EnergyNet

A secure, resilient future for the grid

April 21, 2026

Hosted by BCCN at Bakar BioEngenuity Hub

Global Urban Development

Agenda

April 21, 2026

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02 EnergyNet Basics: Jonas Birgersson

03 Resiliency Case Studies

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- Hurricane Maria: Bria Roettger
- Kincade Fire: Layla Scott
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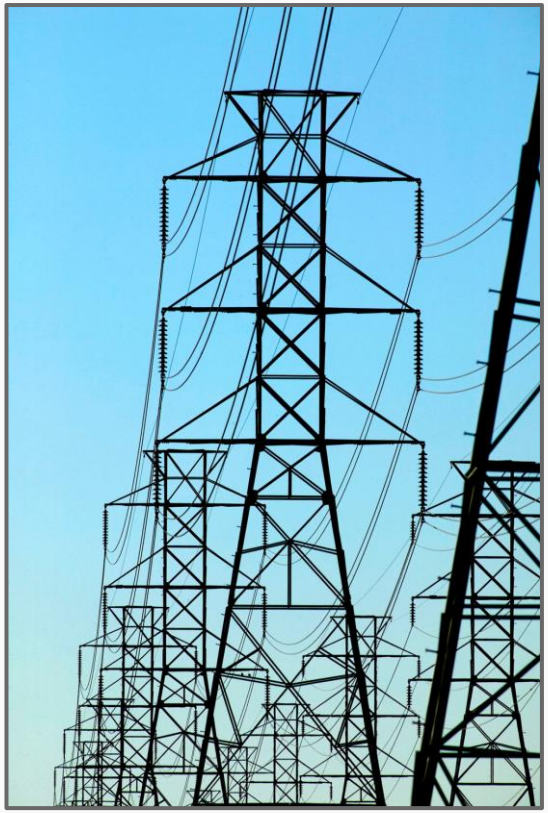
04 Benefits to Utilities: Robyn Lim

05 EnergyNet in North San Joaquin Valley: Thomas Pogue

06 Additional Discussion / Q&A

The U.S. electric grid is a glorious achievement of modern society

4,000+	TWh ANNUALLY
700K+	MILES OF TRANSMISSION LINES
3,000+	UTILITIES
330M+	PEOPLE SERVED



The electric grid is… OLD

The electric grid is... SLOW

Interconnection Queues in 2026

UNITED STATES

2,600 GW

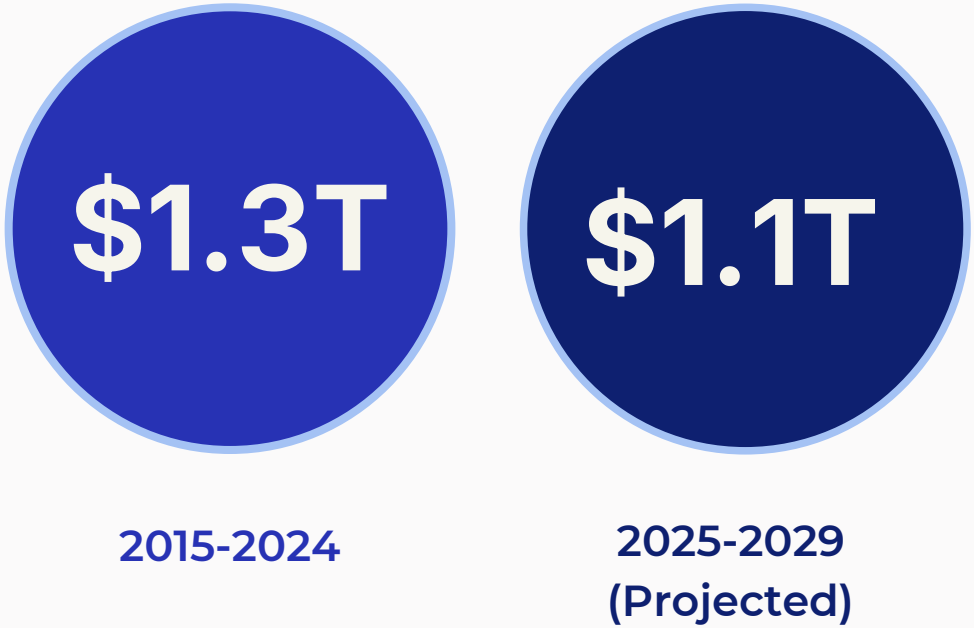
80% of new energy generation projects cancelled

EUROPE

1,700 GW

The electric grid is... EXPENSIVE

Grid Infrastructure Spending by U.S. Utilities*



*From Edison Electric Institute's 2024 Financial Review

The electric grid is… VULNERABLE

Ukraine plunged into darkness after a missile attack

...and it's facing more challenges

Increased demand from electrification and data centers

Intermittent sources impacting fragile supply / demand balance

Extreme weather and heat only getting worse

Current solutions are piecemeal and constrained by limitations of the grid

Grid Hardening

Demand & Supply Response

Individual Microgrids

Resilience Planning Policies

Grid security and reliability challenges are unlikely to ever be fully solved

> “Achieving this vision represents an ambitious change to the existing power system and **will require sustained RD&D over multiple decades.**

> “Our current standard measures of reliability and accepted planning and operational practices **do not sufficiently address these threats.**

Source: U.S. DOE Grid Modernization Strategy (2024)

