Microgrids and Distributed Generation

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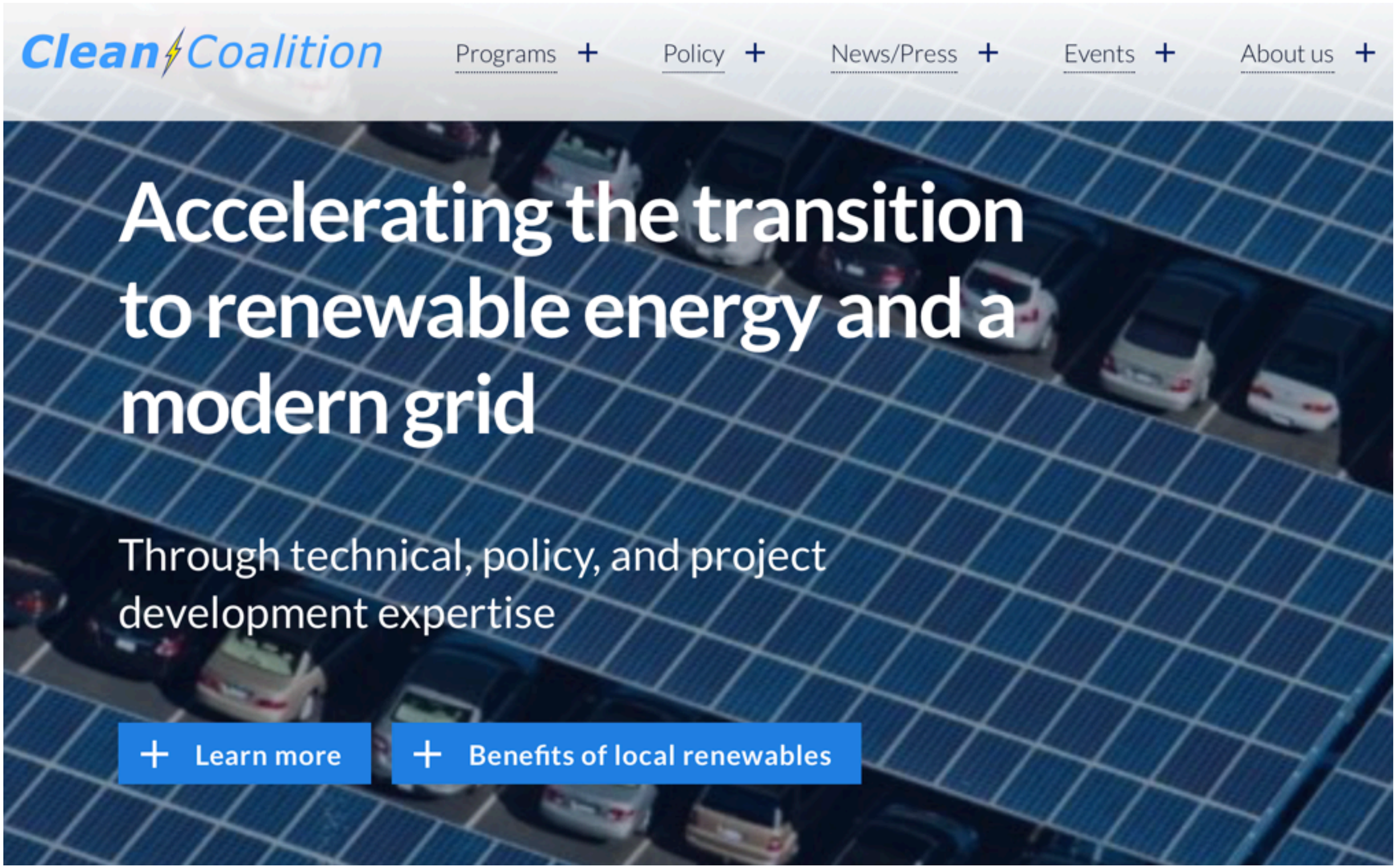

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Agenda

1. **Drivers of Change - Why?**
    1. Identify the operational and regulatory requirements that are influencing and driving healthcare operations

2. **Impact of CA's Renewable Initiative & Decarbonization**
    1. Define the impact of California's hugely successful renewable power initiative and the need to optimize its usage

3. **Regulation**
    1. Understand the regulatory drivers and the changes that will be required to allow these technologies to operate not only as normal power, but also to support operations in prolonged power outages

4. **Systems and Options**
    1. Outline system options and implementation strategies

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John Griffiths PE LEED AP

Electrical Engineer,
Electrician
30 Years Experience

OSHPD HBSB Consulting Member

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CONTECH-CA provides value driven electrical engineering solutions for complex buildings types and systems; including healthcare, mission critical and distributed generation

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Charge Bliss Team

David Bliss, M.D. is the CEO of Charge Bliss, a surgeon-scientist as well as a Board Member and Chair of the Energy Committee for the Office of Statewide Health Planning and Development. He is a recognized expert on renewable energy microgrids including being an invited speaker and panelist at regional, national, and international conferences as well as consulting for engineering, architectural, and policy entities.

Jeffrey Harding is the Director of Construction for Charge Bliss. In addition to over 30 years in the construction industry, he has an AAS in Civil Engineering Technology as well as a BS in Construction Management both from Purdue University. Jeff was the on-site project manager for the first hospital microgrid in the state of California. Jeff's experience also includes natural gas-fired combined-cycle power generation plants ranging in size from 138MW to 1,054MW. This experience combined with an extensive background in commercial construction gives Jeff a very diverse set of skills and an ability to adapt to any type of construction project.

Jon Harding is the COO of Charge Bliss. Jon has 25 years of experience as a successful Project Manager and Estimator in commercial construction. Jon is experienced in managing multiple complex projects within time and budgetary constraints. His skills include organizing, developing, and managing project staff, budgeting, scheduling, jobsite administration, and field supervision. He has managed projects up to $20MM and estimated projects up to $50MM. Jon graduated from Indiana University with a BS in Business Management, International Business, and HR Management.

