

Top Measures to Accelerate Local Clean Energy Programs: How to Push the Envelope on a Budget Case Studies



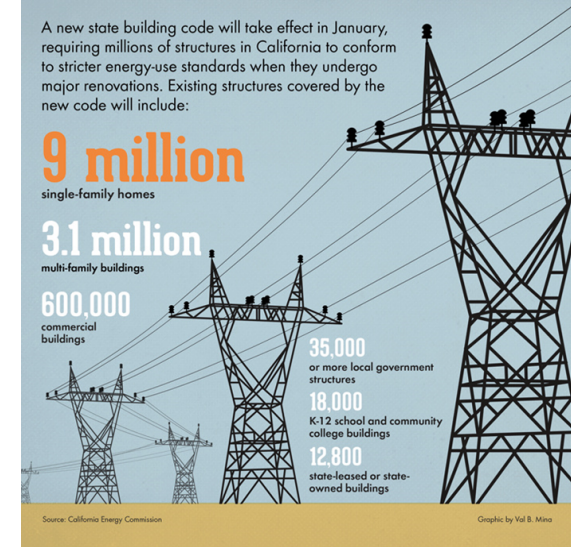
Justine Burt

Advanced Energy Communities

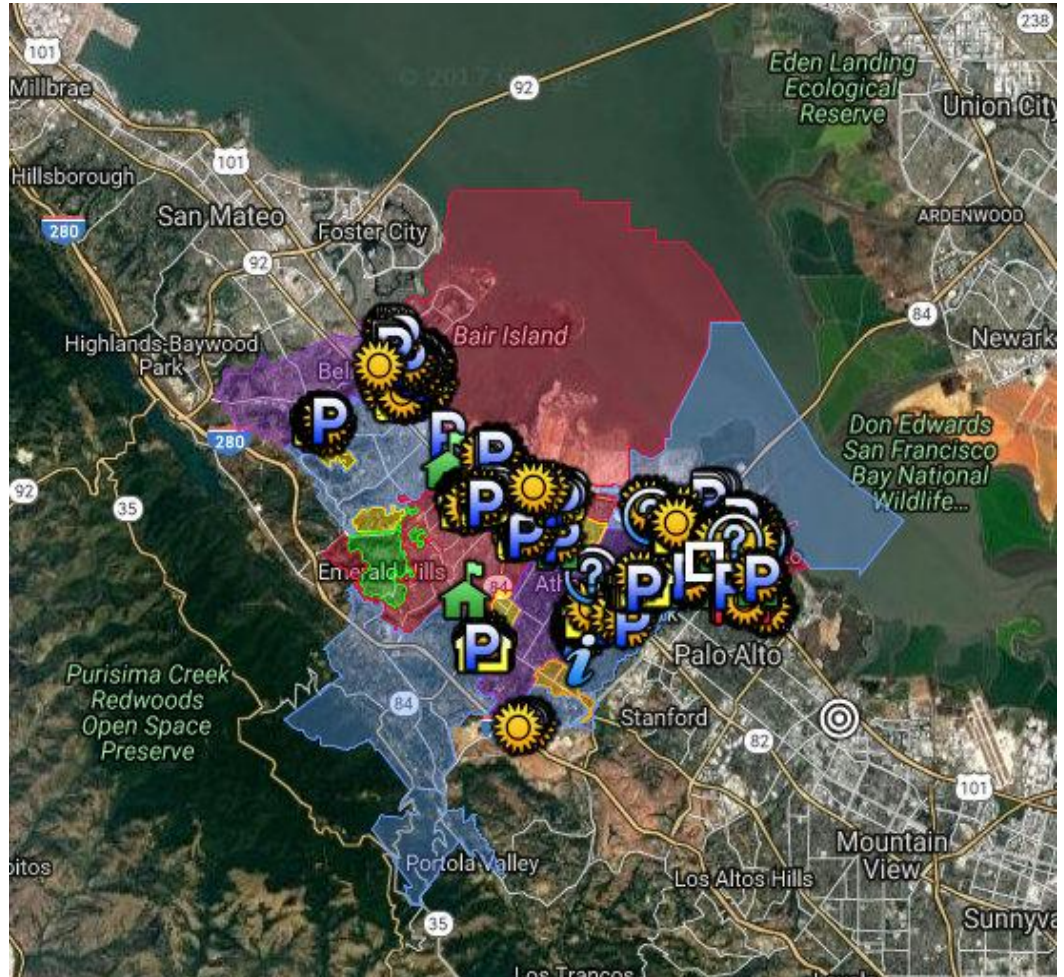
- Zero net energy (ZNE) standards for built environment
- Local renewable energy, demand response, Solar Emergency Microgrids (SEM), and electric vehicle charging infrastructure (EVCI)
- Help state realize clean energy and climate change policy goals

Co-benefits

- Minimize need for new energy infrastructure
- Provide energy savings
- Provide grid reliability and resilience
- Offer easier grid integration

