

NAPA
2040

DECEMBER 10TH, 2019

ELECTRICITY INDEPENDENCE AND MICROGRIDS

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Figure 2: Chang, Alvin. "Microgrid" *Meet the Microgrid, the technology poised to transform electricity*, <https://www.vox.com/energy-and-environment/2017/12/15/16714146/greener-more-reliable-more-resilient-grid-microgrids>

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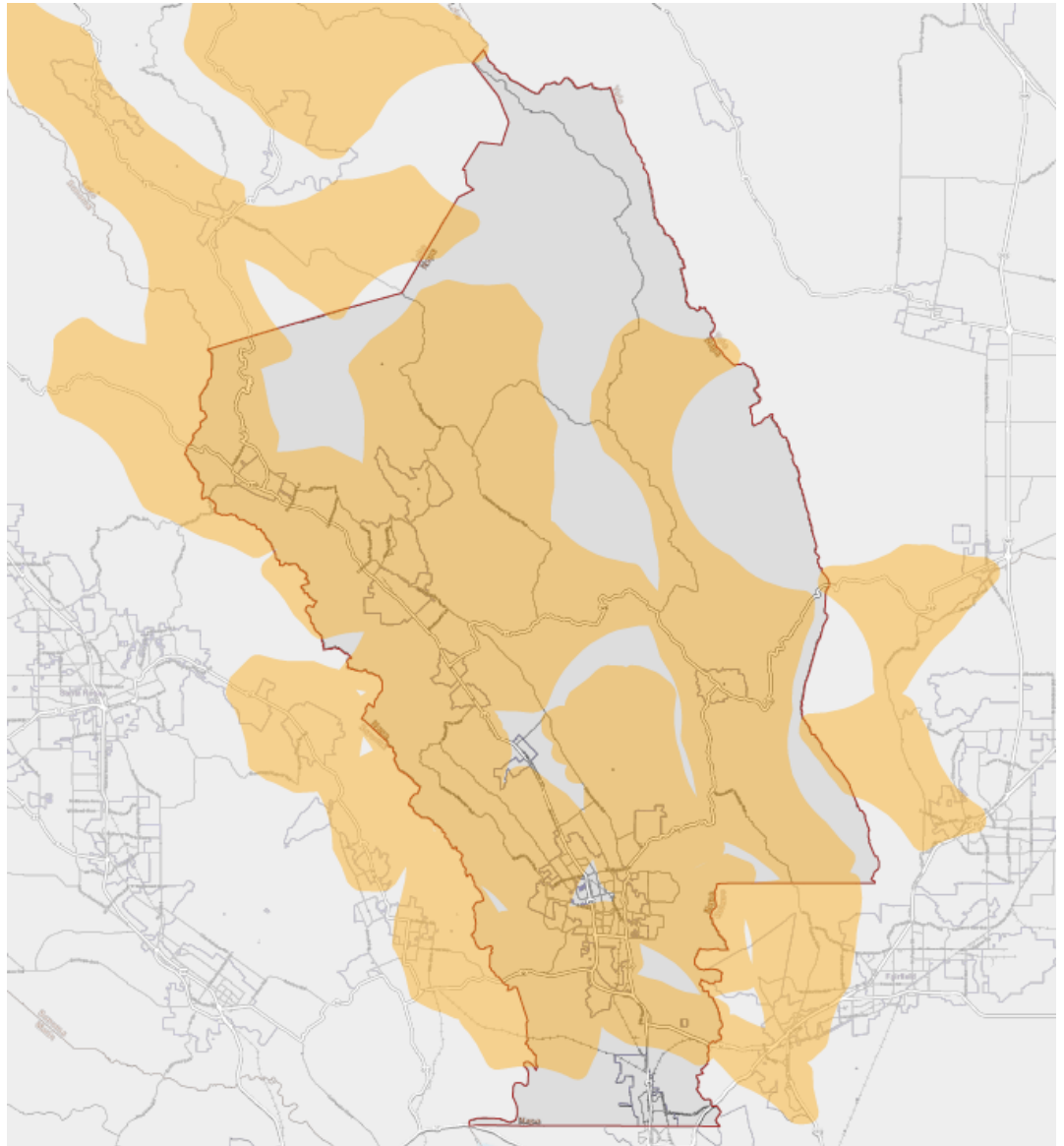
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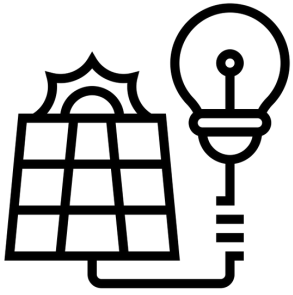
1.1 Introduction