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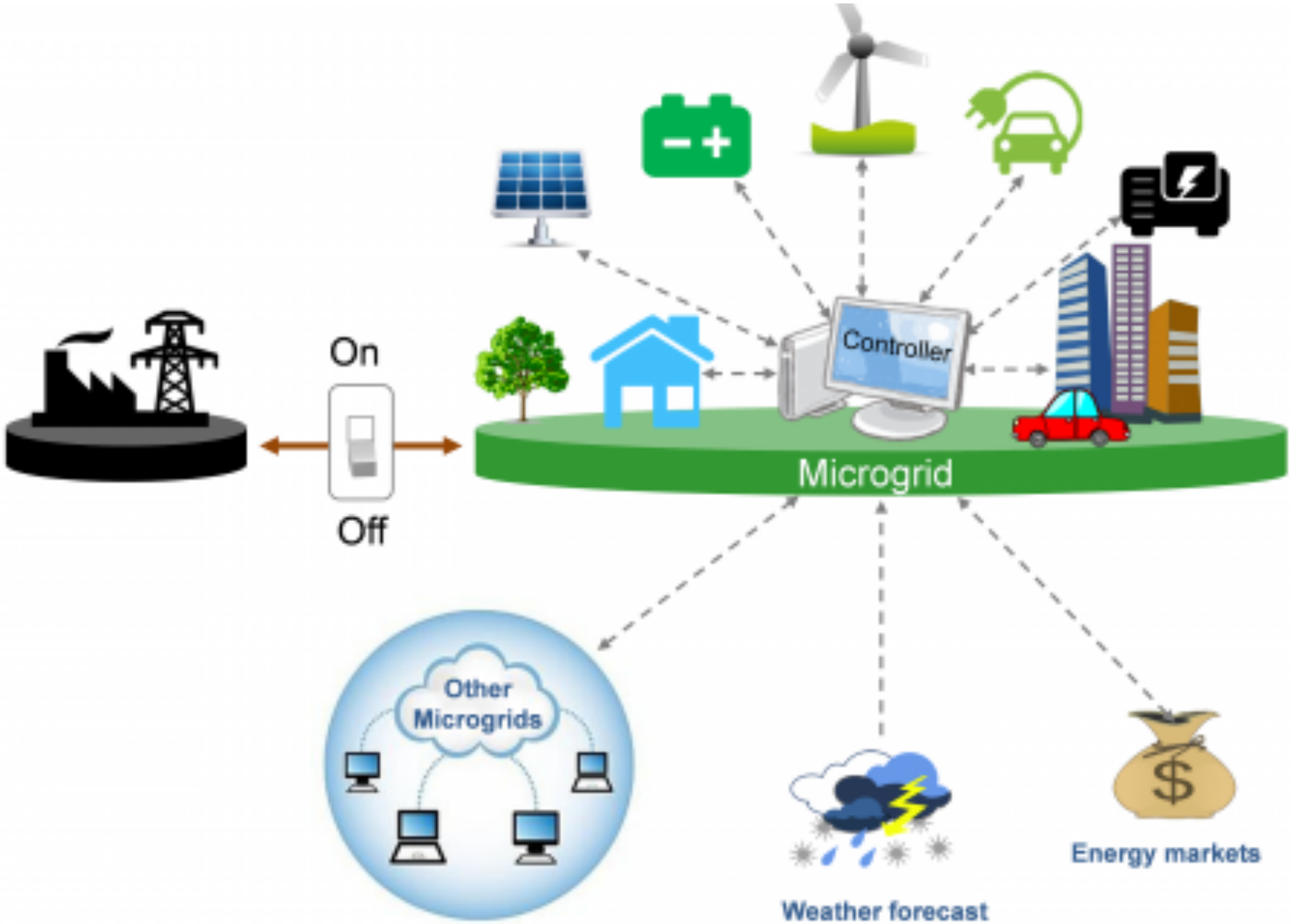
What is a Microgrid?



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Why

Microgrids and Distributed Generation?

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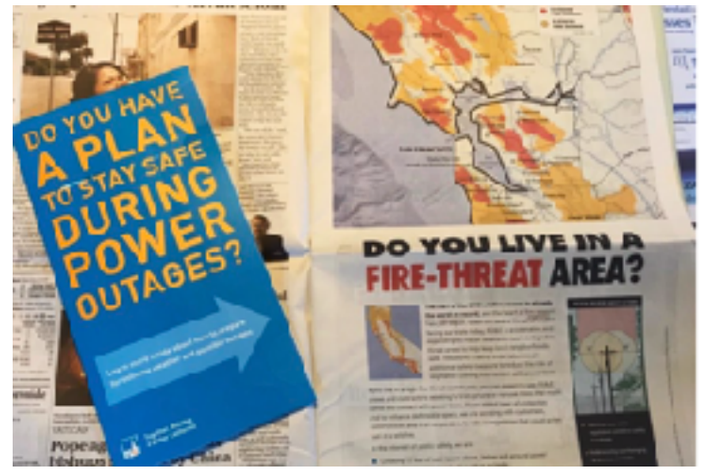

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Driver of Change

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The Golden State is officially a third renewable, and it's not stopping there

California has passed its 33% renewable energy target two years before the 2020 deadline. The state's next renewable milestone is at 44% by 2024, a 33% growth in just over five full years.

FEBRUARY 25, 2019 **JOHN WEAVER**

BUSINESS MARKETS POLICY CALIFORNIA UNITED STATES

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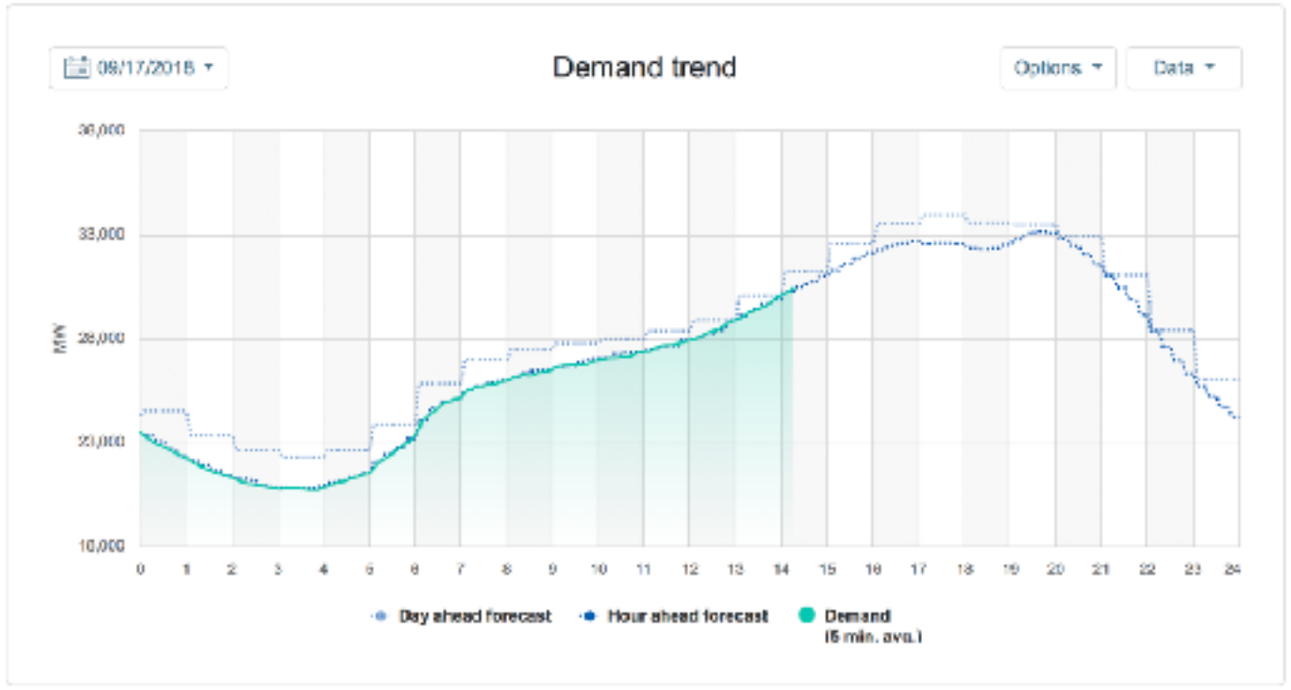
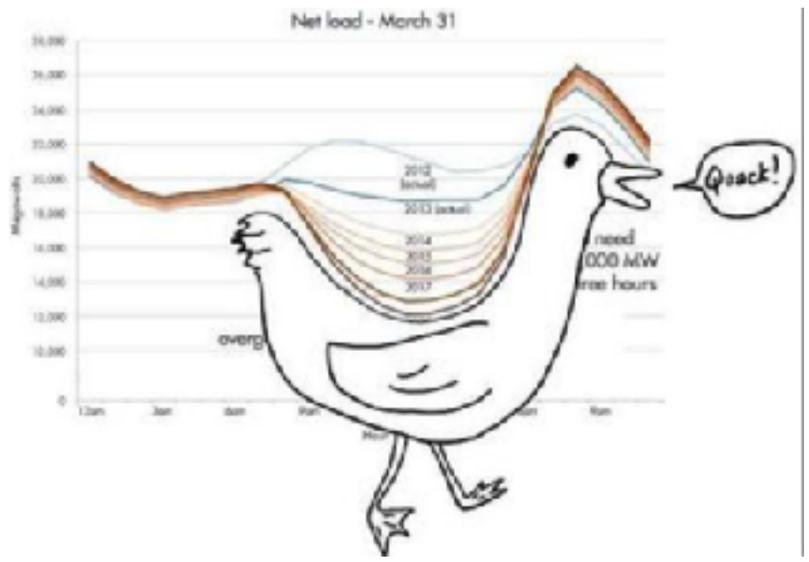
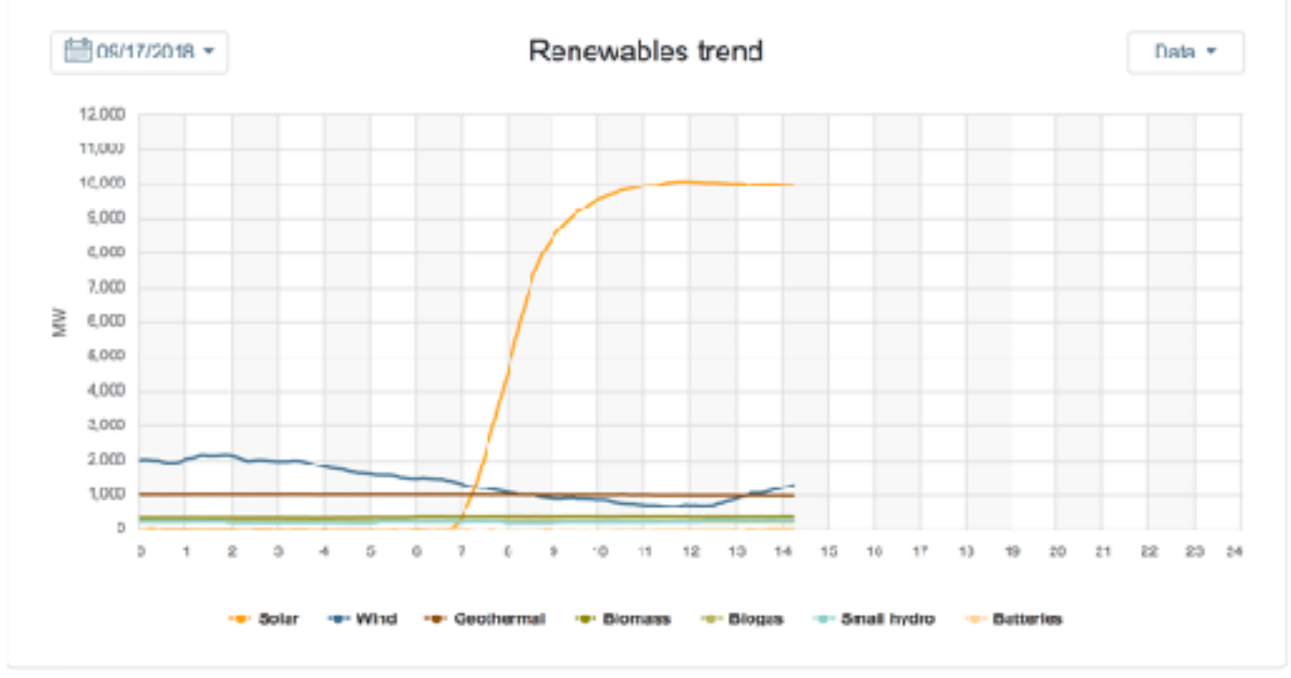
Impact of Renewable Growth







