Peninsula Advanced Energy Community (PAEC)
Accelerating the transition to a clean local energy future

Justine Burt
Dr. Kristin Kuntz-Duriseti
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Questions will be answered during the Q&A portion of the webinar

Contact Josh for webinar questions: josh@clean-coalition.org
Today’s presenters

**Justine Burt** is the Founder and CEO of Appraccel. She has 18 years experience as a sustainability project manager for advanced energy communities, waste prevention, and alternative transportation projects. She applies proven economic, policy, and behavior change tools to successfully implement lasting change for government, university, non-profit, and private sector clients. Justine has degrees in Economics and Environmental Policy.

**Dr. Kristin Kuntz-Duriseti** is Managing Editor of Climatic Change, an international journal publishing interdisciplinary research on the description, causes, and implications of climate change. To support responsible and progressive sustainability policies, promote renewable energy projects, and shift our community to a low carbon future, Kristin has served as an Environmental Quality Commission for Menlo Park, California and is a current Board Member for Menlo Spark, a non-profit initiative working toward climate neutrality in the city.
Agenda

• PAEC
• Advanced Energy Communities
• Policy goals and existing regulatory structure
• Key challenges
• Best practices

• Key findings
• Case studies
• Tools to accelerate to AECs
• Project benefits
• Areas for future study
• Questions
Peninsula Advanced Energy Community

- 21-month project
- 12 Clean Coalition staff and subcontractors
- Funding from California Energy Commission
- Southern San Mateo County
PAEC Reports

Task 2.2 - Best Practices report (Menlo Spark)

Task 2.4 - Gap Analysis (Menlo Spark)

Task 2.6 - Benefit-Cost Analysis Report of Potential Ordinances (DNV GL)

Task 2.8 - Interview with Public Agencies, Installers, and Vendors (Sovereign Energy)

Task 2.10 - Policy Recommendations & Guidelines for Permitting Energy Storage (Sovereign Energy)

Task 2.12 - Model Ordinances for San Mateo County (DNV GL)

Task 2.14 - AEC Regulatory and Permitting Recommendations (DNV GL)

Task 3.II - Backup Power Valuation Methodology (Sovereign Energy)

Task 3.2 – Lending, Customer Compensation, and Government Incentive Report: Strategies and Incentives Available to Advanced Energy Communities In and Around San Mateo County, California (High Noon Advisors)

Task 3.4 + 3.10 - Summary of Financial Pro-Forma Delineating the Cost of Capital, Tenor, Risk/Return Profile, and Value Streams for Behind the Meter Energy Storage (Sovereign Energy)

Task 3.6 - Dispatch Model for Energy Storage System (Sovereign Energy)

Task 3.12 - Successful Energy Storage Financing Program (Sovereign Energy)


Task 3.16 - Economic Benefit-Cost Analysis of Electric Vehicle Charging Infrastructure (Sven Thesen & Associates)


Task 3.1 i - Report Summarizing Literature Review & ISO/RTO Tariff Analysis (Sovereign Energy)

Task 4.2 – Best Practices: Interconnection for Local, Commercial-Scale, Renewable Energy Projects – Streamlining the Interconnection of Advanced Energy Communities to the Grid (Clean Coalition)

Task 4.4 – Design of Pilot for Testing Streamlined Interconnection Procedures (Clean Coalition)

Task 5.2 – Solar Emergency Microgrid Site Design and Deployment Plan (Clean Coalition)

Task 6.1 – Potential Locations for the Electric Vehicle Charging Infrastructure Master Plan (Sven Thesen & Associates)

Task 7.1 – Technical and Economic Feasibility of Sustainability Features for the Atherton Civic Center Report (WRNS Studio)

Task 7.2 – Scorecard of Sustainability Features (Clean Coalition)

Task 8 – Solar Siting Survey (Clean Coalition)

Task 10 – PAEC Community Master Plan (Clean Coalition)

Task 11 – Evaluation of Project Benefits (Clean Coalition)

Task 12.2 – Initial Fact Sheet (Clean Coalition)
Advanced Energy Communities (AEC)

- Strive to meet zero net energy (ZNE) standards for built environment
- Take full advantage of local renewable energy, demand response, Solar Emergency Microgrids, and electric vehicle charging infrastructure (EVCI)
- Help state realize clean energy and climate change policy goals

Co-benefits

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

- Southern San Mateo County has 65 MW solar potential
- Highly developed area
- Dense tree canopy
Vital Community Resources

Solar Emergency Microgrid
Indefinite Renewables-Driven Back-up Power to a Single Customer

Nearly 1,000 potential sites in California
# Policy Goals and Existing Regulatory Structure

**State goals**

- AB 32 (greenhouse gas emissions)
- Title 24 and CalGreen (energy efficiency)
- CPUC Long-Term Energy Efficiency Strategic Plan (ZNE)
- CPUC Integrated Resource Plan and Long-Term Procurement Plan
  - AB 117: Community Choice Aggregation
  - AB 2565: EVCI in rental properties
  - AB 2514: Energy Storage

**Local jurisdictions**

- San Mateo County
- Redwood City
- Atherton
- Menlo Park
- East Palo Alto
Key Challenges

Economic

• Life cycle cost assessments
• Capital vs. operating costs
• Split incentives
• Falling prices not fallen far enough
• Economies of scale
• Limited financing programs
• Who should fund AECs?

