RENEWABLE ENERGY MICROGRIDS
(Local Sustainable Power Plant)
Gridscape Case Studies link

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Background

As California faces frequent and severe weather events, pressures from EV the need for resilient and reliable energy systems has become more urgent.
The deployment of local sustainable power plants (microgrids) in California is critical to achieving the state's renewable energy goals. Gridscape recognizes the magnitude of the energy transition required in California, with hundreds of thousands of microgrids needed to create a robust and sustainable energy infrastructure. Leveraging its extensive experience and technological prowess, Gridscape can help facilitate this transition by designing, developing, and implementing customized microgrid solutions.

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United States grapples with Energy Crisis as grids buckle under climate pressures and growing energy demand

- Global energy demand will grow 47% by 2050.
- Additional pressure coming from EV- this will keep on increasing.
- Increase in PSPS events due to climate crisis.
- Traditional grids are old & in terrible condition- major cause of power failures.
- Approx 70% of transmission lines are at least 30 years old and approaching the end of their lifecycle, and 60 percent of the circuit breakers are more than 35 years old.

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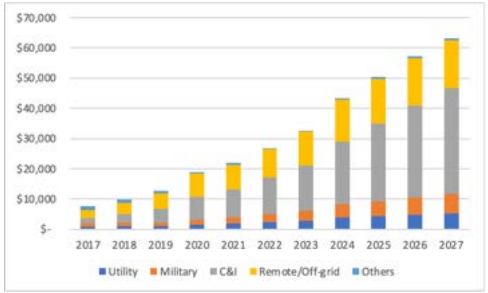
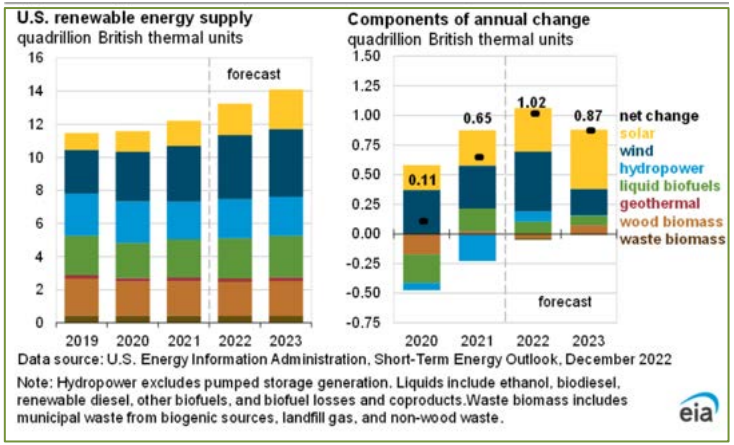
Renewables Gain Traction as Interest in Sustainable Energy Grows

- Share of U.S. electric power generation supplied by natural gas will fall from 39% this year to 37% in 2023 as more renewable generating capacity comes online.
- Wind & solar share will grow from 14% in 2022 to 16% in 2023.
- The need for sustainable options will rise as the cost of electricity will continue to rise.



*Global CAGR: **23.5%**.*
Fastest Growing Segment: C&I CAGR: 35.3%

US: 45%-36% (2017-2027)
CA: 23%-15% (2017-2027)



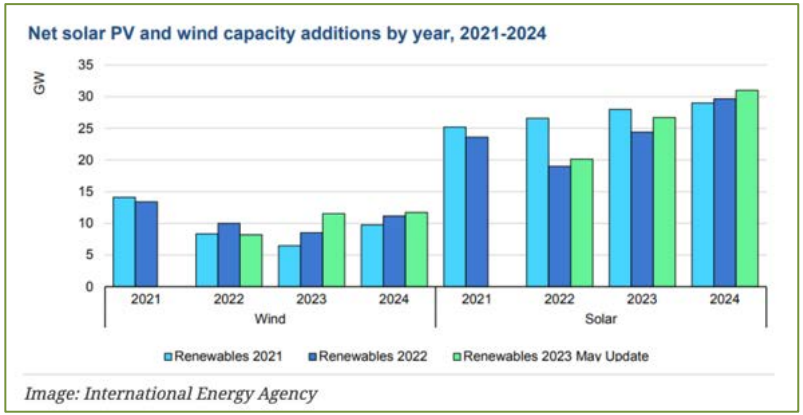


Image: International Energy Agency

U.S. solar deployment to grow 40% this year

Focus on sustainability:
California's Groundbreaking Clean Energy Laws and Mandates

	CARB's Clean Fuel Law:	Ban on sale of new gas and diesel big rig trucks by 2036. Large fleets (>50 trucks) to transition to electric/hydrogen-powered vehicles by 2042.
	SB100: California's Clean Energy Target:	Goal: Achieve 100% clean energy by 2045. By 2030: 60% electricity from renewable sources. Remaining 40% from carbon-free sources like nuclear power and energy storage.
	ARB's Advanced Clean Truck Program:	Requirement: All new medium- and heavy-duty vehicles to be Zero-Emission Vehicles (ZEV) by 2045. Zero-emission technologies: Electric and fuel cell vehicles.
	CARB's Phase-Out of Diesel-Powered Freight Trains:	Target: Phase out all diesel-powered freight trains in California by 2050. Transition to zero-emission locomotives and railcars powered by clean energy sources.
	Energy Efficiency Standards:	Implemented standards to reduce energy consumption and promote energy-efficient technologies. Applicable to buildings and appliances in residential and commercial sectors.