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Goals and Targets

40,000 GWh/year	63,000 GWh/year	Zero Net Energy Residential Buildings Goal	Zero Net Energy Commercial Buildings Goal Double Energy Savings in Existing Buildings Goal	Energy Efficiency
2008	2010	2013 2015 2016	2020 2025 2030	2050
11% RPS Goal	20% RPS Goal	33% RPS Goal 12 GW DG Goal 8 GW Utility-Scale Goal	50% RPS Goal	Renewable Energy
Greenhouse Gas Reductions		Reduce GHG Emissions to 1990 Level (AB 32) – Represents 30% Reduction from Projected GHG Emissions	Reduce GHG Emissions 40% Below 1990 Levels (Exec. Order)	Reduce GHG Emissions 80% Below 1990 Levels (Exec. Order)

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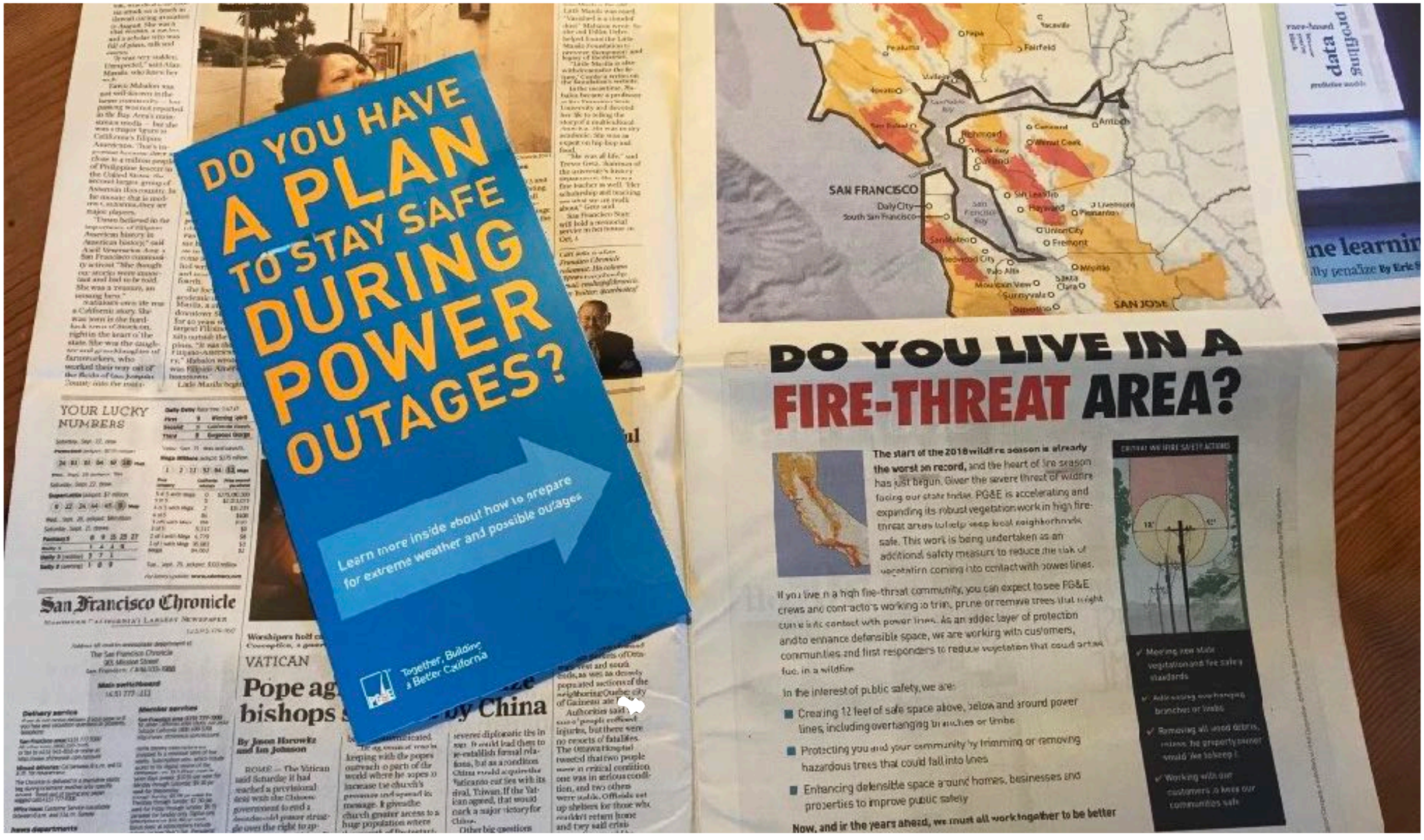
Climate Change



