Electrical Resiliency — It's Time to Do More

June 5, 2023

SUMMARY

Climate change, heat waves, atmospheric rivers, electric vehicles (EVs), and electrification are straining the fragile electrical grid which will only increase. Over the last several years, this has led to more and more brownouts and blackouts in Marin County.[1]

The increasing number of power outages, both planned and unplanned, makes it clear the county and all its communities must begin to envision and create new sources of alternative energy to improve their response to these threats to its residents. What's required is the political will and motivation. As described below, microgrids can play a major role in providing a backup source of energy to critical infrastructure, disadvantaged communities, and neighborhoods.

All electricity in Marin is delivered by Pacific Gas and Electric Co. (PG&E), a public utility supervised by the California Public Utilities Commission (CPUC). PG&E is finding it increasingly difficult to reliably meet Marin County's energy needs.[2] The Grand Jury investigation shows that much more needs to be done by the County, and its local communities to help offset PG&E's systemic fragility. For the purpose of this investigation, resilience means a range of alternative sources of energy that together amplify the county's ability to reduce the number of brownouts and blackouts.

This report (all information was gathered between July 2022 and March 2023) focuses on the historical record of power outages in Marin, the risks that the county faces going forward, and the steps that can be taken by individuals, communities, and the county to mitigate power outages in Marin. Specifically, this report is proposing that Marin County start to plan for alternative local sources of power, ideally "green," and especially microgrids. Resilience will provide residents both private and public opportunities for power during heat waves, storms, earthquakes and other climate and natural catastrophes. Resilience will also augment existing emergency services.

---

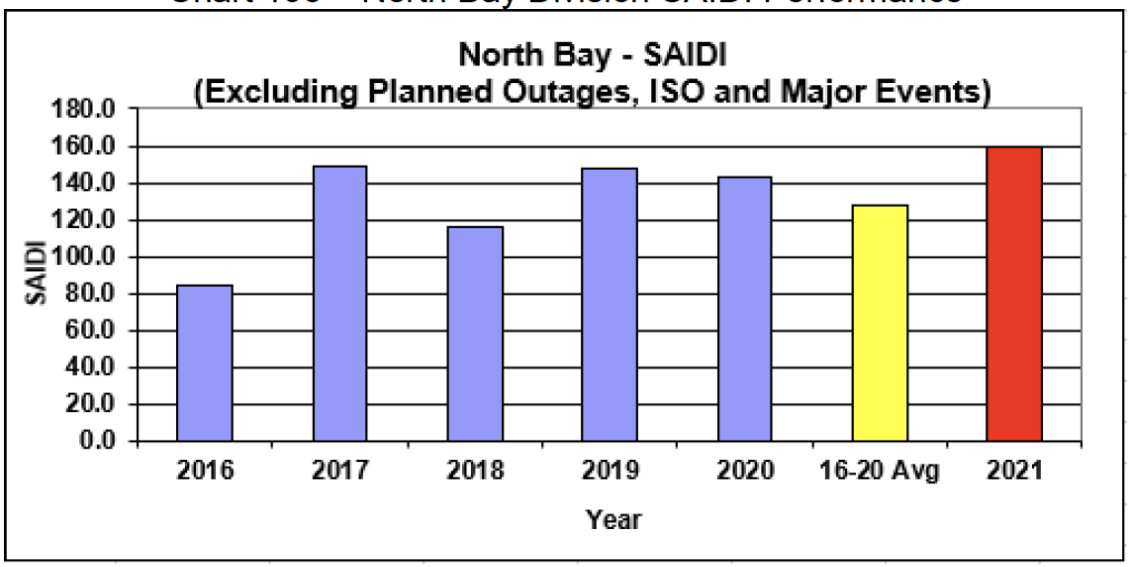
[1] Gary Quackenbush, North Bay Business Journal, https://www.northbaybusinessjournal.com/article/article/marin-county-grand-jury-urges-natural-gas-ban-to-combat-greenhouse-gases/, Accessed on Mar. 27, 2023.;
Bart Zeigler, Business Energy Reports, https://www.wsj.com/articles/url-us-power-grid-electric-vehicles-ev-charging-11675444994, Accessed on Feb. 2, 2023;
Jeremy Hsu, Too many electric cars charging at night may overload the grid (New Scientist September 22, 2022), https://www.newscientist.com/article/2339237-too-many-electric-cars-charging-at-night-may-overload-electrical-grid/, Accessed on Mar. 6, 2023;
PG&E Annual Electric Distribution Reliability Report 2021, p 23, https://www.pge.com/pge_global/common/pdfs/outages/planning-and-preparedness/safety-and-preparedness/grid-reliability/electric-reliability-reports/CPUC-2021-Annual-Electric-Reliability-Report.pdf , Accessed on Feb.12, 2023.

[2] Politico, https://www.politico.com/news/2022/09/23/californias-lofty-climate-goals-clash-with-reality-00058466, Accessed on Feb. 12, 2023.

BACKGROUND

PG&E is a monopoly charged by the state to "deliver energy that is safe, reliable, affordable and clean."[3] PG&E is the supplier of electrical and natural gas supplies to Marin. The number, length, and frequency of electrical outages in Marin have increased in the past 5 years.[4] The effects of climate change, and the goal of fully electrifying Marin to the exclusion of gas and diesel, etc., along with the increased number of electric vehicles, mandated housing will further tax the electrical grid so that power outages might occur even more frequently. This fragility of Marin's electric supply is difficult to quantify because PG&E lumps Marin and Sonoma Counties into a North Bay statistical analysis when reporting power failures.