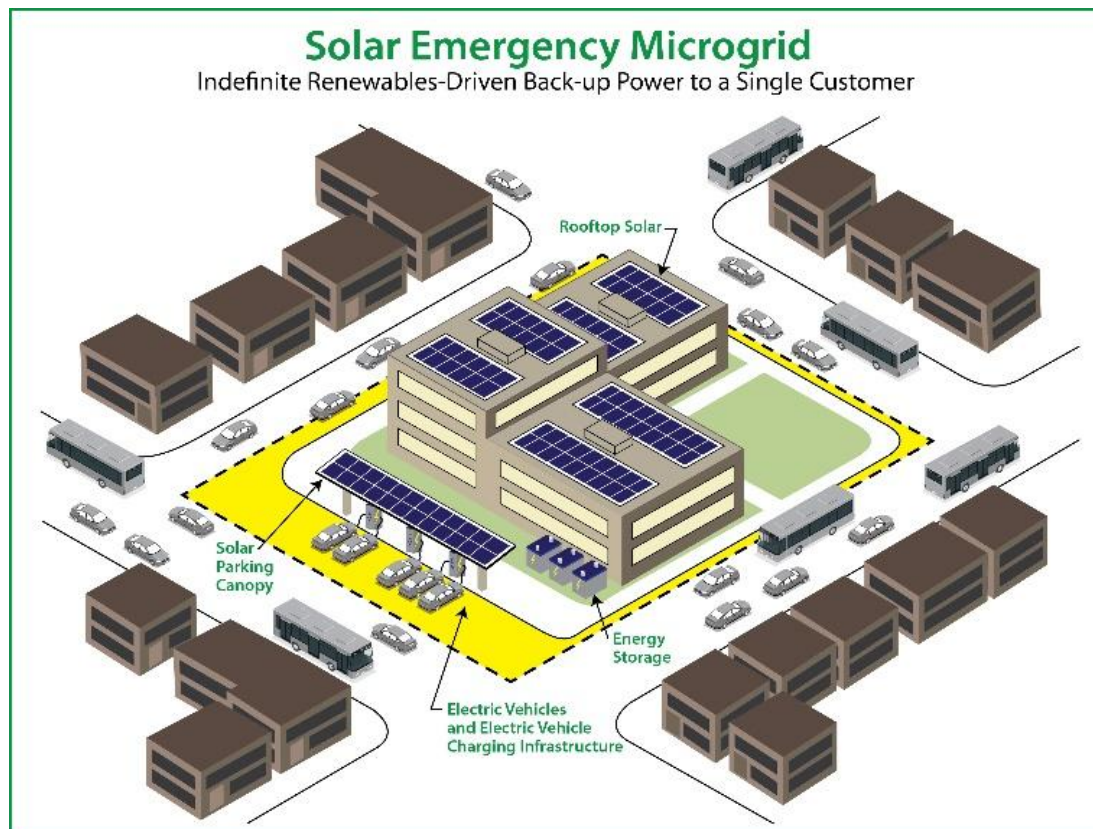


- Southern San Mateo County has 65 MW solar potential
- Highly developed
- Dense tree canopy