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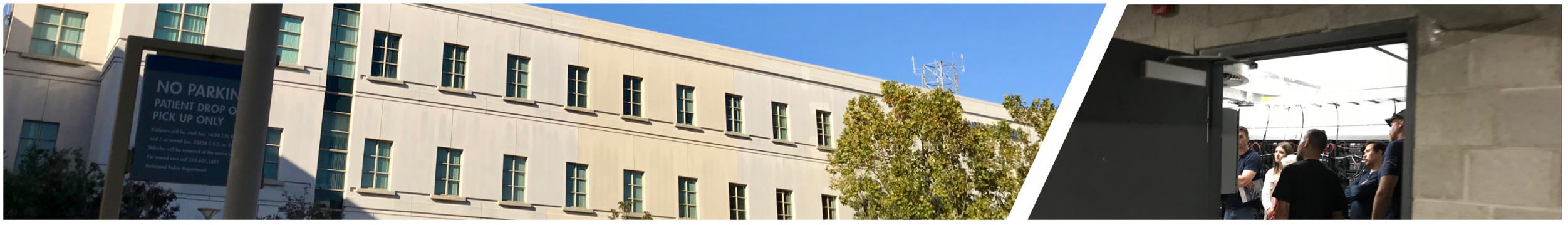
I-Occupancy Microgrid, Kaiser Richmond



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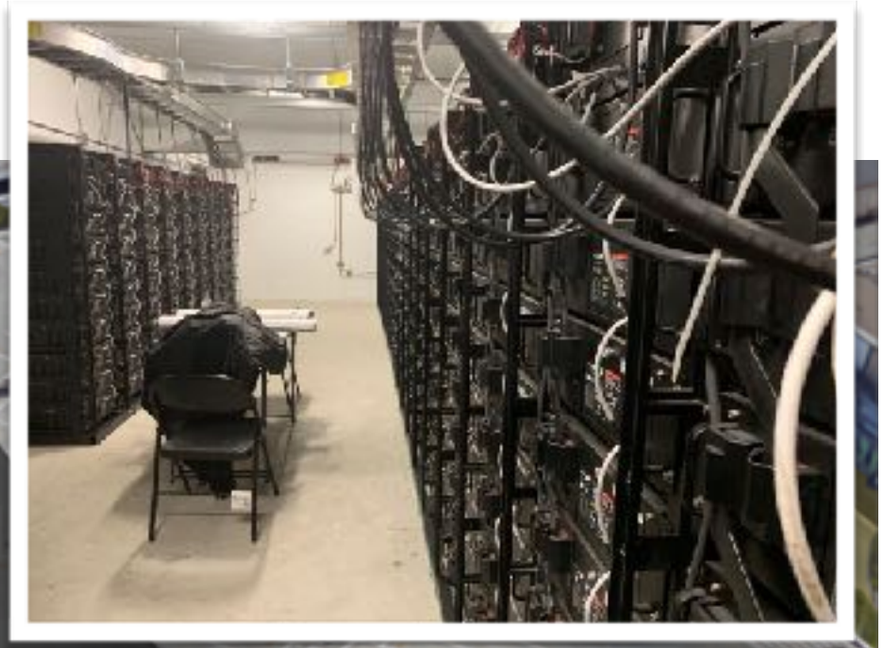

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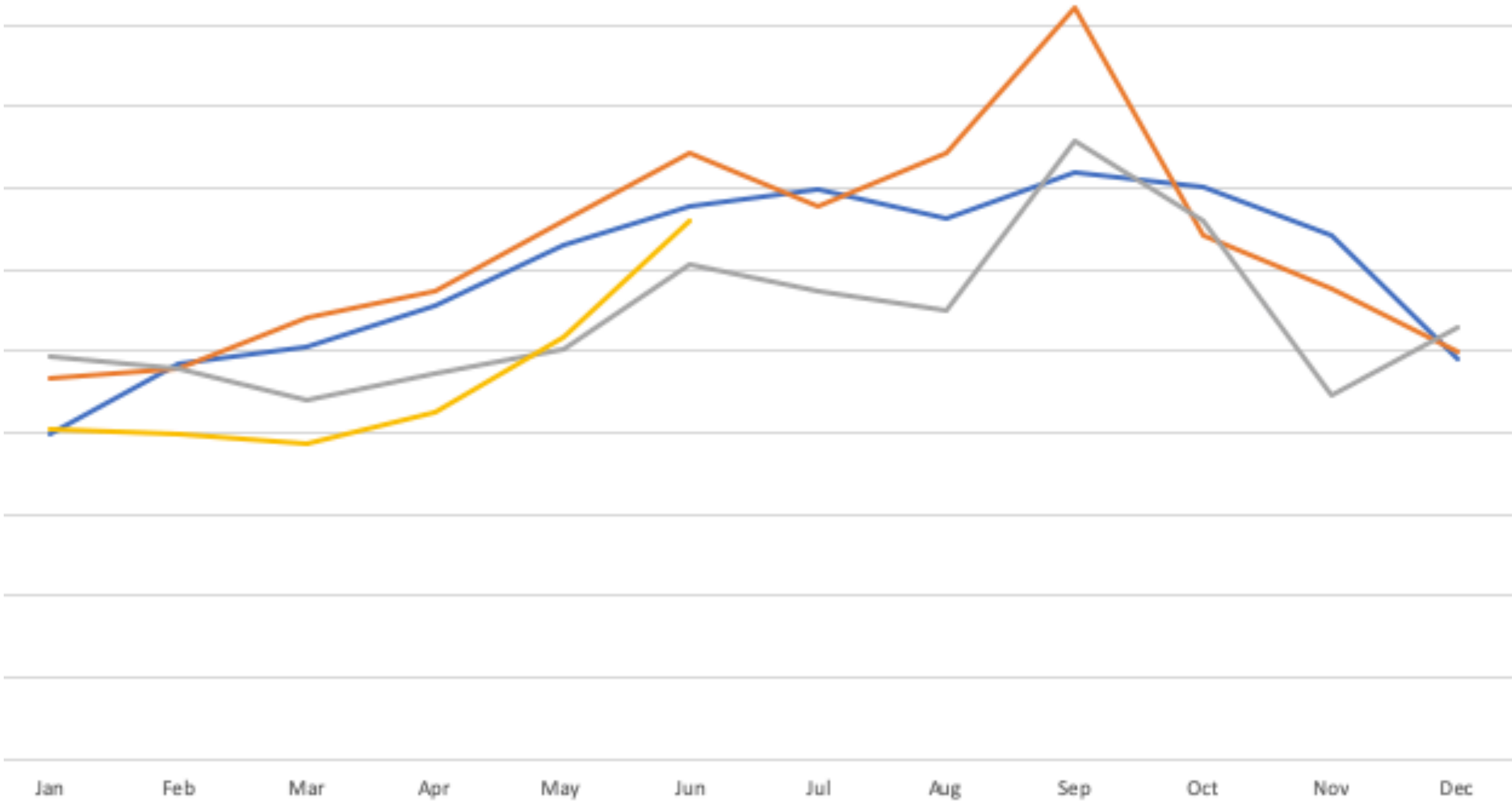
Kaiser Richmond Utility Cost



