Clean Coalition

Public Safety Power Shutoff Workstream #1

Peninsula Advanced Energy Community (PAEC)

Bridging the gap to resilience

Bob O'Hagan
Senior Engineer
408-394-9067
bob@clean-coalition.org

Frank Wasko
Managing Director
949-501-0967
frank@clean-coalition.org

PSPS Workstream agenda

- About the Clean Coalition
- PAEC project goals – aligned with PSPS readiness
- Benefits of Advanced Energy Community (AEC) Projects – prepare for PSPS
- AEC - components and benefits
- PAEC project example Atherton Civic Center - SLD
- AEC leaders – existing projects
- EPIC project core questions - #1 through #5
    - Examples
- PAEC Success creates momentum with Santa Barbara Unified School District
- Q & A

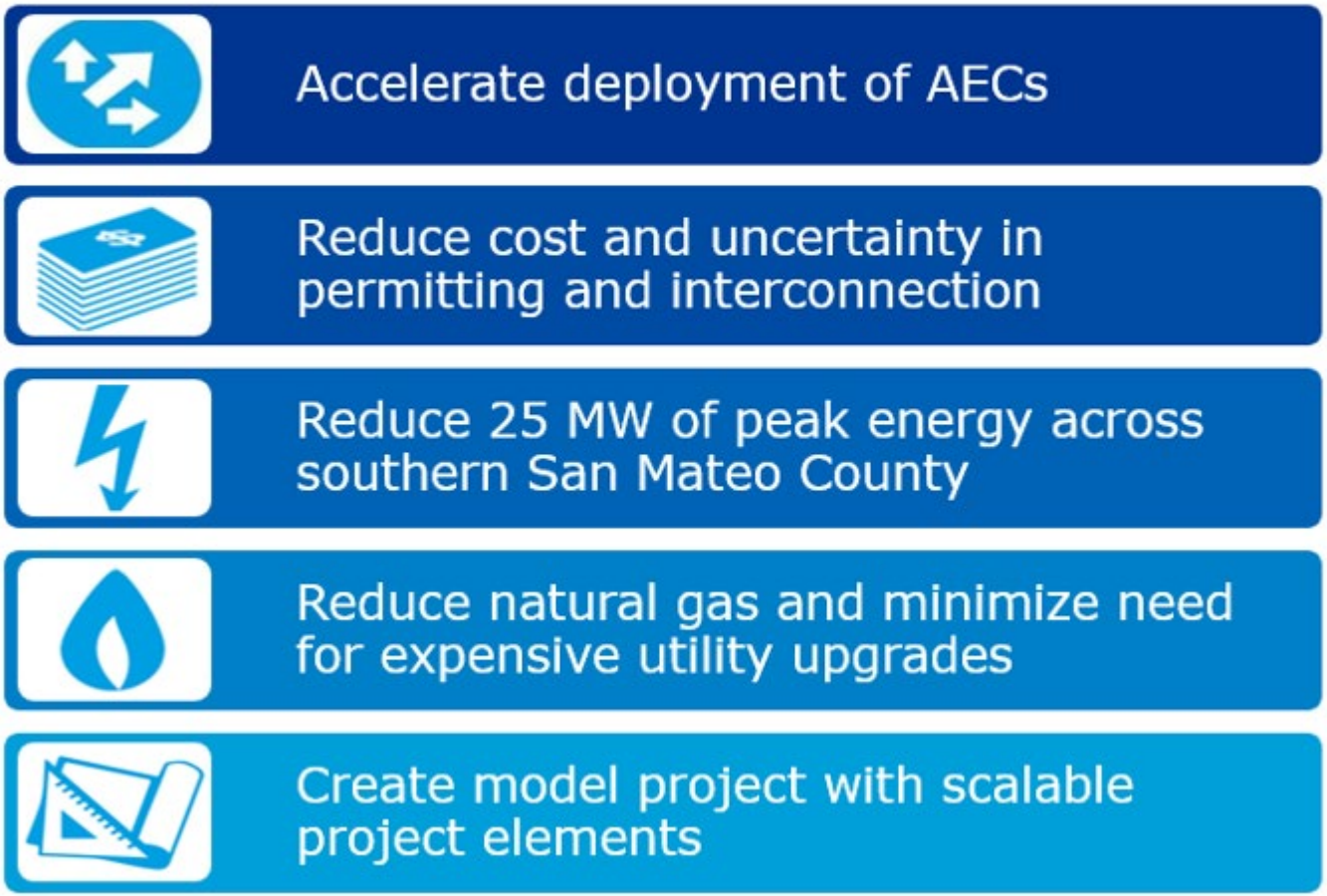
About the Clean Coalition

- We have a wealth of experience in microgrid planning and engineering.
- Renewable energy modeling and design:
  - 20+ Community Microgrid feasibility assessments completed to date with clients including Stanford University, various Fortune 500 companies, and multinational International Pension Plans.
  - 2 California Energy Commission grants.
  - 1 Department of Energy grant.
  - 1 New York Prize Community Grid Competition award.
  - 1 National Renewable Energy Labs contract.
- Experience working with investor-owned utilities (IOUs), municipal utilities, and Community Choice Aggregators (CCAs):
  - **IOUs:** Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, Public Service Electric & Gas Long Island.
  - **Municipal utilities:** City of Palo Alto Utilities, Los Angeles Department of Water & Power, Sacramento Municipal Utility District, San Francisco Public Utilities Commission, Fort Collins Utility, Utah Associated Municipal Power Systems.
  - **CCAs:** East Bay Community Energy, Sonoma Clean Power, MCE, Redwood Coast Energy Authority, Peninsula Clean Energy.
  - Current active projects with Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison, City of Palo Alto Utilities.
- Experience working with municipalities, schools, critical community facilities, businesses, and more:
  - **Municipalities and transit agencies:** City of Camarillo, City of Palo Alto, Redwood City, City of East Palo Alto, City of Menlo Park, City of San Francisco, City of Calistoga, County of San Mateo, Town of Atherton, SamTrans.
  - **Schools:** Stanford University, UC Davis, Los Angeles Community College District, University of California Santa Barbara, Santa Barbara Unified School District, Montecito Union School, Menlo Park City School District, Sequoia Union High School District, Las Lomitas School District.
  - **Critical community facilities**: Montecito Fire Protection District, Menlo Park Fire Protection District, Kaiser Permanente.
  - **Businesses and organizations:** Facebook, Greenheart Land Company, Cyme International T&D, Palo Alto Land Use Consulting, DNV GL, Menlo Spark, Sven Thesen & Associates, Acterra, NRG Energy, Sovereign Energy, Carbon-Free Palo Alto, Silicon Valley Leadership Group, Appraccel.

PAEC project goals – align with PSPS readiness

Clean Coalition

PAEC Project Goals



Benefits of AEC Projects – prepare for PSPS

AEC projects build resilience infrastructure for customers and communities through the effective combination of solar+storage

Benefits of AEC Projects

Customers

- Implementing energy efficiency means:
  - Customers save on their energy bill
  - Improved comfort, health + worker productivity
- Installing solar PV allows customers to prepay their electricity bill for the next 25 years, a hedge against future price increases
- **Builds Resilience**

Community

- Provides clean local energy
- Creates clean energy jobs
- Builds resilience
- Addresses climate change

Ratepayers

- Energy storage bridges the gap between overgeneration by solar PV during peak sunlight hours and peak energy demand later in the evening
- **Building resilience obviates expense of new power plant construction and grid upgrades**

AEC – components and benefits
PAEC project example: Atherton Civic Center

Clean Coalition

Peninsula Advanced Energy Community

Advanced Energy Community Components

1. Energy efficiency
2. Renewable energy
3. Zero net energy
4. Electric vehicle charging infrastructure
5. Energy storage