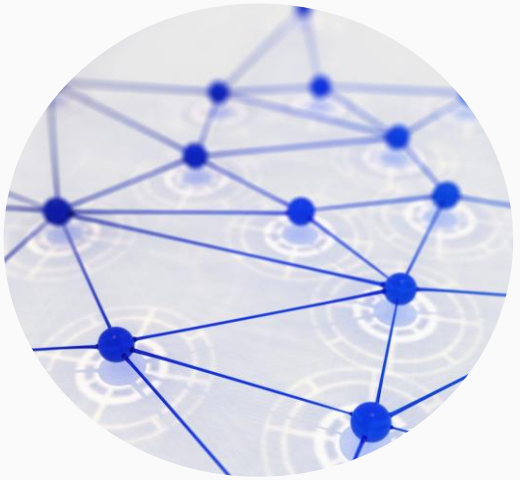
It's time to consider alternatives

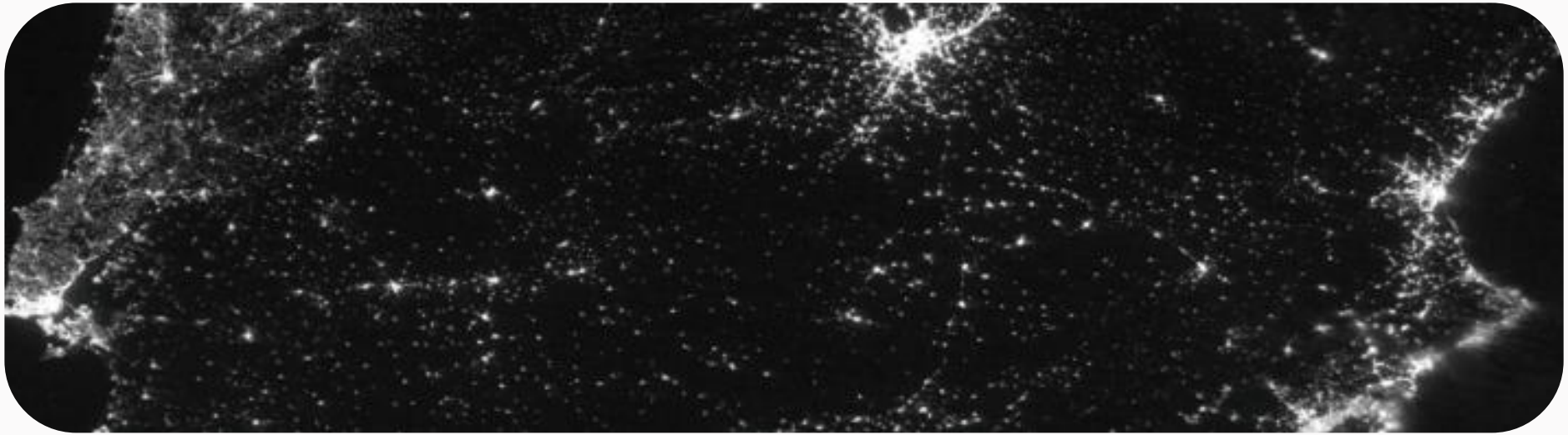
EnergyNet can enable a world with...

No Blackouts

Safe integration of unlimited renewable energy generation

A secure, decentralized energy distribution system





Case Study #1:
Iberian Peninsula - Cascading Blackout (2025)

EnergyNet Benefit: Enabling a more stable and dependable distribution system

Lily Traub

April 21, 2026

What happened: Iberian Blackout (April 28, 2025)

- On Friday April 28th, 2025 at 12:33 CEST, a large-scale blackout affected Spain, Portugal, and parts of southern France
- Tens of millions of people impacted
- Most severe blackout incident in the European power system in over 20 years
- Critical infrastructure disrupted
- Result of a rapid cascading failure in the Iberian power system

> *“49 million people lost 15 gigawatts — equivalent to 60% of its national demand — in five seconds”*

Naishadham and Wilson, 2025, AP News

What happened in the Iberian Peninsula on April 28th, 2025?

Triggering Phase

~12:32:57

Initial generation trips begin in southern Spain

Cascading Sysem Collapse

~12:33:00–12:33:30

Feedback loop:

- Overvoltage → generator trips → more overvoltage
- Full system collapse, Blackout across Spain and Portugal
- Critical Infrastructure out

Restoration

~12:40 onward

Black out procedures begin

Next ~10 hours: Gradual restoration of power across the Iberian Peninsula

Other Cases: Northeast U.S. blackout of 2003

Impact on the Iberian Peninsula during the blackout

5+ deaths

Loss of Life

Societal and Environmental Disruption

Excess Emissions

EnergyNet enables a more stable and dependable distribution system

DC and not “real time”

- Current grid AC
- No need to balance frequency/ oscillations
- Current grid is “real-time”
- Each step isolated→ more transparency and security

Individualized Benefits

- Can reroute without connecting
- Redistribution of excess energy
- Still able to function when partial blackout

Emissions Reductions

- Primarily renewable generation
- No need to diesel generators
- Larger proximity

Case Study #2: Puerto Rico / Hurricane Maria

EnergyNet Benefit:
Decentralized distribution puts power in communities' hands

Bria Roettger

April 21, 2026

What happened in Puerto Rico during Hurricane Maria?

- September 2017: Hurricane María makes landfall as a Category 4 storm
- Island-wide infrastructure failure, including complete grid collapse
- 3.3 million residents lost electricity almost immediately
- Communication, transportation, and supply chains severely disrupted
- One of the worst blackouts in U.S. history

What struck me the most was the effects of the distribution chain being interrupted and people beginning to fear a food shortage, and this lasted months

Alex Figueroa, 2017
El Nuevo Dia

Impact on the electrical grid in Puerto Rico

System Collapse

100% Grid Failure

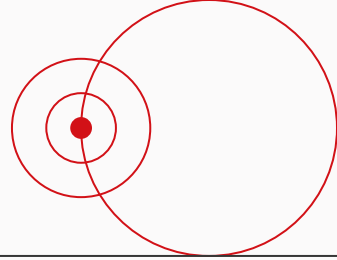
Infrastructure Breakdown

Aging grid + storm damage destroyed transmission & distribution

Human & Economic Crisis

Loss of water, healthcare, and major economic disruption

With EnergyNet, decentralized distribution puts power in communities' hands



Grid Failure → Localized Outages

- Microgrids "island" during outages
- Prevents island-wide blackout
- Failure is contained, not systemic

Slow Recovery → Faster Restoration

- No need to rebuild long transmission lines first
- Power restored locally and quickly
- More adaptive, flexible system

Human Crisis → Protected Essential Services

- Prioritizes hospitals, water, communication
- Reduces deaths and service disruption
- Supports vulnerable communities

Case Study #3:

Kincade Fire and 2019 PG&E Public Safety Power Shutoffs

EnergyNet Benefit:
Alternative energy distribution network during wildfire season

Layla Scott

April 21, 2026

What happened in CA during the 2019 Kincade Wildfire?

- Cause of fire: 230,000 volt transmission line failed
- Forecasted fire risk conditions (wind, humidity, vegetation and grid vulnerability)
- PG&E power shutoffs to control wildfire

“Energy risk is geographically misaligned with lived impact”

