Morning Session is Currently in Progress

Please Join WebEx Room Number
926 591 014
energy.webex.com
Wildfire Prevention Technologies

Moderator: David Erne

Presenters: Dr. Brian Chen, Brian D’Agostino, Dr. Larry Dale
Wildfire Prevention Technologies
Breakout Session

February 19, 2019
David Erne, Energy Technology Systems Integration
Wildfire Potential Increases with Warming Climate

Historical Area Burned per Year
30-yr mean area burned: 1961-1990 CanESM2 85 bau

Projected
30-yr mean area burned: 2070-2099 CanESM2 85 bau

Wildfire: Assessing and Preparing for Risks under Climate Change

• Needs:
  – Phase I - Improve the assessment of risks to the electric infrastructure from wildfires
    • Near-term risk forecasting (7 days)
    • Long-term risk prediction for infrastructure planning
  
  – Phase II - Conduct analyses for California’s Fifth Climate Change Assessment

• Funding: 1 award up to $5 million

• Released: December 27, 2018
• Proposals Due: March 13, 2019 by 5:00pm
Multiple Strategies for Wildfire Prevention

**Fuel Management**
- Clearance Requirements
- Vegetation Management
- Right Tree Right Place
- Aerial Patrols
- LiDAR Surveys

**System Management**
- Infrastructure Hardening
- Protective Device Settings
- Preventative De-energization
- Fault Detection & Analysis
- Maintenance & Inspection

**Weather Monitoring & Prediction**
- Weather Prediction
- Condition Assessments
- Situational Awareness
- Storm Preparation & Response
Ignition Prevention Research Coordination Working Group

• Held Public Workshops July 25 & October 16, 2018
  – Identifying research priorities
  – Coordinating research program efforts
  – Sharing information
Energy Commission Next Steps

**Refine Research Areas**
- Conducting market research
*Oct 2018 – Feb 2019*

**Hold Public Workshop**
- Convene working group to coordinate efforts
- To be held in SoCal
*Mar 2019*

**Develop & Publish GFO**
- Develop scope
- Publish GFO
*Mar - July, 2019*
Panel

Dr. Larry Dale
Staff Scientist
Lawrence Berkeley National Laboratory

Brian D’Agostino
Director of Fire Science and Climate Adaptation
San Diego Gas & Electric

Dr. Brian Chen
Principal Manager of Grid Resiliency and Public Safety
Southern California Edison
ASSESSING THE IMPACT OF WILDFIRES ON THE CALIFORNIA ELECTRICITY GRID

EPIC FUNDED PROJECT

Larry Dale, Michael Carnall, Max Wei
Lawrence Berkeley National Laboratory

Gary Fitts, Greenware Technologies

Sarah Lewis MacDonald, Envision Geo
We focused on selected parts of the transmission and distribution grid.

Transmission “Paths”

Distribution “Fringe” Areas

Evaluated 351 historical wildfires approaching these paths.

Evaluated 360 historical wildfires approaching fringe areas.

Credits: Dale et al. 2018.; CEC; WECC Envision Geo

Credits: Dale et al. 2018.; USGS Envision Geo
We identified grid exposure to wildfires

Los Angeles basin fringe
Nearby fires 2000-2016
We rated the impact severity of the fires

Transmission: CAISO rating system (351 fires)
Distribution: LBNL rating system (361 fires)

<table>
<thead>
<tr>
<th>Transmission Impact Severity Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Large</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(# fires)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CAISO action</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change dispatch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outage, re-dispatch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System wide threat</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

WECC Paths
- 125 fires
- 69% Low
- 2% Small
- 15% Medium
- 13% Large
- 2% Very Large

Other
- 226 fires
- 78% Low
- 3% Small
- 11% Medium
- 2% Large
- 0% Very Large

- Most fires have no impact on the grid
- A few fires have very large impacts
We forecast changes to future T&D wildfire risk