Chart 193 – North Bay Division SAIDI Performance



Source: PG&E Annual Electric Distribution Reliability Report 2021, pg. 156

System Average Interruption Duration Index (SAIDI) is the amount of time the average PG&E customer experiences a sustained outage or outages (being without power for more than five minutes) in a given year. North Bay Division's 2021 SAIDI performance of 160.0 was 32.0 customer-minutes (or 25.0%) higher than the previous 5-year average of 128.0."[5]

These outages have been caused by extreme weather events, including fires, equipment failures, deferred maintenance, aging equipment, and other incidents that have damaged power infrastructure.[6]

As California rapidly boosts sales of electric cars and trucks over the next decade, the answer to a critical question remains uncertain: Will there be enough electricity to power them? State officials claim that the 12.5 million electric vehicles expected on California's roads in 2035 will

[3] PG&E, An Inside Look at Electrical Reliability, https://www.pge.com/pge_global/common/pdfs/outages/planning-and-preparedness/safety-and-preparedness/grid-reliability/electric-reliability-reports/2022-Electric-Reliability-Presentation-for-2021-Reliability.pdf, Dec. 15, 2022, Accessed on Feb. 13, 2023.
[4] PG&E Reliability Report, p.156
[5] PG&E Reliability Report, p.156
[6] Auditor of the State of California, *Electrical System Safety*, March 2022, *p.5.*

not strain the grid. But their confidence that the state can avoid brownouts relies on a best-case, and some say unrealistic scenario: massive and rapid construction of offshore wind and solar farms, and drivers charging their cars in off-peak hours.[7]

In addition to PG&E, MCE (formerly Marin Clean Energy) is an aggregator of renewable electrical energy and uses PG&E infrastructure to deliver "clean" power to Marin, Contra Costa, Sonoma, and Napa Counties. MCE is a public, not-for-profit electricity broker that gives all PG&E electric customers (residential, commercial, and municipal) the choice of having 60 percent or 100 percent of their electricity supplied from clean, renewable sources at stable and competitive rates.[8]

Both PG&E and MCE fall under the CPUC Resource Adequacy Program rules and requirements. The Resource Adequacy Program has two goals:[9]

1. To ensure the safe and reliable operation of the grid in real-time providing sufficient resources to the California Independent System Operator (CAISO) when and where needed
2. To incentivize the siting and construction of new resources needed for future grid reliability

It is important to note that PG&E has no responsibility to create renewable energy. PG&E's role is to distribute energy, including clean energy such as from MCE, through the PG&E infrastructure.

Increased demand as a result of climate change, electric vehicles, the electrification of Marin, and mandated new housing, is stressing the PG&E delivery system. Marin residents have seen heat waves where temperatures exceed 110 degrees in Marin.[10] These heat extremes have forced either planned outages, or power failures due to the lack of electrical capacity in the grid. There have been atmospheric rivers where downed trees and power poles have caused power failures to thousands of customers in the North Bay and throughout California.[11] It is expected that these climate events will continue and increase going forward.[12]

Alternative sources of energy exist and can be made available with the commitment of public agencies and communities. Solar, wind, methane capture, wave/tidal, off-peak large scale battery systems, etc. are examples of alternative sources. For example, there are several cogeneration facilities in Marin where methane is captured and used for power generation. Cogeneration or

[7] Cal Matters, https://calmatters.org/environment/2023/01/california-electric-cars-grid/, Accessed on Mar. 1, 2023
[8] MCE Clean Energy, https://www.mcecleanenergy.org/about-us/, Accessed on J. 25,2023.
[9] California Public Utilities Commission, Accessed on Jan. 3, 2023 https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage
[10] Adrian Rodriguez, *Marin Independent Journal*, "Marin Temperatures Exceed 100 Degrees as Heat Wave Persists," Sept. 6, 2022
[11] Shawn Hubler and Jill Cowan, *New York Times*, "Wild Weather Swings Are Robbing California of Its Trees", Jan. 13, 2023
[12] Claire Hao, *SF Chronicle*, "California Wants People to Switch to All-Electric Appliances. But What Happens When the Power Goes Out," Feb. 4, 2023

combined heat and power (CHP) is "The concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy."[13]

The energy generated via methane capture is used to power farms and commercial recycling facilities, while excess energy is funneled back to the grid. Examples of methane capture include the Ross Valley Sanitary District, and each of the solid waste collection services in the county.

Microgrids, described below, can be built to serve local areas, which would provide a permanent source of energy, or serve as a back-up in the event of a loss of power from PG&E. Turbines can provide wind power either on land or via floating offshore wind farms. Floating solar panels on reservoirs are another potential source of electricity. Finally, some electric vehicles can be used to power homes for a few days. However, whatever the source of additional energy, it has to be transmitted through the PG&E grid, which at present may not be robust enough to support that effort.

The Marin County Civil Grand Jury's Jurisdiction

The jurisdiction of the Marin County Civil Grand Jury encompasses government agencies in the county, not private entities such as PG&E and statewide public agencies such as the California Public Utilities Commission. Thus, recommendations in this report pertain to what Marin jurisdictions can do to offset the impact of climate change and increased demand.