Currently, the City of Napa receives their power from the Pacific Gas and Electric Company (PG&E). For the past years, Napa has suffered multiple power outages due to fire risks caused by fallen power lines. The frequent power outages affect the City of Napa greatly. Without power, businesses are not able to stay open, vulnerable populations are not able to use their medical equipment, and residents lose their overall sense of safety. In addition, the majority of Napa's jobs rely heavily on the wine industry. Wineries use energy in every aspect of the wine-making process. In the vineyard, electricity is used for water pumping, security, and weather measurement. Around 50% of electricity can go toward refrigeration and chilling alone. As everyday power becomes an uncertainty, the City must take action. Through the incorporation of microgrids centered on solar power, Napa can achieve electricity independence and disconnect from PG&E's centralized non-renewable power system.

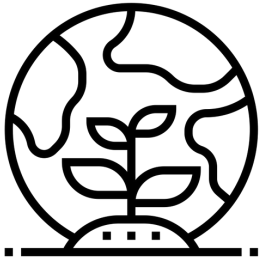
**Affected
areas of
PG&E's
power
shutdown
on October
9th, 2019**



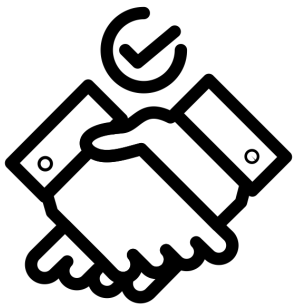
1.2 Our Goals and Principles



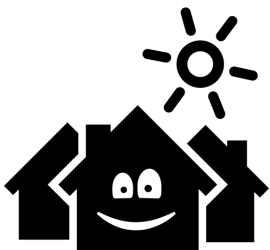
Establish
electricity
independence



Emphasize
environmental
sustainability and
resiliency



Promote an
economically
diverse and
prosperous
community



Prioritize equity
and deliver
power to all

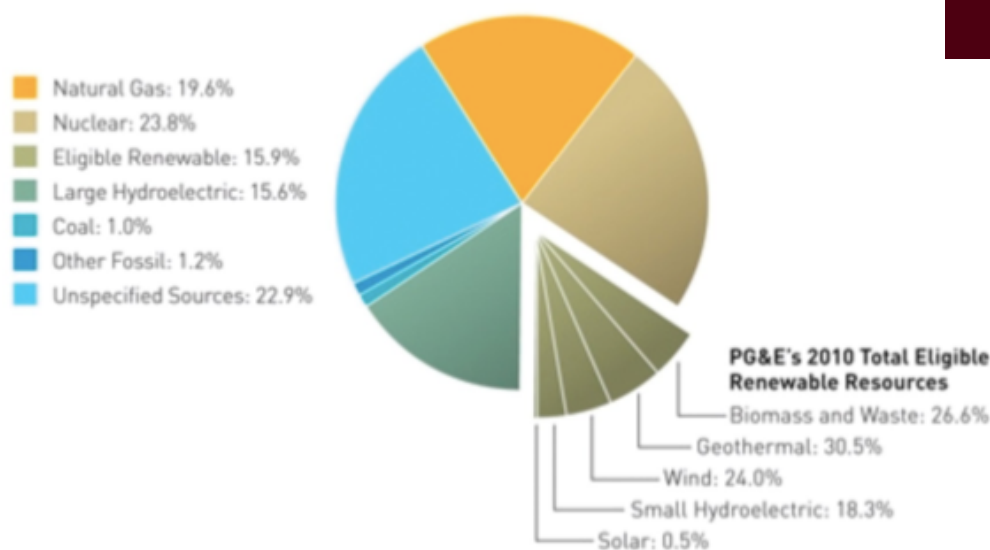


1.3 Current Energy Conditions

According to Napa’s 2012 Sustainability Plan, the City purchases their electricity and gas from the Pacific Gas and Electric Company (PG&E). As shown in Figure 1, PG&E has limited renewable energy opportunities. Only **15.9%** of their total electric power distribution are eligible renewable resources. Due to this circumstance, Napa's current energy plans mainly focus on energy reduction methods. Non-renewable sources of energy produce Greenhouse Gases (GHG), which cause environmental effects such as climate change. Since Napa relies on non-renewable sources of energy, it is critical that the City reduces their energy consumption to decrease their GHG emissions.