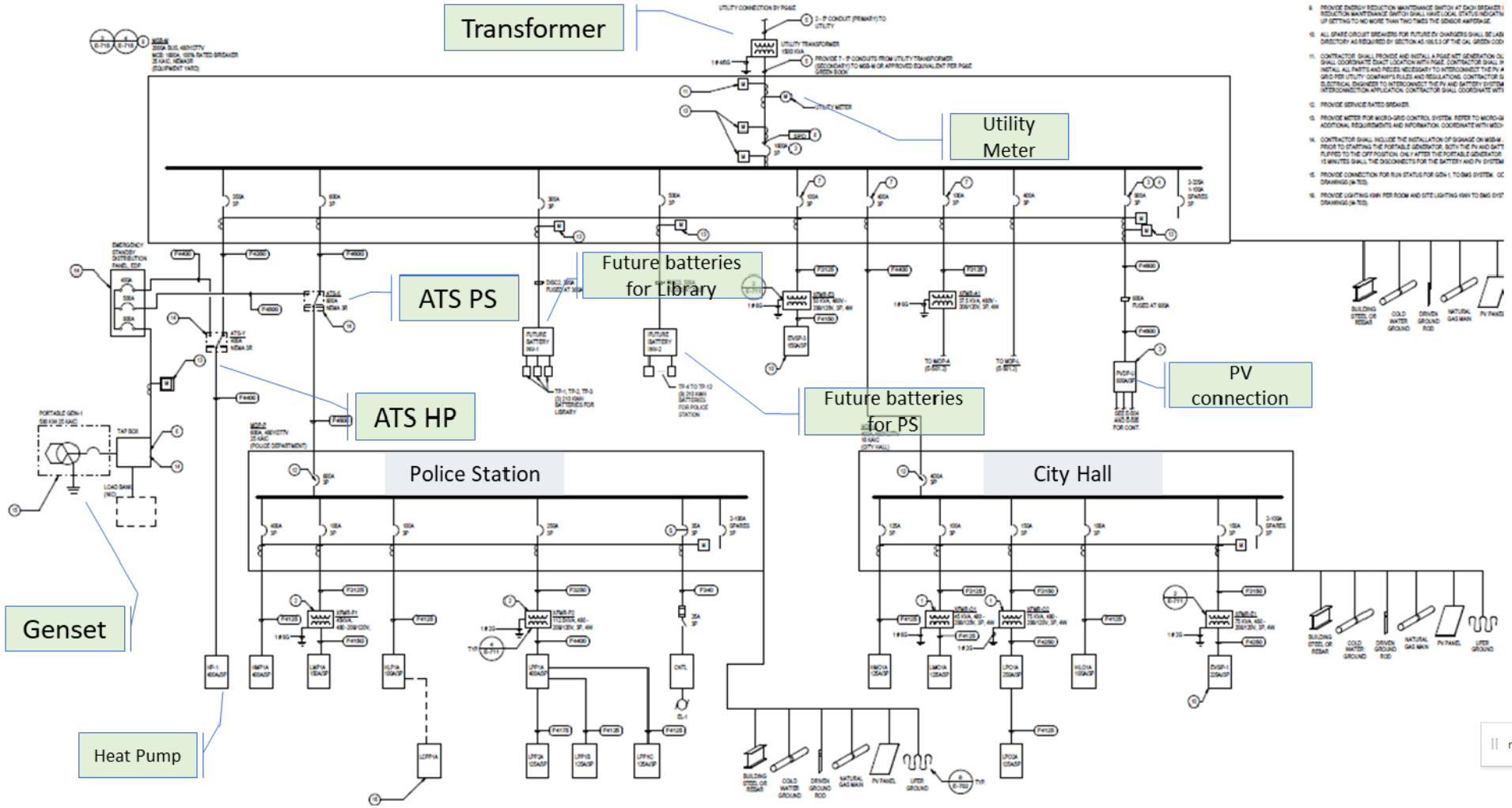
Planned Atherton Civic Center

Benefits

1. Reduces need for new energy transmission + distribution infrastructure
2. Promotes grid reliability + resilience
3. Financially attractive
4. Replicable + scalable

Atherton Civic Center – nearing completion in 2020
Design includes EE measures, solar+energy storage for PSPS readiness, EV-ready, heat pumps (no gas)

Atherton Civic Center project SLD – PSPS ready



AEC Leaders

AEC Leaders

Existing Projects with AEC Components

Palo Alto Bryant Street Garage
(Improving feed-in tariff)
- Solar PV
- EV charging
- Energy storage

Facebook
(Including water treatment in energy footprint)
- On-site black water treatment
- Energy efficiency
- Solar PV
- EV charging
- Energy storage

Jewish Community Center
(Maximizing existing technologies)
- Energy efficiency
- Air-source heat pump
- Solar PV
- EV charging

Kaiser Permanente
(Life-cycle cost solution to split incentive problem)
- Energy efficiency retrofits
- Solar PV power purchase agreement
- EV charging

Redwood City Corp Yard
(Solar emergency microgrid)
- Solar PV
- EV charging
- Energy storage