APPROACH

The Grand Jury conducted a significant number of interviews with representatives from energy distributors and government agencies. Legislation regulating commercial recycling and composting, as well as trade publications, websites and newspapers were evaluated.

Multiple public reports submitted to, and by, the California Public Utility Commission (CPUC) and PG&E were reviewed. The Grand Jury, wherever possible, acquired needed information from both PG&E and CPUC. However, the Grand Jury was unable to obtain non-public information from entities outside of Marin County.

DISCUSSION

Climate change and state legislation have created a new normal for energy supply in California. Marin residents have seen heat waves where temperatures have risen to over 110 degrees, atmospheric rivers that have produced record rainfall, and the result has been power outages. These planned and unplanned outages affect everyone in Marin, but especially disadvantaged communities. We define a disadvantaged community as "the areas throughout California which most suffer from a combination of economic, health, and environmental burdens."[14]

[13] US Department of Energy, Office of Energy Efficiency and Renewable Energy, https://www.energy.gov/eere/amo/combined-heat-and-power-chp-and-district-energy, Accessed on Mar. 3, 2023.
[14] Disadvantaged Communities, California Public Utilities Commission, Accessed on Feb. 16, 2023.

With the future of electric delivery being so uncertain as noted on page 2, Marin, its residents, communities, and County government will need to look towards new sources of energy. Admittedly, these are going to be difficult activities to implement. For example, providing microgrids in an area such as West Marin will require funding, land, and permitting processes that could be time consuming and generate opposition. Achievements will depend, in great part, on the ability of County government officials to impress upon supporting, neutral, and opposing parties the growing need to generate alternative sources of energy. Government officials must clearly articulate how climate change, and other events, will continue to challenge the grid. Thus, preventable brownouts and blackouts may be avoided when electricity is needed the most.

The Grand Jury asserts that it is time for local communities and the County to explore alternative energy sources to reduce the impact of these outages. The priority should be to address significantly affected communities, such as West Marin and Marin City. In the longer term, local communities and the County should explore how those alternatives can be provided to other communities, and critical infrastructure throughout the county.

Marin County has little to no authority over PG&E operations and can only make requests for service improvements including microgrids. According to PG&E, these requests should be in writing from an elected official, though a request does not equate to an approval by PG&E. Being a relatively small county with little leverage over PG&E, it is incumbent upon the leadership of Marin County to make plans to reduce the expected power shortages by providing effective pathways to develop alternative energy supplies. Microgrids are a viable solution.

Microgrids are supply alternatives that can serve a small area for a limited period of time. In addition, larger scale projects, such as an onshore wind farm, could provide energy to Marin, and even fully replace the energy supplied by PG&E. Further, individuals can connect certain electric vehicles with their EV batteries to their homes, thus providing energy while going off-grid. Below, some of these alternatives are discussed.

It appears that alternative energy sources have not been explored either due to lack of awareness of the options available, or to the pressure of "putting out fires." To their credit, the County and most municipalities have formidable emergency action plans to reactively respond to outages. However, the County is not able to proactively provide electric infrastructure resilience to prevent widespread outages, as it has no control over PG&E. Marin County's promotion of alternative energy production and microgrids would allow the County some independence in the long term goal of reducing outages for Marin residents. Microgrids allow Marin residents the opportunity to create, store and distribute electrical power in small areas.

California Public Utilities Commission (CPUC) and Renewable Energy

The CPUC administers the Renewables Portfolio Standard (RPS) Program, which mandates that by 2030, 60 percent of energy sold by PG&E and the other utilities must be renewable. Further, this program states that by 2045, all of California's electricity must come from carbon free

sources.[15] This is just over two decades from now, and it will materialize faster than one imagines. Advanced preparation is therefore of the utmost importance.

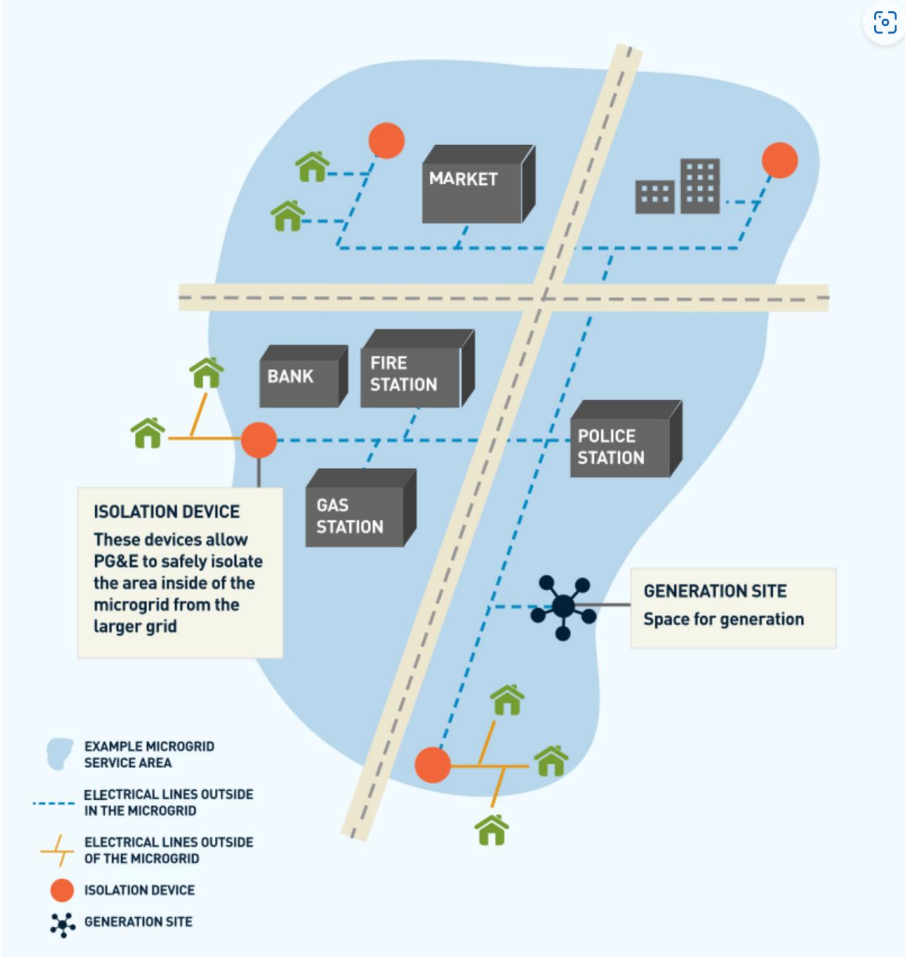
All electricity retail sellers had an interim target between compliance periods to serve at least 27 percent of their load with RPS-eligible resources by December 31, 2017. In general, retail sellers either met or exceeded the interim 27 percent target and are on track to achieve their compliance requirements.[16]