PG&E's 2010 Electric Power Mix Delivered to Retail Customers

Figure 1

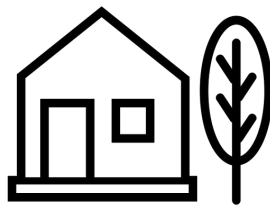


Source: <http://www.pge.com/mybusiness/environment/pge/cleanenergy>

In 2005...



City-owned infrastructure made up **35%** of the City's total GHG Emissions.



Residential homes made up **23%** of the City's total GHG Emissions.

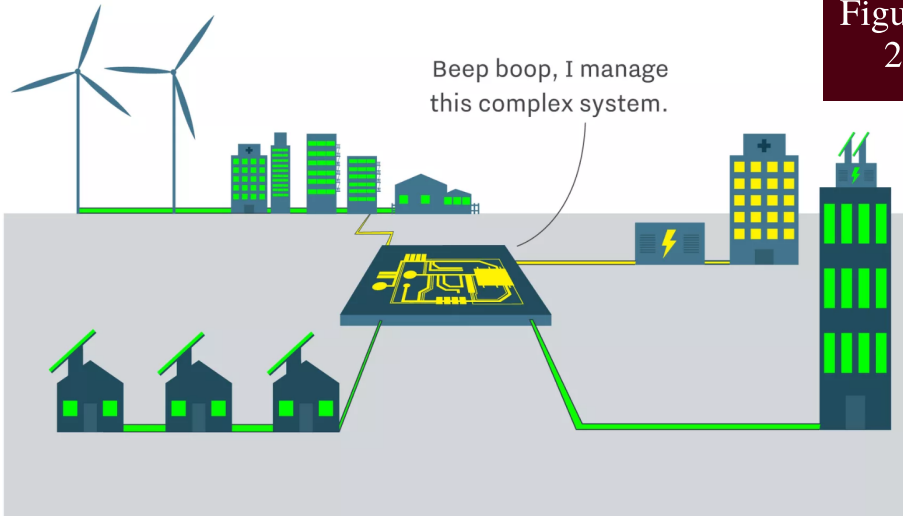


Commercial and Industrial buildings made up **16%** of the City's total GHG Emissions.

For 2040, the City can progress further by disconnecting from PG&E and implementing plans for a renewable energy transition.

1.4 Electricity Independence and Microgrids

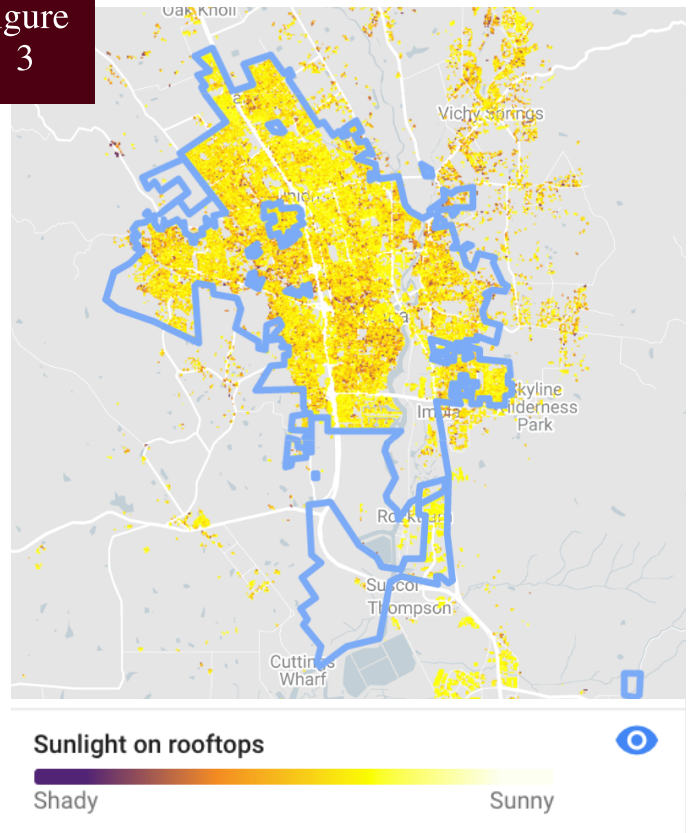
Figure 2



In a traditional macrogrid, like the one currently serving Napa today, between 60-80% of a power plant's energy consumption is lost in production or transmission. An alternative, localized microgrid would produce and deliver electricity at much greater efficiency. Popular on military bases and remote locations, the microgrid is a freestanding grid