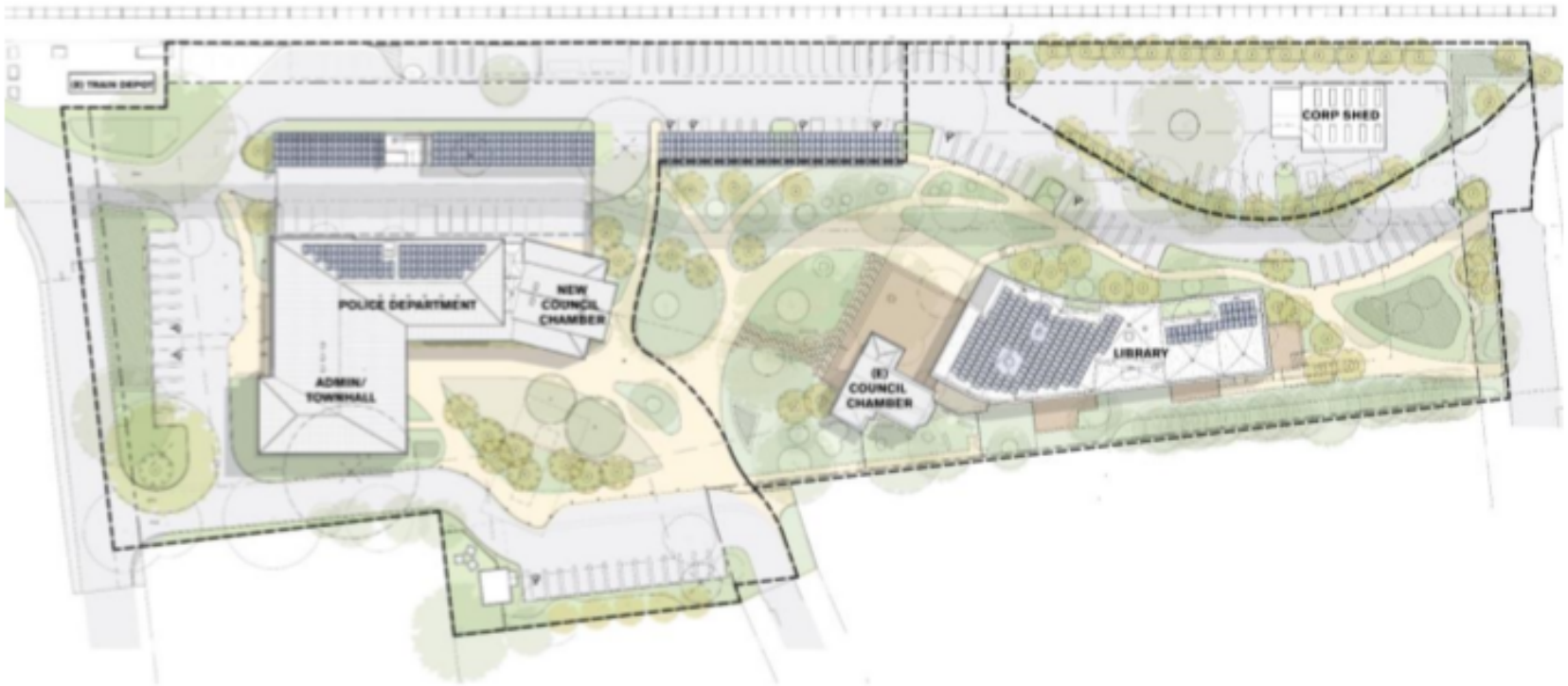


In California

- 345 hospitals
- 482 municipalities

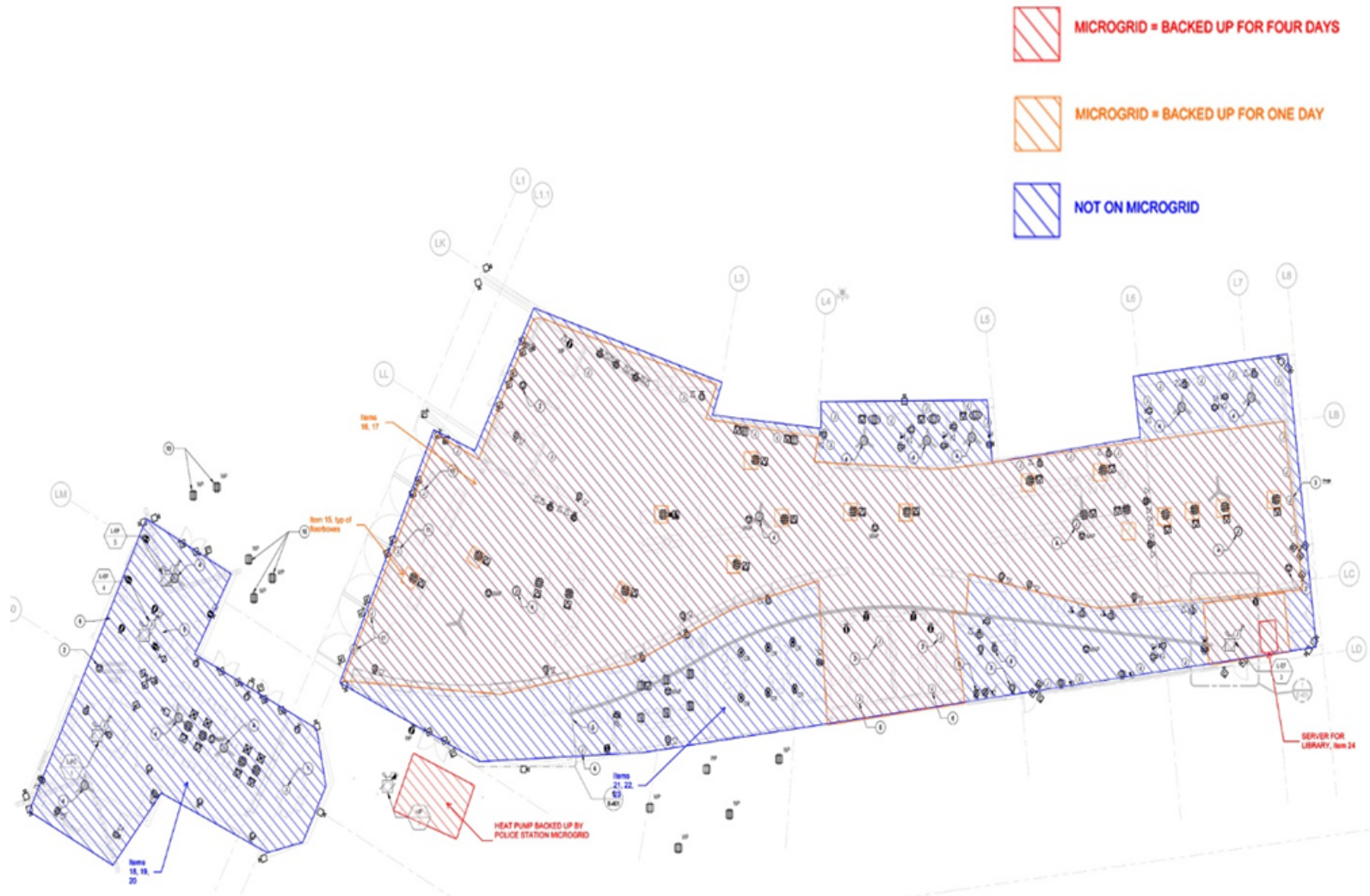


1. Atherton Civic Center



Anticipated first Zero Net Energy civic center in the US

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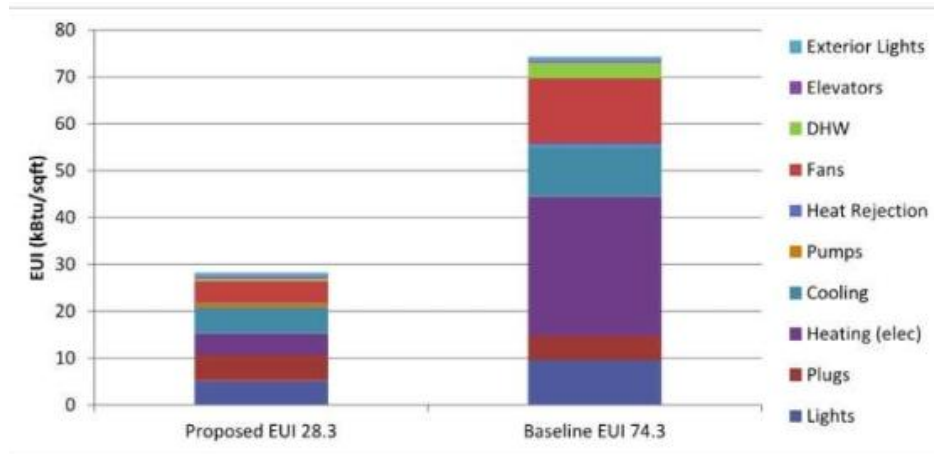
Library and historic City Hall