Policy

• Inconsistent permitting requirements
• Cumbersome and lengthy interconnection approval
• Insufficient staffing
  ▪ to review an increasing number of applications
  ▪ to develop policies and ordinances that support AE solutions
Best Practices

- Renewables
- Energy efficiency
- Zero net energy
- EV charging infrastructure
- Energy storage
- Economics (CCA, on-bill financing, fees)
- Policy (ZNE, retrofits)
- Technical
Key PAEC Findings

Economics
- Future financial viability of energy storage
- Bundling energy efficiency
- Model ordinances
- Inconsistent financial tools (on-bill financing)

Policy
- Context specific
- Deep energy retrofits
- Streamline interconnection
- Streamline permitting

Technical
- Solar Siting Survey - 65 MW WDG, minimum project size 100 kW A/C
- EVCI master plan
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.
Energy Storage

Batteries can provide up to 13 services to three stakeholder groups:

- Customer Services:
  - Backup Power
  - Increased PV Self-Consumption
  - Demand Charge Reduction
  - Time-of-Use Bill Management
  - Distribution Deferral

- ISO/RTO Services:
  - Energy Arbitrage
  - Spin/Non-Spin Reserve
  - Frequency Regulation
  - Voltage Support
  - Black Start

- Utility Services:
  - Resource Adequacy
  - Transmission Deferral
  - Transmission Congestion Relief

Service not possible

Centralized

Transmission
Distributed
Distributor
Behind the Meter
Energy Storage

Double duty
• Back-up power
• Renewable energy storage
• Peak shaving
• Load shifting
• Power conditioning (energy supply smoothing)
• Spinning reserves
Anticipated first Zero Net Energy civic center in the US
Challenge: matching limited solar potential to energy demand
Solution:

- energy saving features reduce EUI
- heat pump with heat recovery (water thermal storage)
Police department and administrative services
Atherton Civic Center

Library and historic City Hall
Stanford Energy System Innovation (SESI) and Central Energy Facility
Comparison of Energy Supply Options

Source: Stanford University Energy and Climate Plan (2015)
For more information, see: [http://sustainable.Stanford.edu](http://sustainable.Stanford.edu)
Other SESI components:

- Hourly dispatch plan to optimize CEF operations increases efficiency by 6%
- Consolidating computer servers and using energy efficient cooling technology saves the university approximately $1 million per year
- Behavior incentives reduce electricity demand by 4% since 2004 and save $320,000 yearly
- New construction designed to LEED gold standards
- Real time monitoring of building performance
- Retrofit investments save Stanford more than $4.5 million each year
- Electrification of the university vehicle fleet and installation of EVCI, including both Level II and DC fast-charging stations.
Key features
• Rooftop PV
• Occupancy sensors
• Building management system (BMS)
• 4 EV chargers
• Water source heat pump
• Individual heat pumps in residential units
Kaiser Permanente

- Healthcare industry 2nd most energy-intensive building sector in US, spends $5.3 billion on energy/year, emits 8% of GHG emissions
- Mission: protect and enhance both community and environmental health, e.g., potential health impacts of climate change
- Minimum LEED Gold certification for all new construction
- Nearly 300 EV charging stations
- 20-year power purchase agreements meet 50% of energy demand
- Goal: carbon net positive by 2025
Public-private partnership facilitated by Feed-in Tariff to install:
- 1.3 MW of solar PV on public garages
- 18 EV charging ports
- EVCI to support an additional 80 ports

Source: www.theicct.org
Redwood City Community Microgrid

Source: Clean Coalition
Redwood City Corporate Yard

Baseline
- Demand Charge: 55.7%
- Fixed Charge: 2.7%
- Energy Charge: 41.6%

Solar PV Only
- Fixed Savings: 40.1%
- Fixed Charge: 5.4%
- Energy Charge: 42.6%

Solar PV & Storage
- Fixed Savings: 52.6%
- Fixed Charge: 12.8%
- Energy Charge: 35.9%

Tariff:
- E-19-TOU-NOPD:
  - Energy Charges: $33,999
  - Demand Charges: $27,605
  - Fixed Charges: $1,679
  - Total Utility Bill: $63,283