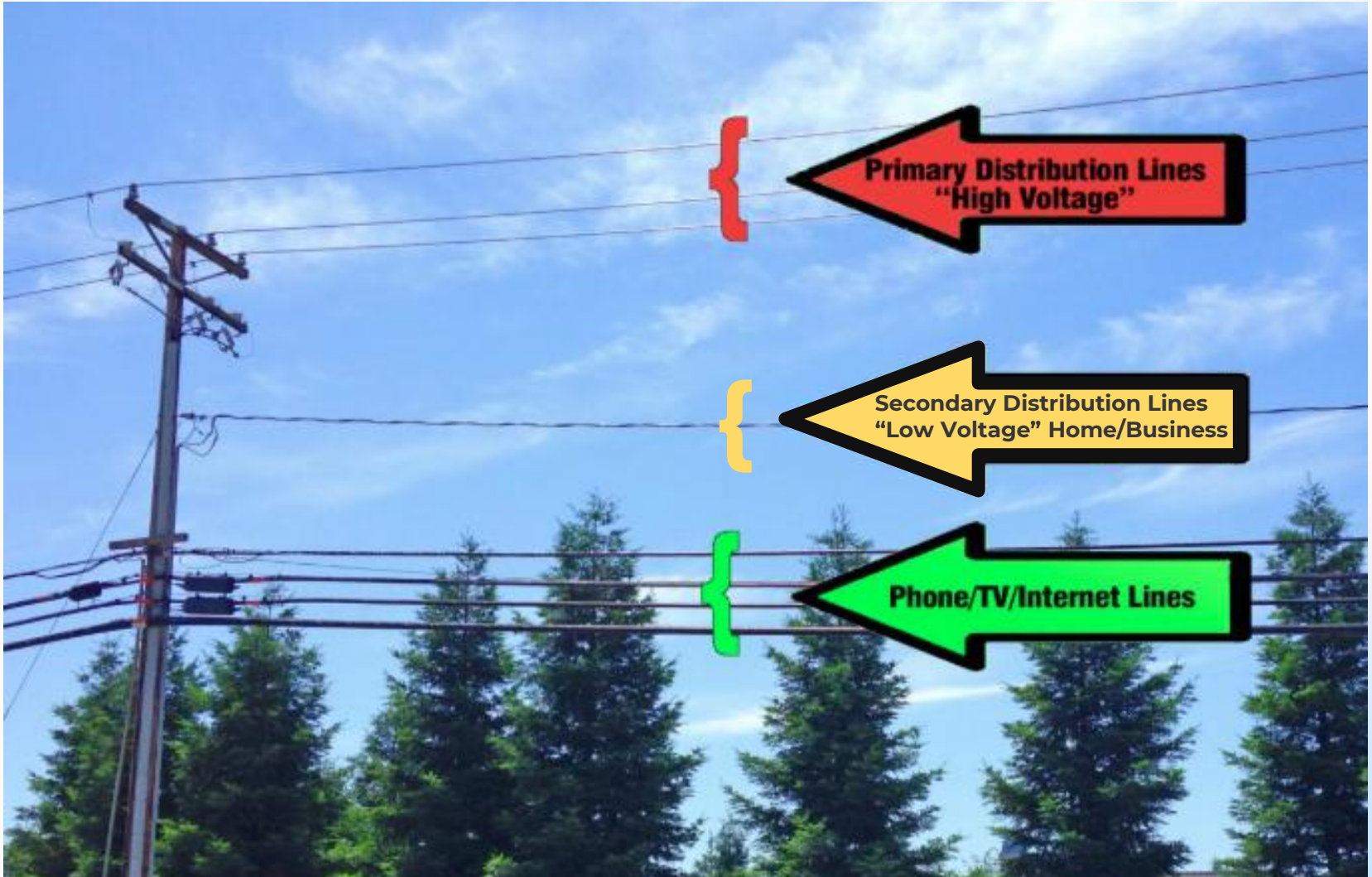
What happened in Napa during the Kincade Fire?