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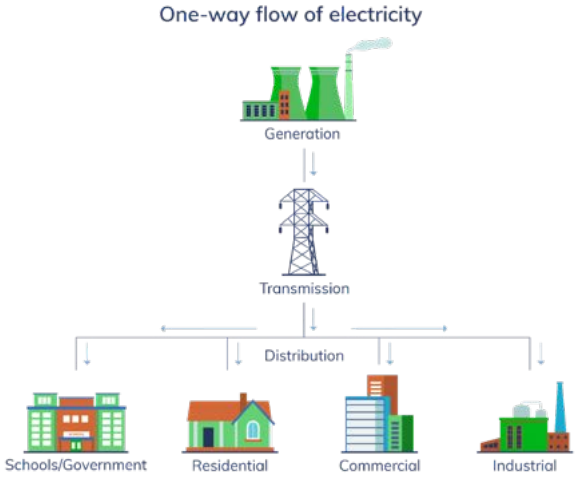
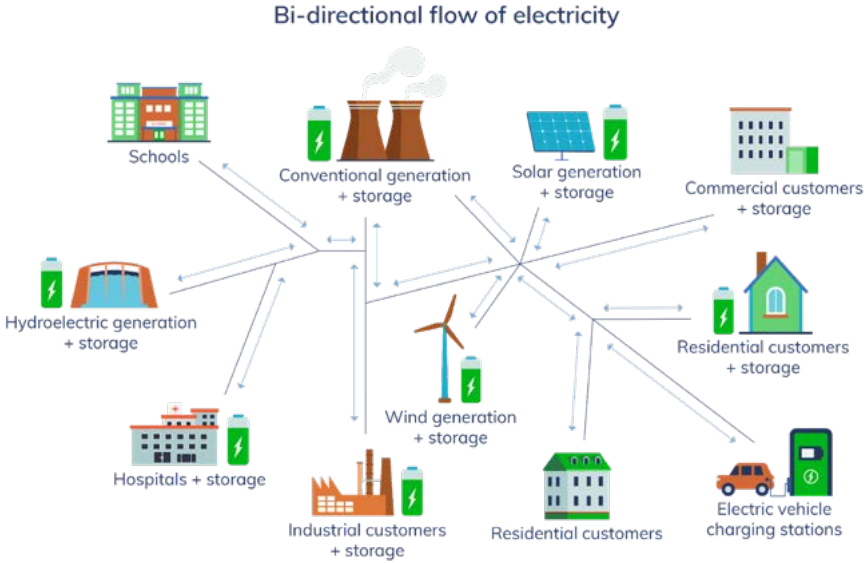
Centralized power generation and distribution - The 20th Century Grid



Distributed power generation and distribution - The 21st Century Grid



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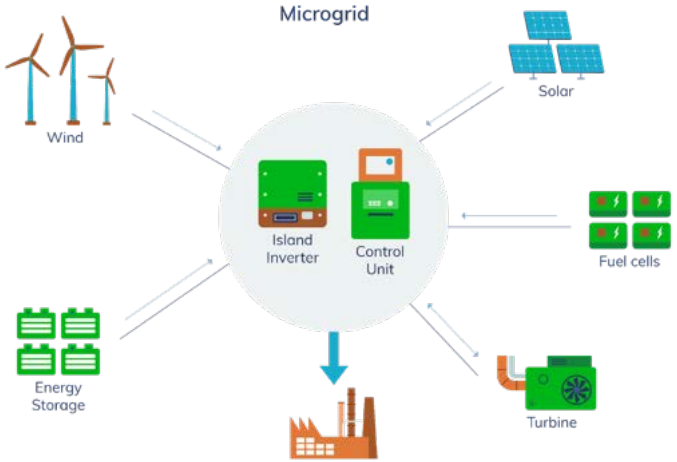
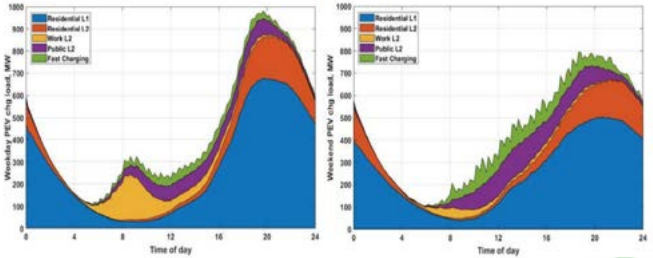
Distributed Energy Resources (DER) to meet the surge of electricity demand and need for grid resiliency.