Wildfire risk now highest along Southern California’s coastal mountains.
Wildfire risk growing fastest in the Northern California mountains (U.C. Merced Model)
Finally, we evaluated selected adaptation options

Transmission
- Eliminate transmission
  - Micro grids
- Move transmission
  - to low fire risk areas
- Diversify transmission
  - Add widely spaced lines or underground lines in high risk areas
  - WECC transmission capacity is concentrated in some high fire risk areas

Distribution
- Eliminate distribution exposure
  - Buy up development rights in high fire risk zones (FEMA?)
  - Encourage urban infill, limit sprawl
- Underground lines
Research gaps

• Modeling Studies
• Adaptation Studies
• Integration Issues
• High Fire Risk Area Identification
Backup Slides
## Distribution—rate fire impacts

**LBNL rating system (360 fires)**

<table>
<thead>
<tr>
<th>Distribution Impact Severity Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Severe</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Catastrophic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No Fringe Burned</th>
<th>Partial Fringe Cell</th>
<th>Between 2-5 Fringe Cells</th>
<th>Between 6-10 Fringe Cells</th>
<th>Over 10 Fringe Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Northern California</strong></td>
<td>103</td>
<td>84%</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Southern California</strong></td>
<td>257</td>
<td>58%</td>
<td>12%</td>
<td>18%</td>
</tr>
</tbody>
</table>

- Most fires have no impact on the grid
- A few fires have very large impacts

Source: GIS analysis applied to wildfire fringe data set (Cal Fire 2001-2016)
## Total Cost of Fires?

Including cost of service interruptions, structural damage, alternative fire projections and 2017 update.

<table>
<thead>
<tr>
<th>Cost (million USD annual)</th>
<th>Current</th>
<th>Mid Century</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total (low)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission</td>
<td>$84</td>
<td>$89</td>
</tr>
<tr>
<td>Distribution (Westerling 2018)</td>
<td>$975</td>
<td>$897</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$1,059</td>
<td>$985</td>
</tr>
<tr>
<td><strong>Total (medium)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission</td>
<td>$84</td>
<td>$89</td>
</tr>
<tr>
<td>Distribution (Jin et. al 2015)</td>
<td>$975</td>
<td>$1,570</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$1,059</td>
<td>$1,659</td>
</tr>
<tr>
<td><strong>Total (high)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission</td>
<td>$84</td>
<td>$89</td>
</tr>
<tr>
<td>Distribution (Jin et al 2015), plus 2017 headline fires</td>
<td>$1,682</td>
<td>$2,710</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$1,767</td>
<td>$2,799</td>
</tr>
</tbody>
</table>
Locate high risk wildfire locations

• Pressing need to flag high risk fire areas
• Red flags include urban areas with:
  – Rapidly rising wildfire risk
  – Located in regions with risk of Santana or Diablo events
  – Downwind of transmission lines
  – Low density, relatively high fringe cell counts
Low Density (extensive WUI)

Credits: Dale et al.; USGS; CalOES
Envision Geo
Areas with Rising Fire Risk:

SACOG

Changes in Fire Probability to Developed Fringe Areas 2009 to 2049

- No Change
- 50 to 72%
- 21 to 50%
- 11 to 20%
- 6 to 10%
- >0 to 5%
- -5 to <0%
- -10 to 5%
- -20 to -9%
- -20 to 28%

Developed Areas (2049)

Westerling Fire Data
Cell Size

Credits: Dale et al.; USGS; Westerling et al.
Envision Geo

Fringe Fire Probability Change 2009-2049
Transmission lines and wind

Camp Fire Active Perimeter, Wildland Urban Interface (WUI) & Major Transmission Paths

Intermix WUI are areas where housing and vegetation intermingle. Interface WUI are areas with housing in the vicinity of contiguous wildland vegetation.