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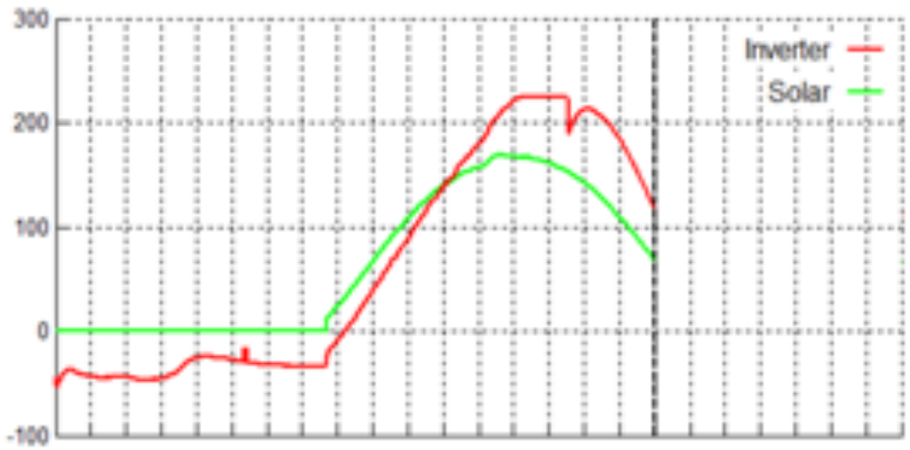
KAISER PERMANENTE
MICROGRID RICHMOND MEDICAL CENTER

Fri, Sep 21 2018
Last Update: 5:01:00 PM

Solar and Inverter Power [kW]

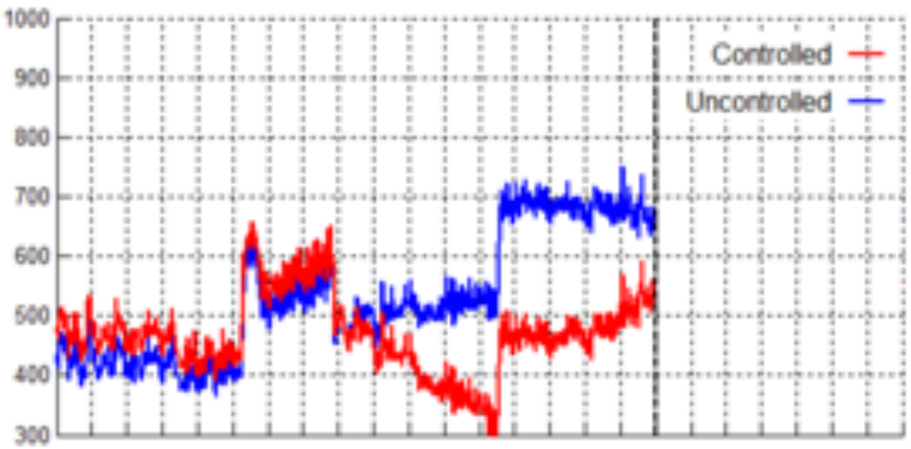


Energy Produced
1067 kWh

CO2e
793.6 kg

Solar Peak
169 kW

PCC Power [kW]

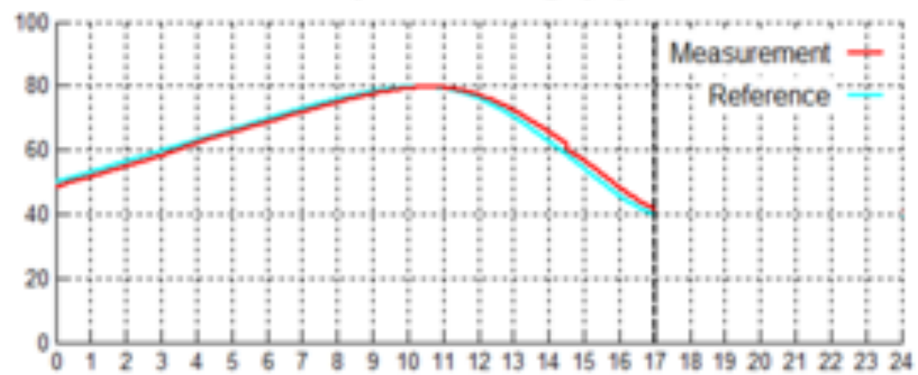


Energy Used
7983 kWh

Peak Demand
622 kW

Peak Reduction
77 kW

Battery State of Charge [%]