- Microgrid and Energy Storage to eliminate Duck & Dragon Curve
- Grid Resiliency (Back up Power in Case of PSPS events)
- California GHG emission target
- Distributed model (fewer single point of failure)
- Cost Effective - Modular, Size to fit specific use case & incremental need
- Deploy as, when, and where needed
- Eliminate costly power plants
- EV Fleet Charging solutions

Figure ES.2: PEV Charging Load Profiles in 2025



(Dragon Curve showing like increase in the demand for electricity during the night in California as EV owners put their cars to recharge.)

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Need

1. The global electricity demand will increase dramatically in the years to come (by 44% in 2030 in comparison with 2012 - IEA) and cost is rising over 4% year
2. Energy Security: California experiences high energy demand, and dependence on the centralized grid leaves the state vulnerable to disruptions.
3. Grid Instability: Aging grids and infrastructure, Climate change and increasing frequencies of natural disasters are putting a lot of pressure on the traditional grids.
4. Cities need to provide emergency shelters (City Halls, Community Centers) that require backup power in case of emergency.

Solution

1. Distributed Energy Generation: Microgrids facilitate decentralized energy generation, enabling communities and businesses to produce their own clean energy and meet energy demand at low cost.
2. Solar microgrids offer localized energy generation, reducing reliance on the grid and enhancing energy security.
3. Solar microgrids alleviate grid congestion by generating electricity at the point of consumption, reducing strain on the centralized system.
4. Energy Resilience: Microgrids use energy storage systems to ensure reliable power supply during emergencies or high-demand periods.

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Why Critical facilities need Microgrid

- Need:
  1. Critical Facility i.e. need uninterrupted power 24x7
  2. First Responder during emergency – can't function without power
  3. Currently use diesel generator as a backup
  4. Diesel generators need constant service and requires diesel whose supply may be disrupted during emergency (wildfire or earthquake)

- Solution:
  1. With local sustainable power plants (Microgrid) provide backup power during grid disruptions, ensuring continuous operations and communication capabilities during emergencies and natural disasters.
  2. Solar Emergency Microgrids are cleaner, greener and cost-effective solution for emergency power
  3. Reliance on Diesel is substantially reduced

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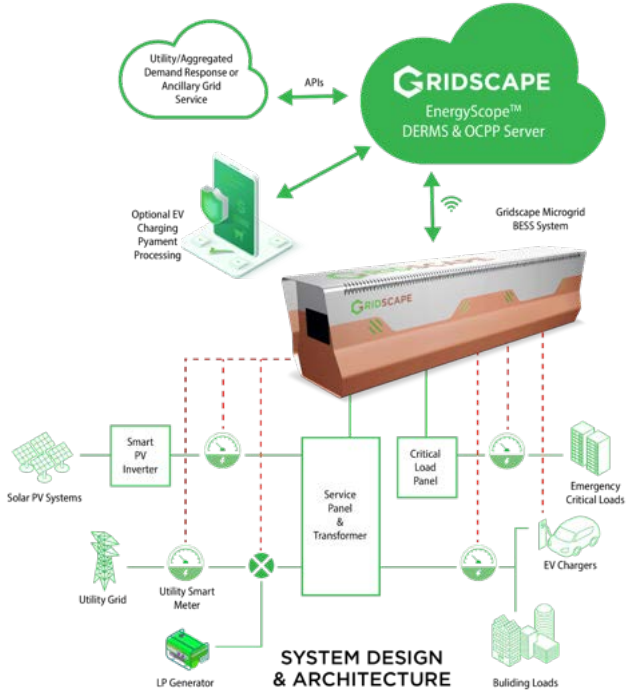
What is a microgrid?

- Local Power Generation (Solar, Wind, Generator…)
- Battery Storage/Inverter
- Smart Energy Management System
- Ability to disconnect from the grid