WUI CLASS 2010
- High_Dens_Interface
- Med_Dens_Interface
- Low_Dens_Interface
- High_Dens_Intermix
- Med_Dens_Intermix
- Low_Dens_Intermix
- Low_Dens_NoVeg
- High_Dens_NoVeg

Transmission Line Major Path

Credits: Dale et al.; Silvis Lab.; CEC; CalOES
Envision Geo
Modeling Studies

• Transmission
  – Additional modeling of wildfire impacts
    • Utility help with “extrapolation spreadsheet” assumptions.
    • Utility estimates of generation cost impact from fire related line outages.
    • Additional PLEXOS runs to better characterize costs impacts of wider range of interruption types, for more path locations and different time periods.

• Distribution
  – More detailed modeling of wildfire spread into urban core areas
    • More probabilistic modeling to explain why fires penetrate some cells and not others.
• Fire Adaptation studies
  – Fire resistant transmission
    • Locate paths that should be undergrounded or relocated.
      – Locate the most vulnerable paths to future wildfire damages.
      – Work with utilities and CAISO to determine the benefits of undergrounding (cost of transmission interruptions).
  – Fire Resistant WUI cells.
    • This is a natural extension of the fire spread modeling work. That work should help identify characteristics of WUI cells that successfully warded off past fires in nearby cells.
    • The work could be expanded to include more detailed information about the type of buildings in WUI cells that resisted past fires, and their value.
  – Fire Resilient Landscapes
    • Obviously, similar work is needed to help identify fire resistant landscapes and landscape treatments (e.g., controlled burns, forest thinning, irrigation).
Study Integration Issues

– Transmission-caused wildfires
  • It bears repeating that the grid itself impacts wildfires.
  • There may be good reasons for separating studies of fire impact to grid, from grid impacts to fires.
  • Some grid resilience options provide benefits that can only be counted by integrating these two types of studies (undergrounding).

– Wildfire model projections
  • Different wildfire models incorporate many uncertain variables:
    – Precipitation
    – Wind speed
    – Ignition (transmission and wind)
  • Gather and pool different fire model projections, perform scenario analysis of variables
    – Similar to climate model ensemble projections
    – Isolate the impact of key variables (wind vs temperature vs vegetation).
Model the cost impact

PLEXOS Example: Path 26

Path 26 (NorCal-SoCal)
2000-2016 Fires within 0.25 miles of a Major Path

Linking northern and southern California grids

Credits: Dale et al. 2018.; FRAP; CEC Envision Geo
EPIC Symposium
SDG&E’s Wildfire Preparedness
February 19, 2019
### SDG&E Service Territory

- 4,100 Square Miles
- ~2,350 Square Miles in High Fire Threat District (HFTD)
- 1.4 Million Electric Meters
- ~4,100 Employees

<table>
<thead>
<tr>
<th></th>
<th>Distribution</th>
<th>Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substations</td>
<td>136</td>
<td>20</td>
</tr>
<tr>
<td>Poles/Structures</td>
<td>208,970</td>
<td>14,330</td>
</tr>
<tr>
<td>Circuits</td>
<td>1,033</td>
<td>237</td>
</tr>
<tr>
<td>Circuit Miles</td>
<td>17,000+</td>
<td>1,970+</td>
</tr>
<tr>
<td>OH Circuit Miles</td>
<td>6,500+</td>
<td>1,800+</td>
</tr>
</tbody>
</table>
• SDG&E operates America’s most granular utility-owned weather network with over 200,000 pieces of weather data collected daily
• Future steps include additional installations in coastal canyons and Wildland Urban Interface areas
• Weather stations in high risk areas are being rebuilt with latest technology
• Over 100 high definition cameras improve fire detection with 16 Pan-Tilt-Zoom Alert SDG&E cameras in service and additional installations planned for 2019
A planning and decision support tool, which has been back-tested, developed by SDG&E to communicate the wildfire potential on any given day, classifying the fire potential within each of its 8 operating districts:

- A seven-day forecast product, produced daily
- Incorporates weather, live fuel moisture, dead fuel moisture, and greenness of the annual grasses
- Used to inform operational decisions, work restrictions, resource allocation
Protection Philosophy

- Three types of protection functions in SDG&E’s automated reclosers:
  - Normal Profile: Protects circuits under normal conditions.
  - Sensitive Profile: Relay is very fast and incredibly sensitive in order to isolate faults faster than normal profile.
  - Sensitive Ground Fault: This setting detects high impedance faults which largely result from downed conductors.