Tariff:
- E-19-TOU-NOPD-NEM2:
  - Energy Charges: $8,664
  - Demand Charges: $27,605
  - Fixed Charges: $1,679
  - Total Utility Bill: $37,948

Energy Savings:
- Baseline: $26,480
- Solar PV Only: $0
- Solar PV & Storage: $0

Payback:
- Baseline: 11.97 years
- Solar PV Only: 7.88 years
- Solar PV & Storage: 7.88 years

NPV:
- Baseline: $15,314
- Solar PV Only: $18,725
- Solar PV & Storage: $232,118

IRR:
- Baseline: 6.59%
- Solar PV Only: 8.25%
- Solar PV & Storage: 11.41%
Hoover Elementary – Solar Emergency Microgrid

Source: Clean Coalition
Scenario 1
- 87.4 kW DC solar PV
- 29 kW/ 60 kWh energy storage

Scenario 2
- 87.4 kW DC solar PV
- 29 kW/ 120 kWh energy storage
- 10 Level 2 EV charging

Scenario 3
- Off-grid operation w/o EVCI (21% of kWh baseline)
- 25 kW DC solar PV
- 4 kW/135 kWh energy storage

Feed-in tariffs would incentivize Solar Emergency Microgrid development at schools

<table>
<thead>
<tr>
<th>Energy Storage System Size</th>
<th>Payback</th>
<th>Net Present Value</th>
<th>IRR</th>
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</thead>
<tbody>
<tr>
<td>29 kW inverter/ 60 kWh (2 hours of energy)</td>
<td>4.2 years</td>
<td>+$242,713 (because of the savings on energy bill)</td>
<td>20.6%</td>
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<tr>
<td>29 kW inverter/ 120 kWh (doubled size of battery)</td>
<td>3.3 years</td>
<td>+$261,207</td>
<td>22.5%</td>
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### Redwood City Community Microgrid

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Stanford Redwood City Phase 1</td>
<td>P1, B1-B4</td>
<td>Campus emergency response</td>
<td>886</td>
<td>0</td>
<td>886</td>
<td>251</td>
<td>2,100</td>
<td>52</td>
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<td>Hoover Cluster</td>
<td>Hoover School</td>
<td>Shelter &amp; food service</td>
<td>73</td>
<td>203</td>
<td>276</td>
<td>29</td>
<td>150</td>
<td>20</td>
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<tr>
<td></td>
<td>Boys &amp; Girls Club</td>
<td>Shelter &amp; food service</td>
<td>11</td>
<td>90</td>
<td>101</td>
<td>0</td>
<td>0</td>
<td>10</td>
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<tr>
<td></td>
<td>Hoover Park</td>
<td>Equipment staging</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Redwood City Corporate Yard</td>
<td>Redwood City Corporate Yard</td>
<td>Road and public facility maintenance and repair</td>
<td>136</td>
<td>352</td>
<td>488</td>
<td>58</td>
<td>360</td>
<td>*4</td>
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<tr>
<td>San Mateo County Corporate Yard</td>
<td>San Mateo County Corporate Yard</td>
<td>Road and public facility maintenance and repair</td>
<td>100</td>
<td>173</td>
<td>273</td>
<td>TBD</td>
<td>TBD</td>
<td>*4</td>
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<tr>
<td>Sobrato Broadway Plaza</td>
<td>Sobrato Broadway Plaza (multiple meters)</td>
<td>Low income housing</td>
<td>0</td>
<td>1,197</td>
<td>1,197</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td></td>
<td>Sobrato CVS</td>
<td>Pharmacy &amp; grocery</td>
<td>0</td>
<td>83</td>
<td>83</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>New Deployments TOTAL</td>
<td></td>
<td></td>
<td><strong>1,206</strong></td>
<td><strong>2,098</strong></td>
<td><strong>3,304</strong></td>
<td>-</td>
<td><strong>2,610</strong></td>
<td><strong>82</strong></td>
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**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
Tools to Accelerate AEC Deployment

Economic

- Standard tools - known benefits, disincentives, competing priorities
- Non-monetary benefits (qualitative metrics) - minimize fossil fuels, accelerate AECs, reduce GHGs
- Scenario analysis (especially resilience)

Policy

- Streamlined permitting guidelines
- Model ordinances
- Model interconnection process checklist
- Green lease language

Technical

- Solar Siting Survey
- Building management systems
Project Benefits

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
Conclusion: Areas for Future Study

- Need additional financing tools and incentives to implement AEC components
- Train more planning and building inspection staff to incorporate AEC component requirements into permitting and inspection checklists
- Accelerate reach codes and deep energy retrofits
- Additional revenue streams for energy storage
- New rates and tariffs for virtual microgrids
- Integrated technology solution providers
Questions?

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For questions and assistance about today’s webinar, contact:

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