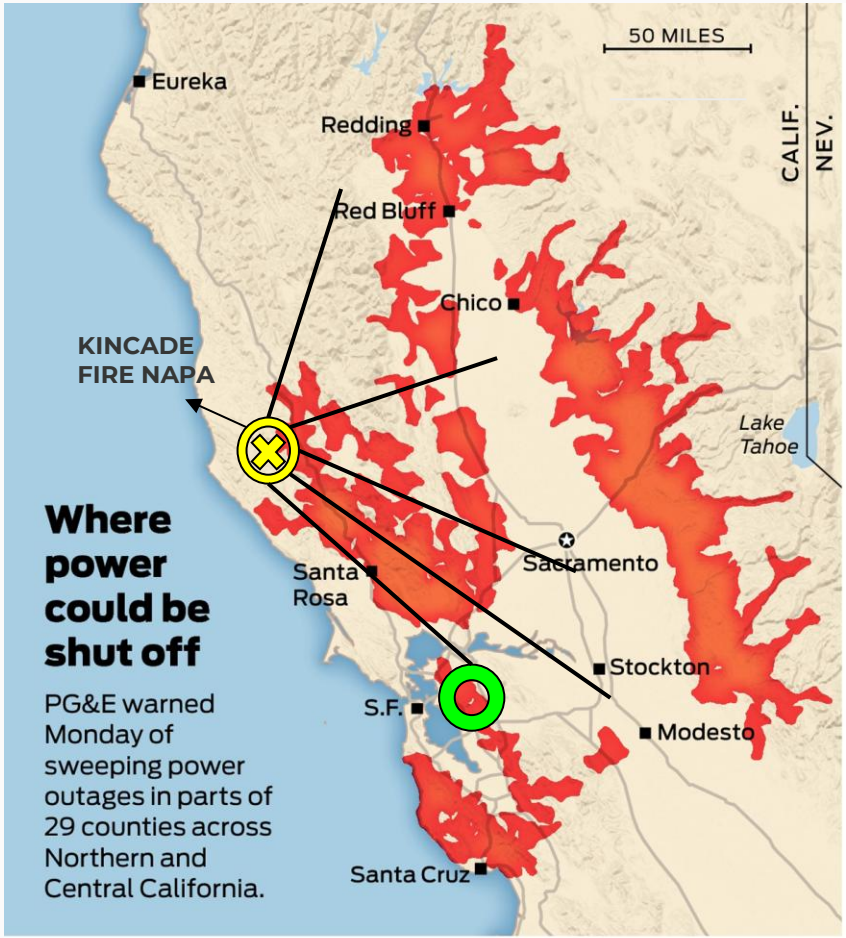
Fire duration:
13 days

374 buildings
destroyed

200,000
Residents
evacuated

4,000+
Firefighters
on site

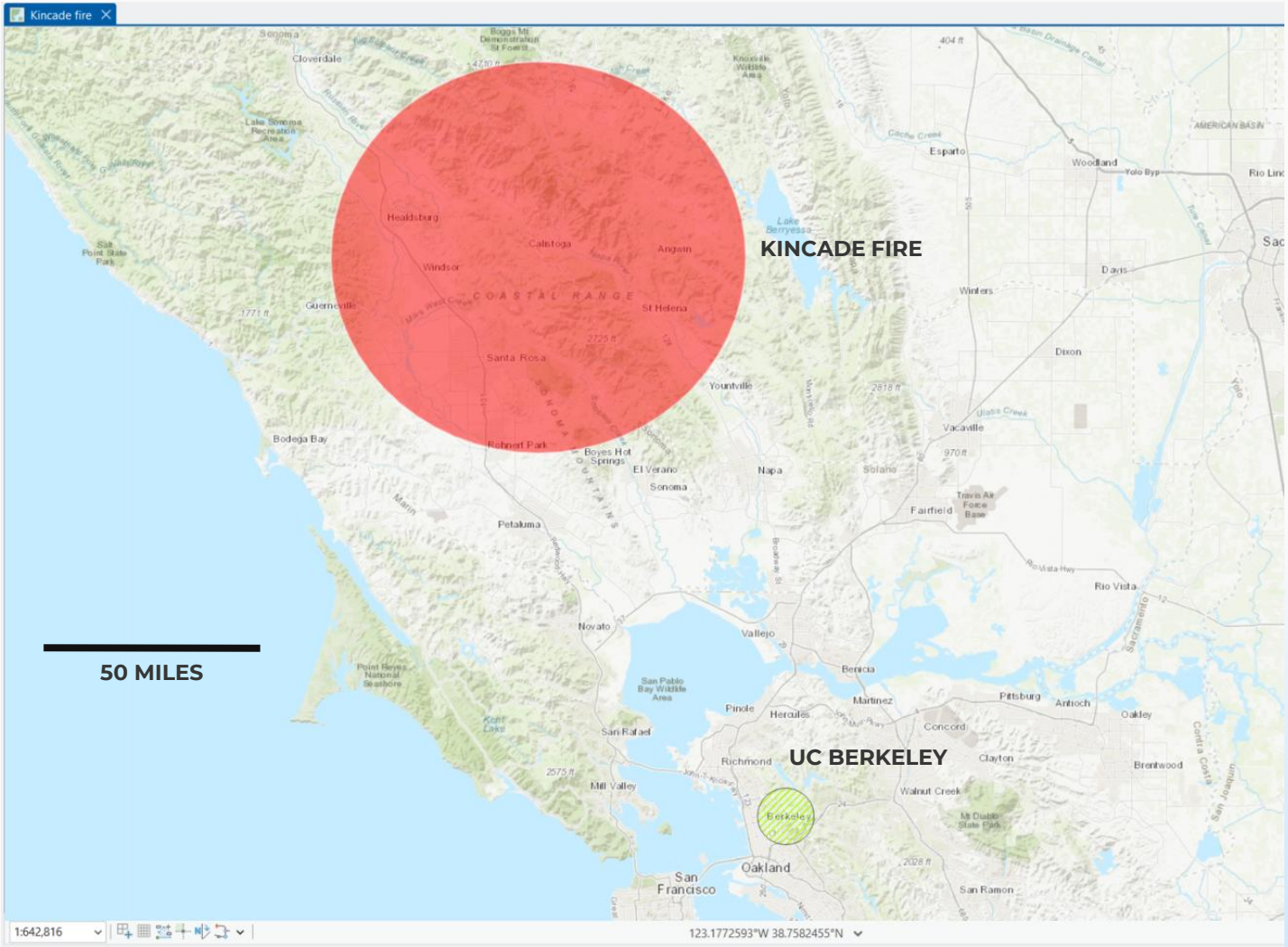

Primary Distribution Lines
"High Voltage"
Secondary Distribution Lines
"Low Voltage" Home/Business
Phone/TV/Internet Lines

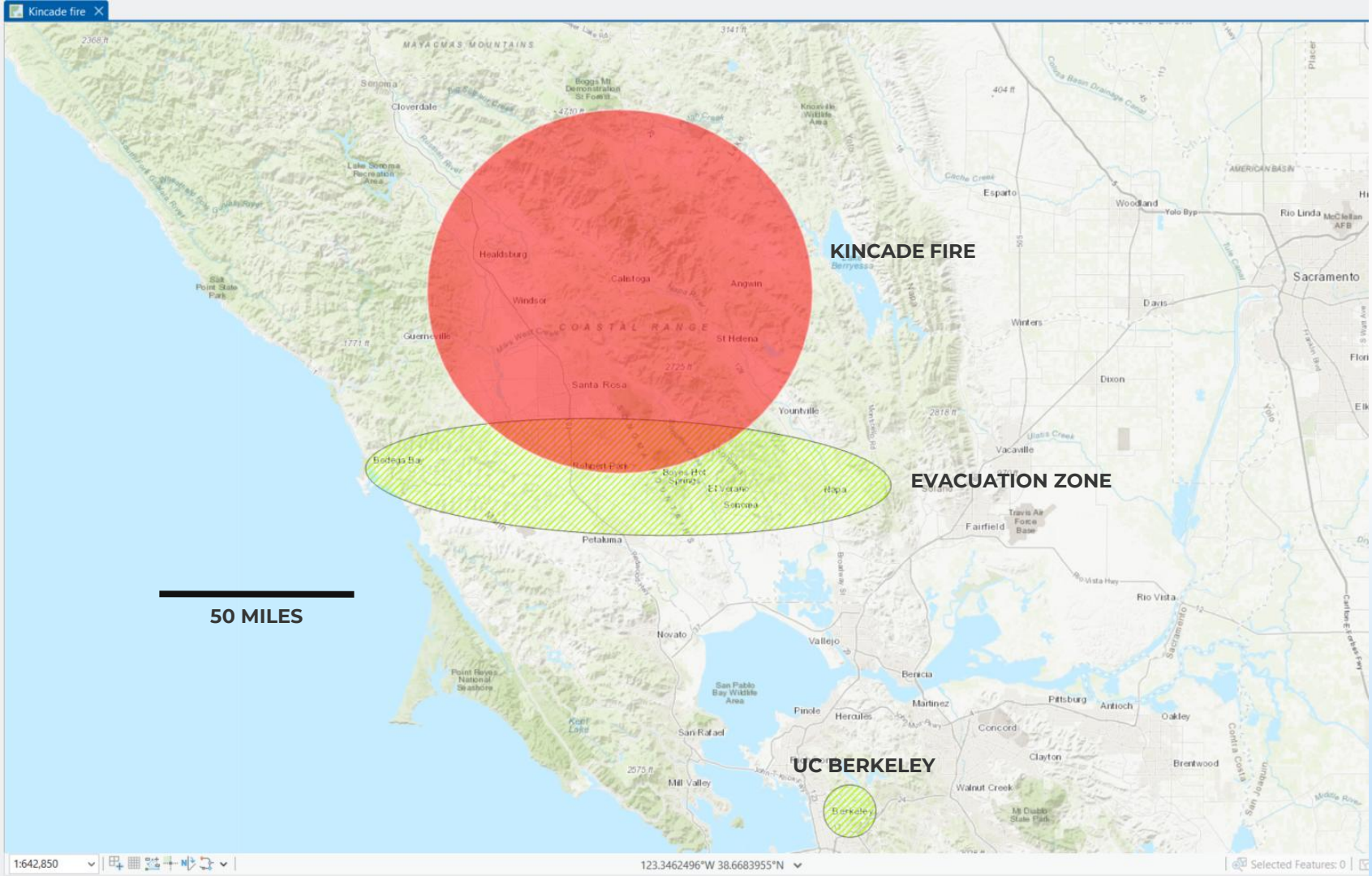


Note: PG&E says its map of potential shut-off areas is approximate. To verify if an address is affected, visit www.pge.com/psps, click "Get Current Information," then click "Check the Map."