that uses a mixture of power sources at a community scale. Reliant mostly on renewables, the microgrid or SMART grid management system, would capture energy produced from either solar or wind, distribute load to consumers and bank excess energy in the form of batteries or fuel cells. Sometimes, these systems can be nested within the macrogrid and operate as a backup when the larger grid goes down. Innovative efforts to create a 100% renewable sourced grid would increase resiliency and reliability to serve communities.

Figure 3



The first step towards electricity independence is to island Napa from PG&E through a 100% solar microgrids. This does intend to close the gate completely, but to only sell solar generated energy to the large utility and refuse to purchase power from PG&E. The question now becomes, would Napa be able to survive if decoupled from PG&E. The answer is yes! In 2016, the City of Napa consumed 432,261 MWh of electricity. According to Sunroof Project by Google, around 92% of the roofs in Napa are viable for solar energy production (Figure 3). If the city were to equip all 23.7K eligible roofs with solar, Napa would be able to produce over 626,000 MWh of electricity annually. As a result, the City would be left with close to 200,000 MW to either store or sell.

1.5 Vision 2040



What this vision is truly striving to capture is pictured here in Tesla's classic extreme. Tesla's futuristic concept proposes that tenants will have the choice to produce and provide their own energy all onsite. In the photo above, a home generates electricity through PV solar and stores the energy in the Tesla Powerwall. This allows for homeowners to bank their own power instead of uploading it to the grid. In 2040, the learning curve will improve and the price of home storage will continue to fall, similar to what happened with solar, allowing for everyone host their own energy storage. Although this may be the high end version of this equation, it begins to highlight how different cities need to think about the possibilities of electricity independence.



2. ENVIRONMENTAL FACTORS

2.1 Impacts of a Non-Renewable Power System

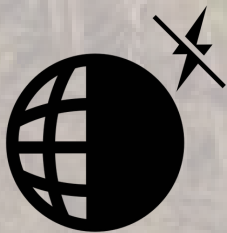


9 Napa Valley wineries damaged during the 2017 Tubbs Fire.

90,000 people evacuated.



Electricity in Napa produces over **250,000** metric tons of GHG emissions annually.



Recent PG&E power shutdowns have affected **32,000** Napa customers.

2.2 Energy Resilient Napa

Following the recent power outages from PG&E, resiliency in energy is more important now than ever.

Implementing a reliable power system is crucial in combating rising temperatures and risks of fires.

Microgrids are an ideal solution for Napa because they highlight two main resilient priorities: solar and storage.

Solar power is a dependable source of energy for Napa because 92% of their roofs are viable to sunlight. This allows residents to collect their own power and store it directly on their property. Through solar and storage, Napa will be able to have power during natural disasters and other emergencies. It is also a preventable measure for fires because the City will no longer have to worry about unprotected or fallen powerlines. Overall, disconnecting from PG&E's unreliable central power system will make Napa an energy resilient city.

The first steps to this shift starts with rapid solar power installations and onsite battery storages. Excess energy from homes will then need to be uploaded to a bigger microgrid that powers city-owned facilities. Businesses and other private industries such as wine production should also install their own solar and storage devices for consistent resiliency.

"Energy Resilience is the capacity of an energy system to tolerate disturbance and continue to provide energy services to communities."



SOLAR



STORAGE



2.3 Sustainable Energy

Napa County’s Climate Action Plan calls for taking action towards fighting climate change by reducing emissions from local sources. It also prioritizes helping the community adapt to climate change and its effects. Electricity independence and microgrids can help fulfil these goals.