Maximum SoC
80 %

Minimum SoC
41 %

charge bliss

CALIFORNIA ENERGY COMMISSION

NEI

PRINCETON POWER SYSTEMS

SIGMA

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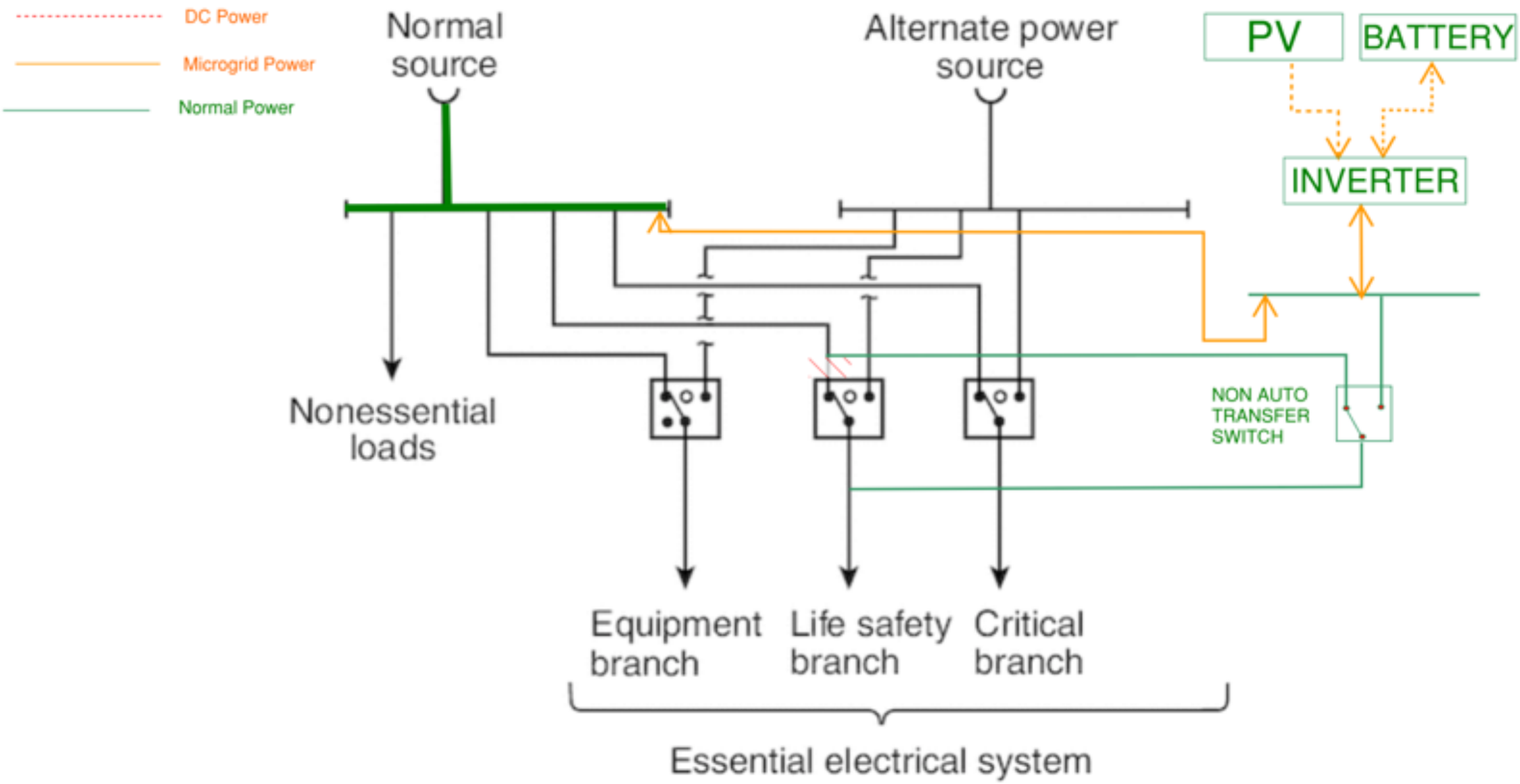
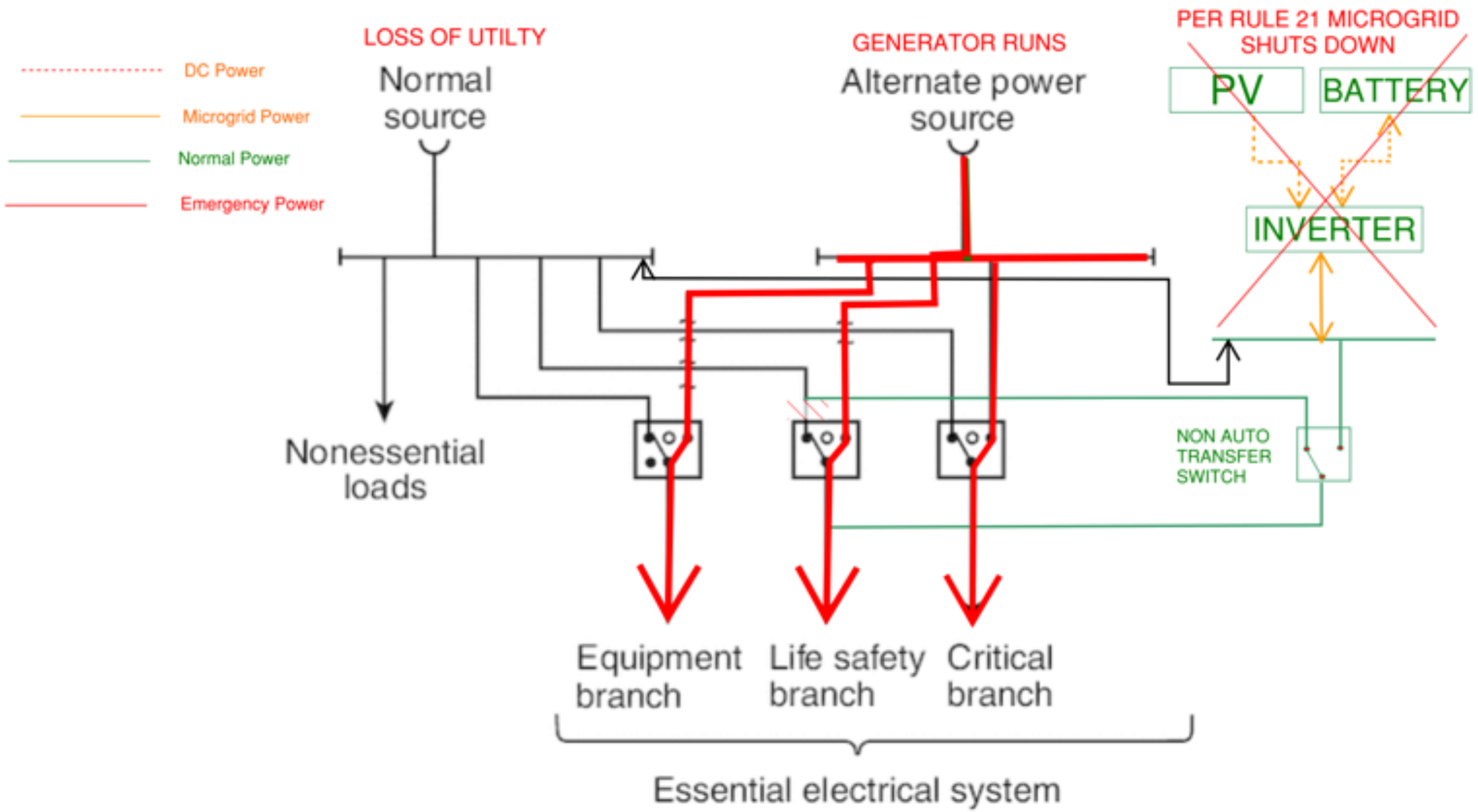


NORMAL POWER



GENERATOR POWER

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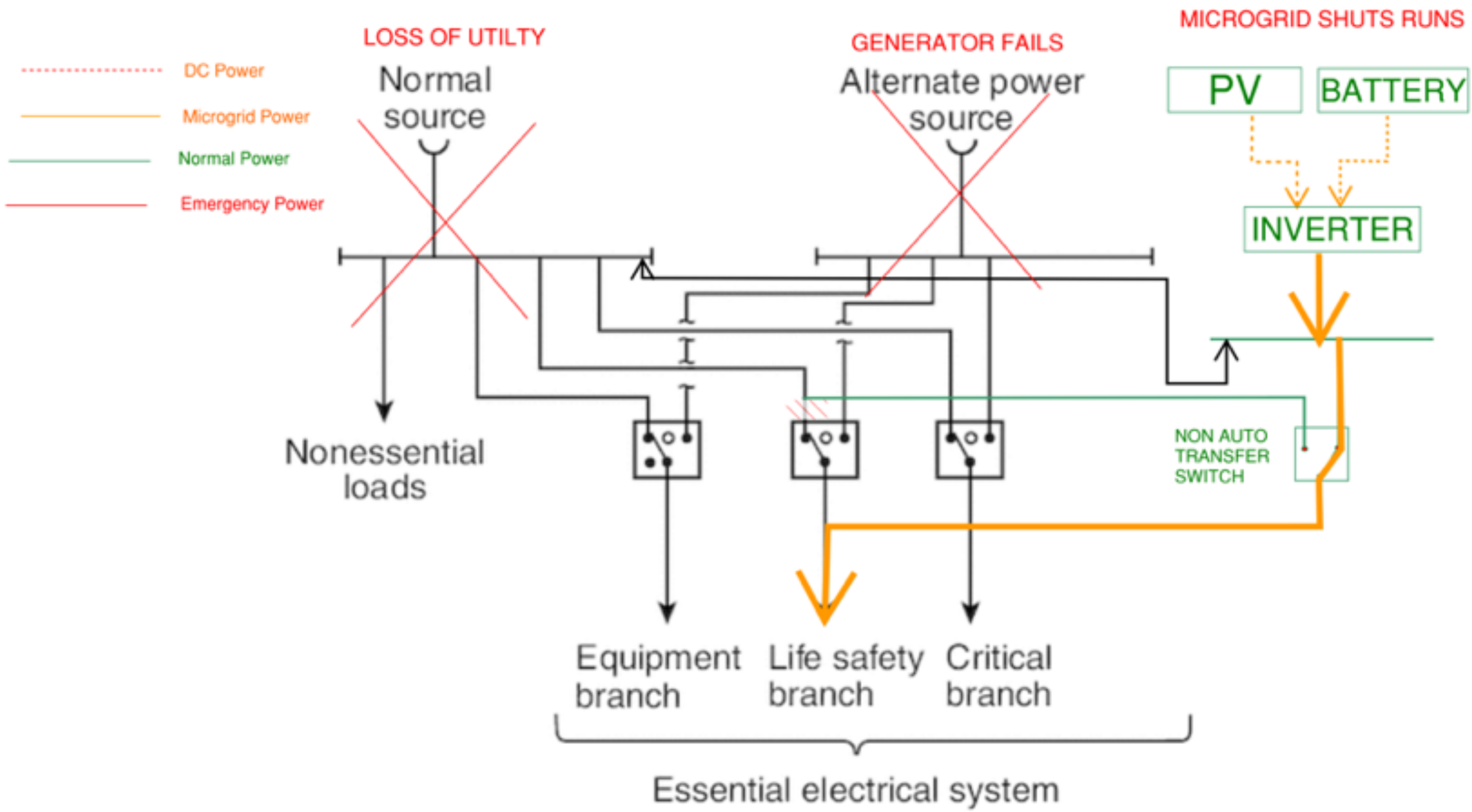

MICROGRID POWER

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San Benito Clinic, Microgrid

SAN BENITO HEALTH FOUNDATION
Community Health Center

We accept most insurances
Medical · Dental · Vision · WIC
For WIC appointments please call (831) 637-6871
The practice serves all patients regardless of inability to pay. Discounts for essential services are offered depending upon family size and income.