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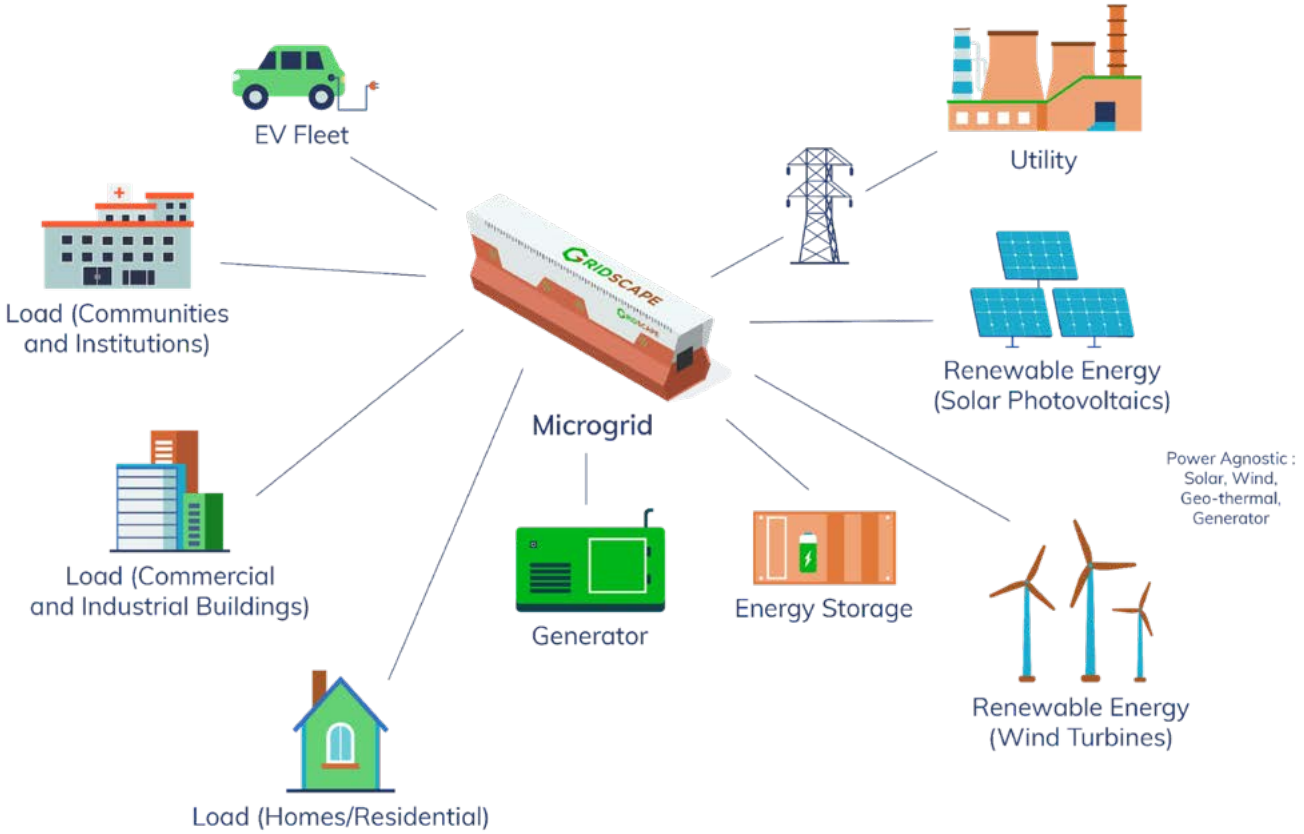
EV Fleet
Utility
Load (Communities and Institutions)
Renewable Energy (Solar Photovoltaics)
Microgrid
Power Agnostic : Solar, Wind, Geo-thermal, Generator
Load (Commercial and Industrial Buildings)
Generator
Energy Storage
Renewable Energy (Wind Turbines)
Load (Homes/Residential)

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About Gridscape

Largest microgrid footprint in California.

Future-proof and AI

Product based expandable technology.

Winner of numerous CEC grants awards

Full strategic end-to-end solutions

- 63 microgrids contracted /deployed
- 1200% growth in microgrids installation from 2017-2023.

- 1,654,910 + tonnes of C02 avoided so far

- Over 12K KW of Solar, 23,000 kWh of Microgrid BESS

- Total estimated savings- over $ 5.5 millions

- Over 184 EV chargers installed.

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Powerful Collaborations:
Gridscape's Diverse Network of Customers, Partners, and Government Agencies

Customers

East Bay Community Energy
DENALI
San Diego
Fontana California
San Jose City College
Chabot College
City of Fremont California
IWP
Fremont Fire Department
San Pasqual Band of Mission Indians

Business Partners

AMERESCO Green • Clean • Sustainable
Shell Energy
SIEMENS
MCE Empowering Our Clean Energy Future
GREENTECH -RENEWABLES-
East Bay Community Energy
SEIA Solar Energy Industries Association®
Industria Power
Sterling Planet
45 SUN LIGHT & POWER EXCEPTIONAL SOLAR
ALLIANCE COMPANIES

Technology Partners

DELTA
EPRI Electric Power Research Institute
LG Energy Solution ESS Battery Division
TRC
Energport
Q CELLS
SAN JOSÉ STATE UNIVERSITY
COLUMBIA RESEARCH
CAL POLY SAN LUIS OBISPO
socomec Innovative Power Solutions
Trinasolar