Protective Devices

- **Sensitive Profile** and **Sensitive Ground Fault** Protection
  - Over 270 distribution circuit automated reclosers in the HFTD have the capability for sensitive profile and sensitive ground fault protection

- **Falling Conductor Protection**
  - Developing technology to de-energize conductors prior to hitting the ground
  - As part of SDG&E’s fire hardening efforts, devices are being installed to enable the future deployment of falling conductor technology
Developing a wireless communication infrastructure for increased reliability and system coverage, enhanced security, and remote access capabilities.

- Providing wider system coverage allowing for additional remote intelligent devices to manage the grid
- Improved network availability and reliability for mobile workforce and electric and gas infrastructure
- Increased network bandwidth allowing for remote access of electric equipment and reduction in truck rolls
- Enhanced cyber security capabilities for remote management and automation
- Standardized technology that enables of grid services and expanded network coverage (Falling conductor, SCADA, Push to Talk, DERMS, Microgrids, DER, etc.)
Questions?
EPIC Symposium

Wildfire Prevention Technologies

February 19, 2019
SCE wildfire mitigation efforts combine long-standing practices with additional enhancements.

- Long-Standing Operational Practices
- Investing in System Hardening of Electric Grid
- Bolstering Situational Awareness Capabilities
- Enhancing Operational Practices
Mitigation Strategy is Based on Fire Science

Weather Conditions (Wind, Humidity)

Energy from Electrical Infrastructure

Vegetation & Structures

Eliminating Any Side of the Fire Triangle Prevents Ignitions
Investing in System Hardening

- Covered Conductor
- Faster-Acting Fuses & Reclosers
- Fire Resistant Poles
Bolstering Situational Awareness Capabilities

**Weather Stations**
- Hi-Res Data
- Local Weather

**Situational Awareness Center**
- 24/7 monitoring
- SCE meteorologists

**Advanced Weather Modeling**
- Better Forecasting
- Advanced Warning

**Fire Monitoring Cameras**
- High-Definition
- Remote-controlled

Fire Cameras: [www.alertwildfire.org](http://www.alertwildfire.org)
Enhancing Operational Practices

Infrared Scanning

Vegetation Management

Public Safety
Power Shutoff

Protective Device Settings
EPIC Demonstration

Intelligent Modern Pole
(Possible EPIC)

Downed Conductor Mitigations
Next Generation Distribution Automation - SSTDR (EPIC)
Meter Alarming of Downed Energized Conductor (not EPIC)
Lunch Session is Currently in Progress

Please Join WebEx Room Number 926 591 014
energy.webex.com
Enabling Localized Clean Energy Portfolios

Moderator: Max Gomberg

Presenters: Dr. Hanna Breunig, Thomas Gratz, Logan Olds, Dr. Sebastien Tilmans, Mark McDannel
CEC EPIC Project: Advancing Cleaner, Less Costly, More Reliable Distributed Generation to Enable Customer Solutions and Zero-Net Energy Communities

Lawrence Berkeley National Laboratory
Corinne Scown, Staff Scientist, Project PI
Alastair Robinson, Program Manager, Project Co-PI
Hanna Breunig, Research Scientist
Ling Jin, Project Scientist

Partners and Supporters:
Allotrope Partners
PepsiCo
Everycs
International District Energy Association
High-Moisture Solids (thousand BDT/yr)

- High-moisture solids are fairly consistent month-to-month and dominated by manure
- Next largest contributor is MSW
- Row crop culls, high-moisture crop residue, and food processor waste are more seasonal
- MSW concentrated in populous South Central Coast region
- Manure concentrated in Northern Valley region
Forestry residue is likely to dominate low-moisture organic residue availability.