1. Atherton Civic Center



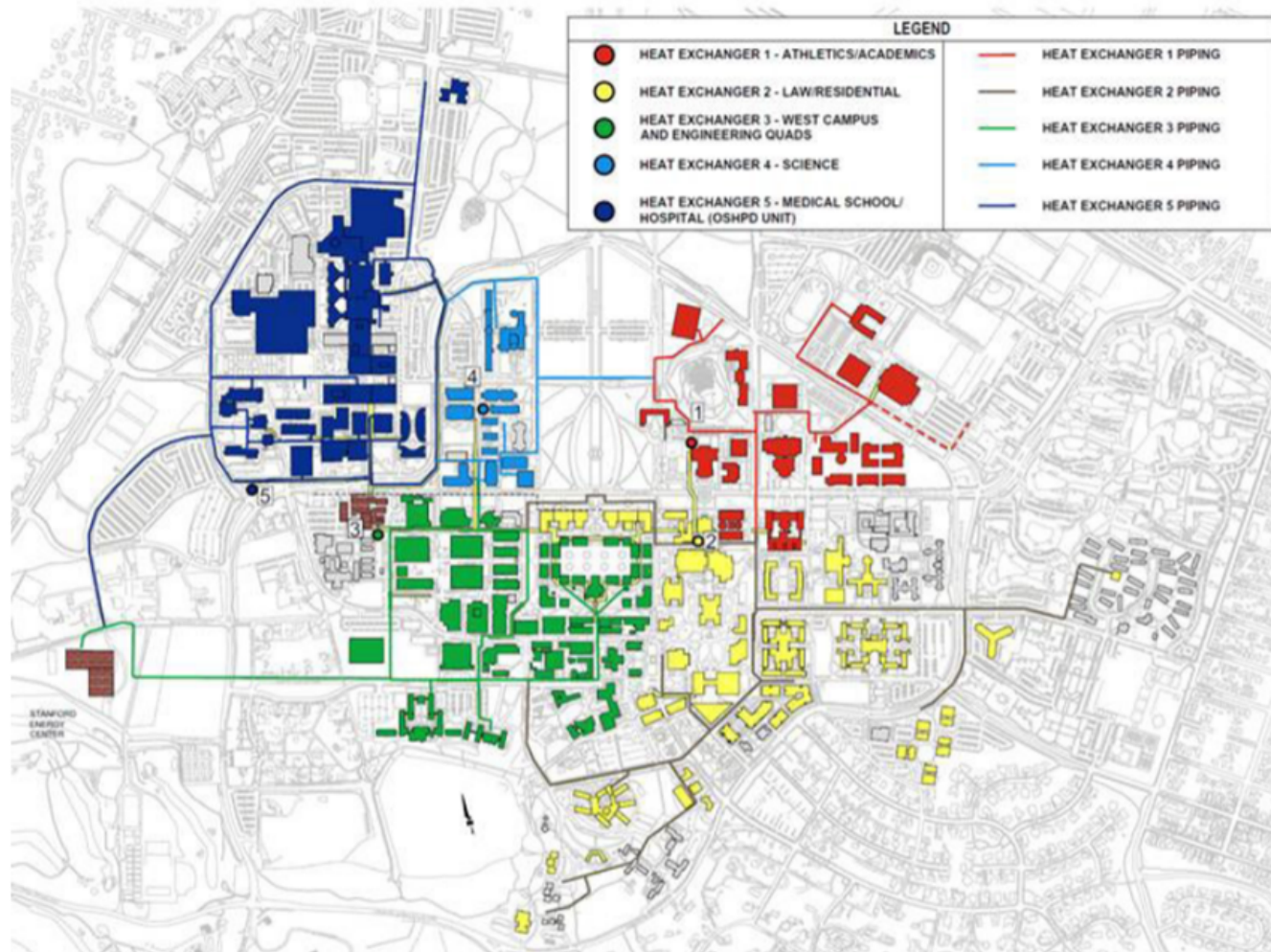
Police department and administrative services