Microgrids

A microgrid is an interconnected power system that can be locally controlled, and can function either while connected to the larger grid, or completely on its own. A microgrid can serve one single building, like a hospital or home. It can serve a group of buildings, such as a university campus. Or it can serve an even bigger territory, such as a city. Clean microgrids use technologies like solar and storage to supply generation within a microgrid, as opposed to diesel generators, which emit harmful pollutants. Clean microgrids can operate year-round and can also provide clean backup generation during outage events caused by wildfires or other weather impacts that are occurring more regularly in California due to climate change.[17]

[15] California Public Utilities Commission, *Renewable Portfolio Standards Program,* https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/rps, Jan. 5, 2023
[16] California Public Utilities Commission, *Renewable Portfolio Standards Program, Jan. 5, 2023*
[17] San Diego Gas and Electricity, https://www.sdge.com/sites/default/files/documents/S2270075_Borrego%20Springs%20Microgrid%20Fact%20Sheet.pdf?nid=21356, Accessed on, Jan. 3,2023.

A typical microgrid would look like this:



Source: PG&E Community Microgrid Enablement Program

The CPUC and PG&E recognize the value that microgrids can offer to the public. In 2021, the CPUC issued Decision D.21-01-018 which, among other items, approved $200 million statewide for a new Microgrid Incentive Program (MIP) intended to fund clean energy microgrids to support the critical needs of vulnerable populations impacted by a grid outage.[18] PG&E applied for and received approval from the CPUC for a Community Microgrid Enablement Program (CMEP). However, as of January 2023, neither the CPUC nor the PG&E programs had been implemented, and the Grand Jury has not been able to learn why they've been delayed or when they will start.[19]

To date, no microgrids have been installed in Marin, but one is being considered for Dillon Beach. In the North Bay division of PG&E, which includes Marin and Napa counties, only two

[18] Pacific Gas and Electricity, *Community Microgrid Enablement Program*, https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/community-microgrid-enablement-progam.page, Accessed on Jan. 3, 2023.
[19] Stephanie Doyle and Shina Robinson, Utility Dive, *California PUC's delay of microgrids program harms disadvantaged communities*, January 2023, https://www.utilitydive.com/news/california-pucs-delay-of-microgrids-program-harms-disadvantaged-communitie/639823/ , Accessed on Feb. 18, 2023.

microgrids have been installed, both in Napa County, in Angwin and Calistoga. Even though outages in Marin are a continuing problem, PG&E has not installed any microgrids in the county. PG&E has provided no reason for this lack of action.

"California has fewer than 100 microgrids, as the US Department of Energy defines them, and even fewer of those are located in, and serving frontline or disadvantaged communities. These communities have borne the worst impacts of pollution and the climate crisis, and they should be prioritized for clean energy solutions."[20] In Marin County there are two particular areas populated by vulnerable and disadvantaged communities: the Marin City unincorporated neighborhood, and West Marin. In Marin City and neighboring Sausalito, the number of outages has generated requests from the communities to underground the power lines, which according to PG&E is economically unrealistic. PG&E has recommended the trimming of trees that are affecting their service delivery. According to PG&E, the parties involved have yet to reach an agreement due to community opposition to tree trimming or removal.

A microgrid in Marin City can be an effective hedge against power outages as it could keep critical infrastructure and essential services functioning.

In West Marin, outages are more frequent and lengthy, probably due to several factors including the topography, above ground power lines, and dense forestation. It should be noted that the agricultural nature of West Marin means there are many low-income, racially diverse working families who are impacted by power outages, and who may lack resources to go through that period safely.

Microgrids offer the County a voice in creating a more robust infrastructure. Collaborating with PG&E will ensure that each microgrid infrastructure is upgraded to handle both the self-generated power, as well as the power from the grid. The microgrid will then become a hardened self-generating and isolated system in times of emergency. Single microgrids will act as islands, but in the future as their numbers increase, microgrids will merge to form a network of resilience in the face of violent weather, earthquakes, and other disasters.