Government Organizations

U.S. Department of Energy
California Energy Commission
GOV.UK

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Gridscape in the news


EnergyTech

DISTRIBUTED ENERGY

Gridscape contracted to build Microgrids for Communities near San Francisco Bay

Under the agreement with East Bay Community Energy, Gridscape will install 3.1 MW of solar PV systems and 6.2 MWh of battery storage systems at 30 sites to offer energy resilience during power outages and lower utility bills during normal operations

EnergyTech Staff

May 8, 2023

MICROGRID KNOWLEDGE

LOGIN JO

Making for a Stronger San Diego: Gridscape Launching Solar-Storage Backup to Fortify Municipal sites

The eight San Diego microgrids being deployed by Gridscape provide a variety of services, from backup power during shutoff events to increased emergency capability neighborhoods, EV charging stations and more. Shell New Energies will own the sites

Rod Walton, Microgrid Knowledge

July 11, 2023

AMERICAN PUBLIC POWER ASSOCIATION

Powering Strong Communities

ASSOCIATION PUBLIC POWER ISSUES & POLICY EDUCATION & EVE

POWER GRID INTERNATIONAL

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Microgrid bundle to provide 30 critical facilities with backup power in California

MICROGRID KNOWLEDGE

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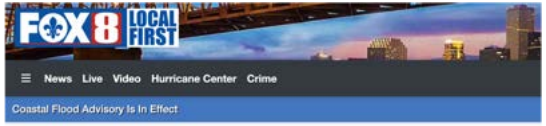
COMMUNITY MICROGRIDS

How California Cities Are Driving Down Costs with Microgrids in Bulk

East Bay Community Energy has figured out how to scale community microgrids, with 30 microgrids on the way and another 50 to 100 to follow.

Elisa Wood



Gridscape's Local Power Plant to boost energy resilience for San Pasqual Band of Mission Indians

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NEWS

Gridscape's Local Power Plant to boost energy resilience for San Pasqual Band of Mission Indians

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Jun 10, 2022 281 views

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Testimonials

''This is going to save the city money over the long haul. There's the savings from the energy perspective. There's also the resiliency component. This is a safety measure for the city as well. Too often climate action is framed as sacrifice — that we will need to give things up to have a healthy, livable planet, this project proves that it is not always the case".

- Council President Sean Elo-Rivera (District 9)

"The City of Fremont's collaboration with local company Gridscape Technologies is a textbook example of a beneficial public/private partnership. Gridscape's vision of piloting solar-battery microgrids at critical municipal facilities to showcase the company's technology dovetailed with the City's goals of reducing emissions, lowering utility bills, and bolstering resiliency. Gridscape secured State funding and worked closely with City staff to develop the necessary contracts, to secure permits, and to construct and put the microgrids in service without adversely impacting Fire Department operations. We are pleased to have been able to showcase the cutting-edge technology of a local firm while also securing many benefits for City operations and the community."

- Mayor Lily Mei, City of Fremont

''The best technology aligns with operational realities and by collaborating with Gridscape, we have managed to achieve exactly that. Gridscape is helping us solve both climate and operational challenges in the most effective way.''

- Dr. Matthew Kritscher. VP Student Services

'' The Chabot College district has been working with Gridscape for 18 months now. At every step of in the process, our expectations have been met with positive results. I fully recommend Gridscape to those looking to implement solar microgrids.''

- Owen Letcher, Vice Chancellor, Faculties, Bond Programs & Operations

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Benefits for our customers- some real life examples

SPBMI: More Power to People

Our local sustainable power plant (microgrid) has give power back to the people of SPBMI, an underserved tribal community of over 1,500 residents. The region, however, is notoriously affected by wildfires and the devastation reaches far beyond the loss of homes and businesses
Now our microgrid powers critical infrastructures, ensuring essential services, emergency response, and administration control, while also creating local employment opportunities and contributing to the local economy.

SpringHills Suites: Business First

Despite a power outage lasting for almost 5 hours, SpringHills Suites continued its uninterrupted operations as the Gridscape local sustainable power plant (Microgrid) flawlessly powered critical loads, including elevators, showcasing its unwavering reliability and resilience.

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Gridscape Differentiator- A vertically integrated microgrid system

Product Centric Approach (vs Project Centric Methodology)	Software driven	Integration with EV charging infrastructure	OAM and Performance Guarantee
• Manufactured integrated, modular microgrid (scales from 75 kWh to 9.1 MWh) • Higher Quality, easier to deploy/interconnect, easier to maintain/operate • Cost Effective	• Future Proof (no technological obsolescence) • Machine learning load forecasting for optimized daily operations • Dynamically configurable (change microgrid operational mode as the need changes) • Realtime reporting including SGIP and ITC	• Manage EV charging from microgrid and lower cost of charging. • Full Strategic solution	• Gridscape offers 24x7 remote support for quick issue resolution, regular software updates for optimized microgrid systems, and comprehensive equipment warranty and RMA support for long-term reliability.