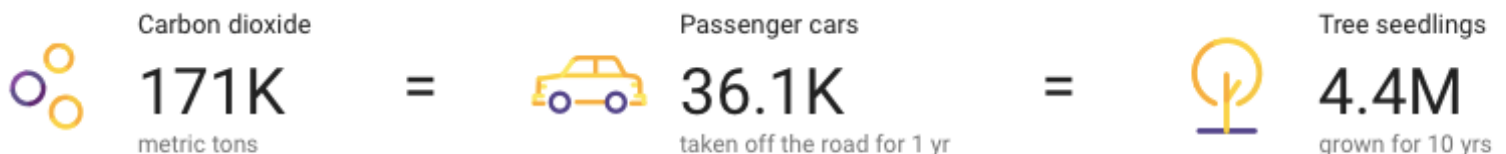
Non-renewable power sources produce tons of emissions. Currently, electricity in Napa produces over 250,000 metric tons of greenhouse gas emissions annually. Microgrids have the capacity to be a zero emission electricity source by using renewable energy like solar power. Fully implementing a solar microgrid system in Napa would be the same as taking 36,100 cars off the road for a year or planting 4.4 million trees (Figure 4). Furthermore, microgrids would decrease the amount of energy lost because they are located close to their users. One large power source requires more energy to match the same demand due to energy being wasted by travelling through long power lines. Centralized power sources also release a lot of unused heat energy into the atmosphere created by fossil fuels and nuclear power. Microgrids use heat energy more productively by decreasing unused heat energy. Their close proximity to communities, homes, and businesses will create multiple benefits that align with Napa’s goals of sustainability and fighting climate change.

“Using clean energy in a way that meets the needs of today without compromising the needs of the future generations”



Figure 4

If all the viable solar installations were implemented, the amount of avoided CO₂ emissions from the electricity sector in Napa would be:

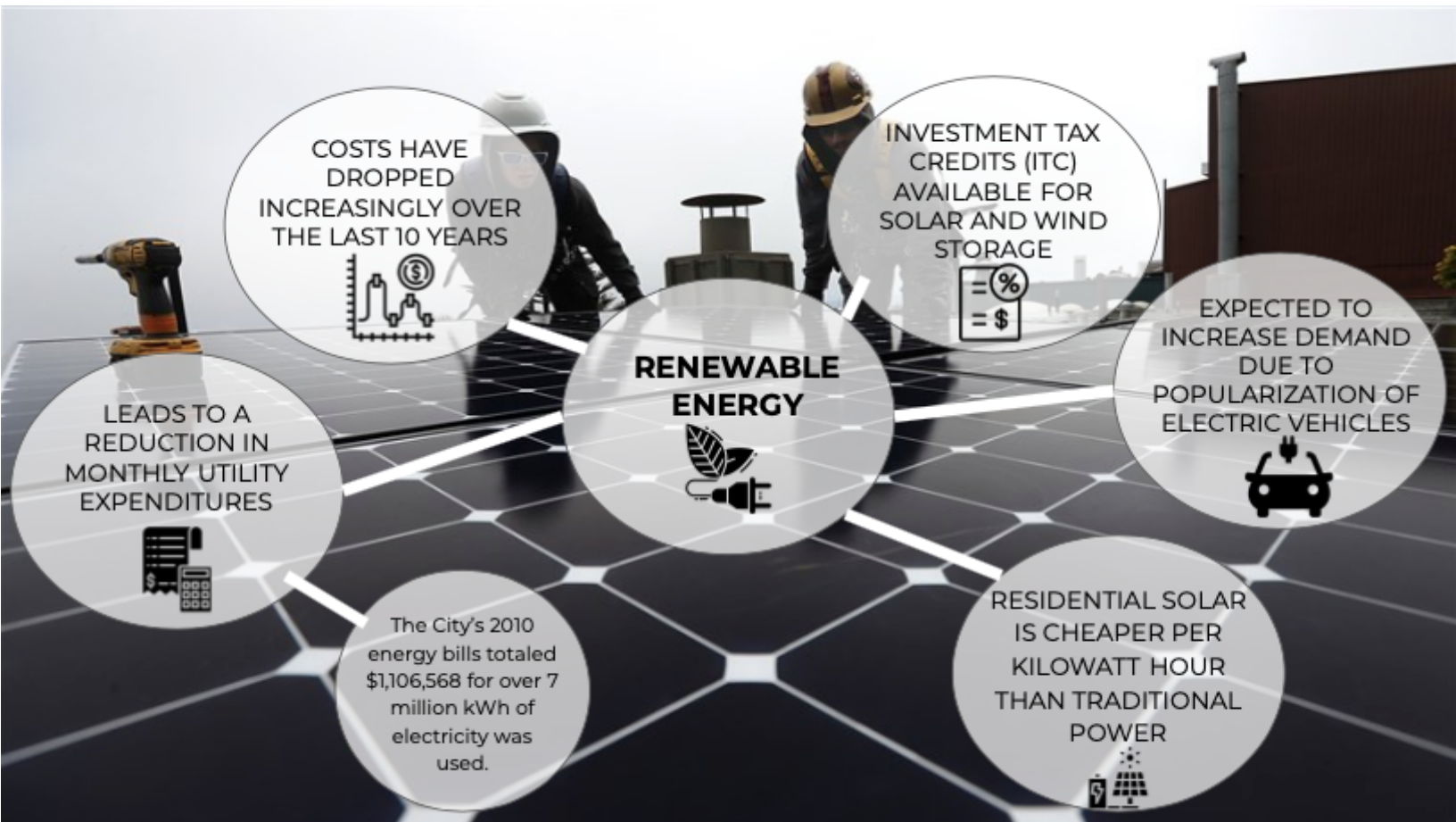




3. ECONOMIC OPPORTUNITY

3.1 Cost and Demand of Microgrids

Increasing the amount of PV solar used in a community leads to a booming and robust economy. In many states, California being one of them, solar has made electricity cheaper than traditionally produced power. This will be very beneficial, as it is expected for the overall demand of electricity to increase with the falling price and the popularization of electric vehicles. Furthermore, Incentive Tax Credits (ITC) have been available for installing solar and wind, but have now been extended to at-home power storage. ITC reduces what a solar owner would pay on their federal taxes, dollar-for-dollar, after installation. Since the launch of the federal program in 2006, ITC has been very successful at popularizing the solar industry that grew the market over 10,000%. Ultimately, it is expected that this trend continues to benefit Napa as PV solar prices continue to fall.