[20] Stephanie Doyle, *California Microgrid Incentive Program is an Opportunity*, https://votesolar.org/californias-microgrid-incentive-program-is-an-opportunity/, Accessed on Jan. 4, 2023.

Borrego Springs Microgrid

Microgrids elsewhere in California have been developed to offset the need to source energy from utilities and can be models for Marin going forward. Noteworthy is the microgrid developed by San Diego Gas and Electric (SDG&E) for Borrego Springs, a remote community of 3,000 in San Diego County.

Microgrid Scenarios

"Normal conditions: the Borrego Springs Microgrid is typically dormant or operating with the regional grid. Local solar plants export power as available, with the battery storage and ultracapacitors charged and ready to provide various grid support."[21]

Planned outage: the microgrid can seamlessly transition to and from the regional grid to provide power. The microgrid can be placed in island mode on demand, where the microgrid is off the grid, both locally and remotely, to respond to conditions which force the community off the larger grid.

Unplanned outages: the microgrid can be activated to restore power. In order to ensure community safety, this process is initiated only after SDG&E is able to patrol the region to identify and isolate any cause of the unplanned power outage. Once it is safe to activate the microgrid, the batteries and/or generator can power the community and critical facilities, such as the fire and sheriffs' stations, and the local food mart.

Day versus night outages: during the day, the microgrid can harness energy from local solar plants and rooftop solar, as well as use batteries and generators to power the entire community. During the night, the microgrid's batteries and generators can power designated critical load areas. As needed, non-critical loads are shed to maintain microgrid stability.

Unfortunately, there are no microgrids (beyond private homes and some small businesses) in Marin although one is being installed at a private home this year. Additionally, in January 2023, Terra-Gen, a private investor, proposed a 300 megawatt microgrid for Novato to provide backup energy. This microgrid would be connected to the PG&E Ignacio substation. That proposal is in the very early stages of being reviewed by the County. The economics of this proposal state that the facility would purchase power from PG&E and store that energy in multiple lithium ion batteries. In the event of a power outage, the stored energy would be directed to the grid. The project could deliver backup energy for four hours or longer.[22]

According to County officials, there have been discussions within PG&E about providing microgrids at the PG&E substations in Marin to provide backup power. However, the status of those plans is unknown. Such a project would be a welcome addition to the resiliency of our energy supplies.

---

[21] San Diego Gas and Electricity, *Borrego Springs Microgrids*, Accessed on Jan. 3, 2023.
[22] Tam Energy Storage Project, Project Description, https://www.marincounty.org/depts/cd/divisions/planning/projects/ignacio/ronsheimer_survivors_trust_tam_energy_storage_p3932_ig, Accessed on Feb. 22, 2023.

The County has done a few projects to provide emergency backup power (via gas/diesel generators) to various government facilities, including at two: Marin Health and Human Services facilities on Redwood Boulevard, and in the Canal neighborhood of San Rafael. They have also provided backup power at the Marin Center's Exhibit Hall and Veterans' Memorial Auditorium, enabling the facilities to function as emergency evacuation sites.[23]

These efforts have not addressed the power outages experienced in other communities throughout the county.

Wind Energy

An appealing and significant source of clean energy exists in wind farms. Wind turbines work on a simple principle: instead of using electricity to make wind—like a fan—wind turbines use wind to make electricity. Wind turns the propeller-like blades of a turbine around a rotor, which spins a generator, which creates electricity.[24] Today, nearly 70,000 wind turbines across the country are generating nearly 140 gigawatts, making it the fourth-largest source of electricity generation capacity in the country. This is enough energy to serve the equivalent of 43 million American homes.[25]

How can this impact Marin? Currently, there are about 105,000 households in Marin.[26] Turbine technology has evolved to where three turbines can produce 25 megawatts - enough energy to supply thousands of households.[27] Nationally, the Biden Administration has set a goal of generating 30 gigawatts (GW) of energy through offshore wind farms by 2030.[28] In December 2022 there was a Federal auction for offshore wind development rights off the coast of California that raised over $750 million. These offshore rights are located at Morro Bay, and in the far Northern Coast of California.[29]

A turbine can generate energy with as little as six miles per hour of wind, and the stronger the wind, the more energy is created. However, a turbine farm's power output will decline as the wind dies. Thus, as in the case of microgrids, there will still be a need to be connected to the grid.

[23] County of Marin Press Release, April 12, 2022, https://www.marincounty.org/main/county-press-releases/press-releases/2022/dpw-backuppower-041222, Accessed on Mar. 3, 2023.
[24] US Department of Energy, Office of Energy Efficiency and Renewable Energy, Wind Energy Technologies Office, https://www.energy.gov/eere/wind/how-do-wind-turbines-work Accessed on Feb. 1, 2023.
[25] American Clean Power, https://cleanpower.org/facts/wind-power Accessed on Feb. 1, 2023.
[26] US Department of the Census, https://www.census.gov/quickfachttps://www.census.gov/quickfacts/marincountycalifforniats/fact/table/marincountycalifornia/PST045222#PST045222, Accessed on Feb. 8, 2023.
[27] Electrek, https://electrek.co/2023/01/30/semi-submersible-floating-offshore-wind-farm/, Accessed on Feb. 14, 2023.
[28] US Department of Energy, Office of Energy Efficiency and Renewable Energy, Wind Energy Technologies Office, https://www.energy.gov/eere/wind/offshore-wind-research-and-development, Accessed on Feb. 7, 2023.
[29] Nadia Lopez, First Ever California Offshore Wind Auction Nets $757 million, (*Cal Matters,* December 2022).