Source: PG&E

Todd Trumbull / The Chronicle


Kincade fire
KINCADE FIRE
UC BERKELEY
50 MILES
Healdsburg
Calistoga
Windsor
Santa Rosa
St Helena
Angwin
Guerneville
Cloverdale
Bodega Bay
Petaluma
Novato
Sonoma
Napa
Vallejo
Fairfield
Vacaville
Dixon
Winters
Davis
Woodland
Esparto
Rio Vista
Benicia
Martinez
Pittsburg
Antioch
Concord
Clayton
Brentwood
Oakley
Pinole
Hercules
San Rafael
Richmond
Mill Valley
Walnut Creek
Berkeley
Oakland
San Francisco
San Ramon
Yountville
Rohnert Park
Boyes Hot Springs
El Verano
Travis Air Force Base
1:642,816
123.1772593°W 38.7582455°N


Kincade fire
KINCADE FIRE
EVACUATION ZONE
50 MILES
UC BERKELEY
MAYACMAS MOUNTAINS
COASTAL RANGE
Sonoma
Cloverdale
Healdsburg
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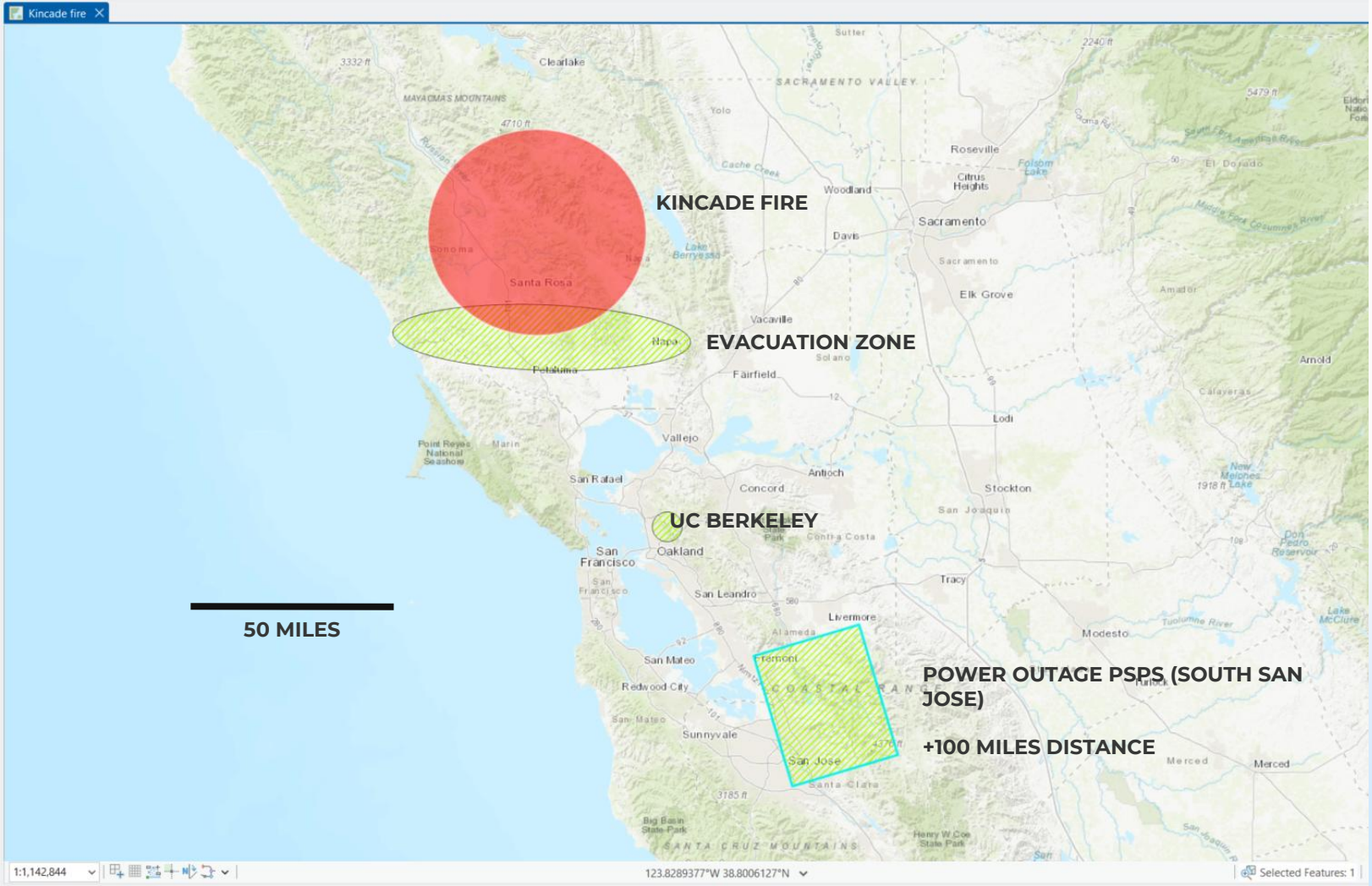
Petaluma
Yountville
Napa
Sonoma
El Verano
Boyes Hot Springs
Vacaville
Fairfield
Travis Air Force Base
Rio Vista
Vallejo
Benicia
Martinez
Pittsburg
Antioch
Oakley
Concord
Clayton
Brentwood
Pinole
Hercules
San Rafael
Mill Valley
Walnut Creek
Berkeley
Novato
Point Reyes National Seashore
San Pablo Bay Wildlife Area
Lake Sonoma Recreation Area
Esparto
Woodland
Rio Linda
Sacramento
Davis
Winters
Dixon
AMERICAN BASIN
1:642,850
123.3462496°W 38.6683955°N
Selected Features: 0


Kincade fire
KINCADE FIRE
EVACUATION ZONE
UC BERKELEY
50 MILES
POWER OUTAGE PSPS (SOUTH SAN JOSE)
+100 MILES DISTANCE
Clearlake
Santa Rosa
Petaluma
Napa
Vacaville
Fairfield
Vallejo
San Rafael
Point Reyes National Seashore
Concord
Antioch
San Francisco
Oakland
San Leandro
Livermore
San Mateo
Redwood City
Sunnyvale
San Jose
Santa Clara
Woodland
Davis
Roseville
Citrus Heights
Sacramento
Elk Grove
Lodi
Stockton
Tracy
Modesto
Merced
Arnold
Sutter
Yolo
Solano
Contra Costa
Alameda
Marin
Sonoma
Napa
Lake Berryessa
Folsom Lake
Cache Creek
SACRAMENTO VALLEY
MAYACMAS MOUNTAINS
COASTAL RANGE
SANTA CRUZ MOUNTAINS
Big Basin State Park
Henry W Coe State Park
New Melones Lake
Don Pedro Reservoir
Lake McClure
1:1,142,844
123.8289377°W 38.8006127°N
Selected Features: 1

LIMITATIONS OF THE GRID : WILDFIRE IMPACTS

2:1

Wildfire + Power outage

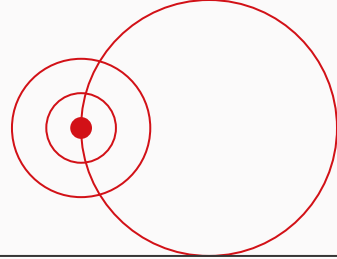
2.1 M

Residents without power

77,758

Acres Burned

EnergyNet can provide an alternative energy distribution network during wildfire season



Decentralized System

- Isolate wildfires locally, maintains power elsewhere.