Orchard & vineyard residue and food processor low-moisture waste are next largest contributors.

Processor low-moisture solids are made up largely of almond waste.

Seasonality is less problematic for low-moisture waste but does require storage.
Assembling & Disseminating Actionable Information

• We aim to house the datasets generated in easy-to-access or visualize, centralized locations.

Smelly: an odor dispersion web-tool to support odor assessment and AD siting decision

biositing.jbei.org

https://tin6150.github.io/smelly
Food Waste Recycling Program

Mark McDannel
Los Angeles County Sanitation Districts

EPIC Symposium
February 19, 2019
Basic Research on Co-digesting Food Waste and Sludge 2011-2012
Quantified Potential for Methane Production

Food Waste Slurry characteristics: Total Solids ~ 14% by wt., Volatile Solids ~ 92% by wt., COD ~ 222,400 mg/L

Adding 10-12% (v/v) food waste slurry to sludge could double biogas production

CH₄ Increase 112%

Gas production with food waste

Prior to Food Waste Addition

Gas production without food waste

17-Jan 31-Jan 14-Feb 28-Feb 13-Mar 27-Mar 10-Apr 24-Apr
Demonstration and Commercialization Phases 2014-2020

Food Waste → Pre-Processing → Anaerobic Digestion → Digester Gas

- Fertilizers/Composting
- Heat/Steam
- Electricity
- Biomethane
- Vehicle Fuel
Pre-processing Facility Started up 2018
Full Scale Demonstration 2014-2018
Conversion of Digester Gas to Vehicle Grade CNG 2020

- Single-pass membrane filtration system to integrate with existing CNG station to utilize 100% biogas
- Produce up to 2,000 GGE’s per day of RNG @ the CNG Station

Biogas 62% CH₄ → Permeable Membrane Filter Strand → RNG 90% CH₄
EPIC Symposium 2019

San Luis Obispo AD Project

Executing a 36,500 TPY Food And Green Waste AD Facility in California
### Key Data

<table>
<thead>
<tr>
<th><strong>Technology</strong></th>
<th>Kompogas HSAD System with CHP for power production</th>
</tr>
</thead>
</table>
| **Project Type** | FDBOO (Finance, Design, Build, Own, Operate)  
• First Kompogas Reference Plant in US |
| **Project Cost** | ~25 M$ (incl. Project Development) with Power only concept  
• Financing through HZI and federal/state grants |
| **Subsidy** | Grants: CalRecycle, CEC EPIC, CAEATFA)  
• ITC program (Investment Tax Credit) |
| **EPC** | HZIU (expected project duration 15 months) |
| **O&M** | Kompogas SLO LLC (duration 20 years) |
| **Customer** | Waste Connection with its Subsidiaries |
| **Feedstock** | 36,500 tons/year |
| **Property** | Owned by WC Subsidiary – leased by Kompogas SLO LLC  
• Existing Building modified to fit overall plant concept |
| **Compost & Liquid Digestate Sales** | Compost to be sold into local agricultural market  
• Liquid digestate as soil amendment for local farming |
KOMPOGAS® - High Solids Plug Flow AD
First class technology combined with HZI turn-key capability

Proprietary Technology from HZI

- Feeding System
- Digester
- Discharge System
- Dewatering
- Gas Utilization

Engineered by HZI

- Electrical, Instrumentation and Controls
- Balance of Plant and Energy Utilization
- Site and Building Services
- Civil

