# **Cost-Benefit Analysis Tools for Federally Qualified Health Centers Considering On-Site Solar Installation: A Healthcare Equity Project**

Group Project Proposal | Winter 2023-Spring 2024







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## Clients

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#### Objectives

Collective Energy (CoECo) equips non-profit, low-income community health centers with on-site solar panels and battery storage systems. Lowering facility electricity costs and equipping these facilities with onsite energy has two major positive impacts; reducing GHG emissions through use of renewable energy systems, and providing underserved communities more resilient local healthcare services in the event of a natural disaster or power outage. Everyone should have equal and reliable access to healthcare, and critical health services can't be provided in the event of a power outage – lifesaving refrigerated medicines go bad, electronic health records are inaccessible, and vital medical equipment is unusable. The goal of this project is to develop an initial evaluation system that these Federally Qualified Health Centers (FQHCs) can use to determine if solar and storage systems are viable options for them. This project will produce an evaluation system that will:

- 1. Establish a system to evaluate site viability and urgency based on aggregate **geographic data**, including: solar energy production potential, natural disaster (fire, flood, hurricane) risk, and power outage risk.
- 2. Create a metric to quantify the **cumulative benefit each health center provides its community** based on clinic-specific characteristics, including: number of patients, patient characteristics, services provided, health outcomes, staffing, revenue, other community benefits like jobs created, training provided, and resiliency hubs.
- 3. Provide an **estimation of resilience against potential outages** via onsite energy storage. Specifically via the associated lost revenue in the event of an outage.

#### Implications

In 14,500 medically underserved areas across the United States, the FQHCs provide equitable and quality healthcare services to communities, irrespective of race, gender, insurance status, or income level. These sites serve as community hubs and are lifelines for those with prescription drug needs. Furthermore, health centers become first responder sites after natural disasters. These essential facilities must remain reliably and continually powered. Ordinary hospitals are required to have three days of backup power or generation capacity. FQHCs do not share this requirement, but now have a need for backup power. This project would aid FQHCs in such preparations. With budgets that must be carefully balanced, this evaluation system would provide data that enables health centers to make informed financial and risk-mitigating decisions.

Wildfire and weather-related power outages are becoming more frequent in California and across the US.<sup>1</sup> Within our state, frequent fires and high winds have led to "Public Safety Power Shutoffs," leaving critical health facilities and millions without power. These events have long-lasting consequences for the health centers and their communities. One such disaster occurred in Mendocino in 2019, where the Community Health Clinic was forced to close for several days due to fires. The health center lost over \$300,000 in patient revenues and spoiled vaccines.<sup>2</sup>

In other parts of the US, a fragile energy grid exacerbates the impacts of severe storms, hurricanes, tornadoes, and other natural disasters.<sup>1</sup> These severe weather events are especially dangerous for people with medical conditions that require constant service. According to one CDC report, hundreds of people died as a result of the 2017 Atlantic hurricane season. One of the most common "circumstances of death" were power outages that exacerbated existing medical conditions, causing "heat-related" and "oxygen-dependent" deaths.<sup>3</sup> As heat waves increase in both severity and frequency, the impacts are disproportionately affecting vulnerable groups such as the elderly, people without homes, low-income

families without air conditioning, and individuals with critical medical conditions. It is estimated that roughly 1,300 Americans die each year resulting from extreme heat.<sup>4</sup> The scope of this project aims to make this tool available for FQHCs within California, with a potential expansion to all of those across the US.

# **Environmental Justice and Equity**

As weather events increase in both severity and frequency, the impacts are disproportionately affecting vulnerable groups such as the elderly, people without homes, low-income families without air conditioning, and individuals with critical medical conditions.