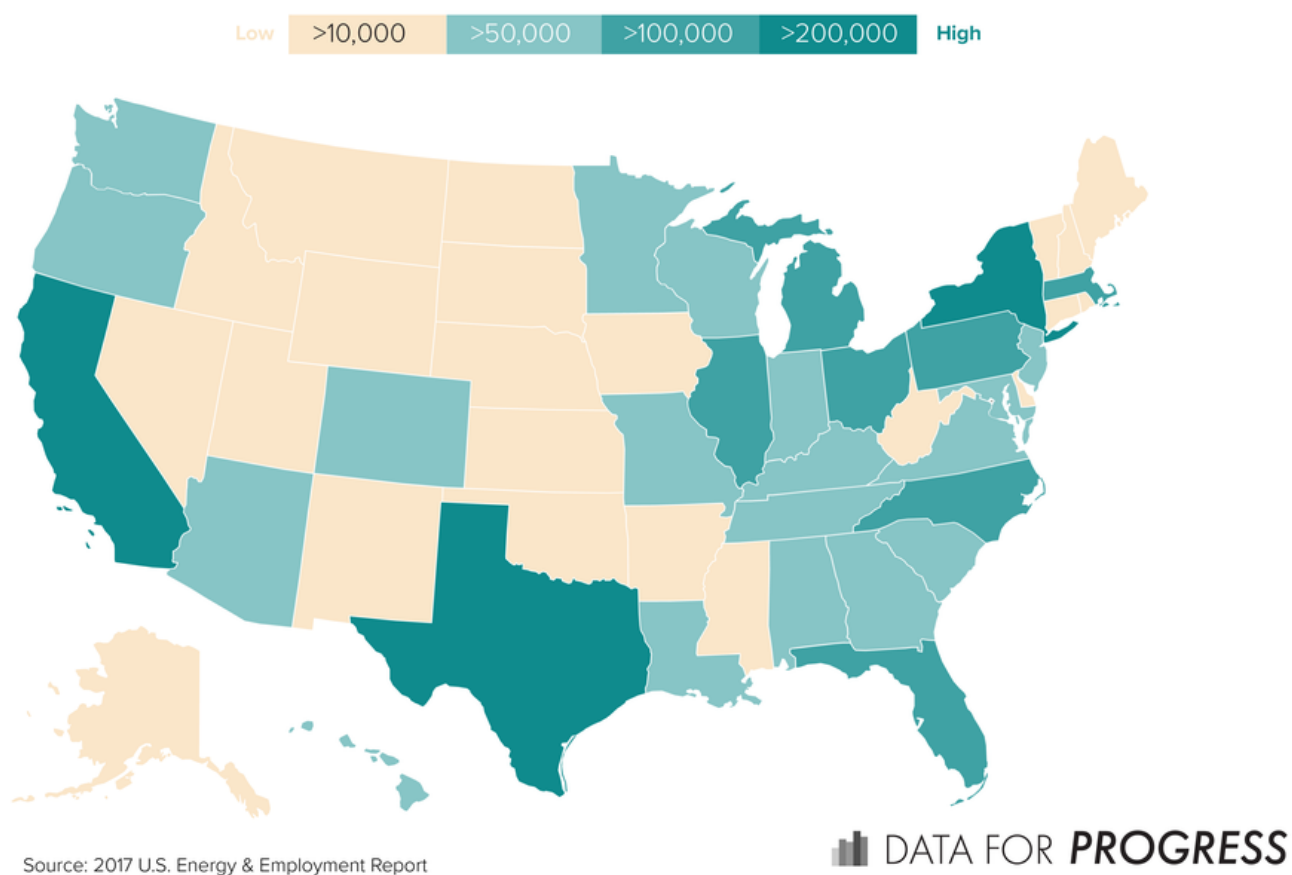


3.2 Forecasted Job Growth

As many know, California has been leading state for green jobs. The Golden State will continue to hold this role while covering viable surfaces with PV solar technology. The U.S. Department of Housing and Urban Development reports that solar installation provides over 400,000 jobs. This is projected to grow within the next few years. Not only is the number of jobs provided exceptional, the wages for these workers are competitive. An average installer makes around \$19/hour, which is more than double the national minimum wage.

Figure
5

Clean Energy and Energy Efficiency Jobs by State



The projected increasing number of green jobs plays an essential role in shifting the economy into becoming green-centered. With the inevitable effects of climate change coming in the near future, it is essential that cities prioritize sustainability in their economic plans. The economic system is one of the main contributors to the unhealthy state of our planet, therefore, its structures and frameworks must transition into green thinking for future generations.

