,000 BTU Centrally Ducted Heat Pump HVAC System With MERV 13 Filter



#### Lowest Bid

Cost without incentives.....\$11,750

Cost with incentives .....\$2,100

# 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	24,000 BTU centrally ducted heat pump HVAC system with MERV 13 filter	\$4,808	\$5,275	\$0	\$11,750	\$2,100	\$14,993	\$5,343	\$16,755	\$7,105
<b>Total</b>		<b>\$4,808</b>	<b>\$5,275</b>	<b>\$0</b>	<b>\$11,750</b>	<b>\$2,100</b>	<b>\$14,993</b>	<b>\$5,343</b>	<b>\$16,755</b>	<b>\$7,105</b>

# INSULATION UPGRADES



# BUILDING SHELL IMPROVEMENTS

Existing  
Attic,  
R38 insulation

Existing  
Ductwork,  
good condition

Existing  
Floor,  
no insulation (slab)

Existing  
Walls,  
some insulation



## RECOMMENDED

### No Change



#### Lowest Bid

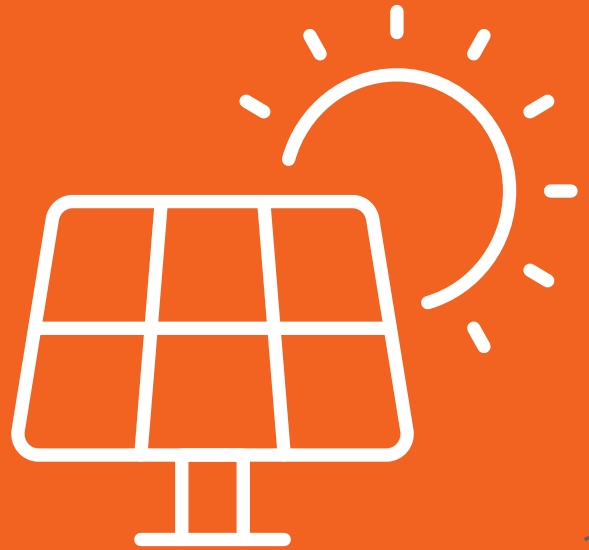
Cost without incentives.....\$0


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 – R38	No Change	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Ductwork: good condition	No Change	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Insulation: floor – none (slab)	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
<b>Total</b>		<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

# OPTIONAL SOLAR & BATTERY UPGRADES



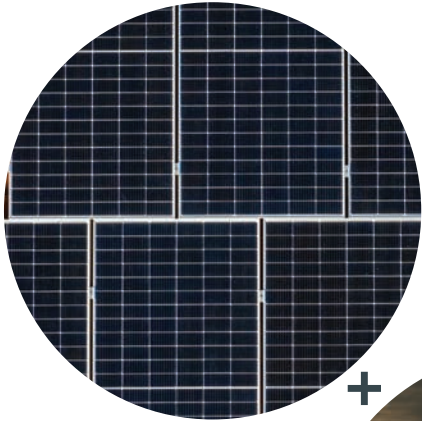


**Decarbonizing a home does not require adding solar or batteries, since the electricity in San Mateo County is 100% carbon emissions free.**

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



# SOLAR & BATTERY



Recommended



Existing



## RECOMMENDED

### 4.2 kW Rooftop Solar System 10 kWh Battery System



#### Lowest Bid Solar

Cost without incentives.....\$8,400

Cost with incentives .....\$5,880

#### Lowest Bid Battery

Cost without incentives.....\$12,600

Cost with incentives .....\$8,820



# 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	\$1,380	\$7,959	\$4,447	\$7,887	\$4,447	\$10,104	\$6,664	\$12,477	\$9,037
Plumbing	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
HVAC	\$4,808	\$5,275	\$0	\$11,750	\$2,100	\$14,993	\$5,343	\$16,755	\$7,105
Insulation	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Total</b>	\$6,188	\$13,234	\$4,447	\$19,637	\$6,547	\$25,097	\$12,007	\$29,232	\$16,142

## 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: 4.2 kW	\$0	\$8,400	\$5,880	\$8,400	\$5,880	\$13,700	\$9,590	\$18,034	\$12,624
Home battery: none	Home battery: 10 kWh	\$0	\$12,600	\$8,820	\$12,600	\$8,820	\$19,000	\$13,300	\$19,075	\$13,353
<b>Total</b>		\$0	\$21,000	\$14,700	\$21,000	\$14,700	\$32,700	\$22,890	\$37,109	\$25,977

For more information about incentives, please visit [www.smcsustainability.org/energy-water/decarbonizing-homes/incentives](http://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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