This project inherently focuses on environmental justice by increasing energy and healthcare equity, decreasing energy poverty in low income areas, and improving healthcare. FQHC's are serving populations of disadvantaged people that to such a degree that over 75% are located in Justice40 communities.<sup>5</sup>

The demographics are such that 20% of their patients are uninsured, 90% are low-income, 65% are members of racial and/or ethnic minority groups. The target market for Collective Energy is the nationwide network of FQHCs that serve 31.5 million people. These health centers provide quality coverage in low-income and medically underserved communities through various community-based facilities (e.g., Community Health Centers, Migrant Health Centers, Health Care for the Homeless, Health Centers for Residents of Public Housing).<sup>6</sup> Our reasoning for objective two is to assist CoECo in prioritizing the FQHCs that need help more than others. In serving FQHCs that have a high number of patients and/or patients with little income, and/or are more prone to power loss or climate catastrophes, CoECo can provide a greater impact per project to vulnerable communities.

## Available Data

- 1. Data sources/tools to calculate site viability and urgency based on aggregate **geographic data**, including: solar energy production potential, natural disaster (fire, flood, hurricane) risk, and power outage risk. energy usage and demand.
  - <u>NREL PVWatts Calculator</u> Estimates the energy production and cost for grid-connected PV.
  - <u>Direct Relief Health and Crisis Maps</u> a gallery of multiple interactive maps that have spatial data pertaining to natural disasters and diseases (e.g. California wildfire Vulnerability.)
  - <u>CPUC High Fire Threat District</u>- California specific fire threat map.
  - <u>PowerOutageUS</u> collects, records, and aggregates live power outage data from utilities across the U.S., to create the single most reliable and complete power outage information.
  - <u>National Outages and Mutual Aid</u> real time outage data from municipalities.
- 2. Developing a tool to provide metrics quantifying the **cumulative benefit each health center provides its community** based on clinic-specific characteristics, including: number of patients, patient characteristics, services provided, health outcomes, staffing, and revenue
  - <u>Health Resources & Services Administration (HRSA)</u>- Data received from health centers under the <u>HRSA program UDS</u> patient characteristics, services provided, clinical processes and health outcomes, patients' use of services, staffing, costs, and revenues.

- <u>CA Fire Social Vulnerability Risk Map</u> GIS Map providing data about community vulnerability and response/recovery capabilities in the event of a wildfire.
- <u>Climate and Economic Justice Screening Tool</u> mapped data showing overburdened and underserved communities based on census data.
- 3. To calculate an **estimation of resilience against potential outages** via onsite energy storage. Specifically via the associated lost revenue in the event of an outage.
  - NREL System Advisor Model (SAM) used to model renewable energy configurations.
  - <u>HOMER Powering Health Tool</u> model for designing electric power systems of facilities with unreliable or unpredictable power sources.
  - <u>Interruption Cost Estimate Calculator</u> tool to calculate the cost of interrupted power or unreliability of power.

## **Possible Approaches**

- 1. Build a Shiny App that estimates savings via **solar electric productivity potential** and **estimated utility cost reduction.** Estimate the cost of the solar system given energy and storage demands to calculate how long it would take the solar system to pay for itself. Clients would provide the inputs such as monthly utility bill costs, and their address for the GIS map.
- 2. Expand Shiny App to include an estimate of cost savings through battery storage investment. Clients could select hypothetical storage capacities, provide their current total on-site refrigerated medicine in dollars on site as well as other associated avoided losses from power outages. Energy arbitrage.
- 3. Build a GIS map integration of California with layers for solar energy production potential, natural disaster and power outage risks that FQHCs can access. Potential expansion to include FQHCs in the continental U.S.

## Deliverables

The focus of the deliverables will be to provide Collective Energy with a tool they can pass on to their clients interested in renewable energy system investments. This will include the following:

- 1. A Shiny App FQHCs can access that will help them calculate their solar energy generation potential, along with the estimated reduction of their electric utility bill. Additionally there can be a calculator of avoided lost revenue due to power loss.
- 2. A GIS map providing FQHCs with calculated natural disaster and power outage risks.
- 3. An evaluation system providing justified, transparent, and reproducible methods to determine which health centers are viable for investment. Methods should highlight critical features that explain why a given health center is favorable.