Utility Safety Resilience

- Critical systems stay online (Water Utilities, Hospitals, Businesses, etc.)

Community Support

- Rural agriculture communities access to resources and power

Case Study #4:
Rockaway Peninsula - Hurricane Sandy

EnergyNet Benefit: A digitalized network enables modern solutions

Santino Plazola

April 21, 2026

What happened in the Rockaways during Sandy?

- Power grid & utilities shut down
- Widespread flood damage
  - Storm surges up to 14 ft
- Electrical fires
  - Breezy Point Fire

Flood Destruction from Hurricane Sandy

Breezy Point Fire Aftermath

Impacts to the grid in the Rockaways:

Grid Damage

Repairs to substations + wires took 11 days

Structure Damage

70% of homes without power or heat after grid repairs

Restoration Work

Homes repowered one by one over five months

With EnergyNet, a digitalized network enables modern solutions

Grid Damage	• Smart network system reroutes around damage. • Distributed power sources support network. • So, the system keeps running.
Structure Damage	• Smart safety monitoring prevents fires. • Precise control gives many power options.
Restoration Work	• Management systems check system health immediately after hurricane. • Healthy systems repowered in minutes.

With EnergyNet, a digitalized network enables modern solutions

Instead of:

Full system blackout
+
Months of tedious repairs

EnergyNet provides:

Powered system
+
Immediate home checks and efficient repairs

How does EnergyNet benefit utilities?

Case Study #5: Alameda Municipal Power (AMP)

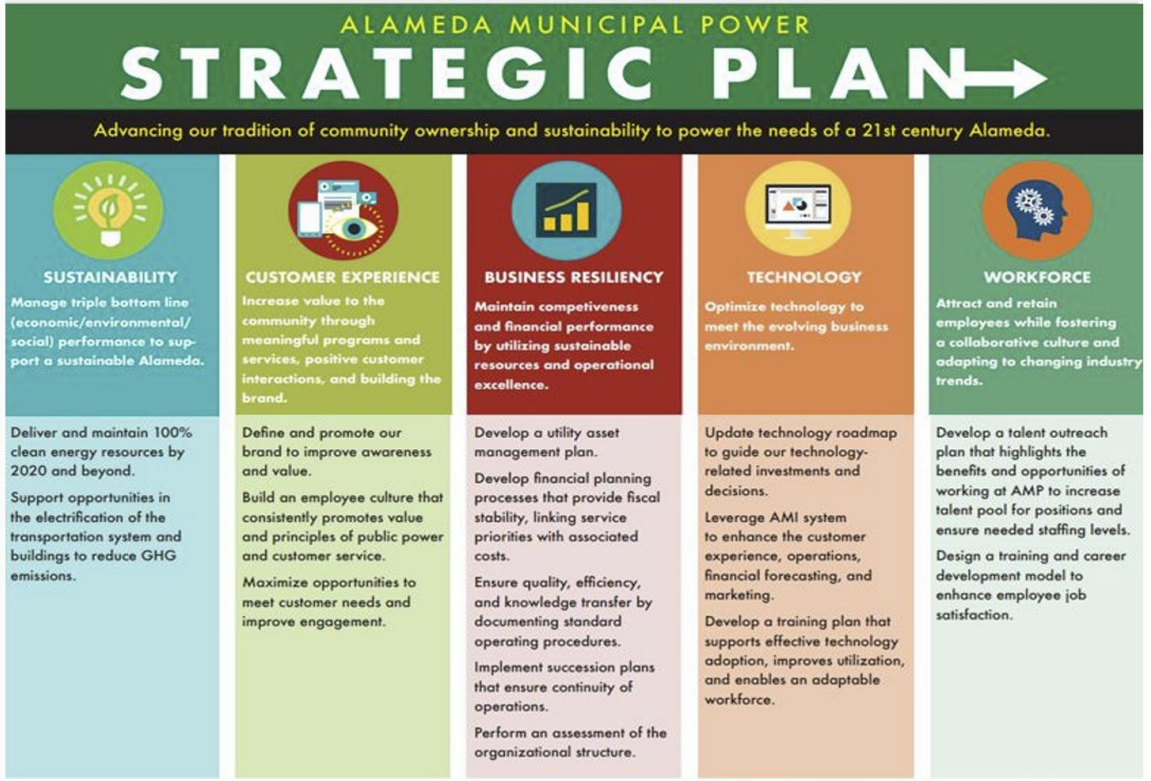
EnergyNet Benefit: More reliable, cheaper, locally-produced and -distributed clean energy aligns with utilities' goals

Robyn Lim

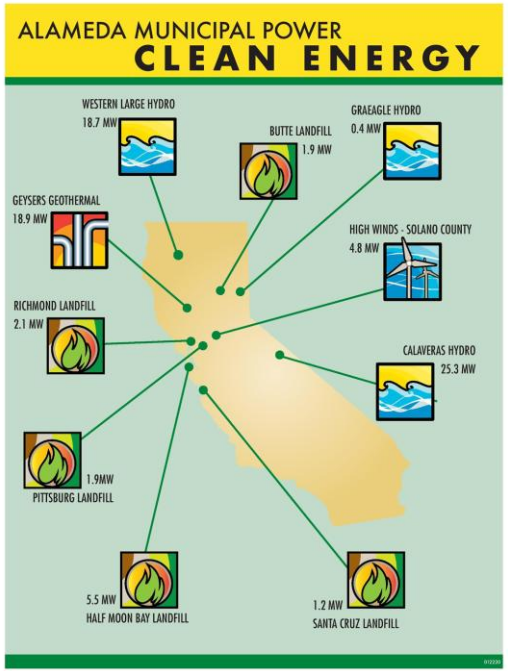
April 21, 2026

Alameda Municipal Power

"To increase value to Alameda by providing safe, reliable, cost effective, and environmentally responsible electricity."



AMP: reliable power?

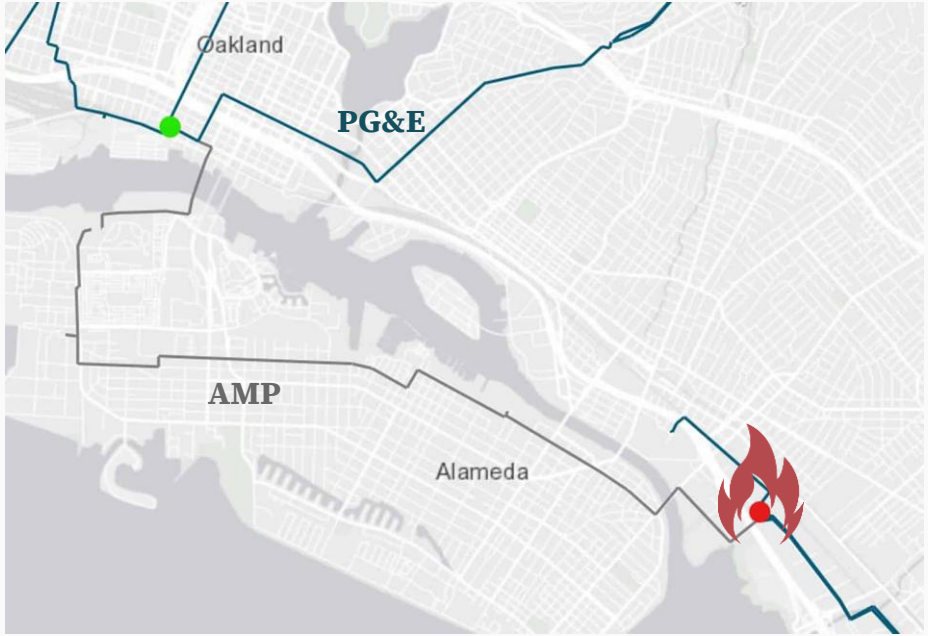


AMP buys power from Northern California Power Agency (different power plants across California)

