



Building Electrification FAQs

(updated February 4, 2020)

What is mixed fuel?

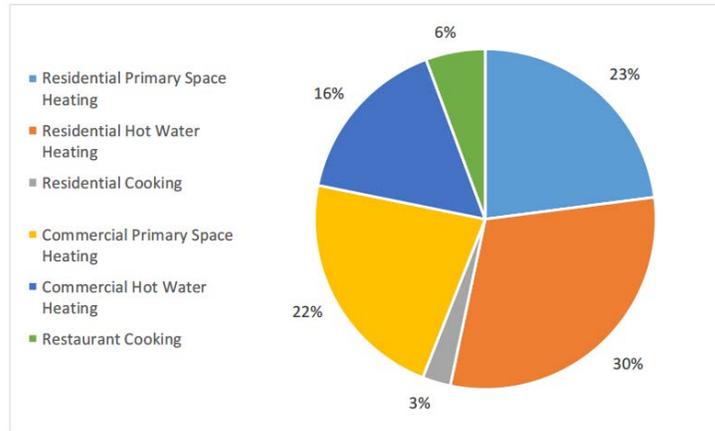
Mixed fuel typically refers to electricity and natural gas as most buildings in our building stock are built today. The units of electricity are called “kilowatt-hours” and the units of “natural gas are called therms.” In the City of Santa Cruz, if you have not opted out from Monterey Bay Community Power (only 3% of region has opted out), your electricity is carbon free as it is procured from renewable and hydropower sources. In the City of Santa Cruz, natural gas or methane is provided through leaking piping infrastructure by Pacific Gas and Electric and, when combusted, produces emissions that contribute to global warming and climate change. The aim of electrified buildings is move away from the use of natural gas in space conditioning (heat/cool) and water heating toward electric heat pump technology in order to drawdown our carbon emissions.

On the gas side, emissions are produced through combustion in the furnace. And, also, through methane leaking at production site and in distribution network.

On the electric side, emissions are produced at the power plant, but less than in a furnace, because of the higher efficiency.

How much of the City’s current emissions are from fuel or gas combustion?

Currently, City emissions (including all municipal operations and community emissions from residential and commercial activity) include approximately 1% from water and wastewater processes, 14% from solid waste, 28% from natural gas use and 57% from transportation related activities. There are no emissions related to electricity since the emission factor for electricity use in our region is zero. The City does not have access to energy usage information down to the building level. However, Monterey Bay Community Power’s Electrification Strategic Plan recently estimated built environment energy use sources as follows:



What Are Reach Codes?

Every three years, cities and counties across the state can adopt local reach codes in line with the new Building Standards Code (Standards) or Title 24 of the California Code of Regulations. Cities and counties may adopt building codes more advanced than those required by the state, which are known as reach codes.

In 2019, a cohort of over X cities in California developed reach codes to update local building codes concurrently with the state-required adoption of the 2019 Standards. The previous adoption cycle with new Standards took effect January 1, 2017. The next reach code adoption cycle, to coincide with the 2019 Title 24 Standards went into effect January 1, 2020 as was adopted by the City at the end of calendar year 2019. Reach codes may include:

- **Prescriptive Codes:** Require one or more specific energy efficiency measures
- **Performance Codes:** Require a building to perform more efficiently based on accepted computer modelling and allow trade-offs between energy efficiency measures

The following table indicates which Californian cities are pursuing or have adopted a reach code pertaining to acceleration of solar PV, building and transportation electrification:

Decarbonization Code Comparison Matrix as of 1/23/2020

Jurisdiction	Approach			Systems			Building Types							Add-Ons			
	Natural Gas Infrastructure Moratorium	All-Electric Reach	Electric-Preferred	Whole Building	Water Heating	Space Heating	Low Rise Residential	City-Owned Properties	High Rise Residential	Hotel	Retail	Office	Restaurant	Life Sciences	Additional Solar	Electric Vehicles	Natural Gas In Lieu Fee
Alameda	X			X				X									
Berkeley	X		X	X			X	X	X	X	X	X	X				
Brisbane*		X			X	X	X	X	X	X	X	X	X				
Carlsbad	X	X			X		X								X		
Cupertino		X		X			X	X	X	X	X	X	X			X	
Davis			X	X			X										
Healdsburg		X			X	X	X	X	X	X	X	X	X	X			
Los Altos Hills		X			X	X	X	X	X	X	X	X	X				
Los Gatos		X		X			X									X	
Marin County			X	X			X	X	X	X	X	X	X	X		X	
Menlo Park*		X			X	X	X	X	X	X	X	X	X		X	X	
Mill Valley			X	X			X		X							X	
Milpitas			X	X			X	X	X	X	X	X	X	X			
Morgan Hill	X			X			X	X	X	X	X	X	X	X			
Mountain View*		X		X			X	X	X	X	X	X	X		X	X	
Pacifica		X			X	X	X	X	X	X	X	X	X		X	X	
Palo Alto*		X	X	X			X	X	X	X	X	X	X	X		X	
San Francisco	X		X				X	X	X	X	X	X	X		X	X	
San Jose*	X		X	X			X	X	X	X	X	X	X	X	X	X	
San Luis Obispo			X	X			X	X	X	X	X	X	X	X			X
San Mateo			X	X			X				X				X	X	
Santa Monica			X	X			X	X	X	X	X	X	X	X			
Santa Rosa		X		X			X										
Saratoga		X			X	X	X	X	X	X	X	X	X			X	
Windsor		X		X			X										

Why Establish Reach Codes?

The benefits of carbon-free or greenhouse gases (GHG)-free electricity can best be realized by electrification of new and existing buildings and transportation vehicles. Electrification transitions buildings and vehicles away from natural gas and gasoline to clean energy provided by Monterey Bay Community Power (MBCP). Serving six counties on the Central Coast, MBCP recently adopted an Electrification Plan that identifies electrification as a key greenhouse gas reduction strategy. MBCP has incentives for developers and cities on the Central Coast to accelerate the transition to all electric transportation and buildings.

In addition to electrification reach codes resulting in energy and GHG emissions reductions, all-electric buildings are safer and healthier to live in along with being cost effective, especially when adopted at the new construction stage.

What approvals are required to adopt and implement a reach code?

There are different options the City is considering in developing reach codes for building electrification. *This section will be updated as the reach code development process proceeds.*

When the Energy chapter of the Municipal Energy Code is changed by a reach code, approvals include Planning Commission, City Council, and the California Energy Commission. Cities must submit studies demonstration that the proposed changes will be cost effective. Those studies were completed in 2019 for residential and nonresidential buildings.

For a natural gas prohibition, typically a City's Municipal Health and Safety Code Chapter will be modified and will require City Council approval only and does not require a cost effectiveness study.

A solar PV requirement on residential buildings 3 stories in greater does not require a cost effectiveness study when a second option is to pay a carbon in lieu of fee in order to utilize natural gas in a mixed fuel building. Any ordinance addressing this would likely involve revision to Chapter 24 of the municipal code which requires Planning Commission and City Council approval.

Are all-electric buildings viable today?

Yes. The equipment is available, most building types, including residential, office, restaurants and many other commercial types, are compatible or benefitted by all-electric, and a growing but small numbers of developers in CA are now selecting all-electric buildings for their inherent advantages.

How do construction costs compare?

Both residential and municipal/commercial buildings will typically cost less to construct using all-electric technologies. The cost savings come from eliminating the main gas hookup, piping, and exhaust flue(s). In residential where air-conditioning is selected, a single combined heat pump space conditioner costs less than a separate air conditioner and gas furnace. **How does the life cycle cost compare?** When utilizing available smart control technology and favorable time-of-use electric rates, all-electric buildings are cost-competitive with mixed natural gas +

electric buildings even with the current low price of natural gas. Combined with solar, electric heating can cut heating bills in half or more.

What are the advantages to all-electric buildings?

For municipal/commercial buildings, using combined electric systems saves potential internal and rooftop space, allowing for more valuable use of those spaces. Eliminating combustion of natural gas in livable areas improves the indoor air quality and improves overall safety associated with fires and gas leaks. Buildings with electric heating are allowed a larger winter baseline quantity of electricity. Both sectors can benefit financially from expanded demand response and load shifting opportunities. All-electric buildings can more effectively utilize on-site solar generation, required in the 2019 Building Code.