#### Internships

The Bren MESM Summer Internship Fellowship will provide funding in the amount of \$6200 per student to enable one or two students, depending upon availability, to advance the project's objectives during Summer 2024. The intern(s) will work remotely (Pacific Time preferred) and will work directly with Andrew and Melissa MacCalla. The roles and responsibilities of the intern(s) will depend upon the finalized project work plan in Spring 2025. See attached client letter of support.

#### References

1. Surging Weather-related Power Outages. (2022, September 13). Climate Central. Retrieved January 12, 2024, from <a href="https://www.climatecentral.org/climate-matters/surging-weather-related-power-outages">https://www.climatecentral.org/climate-matters/surging-weather-related-power-outages</a>

2. Mendocino Community Health Clinic Forges Innovative Partnership to Combat Wildfire-Driven Power Outages. (n.d.). Retrieved January 21, 2022, from https://www.winebusiness.com/news/article/237924/

3. Issa, A. (2018). Deaths Related to Hurricane Irma—Florida, Georgia, and North Carolina, September 4–October 10, 2017. MMWR. Morbidity and Mortality Weekly Report, 67. https://doi.org/10.15585/mmwr.mm6730a5

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5. Justice40 Initiative | Environmental Justice. (n.d.). The White House. Retrieved January 12, 2024, from <u>https://www.whitehouse.gov/environmentaljustice/justice40/</u>

6. America's Health Centers: 2022 Snapshot. (2022, August 1). NACHC. Retrieved January 12, 2024, from <u>https://www.nachc.org/resource/americas-health-centers-2022-snapshot/</u>

#### **Data Citations**

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US Power Outages. (n.d.). Retrieved January 11, 2024, from <u>https://www.nationaloutages.com/us-power-outages/</u>

#### Budget

Project budget is not anticipated to exceed the \$1,300 allocated by the Bren School to cover the group's basic operations. Project funds are planned to be used for travel to one of the health center solar projects in Northern California and Collective Energy's project at Fillmore Health Center in Ventura County. Travel to health clinics will provide valuable insight for on the ground assessment, data analysis, technical understanding, and impact realization.

Expense	Estimated Cost
<ul> <li>Travel / Site Visits: Car Mileage Reimbursement</li> <li>1st Site Visit (~100 mi. away) @ \$0.56 per mile, roundtrip</li> <li>2nd Site Visit (~100 mi. away) @ \$0.56 per mile, roundtrip</li> </ul>	\$225
Travel / Site Visits: Food (4 group members @ \$60/day)	\$480
Purchasing of Proprietary Data	\$200
Review Meeting Refreshments	\$100
TOTAL	\$1005



## TO:

Group Project Committee **Bren School of Environmental Science & Management** 

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# FROM:

Andrew MacCalla Co-Founder + CEO, Collective Energy Co, LLC maccalla@collectiveenergyco.com

Melissa MacCalla Co-Founder, Collective Energy Co, LLC mmaccalla@collectiveenergyco.com

Collective Energy Company would like to formally endorse the proposed master's project designed to develop a cost-benefit analysis tool and assessment framework for evaluating Federally Qualified Health Centers (FQHC) as recipients of solar and/or storage solutions. Together with the Bren School students and faculty, we hope to achieve the following:

- 1. Establish a system to evaluate site viability and urgency based on aggregate geographic data, including: solar energy production potential, natural disaster (fire, flood, hurricane) risk, and power outage risk.
- 2. Create a metric to quantify the **cumulative benefit each health center provides its community** based on clinic-specific characteristics, including: number of patients, patient characteristics, services provided, health outcomes, staffing, and revenue
- 3. Provide an estimation of resilience against potential outages via onsite energy storage. Specifically via the associated lost revenue in the event of an outage.

Please accept this letter as a show of support for the proposed Bren Group Project and agreement to work with the students and faculty to ensure success. Both of us have worked as interns and with interns in the past and understand that success in found in collaboration. We hope this project is selected and we have the opportunity to work with the Bren School students and faculty to offer reliable, affordable, clean power to health centers in our home state and beyond.

Sincerely,

Melissa MacCalla

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LET'S CONNECT



Andrew MacCalla



www.CollectiveEneravCo.com

DATE: January 12, 2024