1. Atherton Civic Center

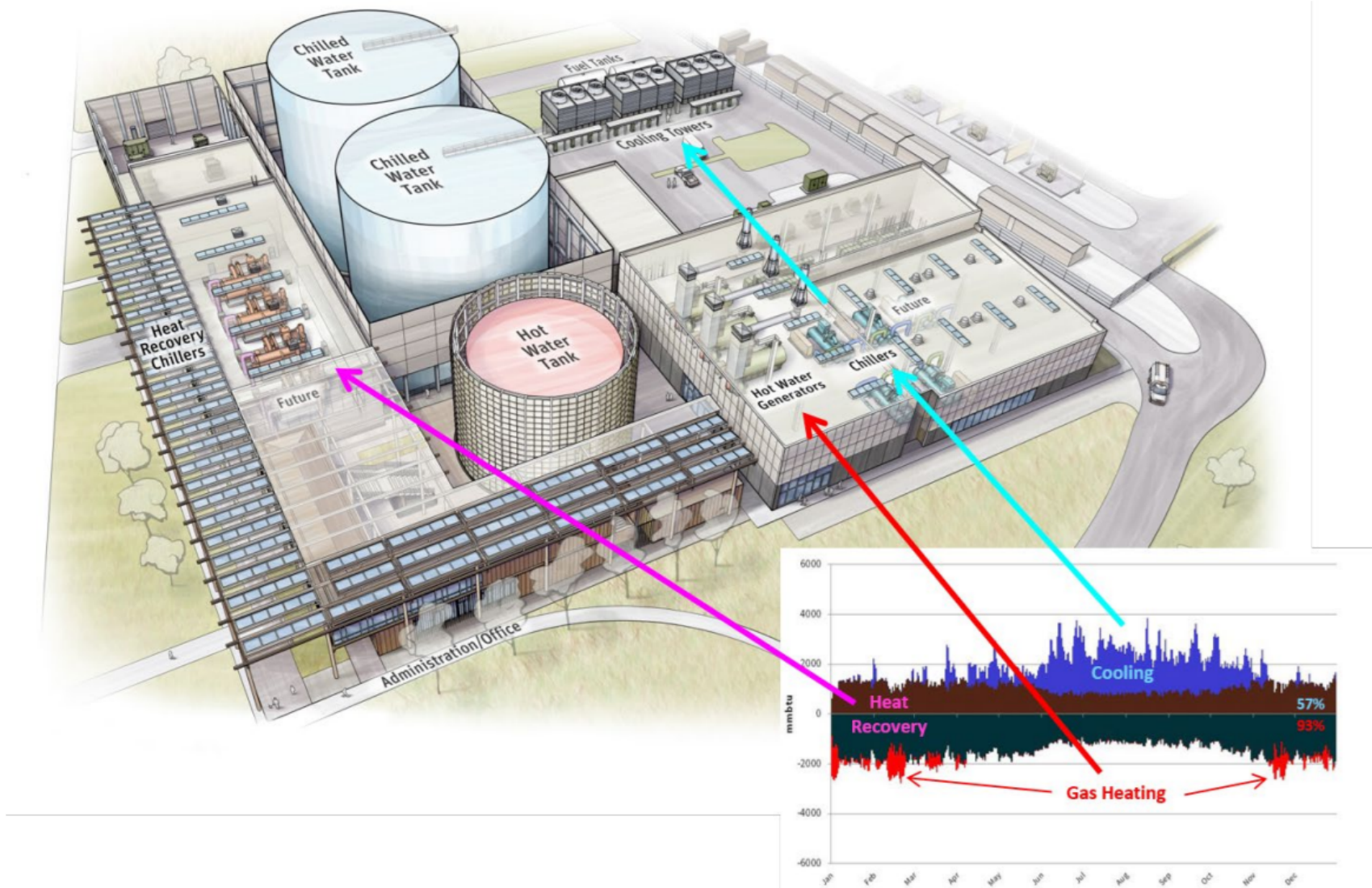


2. Stanford University Heat Exchange System

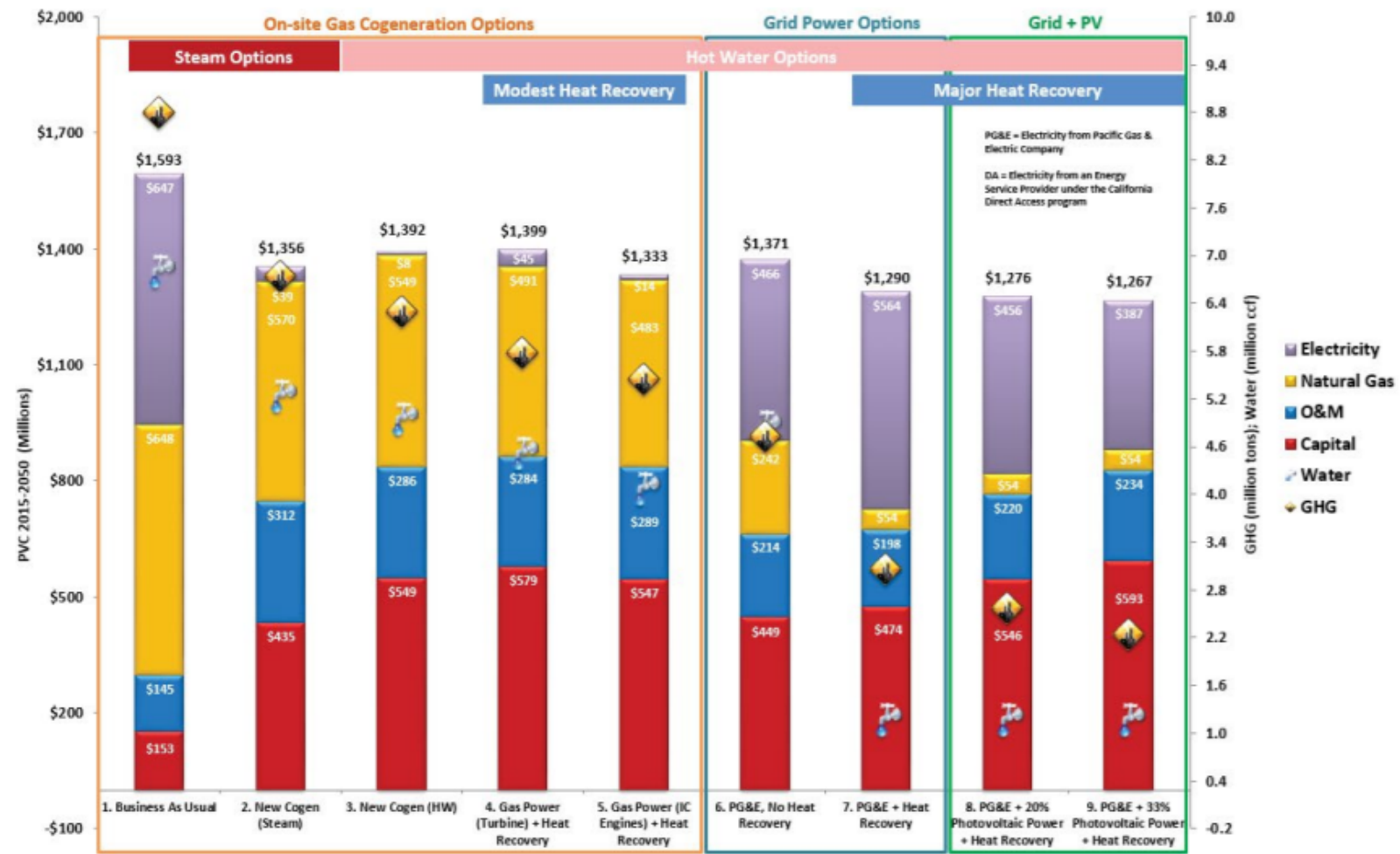
Overall Conversion Plan



2. Stanford Energy System Innovation (SESI) and Central Energy Facility



Comparison of Energy Supply Options



3. Oshman Family Jewish Community Center



Key features

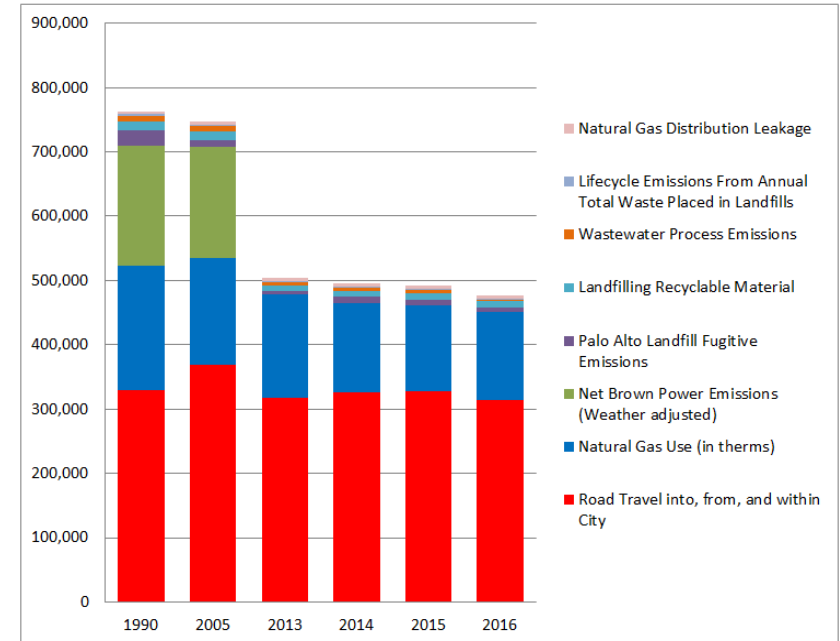
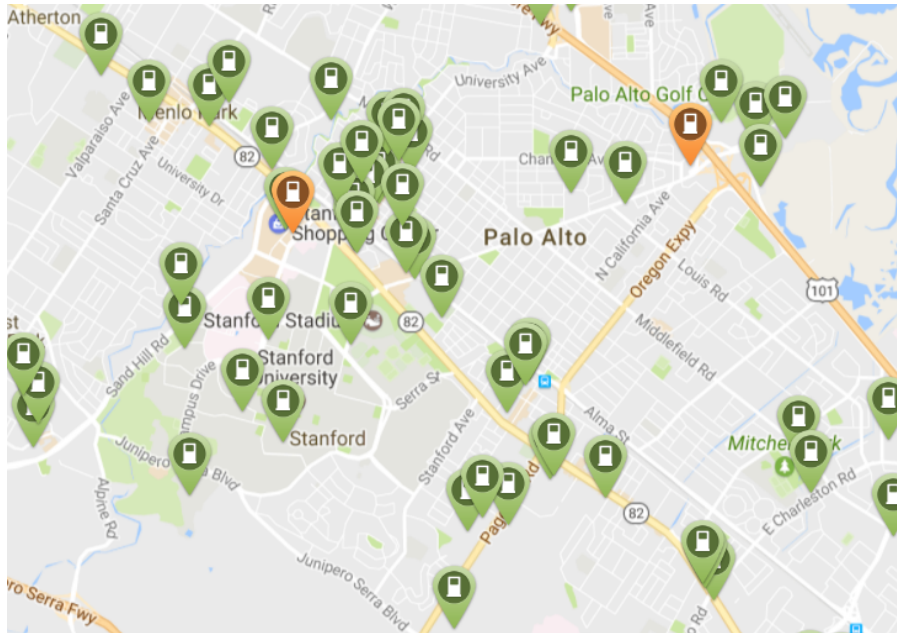
- Rooftop PV
- Occupancy sensors
- Building management system (BMS)
- 4 EV chargers
- Water source heat pump
- Individual heat pumps in residential units