Which project types are more challenging?

Hospitals and certain industrial processes currently necessitate natural gas and electricity (aka mixed-fuel) to meet their needs.

What are the potential drawbacks of all-electric buildings?

Some people still prefer to cook with gas, though electric induction stoves are driving a trend toward electric cooking. When compared to tankless hot water heater options, electric heat pump water heaters take up more space as they include a hot water storage tank.

Are there examples of all-electric buildings nearby?

Yes. Below are a few examples of existing all-electric buildings throughout Santa Clara county. Each of them has promoted the health, savings, and controllability benefits. While much more common in other areas of the US and internationally, all-electric design is still nascent in CA.



Office Building
Sunnyvale



Senior Housing
Mountain View



Multi-tenant
Morgan Hill



Single-Family
Los Altos

What is an electric heat pump water heater and how does it work?

Heat pump water heaters are two to three times more efficient than gas water heaters. They use electricity to move heat from one place to another instead of generating heat directly. To move the heat, heat pumps work like a refrigerator in reverse. While a refrigerator pulls heat

from inside a box and dumps it into the surrounding room, a standalone air-source heat pump water heater pulls heat from the surrounding air and dumps it at a higher temperature into a tank to heat water.

Does a heat pump water heater work if the outside air is too cold?

Yes. While this is unlikely in Santa Cruz's climate, if it gets too cold, an electric heat pump water heater will switch to backup coils and run just like an electric resistance water heater.

What are the benefits of switching from a gas water heater to an electric heat pump water heater?

- Lower Energy Bills – While an Energy Star®-certified heat pump water heater costs slightly more upfront, the energy cost savings will pay for its additional costs in about three years for a typical home.
Source: [Energy Star](#)
- Healthier and More Comfortable Living Spaces – Burning natural gas creates emissions of unhealthy gases such as nitrogen dioxide, carbon monoxide, and formaldehyde. Eliminating these emissions in your water heater or stovetop will improve indoor air quality while cooling the surrounding areas.
- SMART Home – Most heat pump water heaters can be connected to Wi-Fi and to your smartphone for setting schedules and important alerts like water leak detection.
- More Energy-Efficient and Climate Smart – Heat pump water heaters can be two to three times more energy-efficient than conventional electric resistance and natural gas water heaters, reducing your greenhouse gas emissions.

What are the benefits of a heat pump when used with solar electricity?

During the day when the sun is shining, rooftop solar panels harvest solar energy and convert it to be used in your home as electricity. Because heat pump water heaters are powered by electricity, pairing the heat pump with rooftop solar could effectively reduce the cost to run it compared to running it without solar.

What are other ways to move toward a carbon-free home?

Additional ways to move towards a carbon-free home include:

- Choosing MBCP's green power option to power your home with 100% renewable electricity
- Electric washers/ dryers
- Induction cooktops

- Air-source heat pump heating and cooling systems
- Electric vehicles
- Rooftop solar

In order to meet the State’s 2045 carbon neutrality, rapid decarbonization through transportation and building electrification must be a key strategy.

What happens when the power goes out?

Many modern gas appliances do not work without electricity. Electricity is easier and faster to reinstate, and backup options are safer. Resiliency is improving with MBCP’s local clean generation and back up resources coming online in the next few years in the form of microgrids and batteries. Electric water tanks provide on-demand hot water supply.

Isn't electricity dirty too?

Santa Cruz residents were automatically opted into MBCP in 2018 and, unless they are part of the 3% of residents who opted out, the electricity procured on residents’ behalf by MBCP is carbon free (renewables and hydropower).

Additionally, electric heat pump water and space heating technology is 3-5 times more efficient than the best gas technology.

Is electric heat really cleaner than gas heat?

Gas heat is the conventional way to produce heat and hot water in CA buildings. Gas is sourced by extracting it from the earth, such as with fracking, transporting and distributing it to buildings through pipelines, and burning it in a furnace, which is typically 80% efficient.

Electric heat in Santa Cruz as procured by MBCAP is renewable and hydropower electricity which are transmitted and distributed via the grid to buildings where it powers a super-high efficiency heat pump to generate the same amount of heat.