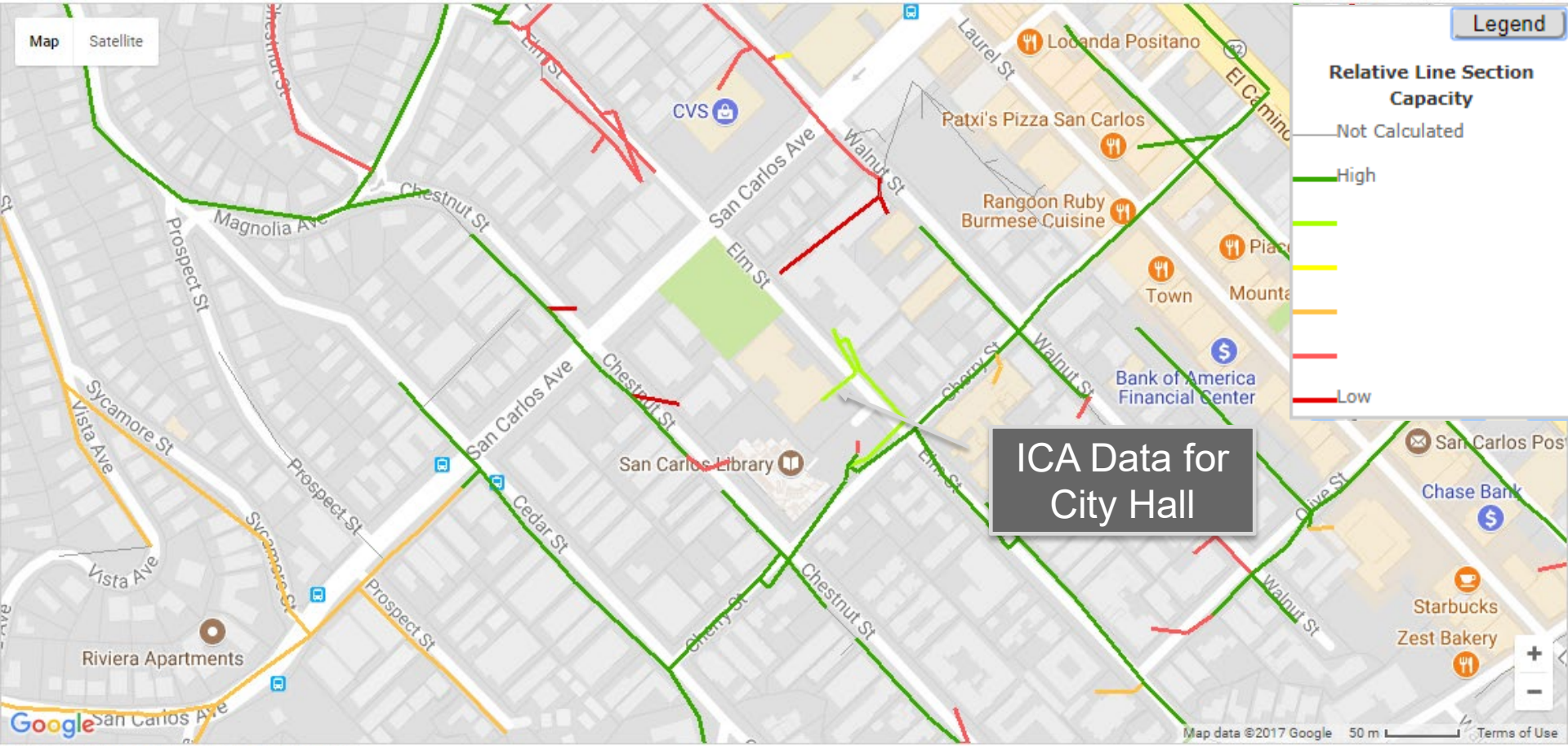
Stanford University
(District-level projects)
- Energy efficiency
- District-scale heat exchange system
- Solar PV
- EV charging

EPIC project core questions - #1

- What are the best ways to identify energy assets in the community?
  - Use ICA map to see amount of PV on each feeder as well as hosting capacity. The ICA also shows load profiles for that node on the feeder as well as for the total feeder and substation.
  - Solar siting surveys: look for existing PV (and potential)
  - Look for certain retailers' sites with strong commitments to clean energy that have a lot of PV, e.g. Costco, Target, Walmart, Staples, etc.

Solar Siting Survey at Costco

ICA Map for San Carlos City Hall



map width: 1.35 miles, map height: 0.64 miles

600 Elm St, San Carlos

Go

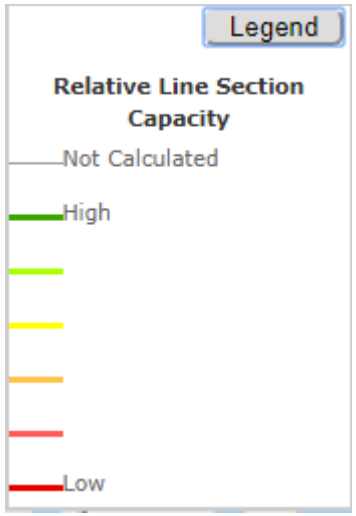
- ☑ Distribution Lines
- ☑ Substations
- ☑ Transmission Lines

ICA Data at Feeder into San Carlos City Hall

Clean Coalition

Asset Info | DER Capacity

Shape	Polyline
Feeder Name	SAN CARLOS 0402
Feeder Number	24180402
Nominal Circuit Voltage (kv)	4
Circuit Capacity (MW)	2.48
Circuit Projected Peak Load (MW)	2.15
Substation Bank	1
Substation Bank Capacity (MW)	12.5
Substation Bank Peak Load (MW)	12.8
Existing Distributed Generation (MW)	0.102
Queued Distributed Generation (MW)	0
Total Distributed Generation (MW)	0.102
ZoneId	24180402.007