4. Kaiser Permanente

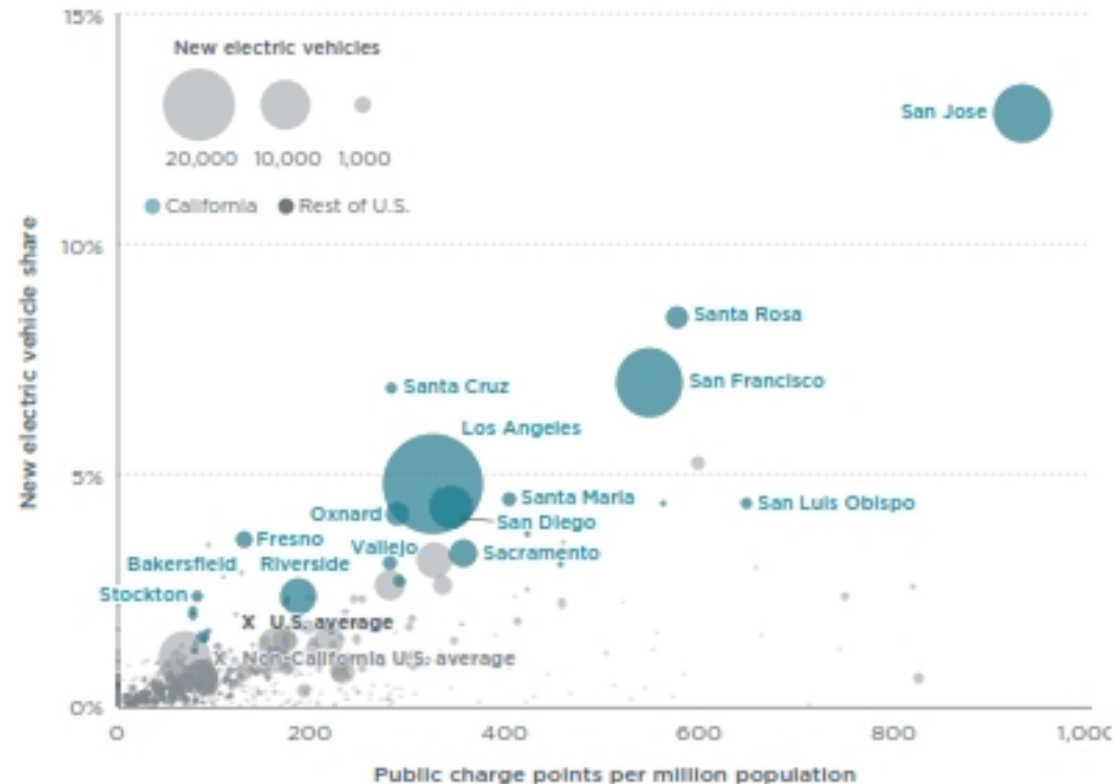
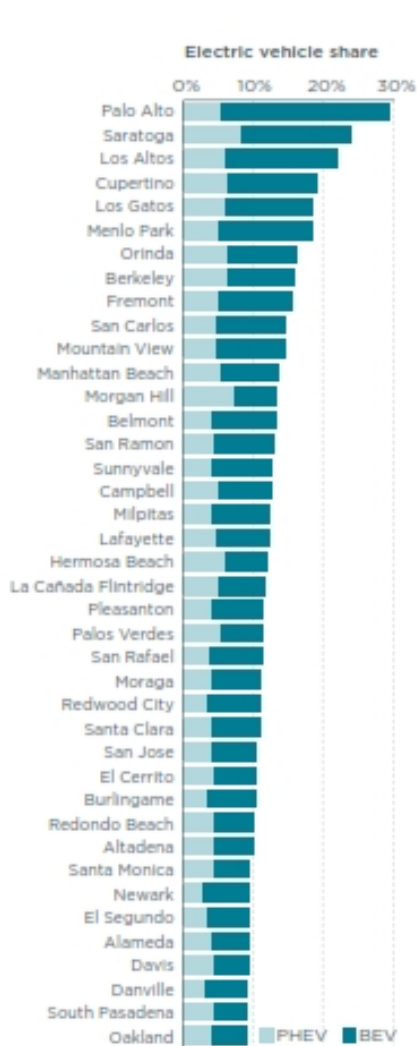
- Healthcare industry 2nd most energy-intensive building sector in US, spends \$5.3 billion on energy/year, 8% of GHG emissions
- Mission - protect and enhance both community and environmental health, ex: potential health impacts of climate change
- Goal - carbon net positive by 2025
- 20-year power purchase agreements: 153 MW NextEra Energy Resources + 75 MW solar NRG Renew and Ameresco



5. City of Palo Alto Bryant Street Garage



5. City of Palo Alto Bryant Street Garage



Public-private partnership facilitated by FIT to install:

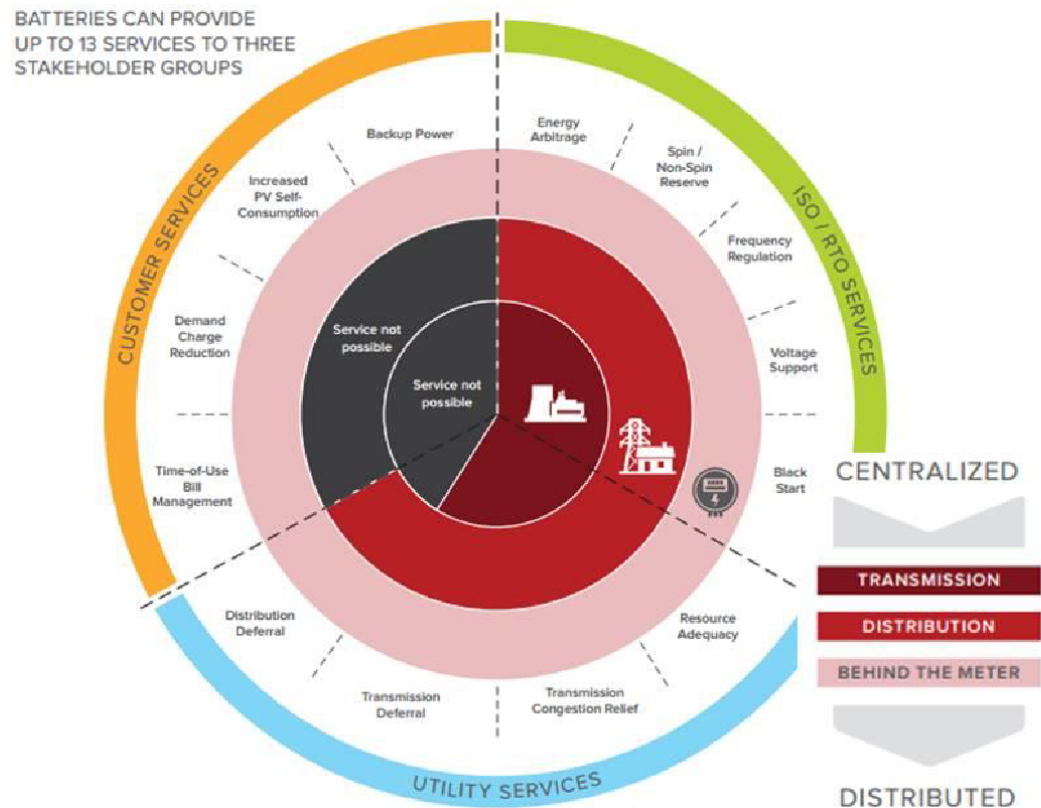
- 1.3 MW of solar PV on public garages
- 18 EV charging ports
- EVCI to support an additional 80 ports

EVCI Master Plan – low cost measures for jurisdictions

1. Create stronger code requirements for EV Level 2 charging outlets at Multi-Unit Dwellings (MUD) and workplaces -- new construction or major renovations.
2. Encourage Direct Current Fast Charging stations at transit corridors -
- ownership, installation and operation by third parties.
3. Encourage building owners to secure grants from public agencies and utilities for costs of installing at MUDs and workplaces.
4. Encourage public signage visible from roadways to educate and reassure non-EV owners there are plenty of places to plug in.
5. Host or encourage “EV Ride & Drives” to educate people about the benefits of EVs.

Double duty

- Back-up power
- Renewable energy storage
- Peak shaving
- Load shifting
- Power conditioning (energy supply smoothing)
- Spinning reserves



6. Hoover Elementary – Solar Emergency Microgrid



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Scenario 1

87.4 kW DC solar PV + 29 kW/
60 kWh energy storage for
demand charge management

Energy Storage System Size	Payback	Net Present Value	IRR
29 kW inverter/ 60 kWh (2 hours of energy)	4.2 years	+\$242,713 (because of the savings on energy bill)	20.6%

Scenario 2

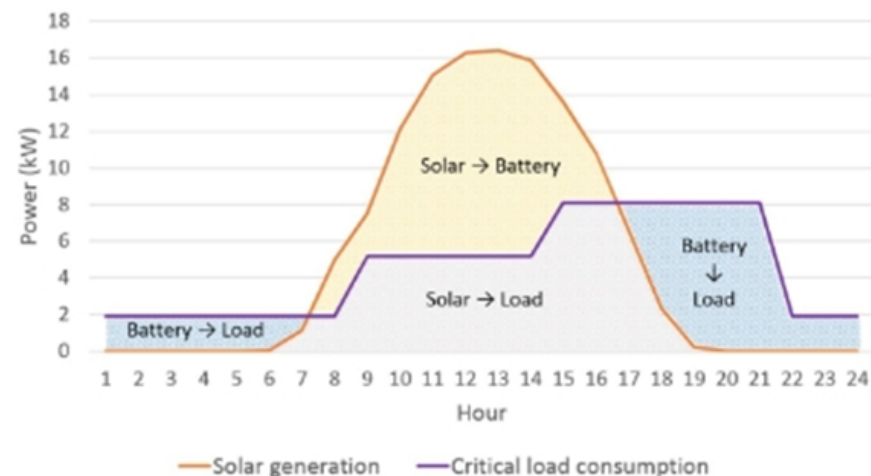
87.4 kW DC solar PV + 29 kW/
120 kWh energy storage + 10
Level 2 electric vehicle charging

Energy Storage System Size	Payback	Net Present Value	IRR
29 kW inverter/ 120 kWh (doubled size of battery)	3.3 years	+\$261,207	22.5%