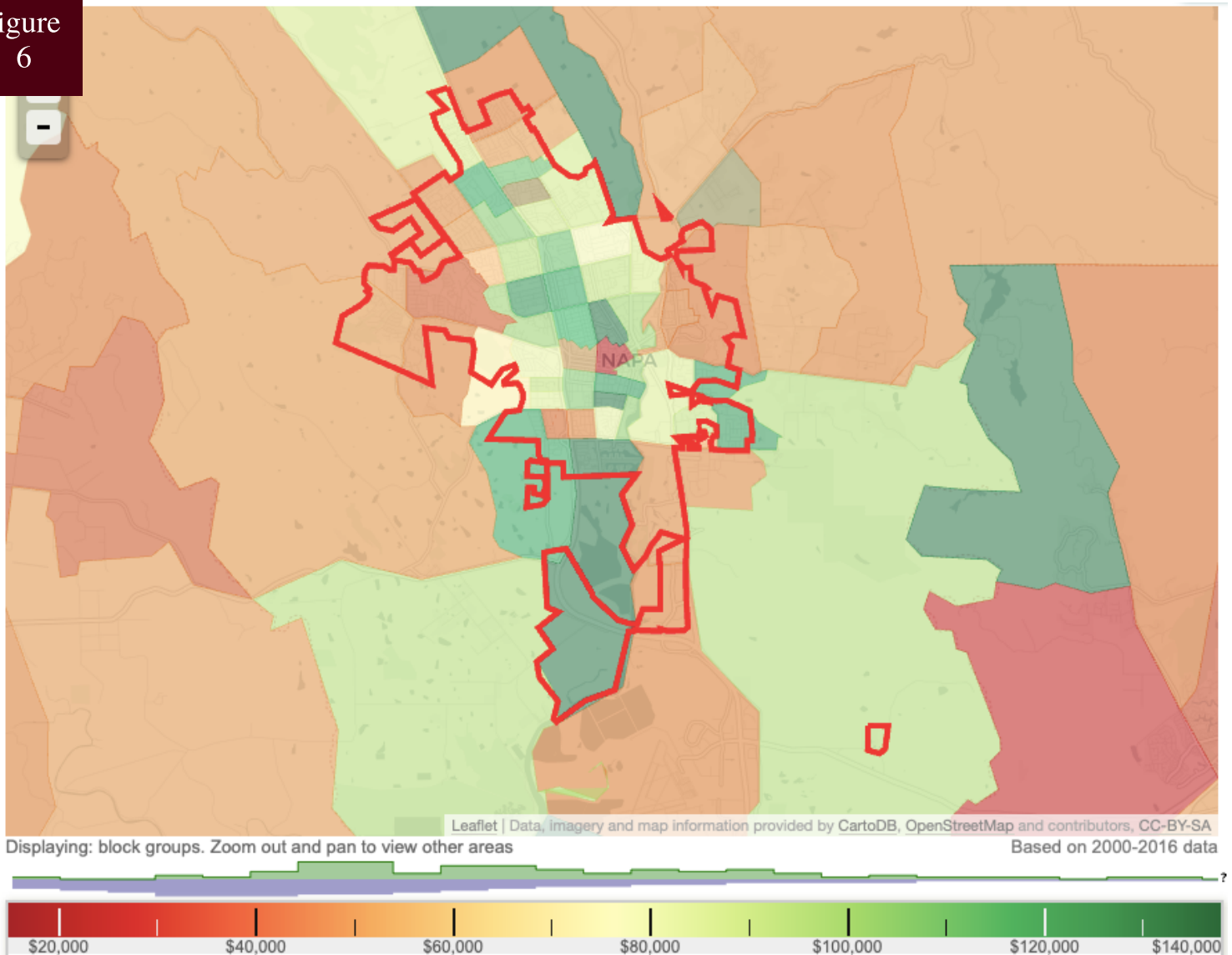


4.
EQUITY
PRIORITIZATION

4.1 Recognition of Napa's Demographics

- In 2017, Napa's median household income was approximately \$75,341, a **40.3%** increase from 2000.
- **44.8%** of households live under the median income.
- **40%** of households are renter occupied.
- **39.6%** of households in Napa County are rent-burdened.
- Only **1.1k** of households have solar power installations.

Figure
6



4.2 Renewable Energy for All

Existing Action

Napa County’s Climate Action Plan (CAP) **GHG Reduction Measure BE-10** plans to establish a program that creates a funding mechanism that allows new development to indirectly finance retrofits for qualifying existing low-income residential buildings.

Napa County’s Climate Action Plan (CAP) **GHG Reduction Measure BE-11** plans to encourage solar panel installations by working with MCE and reducing fees.

Napa's existing partnership with **MCE Community Choice Energy** helps transform infrastructure into 100% solar or wind energy.

Future Action

Create measures and policy that follow the guidelines of non-profit organization, **Equiticity**. Equiticity pushes for policy that prioritizes the needs of Black and Indigenous underrepresented communities.

Establish Partnership with **Solar on Multifamily Affordable Housing(SOMAH)** to give the renter community an equal opportunity to solar energy.

Expand partnership with the Bay Area’s Largest Public-Private Solar Partnership, **MCE Solar One**. Figure 6 shows an example of this partnership being successful by implementing their strategies in the neighboring city of Richmond.

Figure 7

MCE Solar One, The Bay Area's Largest Public-Private Solar Partnership

MCE Solar One was conceived by the Richmond community to integrate renewable energy and solar facilities in the Chevron Modernization Project. MCE teamed up with RichmondBUILD – which has successfully graduated hundreds of students and placed an impressive 80% of its graduates into well paying jobs – to train and hire its skilled, local graduates for the project.

Environmental and Local Benefits:

- Expected to eliminate 3,234 metric tons of carbon dioxide in one year, equivalent to taking more than 680 fossil fueled cars off of the road annually*
- Repurposed 60 acres of a remediated brownfield site
- Supported 341 jobs
- Maximized local economic benefits by requiring 50% local resident workforce and engaging Richmond-based contractors and supplier

*Based on the EPA's greenhouse gas equivalencies calculator.

10.5 MW 3,900 annually Richmond

MCE Solar One: The Bay Area's Largest Public-Private Solar Partnership

Watch later Share

For press inquiries, please contact Kalicia Pivrotto, Marketing Manager, at: kpivrotto@mceCleanEnergy.org.

MCE Solar One Fact Sheet Flyer (pdf)

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