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Project Images

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Case Study

Video*

Microgrids	30
Total Microgrid Size	6,200 kWh
Estimated utility cost avoided (25 yr)	$60,690,440
GHG Reductions	1814 MT/yr
Financing Partner	SunWealth
EPC	
Agreement Term	

Microgrids	8
Total Microgrid Size	2175 kWh
1st Year Savings	$420,854
GHG Reductions	2,175 MT/yr
Financing Partner	Shell
EPC	Green Realities
Agreement Term	25

Microgrids	1
Total Microgrid Size	1200 kWh
1st Year Savings	$174,305
GHG Reductions	595 MT/yr
Grant Provider	CEC
EPC	Green Realities
Agreement Term	10

Microgrids	1
Total Microgrid Size	480 kWh
Annual energy cost saving	$78,286.
GHG Reductions	112 MT/yr
Grant Provider	DOE
EPC	Industria Power
Agreement Term	10

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Project: City of San Diego

Objective:
Deploy eight microgrids in the City of San Diego to support its goal of 100% renewable energy by 2035 and achieve financial savings, resilience, and environmental benefits. Make this project a model for microgrid deployment across California, contributing to the state's clean energy goals.

Benefits:
- Community Benefit and Renewable Energy Equity: Strengthening green energy equity and promoting community benefits. Four of the eight sites are disadvantaged communities (DAC sites).
- Climate Action Plan and SB 100: Progress towards meeting the city's climate action plan and state's GHG emission goals.
- Leadership Role: Deployment of eight microgrids sets an example for other cities in California, positioning San Diego favorably for future grants.
- Resilient Infrastructure: Microgrids provide reliable power during natural disasters and reduce dependence on aging grids.
- EV Readiness: Microgrids accommodate the increasing demand for electric vehicles and support future EV infrastructure.

The Project:
960 kW of solar PV systems in various rooftop and carport configurations, 2175 kWh of battery energy storage systems and twelve EV charging stations.
1. The project will save approx. $420,854 in utility costs annually.
2. Year 1 (FY23) avoided energy costs (savings) are estimated at $57,000. The project is expected to generate cumulative 25-year avoided energy costs of $6,000,000
3. Annual GHG offset of 2,175 MT.

Project: Fremont

Financing
- California Energy Commission Grant Funding: $1.8M
- Private Funding (Match funding): $600K

Energy Savings Produced
- $18K to date
- Over $350K expected over the 10 year period

Resiliency
- Goal of 3 hour islanding easily attained
- Reached a time period of 13 hours islanding during some tests

Carbon Reduction
- 97 MWh Solar Power produced
- 99,645 lbs of GHG emissions reduction

Community Benefit
- Model for critical facility and emergency shelter municipal sites
- Becomes easier to replicate as time goes on

Project: Hayward

Project Site Information: Hayward Fire Station 6 and Fire Training Center
This is a new fire training facility and a Fire station building.
There are several buildings.
Building 1 - FS #6 and Classroom Building
Building 2 - Apparatus Building
Building 3 - Hanger Building
Building 4 – Storage Building
Building 5 – Burn Building
Building 6 – Break Area (Covered)
Building 7 – USAR/BARY Station (For training)
Building 8 – Training Tower.

The Project:
Total Solar: 128.7 kW
PV Module: Canadian Solar 355 W
PV Inverter: Solar Edge 60 kW
Total BESS - 90/231
Battery Technology – LFP (Lithium Iron Phosphate technology)
Battery inverter - 90 kW
Battery Capacity: 231 kWh

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Project: Fontana

Five Microgrid Sites

- City Hall
- Police HQ
- Community Senior Center
- Public Works Dept
- Community Services Center

Equipment

- 1.54 MW Solar PV System (Carports & Rooftops
- 1.5 MWh Life Li-On Energy Storage System
- EnergyScopeTM Microgrid Controller & DERMS
- 20 EV Charging Stations (including two V2G chargers)
- One Mobile Battery System

Project: SPBMI

Project goals:

- Economic Cost Savings
- Resilience
- Environmental (100% renewables and emissions reduction)
- The microgrid provides 100% energy and cost offset to the SPBMI tribe.

The project site includes

1. 181kW Solar PV Carport System
2. 480kWh Microgrid BESS System
3. Gridscape EnergyScopeTM Microgrid Control System
4. 6 EV Charging Stations
5. 480V/3ph Interconnection with SDG&E on a master meter
6. Software-driven Load Control and Management
7. Integration with Google Nest Cloud for HVAC load Control

This DOE-sponsored $2.5M project was commissioned in January 2022 ,and has been operational since then.

Additional Benefits:

- Annual Energy Cost Savings: Approximately $78,286.
- GHG Offset: 112 metric tons annually.
- Peak Demand Reduction: Enhances cost savings.