Wind power has been on the agenda for Marin in the past and opposed, primarily on environmental grounds. Some of those concerns, namely the number of turbines required, and danger to birds, have been mitigated with new technology. Bird strikes have been minimized.

Solar Energy

Solar energy has become the de facto source for personal or homeowner backup energy as the solar panels can be installed on the roofs of homes, as well as businesses. Further, they are important sources of energy in microgrids when the terrain and exposure to the sun are favorable. However, the amount of land required for a solar array is considerable.

"A conservative estimate for the footprint of solar development is that it takes 10 acres to produce one megawatt (MW) of electricity. This estimate accounts for site development around the solar arrays, including for maintenance and site access." Thus, a 25 MW solar array would require about 250 acres.[30]

A potential source of power in Marin could be similar to a solar array just installed in South Korea. The installation consists of giant floating solar panels on the waters of a 17 mile long reservoir. The panels generate 41 megawatts from 92,000 solar panels.[31] Marin has seven reservoirs in Marin that could be the locations for a floating array.

Source: Brighter Side of News, Giant Floating Solar Panel Flowers Provide Clean Energy to 60,000 People

[30] Jesse Wyatt, Maggie Christian, Great Plains Institute, "The True Land Footprint of Solar Energy", Sept. 14, 2021, https://betterenergy.org/blog/the-true-land-footprint-of-solar-energy/, Accessed on Mar. 6, 2023.

[31] Brighter Side of News, *Giant Floating Solar Panel Flowers Provide Clean Energy to 60,000 People*, https://www.thebrighterside.news/post/giant-floating-solar-panel-flowers-provide-clean-energy-to-over-60-000-people, Accessed on Mar. 15, 2023.

Such a project which would require battery storage and could help supply much of Marin's household energy needs. Due to the remote location of the reservoirs, connecting to the grid would be challenging.

Methane Capture

Methane is a potent greenhouse gas that is also a valuable energy source. It is commonly used as fuel in power generation and heating applications. The gas collected from landfills and other sources can be purified and burned to produce electricity or heat, reducing emissions, and providing a renewable source of energy. This process is known as landfill gas (LFG) energy recovery. In this way, methane that would otherwise be released into the atmosphere and contribute to climate change, can be harnessed and used to produce clean energy.

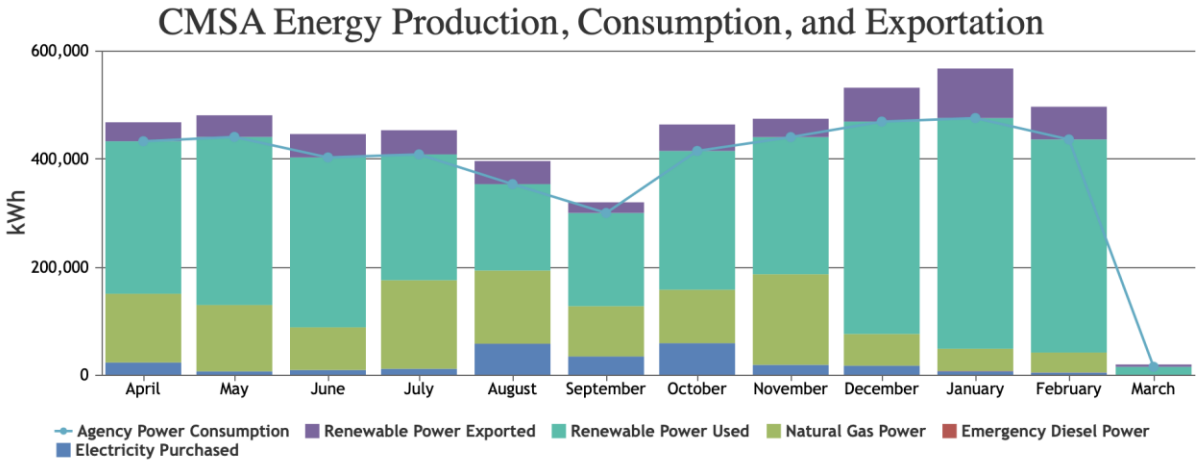
In California, state law requires landfills to capture methane emissions as a greenhouse gas by using gas collection and control systems. The California Solid Waste Management Act requires that all sanitary landfills install and operate a gas collection and control system to reduce methane emissions to the atmosphere. Additionally, the state's climate change regulations specify that methane emissions from landfills must be reduced by at least 75 percent, compared to the emissions levels in 2020. These regulations aim to reduce methane emissions and protect the environment.[32]

Methane recapture from solid waste is being done throughout Marin, including farms in West Marin, landfills, and sanitary districts that are large enough to justify the effort and expense. The energy captured is being used to offset energy demands of PG&E and can result in significant savings. For example, Chart #1, the Central Marin Sanitary Agency (CMSA) captures methane and converts it to biogas. The biogas is used to generate heat and renewable electricity via their cogeneration system. CMSA is largely energy independent because of their advanced systems, and at times exports energy which is purchased by MCE. The graph below illustrates CMSA energy production, consumption, and exportation.[33]

[32] Complying with California Mandatory Commercial Recycling and Composting Laws, https://zerowastemarin.org/businesses/commercial-recycling, Accessed on Jan. 27, 2023.
[33] CMSA, https://www.cmsa.us/about-us/power-generation, Accessed on Feb. 27, 2023.