500 kW PV should be straightforward interconnection

Asset Info | DER Capacity

Feeder name: SAN CARLOS 0402 **Zone Id:24180402.007**

DER	Zone DER Capacities (kW)		Substation DER Capacities (kW)	
	Minimal Impacts	Possible Impacts	Feeder Limit	Substation Bank Limit
Uniform Generation (Inverter)	551	594	610	3,402
Uniform Generation (Machine)	146	150	464	2,584
Uniform Load	-	-	-	-
PV	551	594	1,021	5,443
PV with Storage	551	594	1,132	6,025
PV with Tracker	551	594	787	4,268
Storage - Peak Shaving	-	-	-	-
EV - Residential (EV Rate)	-	-	-	-
EV - Residential (TOU Rate)	-	-	-	-
EV - Workplace	-	-	-	-

Notes:

- Integration Capacity Values last updated on July 1 2015

EPIC project core questions - #2

- What energy data is valuable for community planning and how do you get it?
  - Aggregate load data can be useful for some types of planning.
    - One source is the ICA maps in the IOU territories.
    - A new source is the Energy Atlas [https://energyatlas.ucla.edu], a first of its kind interactive website built with the largest set of publicly available disaggregated energy data in the nation.
  - For individual customers, annual 15-minute load profiles are the best data to have for any modeling/planning and is readily available from individual customers if they give permission to use API.
  - Next best load source is utility monthly bills, also from direct request.

EPIC project core questions - #3

- What considerations are most important for developing advanced energy community plans?
  - What are the goals?
    - Energy use reduction/bill saving during normal operations?
    - Resilience?
  - What are the funding resources?
  - Are assets for normal operations or for backup?
  - Will certain locations be repurposed for other community uses during a multi-day outage? E.g.
    - shelters
    - supply distribution
    - operations centers
    - commissaries, etc.

EPIC project core questions - #4

- How do different outage durations affect critical needs in communities?
  - Life sustaining/safety is always paramount.
    - The following answers assume that individual life sustaining needs are handled separately
    - Hospitals already have their own requirements under OSHPD and are therefore not good candidates for community energy planning.
  - Minutes: Stay in place if possible. Wait it out. Most common scenario.
  - Hours: Safe egress to get home or to safety becomes important. Merchants must clear stores and prevent shoplifting.
  - Days: Maintenance of community-serving functions becomes important, e.g. water pressure, wastewater treatment, police/fire/communications, traffic control, …

EPIC project core questions - #5

- Is every community and every block different when it comes to resiliency and energy assurance? Or is there a way to create a standard approach and structure to providing community solutions?
  - The loads to be served and the needs vary dramatically between residential, commercial, industrial, and municipal services zones.
  - Different zones will probably have similar load profile shapes, but magnitudes will be very different.
  - In PAEC, we learned each city has similar needs but great differences in magnitude of funding resources for building resilience infrastructure.
    - One key standard approach we have found is sizing PV+storage resources to be cost effective on their own for bill savings and then examining what critical loads could be served in outages of varying durations, which we call VOR123 (Value of Resilience, load tiers 1st, 2nd 3rd).
    - This process does require a careful examination to create load tiers in order to utilize renewable resources as primary backup instead of diesel gensets.

PAEC Success creates momentum with Santa Barbara Unified School District – 6 schools PSPS ready

NEWS RELEASE: Santa Barbara Unified School District (SBUSD) Board unanimously approves moving forward with Solar Microgrids throughout the district
The Clean Coalition and Sage Energy Consulting facilitated a groundbreaking feasibility and RFP process that will save the SBUSD millions while providing almost equal value in resilience to the District for free

SANTA BARBARA, CA — In a big win for clean local energy and resilience in the Santa Barbara region, the Santa Barbara Unified School District (SBUSD) Board unanimously voted last week to proceed with Solar Microgrid projects throughout the District, along with additional standalone solar projects.
For the Santa Barbara Unified Solar Plus Energy Resiliency Project, the Clean Coalition, a nonprofit organization, and Sage Energy Consulting completed feasibility studies for Solar Microgrid and standalone solar installations at 18 SBUSD sites. This was followed by designing and executing a state-of-the-art request for proposals (RFP) process for a 28-year fixed-rate power purchase agreement (PPA) for solar at 14 sites, with full Solar Microgrids at 6 of those sites.