Quality Healthcare for Everyone

San Benito Health Foundation

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Microgrid Details

Edit Notifications

Grid Tied	PV Array	Battery System	PV Inverter	Storage Inverter	Hybrid Inverter	Generator	Energy Cost
Yes	86.4 kW	548 kWh	(12) SMA SB	EPC PD250	None	150 kW Cummins	0.18 $/kWh

Energy — Lifetime

34.98 MWh

Total Load Energy Consumed

Renewables — Lifetime

21.85 MWh

Total Renewable Energy

CO2 — Lifetime

15.36 Tons

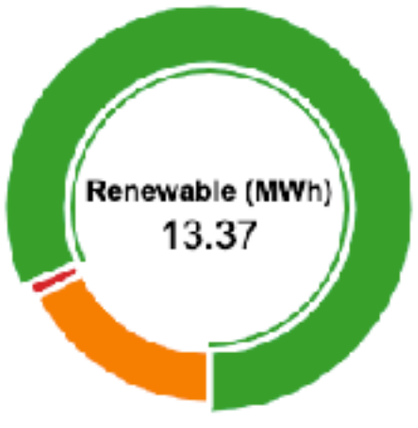
Total CO2 Reductions

Savings — Lifetime

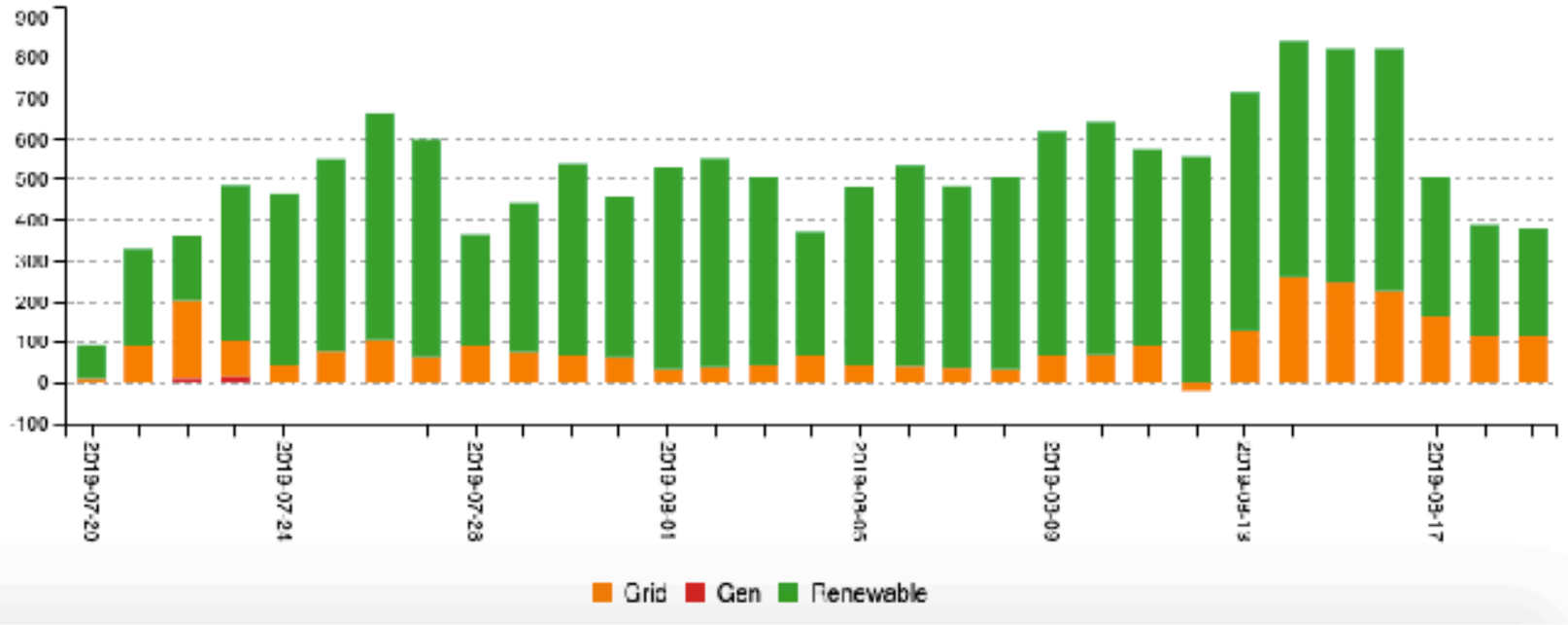
$ 3,933.43

Total Dollars Saved

Energy Source (Last 30 Days-MWh)



Energy Source Per Day (kWh)



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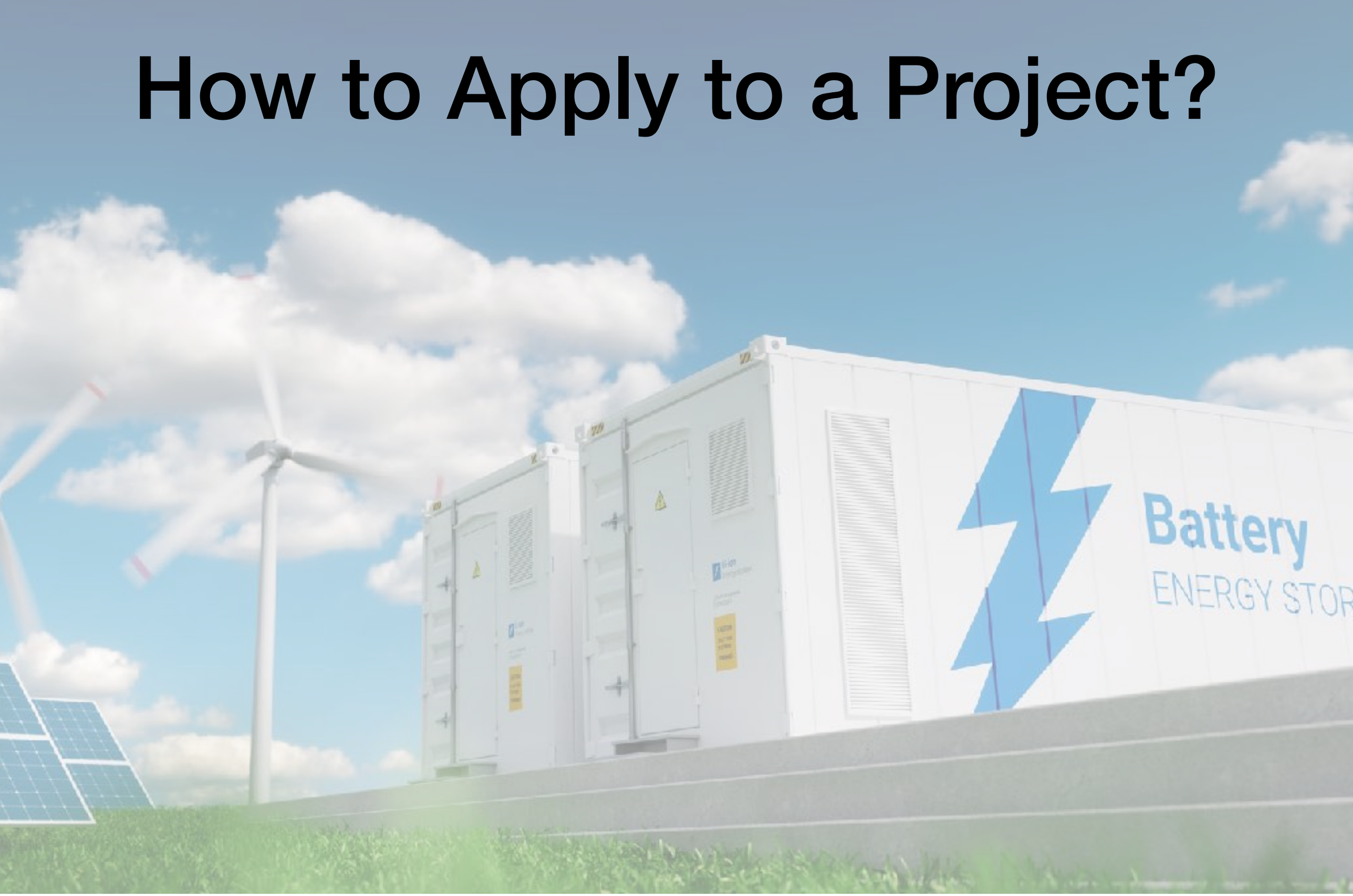
How to Apply to a Project?