Technical Innovation: Google Nest Cloud Integration for load control. EV charging integration with the microgrid.
Single Microgrid Box design for cost-effective installation.

GRIDSCAPE'S expertise

Local sustainable power plants (Microgrid)

Fleet Electrification

Turnkey Solutions

Gridscape Integrated Microgrid

- Integrated outdoor-rated, expandable box that includes all essential components.
- Manufactured by Gridscape that ranges from 75kWh to several MWh
- Software driven, future proof
- Powered by Smart AI-based energy management and optimized load and generation dispatch
- On Site and Off Grid Mode (Islanded)
- Meets Rules and Open Standards UL9540, UL9540A, UL1973, UL1741SA-CRD , Rule 21 (CA) - Phase 1, 2, 3, IEEE 2030.5, 2030.7/8, SunSpec MESA

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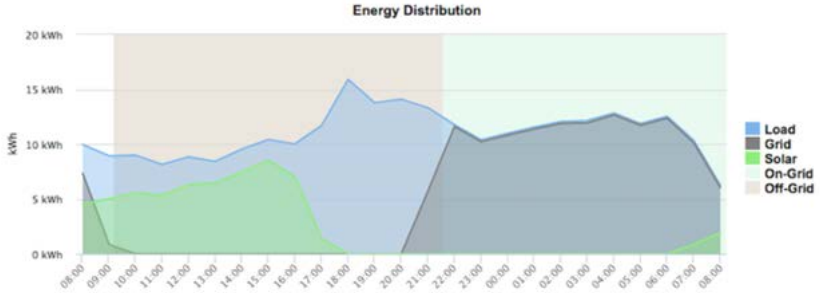
On Grid Mode

1. Optimize local energy resources and load
2. Minimize energy consumption from grid and renewable energy export (Self Consumption)
3. Maximize use of locally generated renewable power
4. Reduce demand charges
5. Manage load dispatch using battery during demand response and voltage/frequency regulation
6. Ready for other future grid services

Off Grid Mode

1. Operate site without grid power.
2. Isolate and energize critical loads. Shed non-critical loads
3. Curtail Solar generation to balance local microgrid
4. 24-hour resiliency by balancing power from solar, battery, onsite generators and critical loads (depending upon size of battery and critical load demand)



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Gridscape EnergyScope™ Dashboards

Microgrid/Solar + Storage
Management Portals

OCCP EV chargers Management Portals

Deeper insights into energy data.
Provides actionable insights

Improves efficiency.
Simplifies energy management.

Predicts trends.
Creates forecasts.

Saves time.
Manage from anywhere, anytime.

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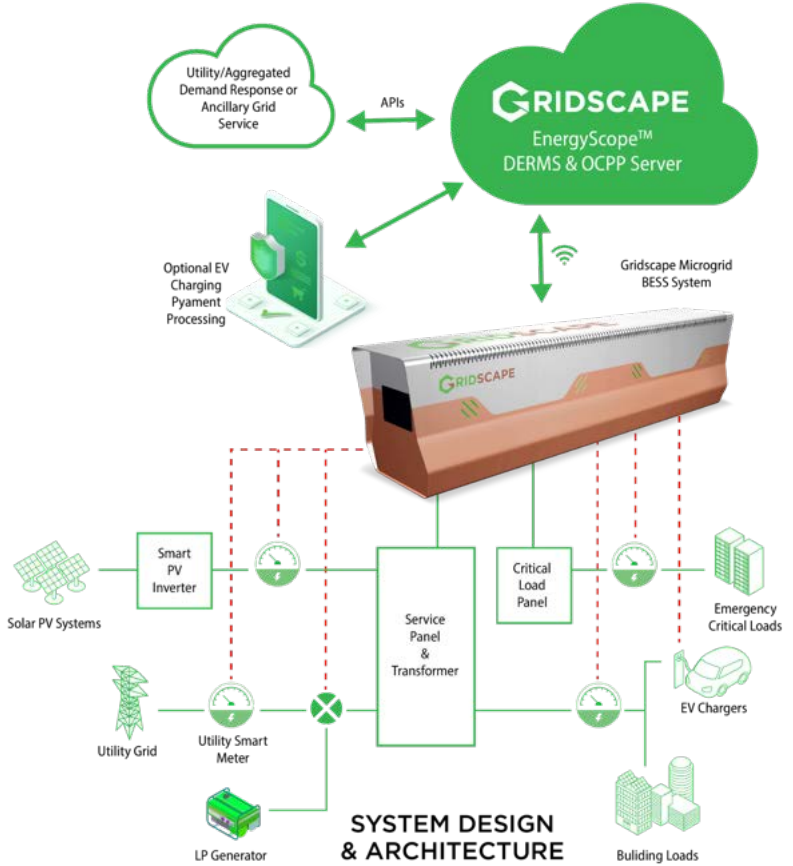
System Design

EnergyScope™ Management System

- Load Management & Analysis
- Renewable Self Consumption
- Demand Charge Management
- Demand Response
- OCPP Charger Management
- Charger Payment Mgmt
- Battery Life Performance
- Extensive Reporting



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EV Charging Solutions

Need for Local Sustainable Power Plant: Key Factors for Dynamic EV Charging Load Management

Depot EV Bus Charging Load Management:

- Careful management required to avoid utility-imposed demand charges.
- Unmanaged charging can lead to utility transformer overload on plug-out.