Santa Barbara Unified School District
San Marcos High School design - ready for PSPS

Clean Coalition

San Marcos HS

4750 Hollister Ave, Santa Barbara CA 93110

Solar PV

Total PV Capacity Shown (kWp)	Total Modeled PV Production (kWh)	Percent of Future Site Annual Consumption Offset
723	1,175,200	101

Battery

Battery Energy Capacity (kWh)	Battery Power Capacity (kW)	SOCr (kWh)	SOCr % of Total Battery
710	355	28.50	4.0

EV Stall Count

Stalls	ADA Stalls	Non-ADA Stalls	Existing EVSEs	5-Year Install
514	22	492	0	37

Notes

1. No lighting in main lot (some perimeter).
2. Two existing light poles to demo/replace under C1 & C2 (one under each).
3. Will need to add ADA stalls under canopies and POT as part of main parking lot reconfiguration.
4. Will need to cover existing stalls in NW Lot with the south end of canopy.
5. Suggest two separate NEM rather than NEMA due to locations of services and critical load distribution.
6. Potentially minimize northwest PV capacity and tie that into stadium meter to power stadium lights and bathrooms during emergency outage.
7. Main office (Bldg B), data center, theater, gymnasium on Main SCE service. Football field lights and bathrooms powered by Stadium SCE service.
8. Due to location of EV charging areas, SCE likely to drop a new dedicated service feed.

Santa Barbara Unified School District
PV and EV Siting

WORKING DRAFT | 3/27/2020

SAGE ENERGY CONSULTING

Clean Coalition
Making Clean Local Energy Accessible Now

Q&A

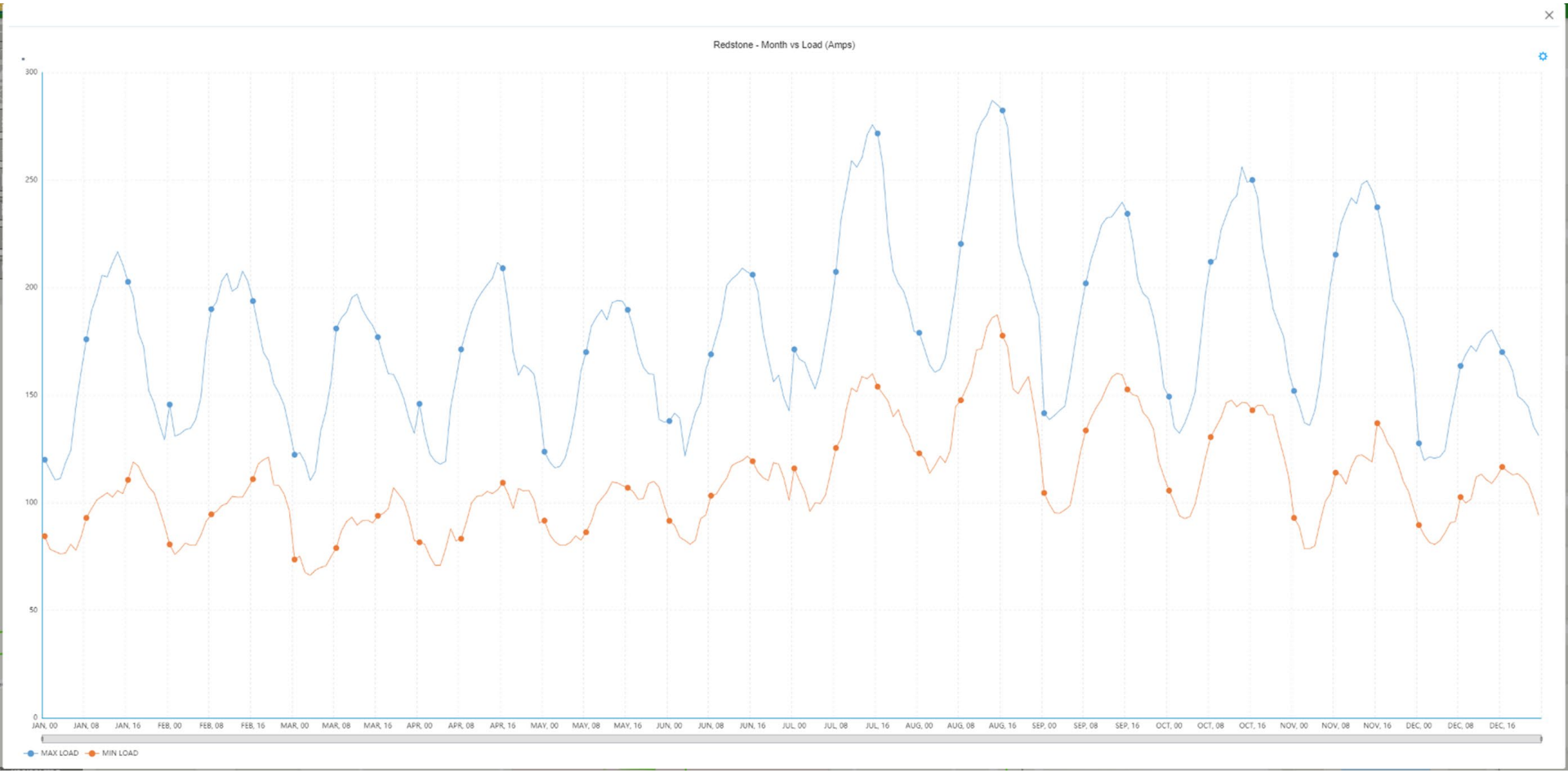
Questions?