And pays PG&E to use transmission lines to move power from these power plants to Alameda

Vulnerable to external failures…

In February 2023, approximately 20,000 AMP customers lost power for more than four hours because one PG&E substation serving the island caught fire….



EnergyNet is more resilient

With networked microgrids distributing power, residents wouldn't be disrupted by damage to a substation.

AMP: cost-effective power?

YES but... PG&E transmission costs passed off to customers; accounts for 16% of what customers pay

Cost of capital projects (upgrading AMP infrastructure) set to soar in the next two decades (projected $60 million)

What does my utility bill actually pay for?

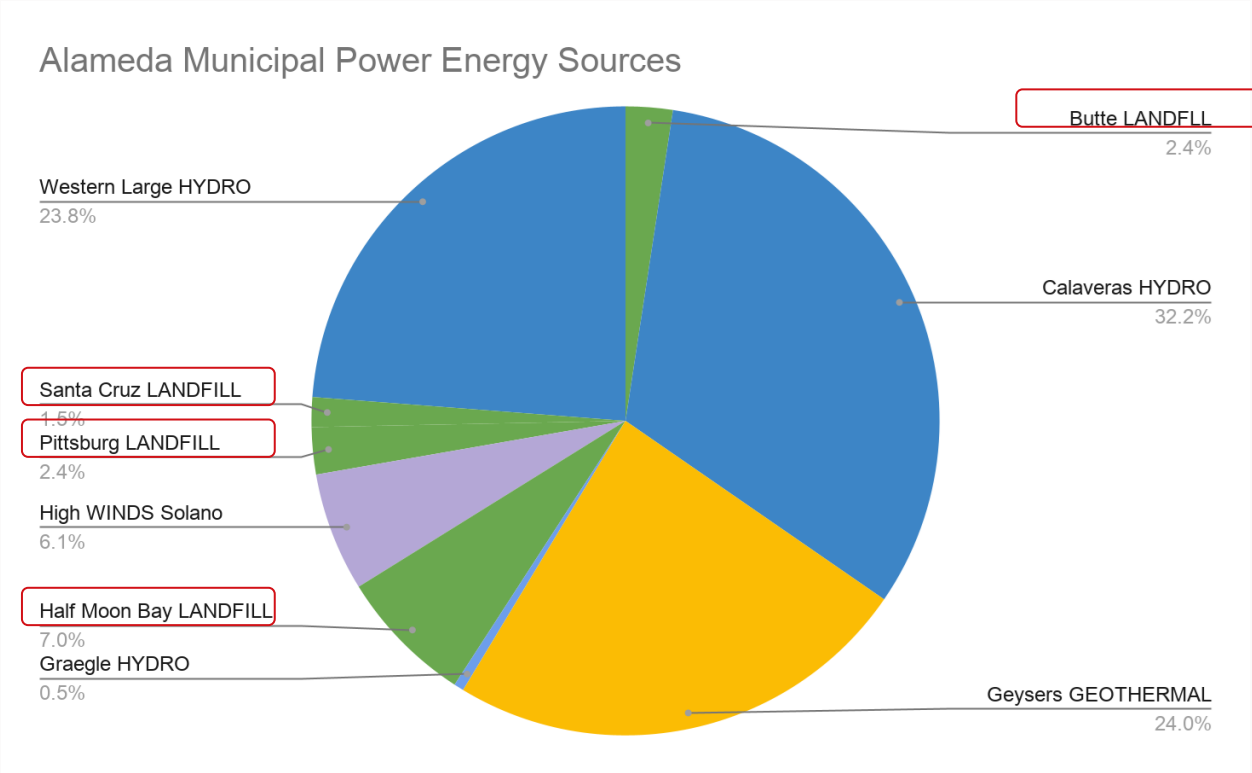
Alameda Municipal Power's (AMP) entire budget to operate Alameda's electric system comes from our rates. Here's where your dollar goes, as of July 1, 2025:

- 28 cents for purchased power
- 23 cents for services and materials
- 18 cents for labor
- 16 cents for transmission delivery
- 8 cents for capital projects
- 7 cents is transferred to the City of Alameda

Capital projects are spread across services, labor, and materials.

Rates

AMP: clean power?

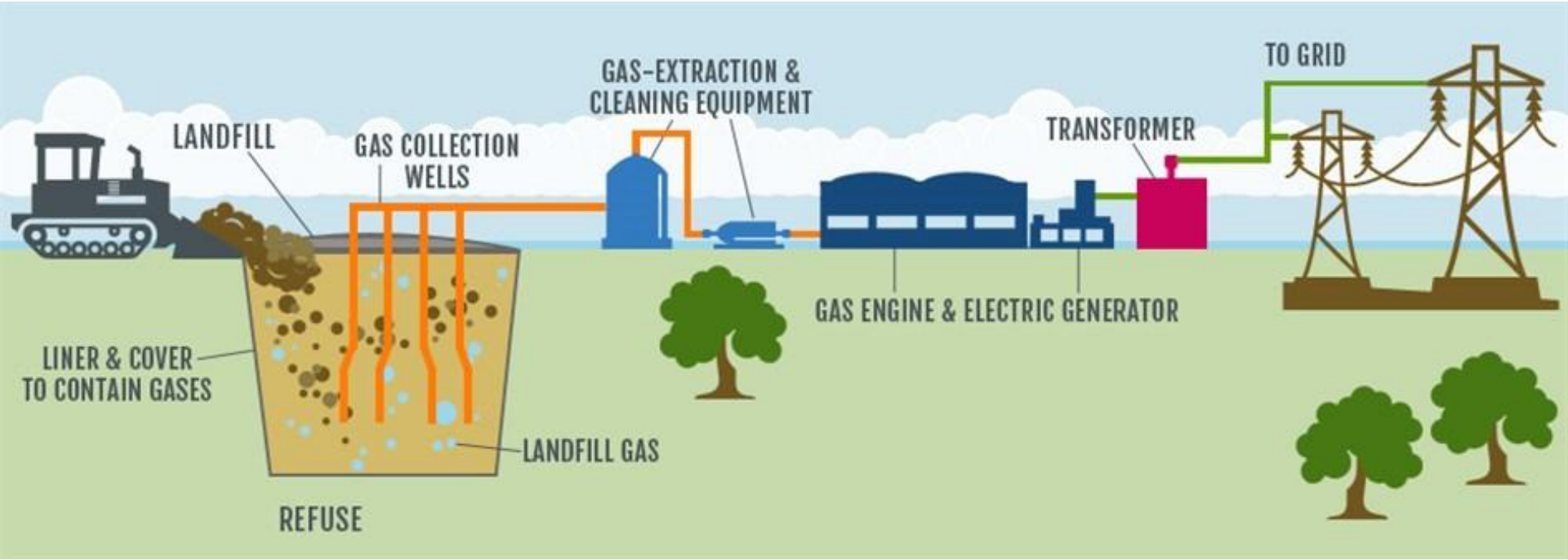


It claims 100% renewable but not quite...