Scheduled Smart Solar & Battery EV Charging:

- Allows optimal charging when Time-of-Use (TOU) rates are expensive.
- Economic optimization for EV charging.

EV Charger/Dispenser DC Load Management:

- Multiple EVs with different DC connectors can cause DC side imbalances.
- Implementation of multiplexing technology to manage the load.

Future-proofing EV Fleet Charging with V2G/V2B Technology:

- Bidirectional Vehicle-to-Grid (V2G) and Vehicle-to-Building (V2B) technology.
- Integration with a microgrid system for efficient energy utilization.

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Fleet EV Charging Design for 27 Trucks

- No. of charging stations = 14 (dual port charging stations)
  - DCFC high voltage chargers at 62.5 kW
- No. of EV vehicles = 27 trucks
- Electricity consumption = 157 MWh annual per truck
- Operating hours = Overnight 16.00 to 09.00 daily
- PG&E BEV-2-S assumed as PG&E rate of choice

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Cost - Benefit Analysis

Total Solar Size (kw)	**2,400**
Total Solar Production (kwh)	**4,197,608**
Solar Offset (based on total Solar Size)	**96%**
BESS Size (kWh)	**5,200**
Resiliency Allocation (kWh)	1,040
Peak/Cost Shaving Allocation (kWh)	4,160
Cost Savings	
Energy Costs	*$938,461*
Demand Costs	*$0*
Annual bill before MG	**$969,423**
Energy Costs	*$89,049*
Demand Costs	*$0*
Annual Bill After MG	**$120,010**
Utility Cost Savings	***$849,413***
Cost Offset	**87.6%**
Maximum resiliency hours	**24**
Average Resiliency Hours	**3.68**
Minimum resiliency hours	**0.25**
Critical Load (%)	**80%**
Total Estimated Project Cost	**$13,841,350**
Estimated Incentives	
SGIP ($0.25/Wh)	$1,560,000
ITC (40%)	$5,536,540
Depreciation Total (30%)	$4,122,405
Total incentive	**$11,218,945**
Effective Cost	**$2,622,405**
Net Cost Avoidance Savings (2024)	**$789,413**
pay back period	**3.32**

** **Savings** doesn't include cost of EV, Fuel and Operational Savings.

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Gridscape Fleet EV Microgrid Solutions

Local renewable power generation with Solar PV Carports and/or other sources (Wind, Fuel Cells, etc.)

Right-sized Microgrid BESS system to offset 100% energy and local resiliency needs.

Dynamic, AI software-driven on-grid/off-grid operations to maximize energy savings, renewable self-generation and resilience.

Smart AI-based Dynamic Load Management to reduce huge utility demand charges and utility transformer overloads for sudden load changes (plug-in/plug-out of electric buses).

V2B/V2G integrated system to maximize ancillary grid service revenue and secondary energy backup.

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Microgrid Financing

Viable Options: PPA, Energy Savings Agreements and Cash Purchase

Renewable Energy Incentives

- Total Incentives can be substantial (60-70%) with ITC, SGIP

Investor Financing and Ownership Model

- Investor finances and owns Microgrids (PPA/ESA)
- Site owner gets the benefit of microgrid (energy savings, grid resiliency, reduction in GHG emission)
- Site owner makes payment to Third Party either as Purchase Power Agreement (PPA)/Energy Savings (ESA) or “Lease” payment

Financial Benefits to Site owner

- Zero down Payment
- Reduction of Utility bill up to 90% (Depends upon many factors such as utility rates, demand charges)
- Total cost of payments to Third Party and Utility bill after microgrid will be similar to current Utility bill
- Protection against any future changes to Utility and TOU rates

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Microgrid Cash Purchase or Loan

Renewable Energy Incentives under IRA

- Direct payment to cities for SGIP and ITC

Financial Benefits to Site Owner

- Site owner pays the full amount and owns the asset (It can be borrowed – DOE LPO e.g.)
- Reduction of Utility bill up to 90% (Depends upon many factors such as utility rates, demand charges, Utility load – usually larger the Energy Load More the Benefit
- Site owner pays Gridscape monthly O&M fees
- Protection against any future changes to Utility and TOU rates

Operations and Maintenance

- Gridscape operates and maintains the equipment under contract from Site owner

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