Thank you for your time and consideration

Backup slides

Backup slides

Example SCE ICA feeder-level load profile: min/max profiles by month



PAEC report highlights

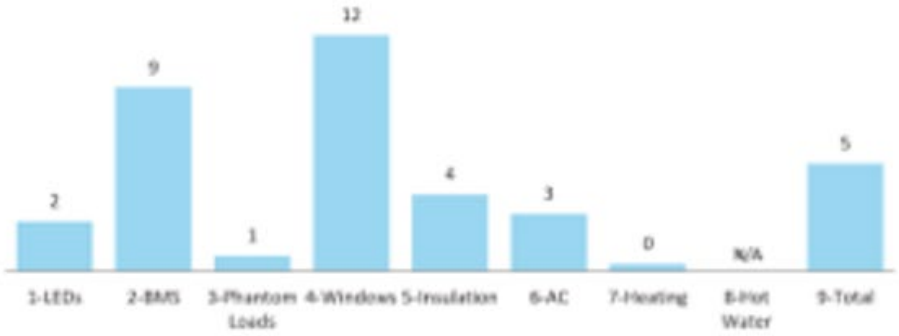
Challenges

- Inconsistent permitting processes (documentation requirements, costs, reviews, timelines) at municipalities and utilities
- Inconsistent financial instruments available to fund investments for AECs in commercial, residential, and public sectors
- Split incentives between building owners + tenants
- Tension between Capital expenses + operating expenses
- Tendency to favor initial cost over life cycle costs
- Range anxiety - Lack of EV fast chargers

Recommendations

- Implement bundles of energy efficiency measures. Average 5-year payback = 18% return, better than returns from most other investment options.