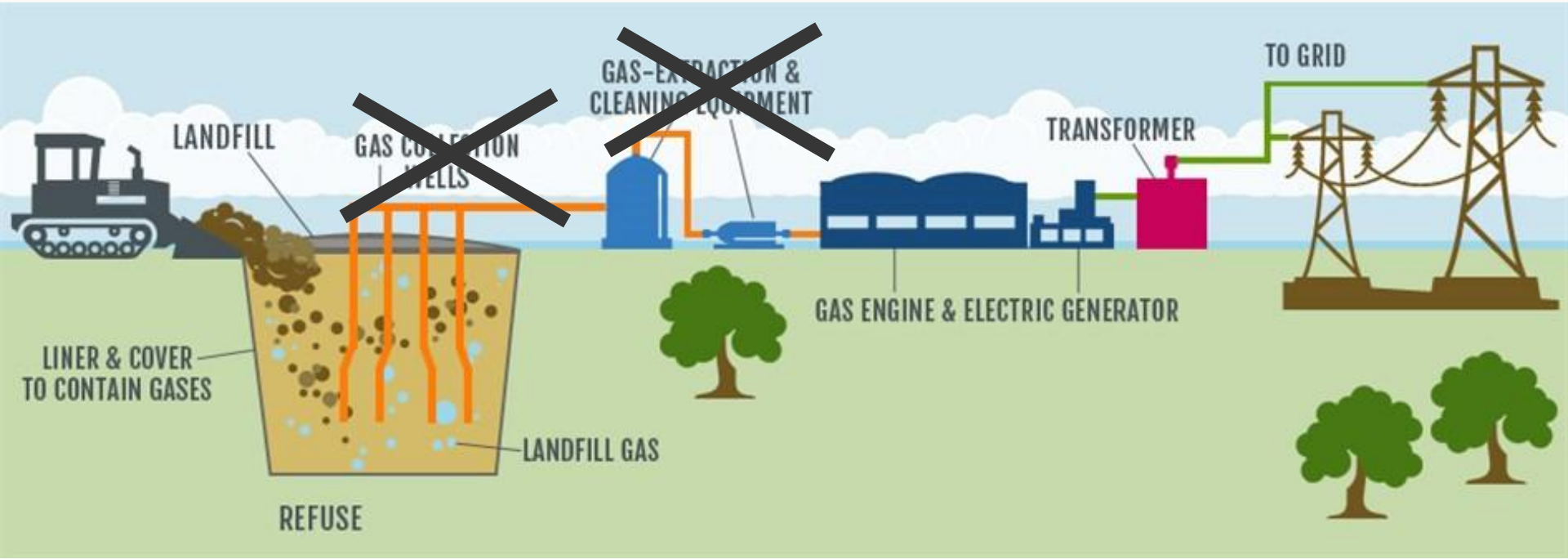
13% = landfill

Burning biomass to capture methane and turn it into CO_2 & other pollutants

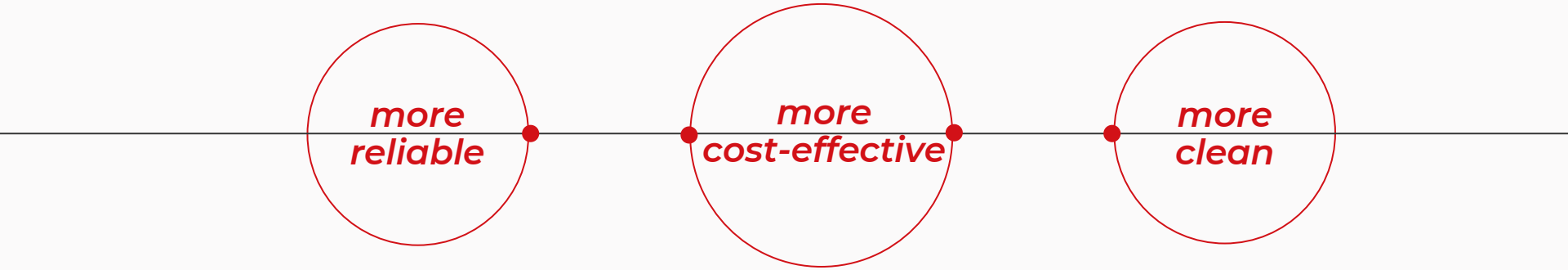
AMP: clean power?



AMP: clean power?



If AMP invested in EnergyNet, it could locally produce, distribute, and sell its own renewable power



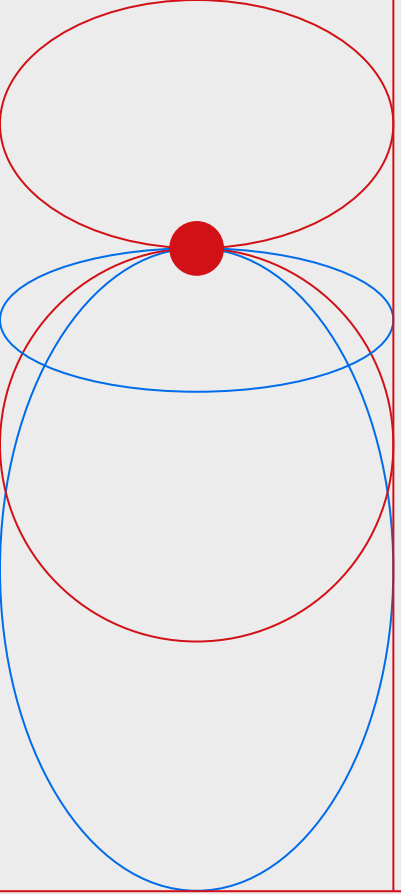
EnergyNet = new revenue streams

If AMP invests in EnergyNet infrastructure, solar + batteries

- AMP can be producer and distributor of clean energy, at a potentially lower cost than energy that's produced elsewhere
- Developers, especially those that plan to build several buildings, can buy or lease EnergyNet routers from AMP

the GOAL of Power Utilities

to provide reliable, affordable, and clean electricity to customers



Discussion

Q&A