There are 2 key differences between gas and electric heat:

- Note the difference in efficiencies: 80% vs. 300%: it takes 5x less energy to power a heat pump than a gas furnace!
- Gas pathway uses 100% fossil energy and the electric pathway uses mix of hydropower and renewables, that is carbon-free.

Isn't gas cheaper than electricity?

“Cheaper” is different than “more cost-effective.” Modern electricity is 5 times more efficient and can be offset with solar. Thus overall power usage is lower with more efficient systems. Furthermore, gas costs are increasing so gas will cost more in the future.

Also, there are upfront capital savings – builders are realizing this and their unit costs are evaluated without considering externalities like climate change, pollution and decreased health

outcomes associated with combusting fossil fuels both at the power plant and in homes.

Doesn't this just benefit the rich who can afford this technology?

Tenants don't have choice about the systems in their units but pay the ongoing utility costs. Affordable housing developers have embraced all-electric design due to lower ongoing utility costs. Construction costs are skyrocketing, limiting housing production.

What about jobs in the gas industry?

U.S. and local clean jobs far surpass fossil fuel employment. One of MBCP's objectives is to support local economy and local jobs.

Why not just wait for the state to do this?

The U.S. is one of the biggest emitters in the world and Santa Cruz is poised to build hundreds more units in the next 5 years. Our efforts will help spawn an industry/bring down costs. The State code will eventually require such measures and so we are going to have to do this soon anyway.

Would I have to give up my gas stove? Isn't gas cooking better?

No! Any natural gas prohibition ordinance would only apply to new buildings and exempts restaurants

Julia Child, Wolfgang Puck, other famous chefs don't think so cooking on gas is better than electricity!

Do people know how to build these buildings?

They are being built all over the world, including here in Santa Cruz. Local developers are already making the switch.

Is the City's electricity carbon free? Is it 100% renewable? What do these terms mean?

97% of residents are opted in to Monterey Bay Clean Power's default option which is carbon free.

CARBON FREE: Carbon free energy resources produce energy without emissions of carbon compounds, such as carbon dioxide, into the atmosphere. Examples of carbon free electricity resources include solar, wind, and hydroelectric power.

100% RENEWABLE: In order to qualify for California's Renewable Portfolio Standard, an energy source must meet the RPS Eligibility Rules. Under those guidelines, power generated from solar, wind, landfill gas and small hydroelectric sources is considered renewable while power generated by large hydroelectric plants does not qualify. Since in a normal rain year about 65% of MBCP's power supply comes from large hydroelectric sources, our power is not considered to be 100% renewable under the state's standard.

What does carbon neutral mean?

Carbon neutral means no net emissions of greenhouse gases (GHGs) into the atmosphere. The definition can be more specific for different types of energy, such as electricity and natural gas.

What's the timeline for the exploration and possible adoption of a reach code?

Community Workshop 1: Building Electrification 101 [done]

>>Feb. 4 | City Council Chambers | 6 – 7:30 pm

City Council Study Session

>>Feb. 18 | City Council Chambers | 1 – 3:30 pm

Developer's Roundtable

>>Feb. 26 | Civic Auditorium Tony Hill A, B C Room | 3:30 – 5 pm

Community Workshop 2: Bldg Electrification Policy Options

>>Feb. 27 | Downtown Main Library Community Room | 6 – 7:30 pm

Electrification Coffee Talk with Trades, Vendors, Designers and Builders

>>Feb. 11 – March 10 | 11th Hour Coffee | 8:30-9:30 am

PLANNING COMMISSION

>>March 5 | City Council Chambers | 7 pm

CITY COUNCIL – FIRST ORDINANCE HEARING

>>March 24 | | TBD time

CITY COUNCIL – SECOND ORDINANCE HEARING

>>April 7 | City Council Chambers | TBD time

BUILDING ELECTRIFICATION EXPO AT EARTH DAY

>>April 18 | San Lorenzo Park | 11 am – 4 pm

CALIFORNIA ENERGY COMMISSION APPROVAL OF REACH CODES

>>April – June, 2020

IMPLEMENTATION = ???