Chart #1

CMSA normally produces up to 100% of the facility's power needs, and at times, exports electricity to the grid, making the Agency largely energy self-sufficient.The graph below shows the average energy consumption of the facility per month (blue line), how many kW hours were purchased (either natural gas or electricity), and how much biogas-generated electricty was exported and sold. Renewable power generated by CMSA is procured by MCE (Marin Clean Energy).



Source: CMSA.com

Hydroelectric Power

Water as a source of renewable energy has been a part of California's energy portfolio for generations, but its impact is lessening. Droughts reduce or eliminate hydroelectric output; as a result, other sources of renewable energy have become more important.[34]

It's true that Marin does not generate any hydroelectric energy, but it may be possible. According to the Marin Municipal Water District or MMWD (now known as Marin Water), a project to produce hydropower could occur at Kent Lake, one of the seven MMWD district reservoirs, which sits in the hills above Fairfax.[35] The Grand Jury is not aware of any plans to look into this option any further.

Electric Vehicles as Backup Power

Electric Vehicles (EVs) are another source of alternative energy. Currently a typical EV stores between 50 and about 100 kilowatts-hours (kWh) in its battery, which can provide a few days' worth of electricity.[36] Until recently, the only way to tap into the battery was by rigging an inverter system. But, with bidirectional charging, the ability for vehicle electricity to flow both

[34] Public Policy Institute of California, https://www.ppic.org/wp-content/uploads/water-and-energy-in-california.pdf, Accessed on Mar. 8, 2023.
[35] Marin Municipal Water District, https://www.marinwater.org/sites/default/files/2020-11/09-25-2020%20Board%20Retreat%20Packet%20Updated.pdf, Accessed on Mar. 14, 2023.
[36] Electric Vehicle Database, https://ev-database.org/cheatsheet/useable-battery-capacity-electric-car, Accessed on Mar. 1, 2023.

ways is now an emerging commercial reality in the United States. By 2024, numerous makes and models of EVs will be in dealerships that will offer that capability.[37]

To connect an EV's battery to a home requires some equipment: a bidirectional AC/DC converter in the EV, and a home integration system, which is a hardware unit that allows you to disconnect a house from the grid and power it with your EV.[38] Another example is Tesla's Powerwall battery system, which is essentially a standalone version of the battery in an EV.[39] Additionally, under their Virtual Power Plant (VPP) program,[40] Tesla allows for the ability for the power company to utilize that stored electricity during emergencies - and pays homeowners a generous price. As California moves towards more and more EVs, this energy source can be useful to help households live comfortably through power outages.

The Grand Jury recognizes that this solution is not widely available, but it is a growing option for new EV owners. California has mandated that every new car sold by 2035 must be an EV. Thus, for those with properly equipped EVs, their household will have the opportunity to be off the grid either intentionally or in the event of outages, for a substantial amount of time.

Communications Including Cellular and Internet

In any discussion of power outages, the continued availability of communications, including cellular and internet service, has to be considered. Emergency response teams require robust backup systems to ensure they can effectively respond to emergency calls. The County Emergency Services departments have done substantial preparations to be able to maintain their communications.

For cellular and internet service the reality is not as positive. While cellular carriers are required to have emergency backup power at the cellular towers for as much as 72 hours after a blackout, this may not be provided. The battery backup at the cell tower may have a faulty battery, the tower may have been damaged, or the tower may not have a backup system installed. In the event of a power outage, internet and/or cellular service to the home is less likely to be available.[41]

"Wireless internet access relies on devices that require power such as our towers in the field or routers in the home. When the power goes out, those devices stop working, which means you'll

[37] Michael J. Coren, "Electric Vehicles Can Power Your Home for up to three days," (*Washington Post),* Feb. 7, 2023).
[38] Coren, "Electric Vehicles Can Power Your Home for up to three days"
[39] Tesla Power Wall, https://www.tesla.com/powerwall, Accessed on Mar. 27, 2023.
[40] Fred Lambert, "Tesla launches its own virtual power plant with Powerwalls to help California's grid", July 16, 2021, https://electrek.co/2021/07/16/tesla-launches-virtual-power-plant-powerwalls-help-california-grid/#:~:text=Now%2C%20Tesla%20is%20launching%20its%20own%20virtual%20power,on%20the%20least%20efficient%20fossil%20fuel%20power%20plants Accessed on Mar. 27, 2023.
[41] AP, *California Requires Cell phone Towers to Provide Backup Power*, https://apnews.com/article/679f1066a90fb6bd1c4b1dee80059212, Accessed on Mar. 9, 2023.

lose your connection."[42] Microgrids would allow isolated pockets of power and internet/cell coverage if managed correctly.

Funding - how to pay for these projects

Getting Marin to be more resilient is doable, but it is going to be expensive. Any of the suggestions listed here are costly and will take time and significant effort to implement. But there are financial resources available to fund the project(s).