Energy efficiency ROI for office Building

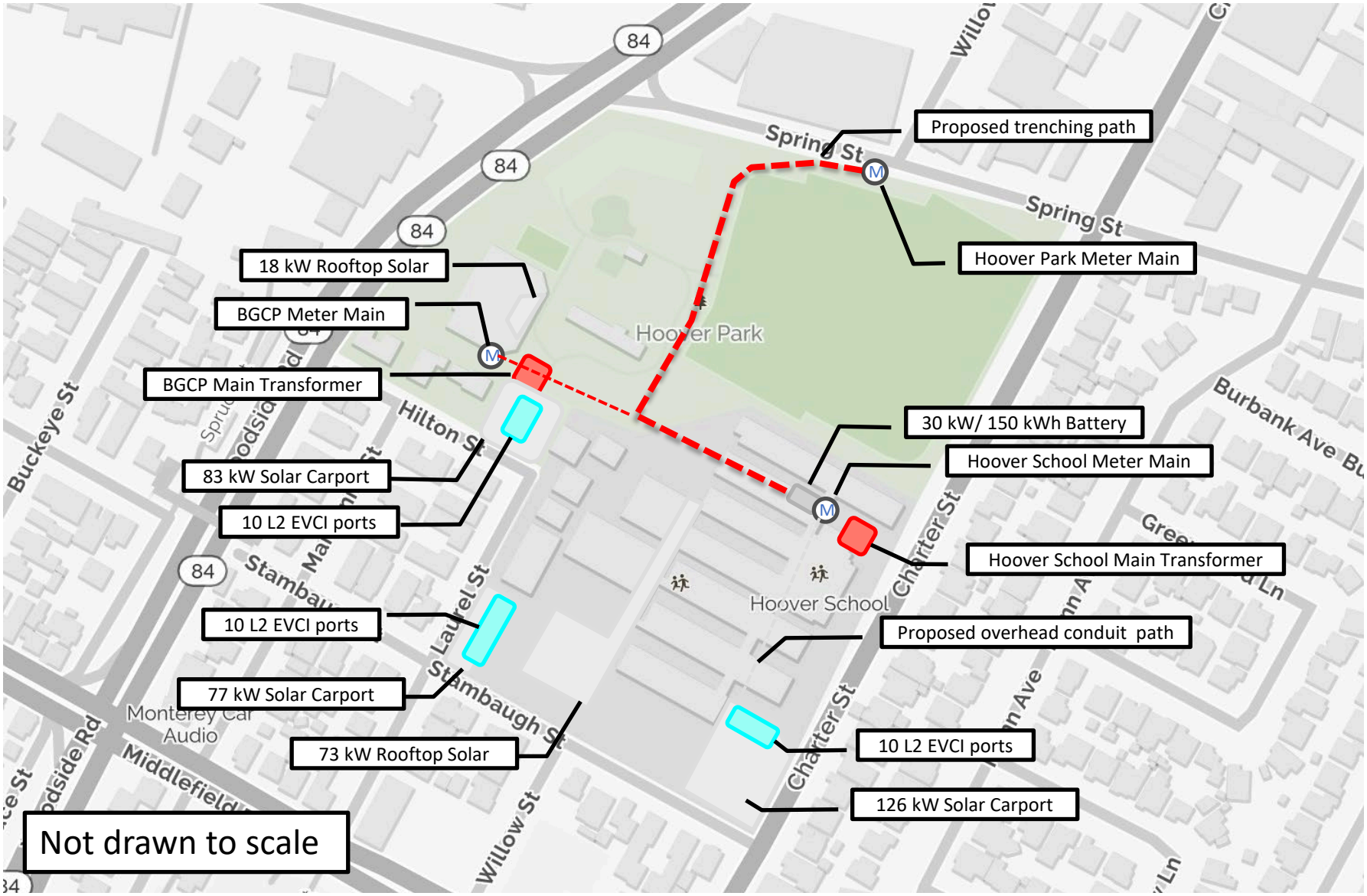


- Focus on the following in southern San Mateo County:
  - Deep energy retrofits for residential + commercial properties
  - Financial options that allow energy savings to fund capital investments
  - Zero net energy for new developments
  - Increasing EV charging infrastructure with battery storage
- Municipalities should develop EV-ready codes for multi-unit dwellings
- Continue subsidizing energy storage in the near term as the market brings the price down

Tools

- Streamlined permitting
- Model interconnection process checklist
- Model ordinances
- Green lease language
- Solar siting survey
- Electric vehicle charging infrastructure master plan

Hoover Cluster Conceptual Diagram



Clean Coalition (nonprofit) mission and vision

Mission

To accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise.

Renewable energy end-game

100% renewable energy; 25% local, interconnected within the distribution grid and ensuring resilience without dependence on the transmission grid; and 75% remote, fully dependent on the transmission grid for serving loads.

Clean Coalition overarching objectives

- From 2025 onward, at least 80% of all electricity from newly added generation capacity in the United States will be from renewable energy sources.
- From 2025 onward, at least 25% of all electricity from newly added generation capacity in the United States will be from local renewable energy sources.
    - Locally generated electricity does not travel over the transmission grid to get from the location it is generated to where it is consumed.
- By 2025, policies and programs are well established for ensuring successful fulfillment of the 80% & 25% objectives.
    - Policies reflect the full value of local renewable energy.
    - Programs prove the superiority of local energy systems in terms of economics, environment, and resilience; and in terms of timeliness.

Advanced Energy Community Concepts

Clean Coalition

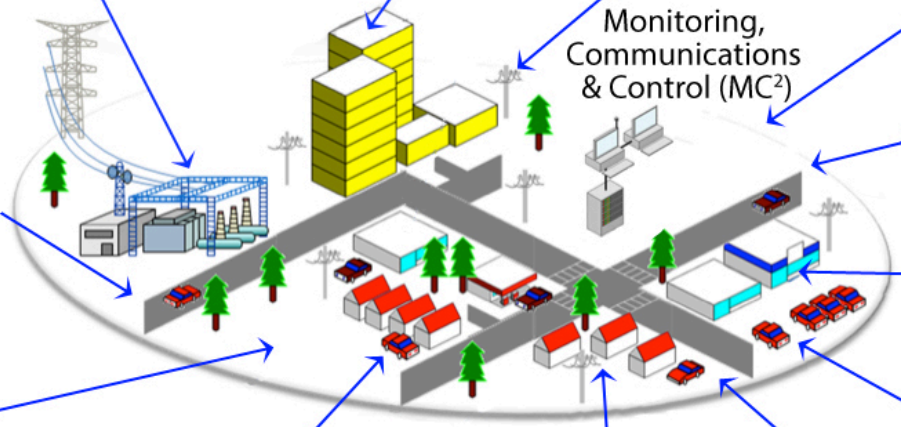
Grid Energy Storage

Distributed Generation

Switches & Power Electronics

Distributed Generation

Biopower Generation



Monitoring, Communications & Control (MC^2)

Energy Storage

Microturbine

Distributed Generation

Electric Vehicles (EV)

Home Energy System

Fuel Cells

Distributed Generation