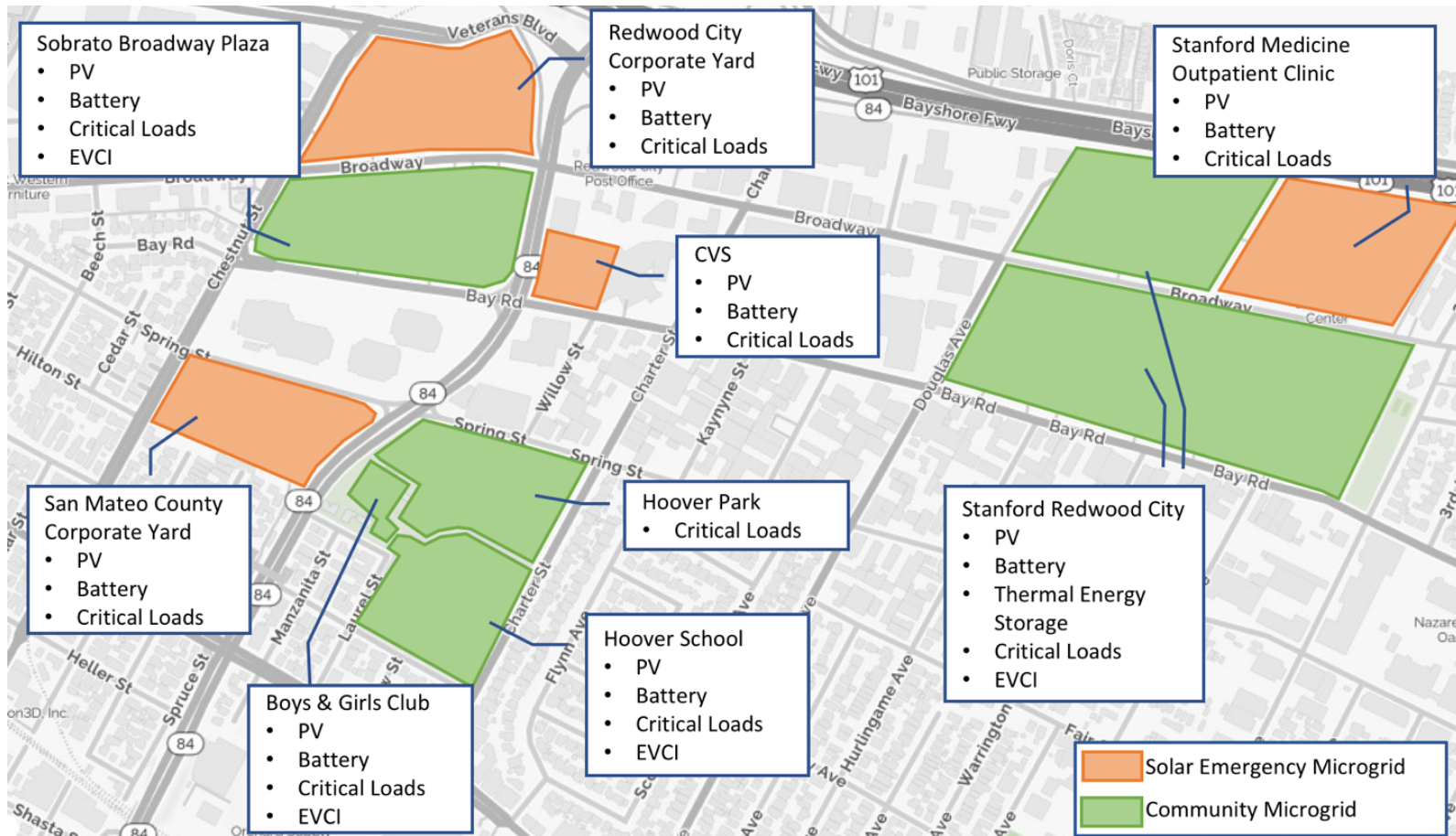
Scenario 3

4 kW/135 kWh energy storage
off-grid (21% of kWh baseline
with no EV)

*Feed-in tariffs would incentivize
SEM development at schools*



7. Redwood City Community Microgrid



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Site Name	Meters or Buildings	Critical Loads	NEM Solar [kW AC]	FIT Solar [kW AC]	Total Solar [kW AC]	Battery [kW]	Battery [kWh]	EVCI [Level-2 charging port count]
Stanford Redwood City Phase 1	P1, B1-B4	Campus emergency response	886	0	886	251	2,100	52
Hoover Cluster	Hoover School	Shelter & food service	73	203	276	29	150	20
	Boys & Girls Club	Shelter & food service	11	90	101	0	0	10
	Hoover Park	Equipment staging	0	0	0	0	0	0
Redwood City Corporate Yard	Redwood City Corporate Yard	Road and public facility maintenance and repair	136	352	488	58	360	*4
San Mateo County Corporate Yard	San Mateo County Corporate Yard	Road and public facility maintenance and repair	100	173	273	TBD	TBD	*4
Sobrato Broadway Plaza	Sobrato Broadway Plaza (multiple meters)	Low income housing	0	1,197	1,197	TBD	TBD	TBD
	Sobrato CVS	Pharmacy & grocery	0	83	83	TBD	TBD	TBD
New Deployments TOTAL			1,206	2,098	3,304	-	2,610	82

- NEM: only 1.2 MW of solar PV (1/3 of total solar PV capacity)
- FIT: an **additional 2.1 MW** of local, renewable generation could be deployed

Summary of benefits from the Stanford RWC community microgrid

Impacts	Annual per MW deployed	20 year cumulative per MW	Annual 90 MW addition system-wide	System-wide annual total at year 20
Formula	Base value	BV x 20	BV x 90	BV x 1800
Peak Capacity Savings	\$24,000 @ 20% ECC	\$480,000	\$2,160,000	\$43,200,000
T&D Line Loss Savings	\$11,835	\$236,700	\$1,065,150	\$21,303,000
New Transmission Capacity Savings	\$30,500	\$610,000	\$2,745,000	\$54,900,000
Energy Purchase Reduction	1,550MWh	31,000MWh	139,500MWh	2,790,000MWh
Energy Cost Savings	\$71,920	\$1,438,400*	\$6,472,800	\$129,456,000
Reliability Value	\$1,766	\$35,320	\$158,900	\$3,178,800
CO2 Reduction	513 MT	10,260 MT	46,170 MT	923,400 MT
NOx Reduction	1.39 MT	27.85 MT	125 MT	2,506 MT
Water Savings	0.03 M gal	0.6 M gal	2.7 M gal	54 M gal

Quantitative:

- \$2,000 savings per commercial application
- \$116 million in total added economic output
- \$35 million in local wages from construction and installation
- Energy consumers will save \$27 million
- 20% lower prices for clean local energy

Qualitative:

- Help meet clean energy policy goals and reduce GHG emissions
- Enhance grid resilience and security
- Provide emergency power
- Obviate expense of new power plants
- Support grid modernization
- Increase percentage of renewables for RPS
- Improve interconnection policies
- Create green jobs



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**The Great Pivot: Creating Meaningful Work
to Build a Sustainable Future**

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