For example, a microgrid can cost anywhere from $1.2 million to $9 million, according to the California State auditor. Those amounts were as of 2021, so undoubtedly the costs will be higher now.[43]

Funding sources can include:

- US Department of Energy, Funding and Financing[44]
- California Energy Commission Grants[45]
- US Department of Energy, Office of Energy Efficiency and Renewable Energy[46]
- California Public Utilities Commission, Microgrid Incentive Program[47]
- PG&E Community Microgrid Enablement Program[48]
- Grants Summary Guide - Congressman Jared Huffman - March 2023[49]
- Private or for-profit organizations

While the costs of developing and implementing alternative energy sources for Marin are substantial, it has been proven that it can be done, as evidenced by the work done by SDG&E building multiple microgrids, and by the increasing number of wind farms that have been developed, both onshore and offshore.[50]

Private funding is an opportunity that should be aggressively explored. For example, an investor could build a "green" microgrid, and when the energy is not needed, which would be most of the time, the excess energy could be sold to MCE, to be funneled into the grid. As mentioned earlier, a version of this for-profit approach is currently being proposed in Novato at the PG&E Ignacio substation.[51]

---

[42] Softcom, *How Power Outages Affect Your Internet Access,* https://www.softcom.net/how-power-outages-affect-your-internet-access/, Accessed on Mar. 9, 2023.
[43] Auditor of the State of California, "Electrical System Safety," (March 2022, p.28) https://www.bsa.ca.gov/pdfs/reports/2021-117.pdf , Accessed on Mar. 27, 2023.
[44] Funding and Financing, https://www.energy.gov/funding-financing, Accessed on Feb. 9, 2023.
[45] California Energy Commission, https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/funding-renewable-energy, Accessed on Feb. 9, 2023.
[46] US Department of Energy, Office of Energy Efficiency and Renewable Energy, "What Funding is Available from the Office of EERE", https://www.energy.gov/eere/funding/what-funding-available-office-eere, Feb. 9, 2023
[47] California Public Utilities Commission, Resiliency and Microgrids, https://www.cpuc.ca.gov/resiliencyandmicrogrids, Accessed on Jan. 2, 2023.
[48] Pacific Gas and Electric, Community Microgrid Enablement Program
[49] https://huffman.house.gov/imo/media/doc/grants_summary_guide_2023.pdf, Accessed on Feb. 22, 2023.
[50] American Clean Power, https://cleanpower.org/news/wind-powers-america-annual-report/, Accessed on Mar. 1, 2023.
[51] Tam Energy Storage Project, https://www.marincounty.org/depts/cd/divisions/planning/projects/ignacio/ronsheimer_survivors_trust_tam_energy_storage_p3932_ig, Accessed on Mar. 1, 2023.

FINDINGS

F1. PG&E's electric transmission infrastructure is fragile, unable to reliably deliver electricity due to climate change events, and older electrical infrastructure, etc. A result of these events is that outages are increasing in number, frequency, and duration.

F2. Marin County has developed strong emergency action plans that allow a unified response to outages with a range of resources for the community. However, the level of responsiveness for solutions to outages is not adequate. There is a clear need to build electric resiliency in Marin in order to reduce outages, and emergencies stemming from them.

F3. Microgrids are an energy source that, although costly, can provide backup power in the event of brownouts or blackouts.

F4. Initial establishment of microgrids will provide Marin County with islands of resilient power during times of emergency (earthquakes, extreme heat emergencies for example). As additional microgrids are built, these islands merge together creating ever larger areas of self-sufficient power and resilient power storage and distribution for Marin residents and businesses.

RECOMMENDATIONS

R1. By December 31, 2023, the Board of Supervisors should vote on funding a study to determine the viability of microgrids, and how they could be installed in Marin County.

R2. By December 31, 2024, the Board of Supervisors will have committed to installing microgrids, in coordination with local leadership. Two sites should be chosen as pilot programs. The Grand Jury recommends Marin City and West Marin as the sites because they include underserved communities. Also, West Marin is a remote location that would benefit from reliable energy via alternative sources.

R3. By September 30, 2024, the Board of Supervisors will update the County Strategic Plan to include microgrids and enlist public support for the project.

R4. By September 30, 2024, the Board of Supervisors will engage with County Planning to develop permitting and construction guidelines to accelerate the development of microgrids.

R5. By December 30, 2024, the Board of Supervisors will investigate and identify public and private funding sources for the proposed microgrid(s).

RESPONSES REQUIRED

The following responses are required pursuant to Penal Code Sections 933 and 933.05 from the following elected county officials within 90 days:

From the following governing bodies:

- Marin County Board of Supervisors (F1-F4, R1-R5)

The governing bodies indicated above should be aware that the comment or response of the governing body must be conducted in accordance with Penal Code section 933 (c) and subject to the notice, agenda, and open meeting requirements of the Brown Act.

INVITATION FOR RESPONSES

Pursuant to Penal code section 933.05, the Grand Jury invites responses to each of the Grand Jury's Findings (F1-F4) and Recommendations (R1-R5) as follows:

- Marin County Fire - Office of Emergency Management
- Marin City Community Services District
- Bolinas Community Public Utilities District

Note: At the time this report was prepared information was available at the websites listed.

Reports issued by the Civil Grand Jury do not identify individuals interviewed. Penal Code Section 929 requires that reports of the Grand Jury not contain the name of any person or facts leading to the identity of any person who provides information to the Civil Grand Jury. The California State Legislature has stated that it intends the provisions of Penal Code Section 929 prohibiting disclosure of witness identities to encourage full candor in testimony in Grand Jury investigations by protecting the privacy and confidentiality of those who participate in any Civil Grand Jury investigation.