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How to Apply to a Project?

New Build

- **Opportunity**
  - Incorporate in to early planning and infrastructure
  - Optimize system integration
  - Minimize legacy systems
- **Challenges**
  - Funding
  - Regulation
  - Design Skills, Education

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How to Apply to a Project?

Existing

- **Opportunity**
  - Take incremental strategic approach
  - Optimize system integration
  - Minimize legacy systems
- **Challenges**
  - Funding and Existing PPA's
  - Limiting Existing Infrastructure
  - Design Skills, Education

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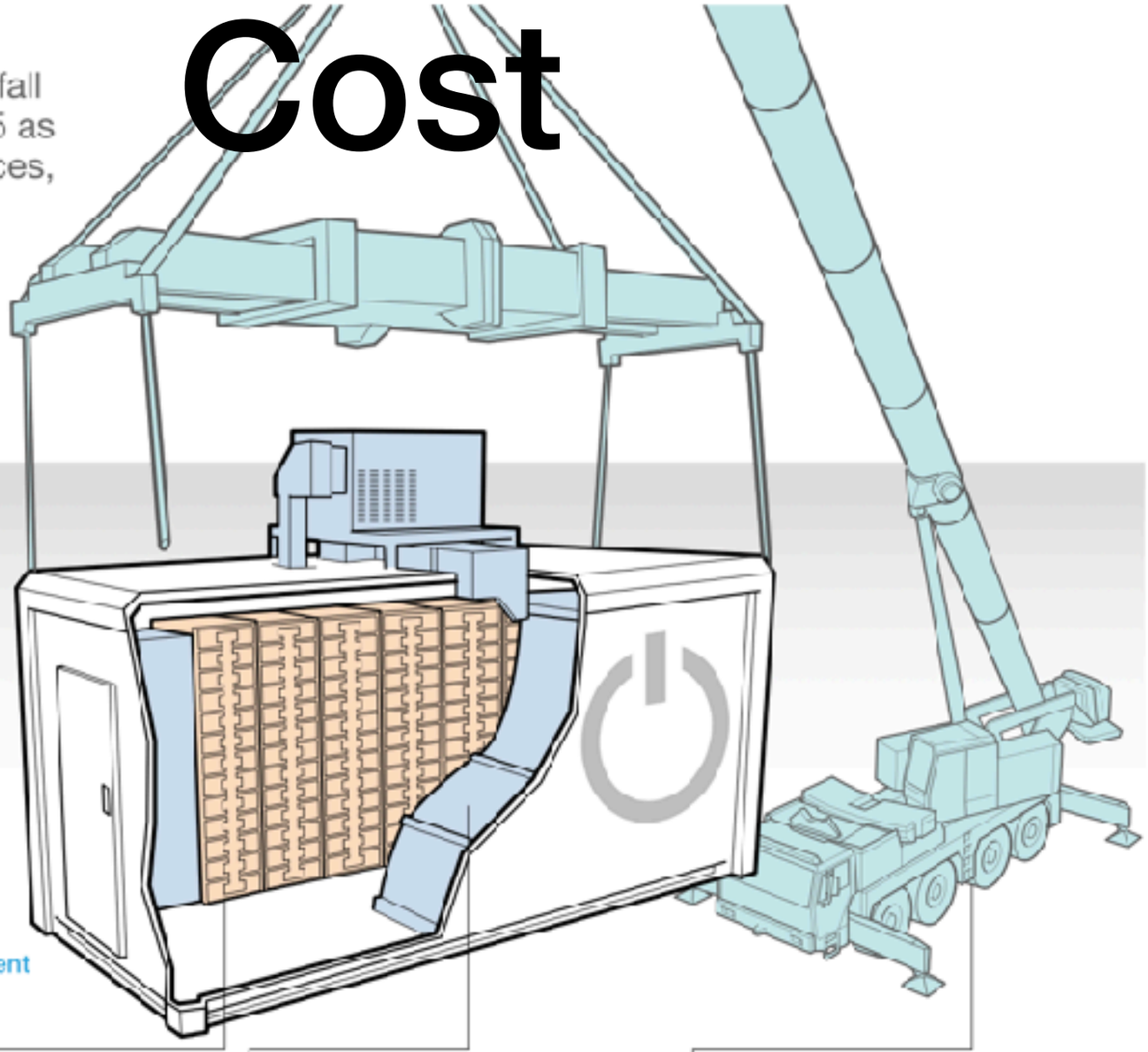
Cost

The total cost of energy-storage systems should fall 50 to 70 percent by 2025 as a result of design advances, economies of scale, and streamlined processes.

Where battery-storage-system costs will be affected, range

(ranges indicate estimated price decreases under base-case and best-in-class scenarios)



Soft costs: Customer acquisition and development, interconnection, overhead, taxes, and duties

Developers spend less time educating increasingly savvy customers, digitized tendering speeds up bids, and permitting and interconnection get faster with standardization.

Decrease by 2025: 60 to 75 percent

Battery pack: Battery-management system, cells, and modules

Large-scale manufacturing, consolidation, and improvements in processes and technology drive costs down.

Decrease by 2025: 50 to 70 percent

Balance-of-system hardware: Climate control, containerization, controller and controls, and inverter

Design improvements remove unnecessary costs and complexity. New low-cost competitors put pricing pressure on incumbents.

Decrease by 2025: 55 to 70 percent

EPC: Engineering, procurement, and construction

EPC companies create economies of scale and reduce on-site labor by pursuing standardization in design and construction. Prefabricated, plug-and-play components also lessen manual effort.

Decrease by 2025: 40 to 55 percent

McKinsey&Company

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Summary

1. **Drivers of Change - Why?**
2. **What is a Microgrid**
3. **Example of a Microgrid**
4. **How to Apply to a Project**
5. **Cost**

Questions?

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