Managed by HZI

- Project, Site and Construction Management

Integrated Solution

Maximized Efficiency

Reliable Execution
Projected Milestones

- Major construction completed July 2018

- Hot commissioning – commenced August 2018 with inoculation of digester

- First feeding late September 2018

- Facility on line since December 2018.
Networking Break and Poster Session
Resilient and Equitable Communities

Moderator: Commissioner Martha Guzman Aceves

Presenters: Michelle Tirto, Ram Narayananmurthy, Andy Brooks, Dr. Peter Alstone, Madeline Stano
Just Transition

Madeline Stano
@MadStano
madelines@greenlining.org
Just Transition
Optimizing Water Heating Performance for Multifamily ZNE

Andy Brooks · Director of West Coast Operations, AEA

February 14, 2019
Demonstration Sites

Calistoga Family Apartments

Cloverdale Family Apartments

Atascadero Family Apartments

Benner Plaza
Calistoga HVAC+ DHW System
Cloverdale HVAC+ DHW System
Atascadero DHW System
Benner DHW System
<table>
<thead>
<tr>
<th>Project Name</th>
<th># of buildings</th>
<th># of units</th>
<th># of stories</th>
<th># of bedrooms</th>
<th>CZ</th>
<th>Targeted pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calistoga Family Apartments</td>
<td>1</td>
<td>48</td>
<td>2</td>
<td>1-3</td>
<td>2</td>
<td>30-60% AMI</td>
</tr>
<tr>
<td>Cloverdale Family Apartments</td>
<td>1</td>
<td>31</td>
<td>2</td>
<td>2-3</td>
<td>2</td>
<td>30-60% AMI</td>
</tr>
<tr>
<td>Atascadero Family Apartments</td>
<td>2</td>
<td>59</td>
<td>2</td>
<td>2-4</td>
<td>4</td>
<td>30-60% AMI</td>
</tr>
<tr>
<td>Benner Plaza</td>
<td>1</td>
<td>66</td>
<td>3/podium</td>
<td>1-3</td>
<td>4</td>
<td>30-60% AMI</td>
</tr>
</tbody>
</table>
New Project: To Launch Q2-2019

Mass Deployment Model for ZNE Retrofits

INITIATIVE OVERVIEW

CEC EPIC GFO 17-304
Thank You
Solar+ for Small and Medium Commercial Buildings

CEC EPC 17-002

Peter Alstone
Schatz Energy Research Center
Humboldt State University

February 19, 2019
CEC EPIC Symposium

Core Project Partners:
Schatz Energy Research Center at Humboldt State University
Lawrence Berkeley National Lab
Blue Lake Rancheria
Can we make microgrids streamlined and affordable for small sites with high resilience value?

**Integrated Process for Solar+ at Convenience Stores**

- **Reactive power support** and other service to distribution and bulk power system
- **Model-predictive control** of building thermal systems for low-cost solar support service
- **Targeting sites** based on remote sensing with AMI and local power system values

Manage increased peak loads from hosting **EV charging**

Owner / Operator value proposition based on energy upgrade

Optimal sizing and control of storage in the context of Solar+ integration

*Figure 1: Illustration of integrated research objectives for Solar+ at convenience stores*
Major Research Tasks

- Design and construct solar (60 kW), battery (109 kW/174 kWh), and controls upgrades
- Design and implement software for Model-predictive control and integrating building and electrical systems
- Operate facility to test demand response and resilience performance
- Market research on ubiquitous SMB, and focus on convenience stores
- Synthesis of work on hardware, software, and market
Blue Lake Rancheria
Clean energy deployment leadership

Solar+ at the Playstation C-store

Award winning 500 kW microgrid project (foreground)
Distributech 2018 Project of the Year Award
FEMA’s 2017 Whole Community Preparedness Award
Enabling affordable, healthy, decarbonized communities

Ongoing EPIC collaboration

Ram Narayanamurthy
Program Manager

EPIC symposium
Sacramento, CA
2-19-2019
Enabling Healthy, Affordable communities

Efficiency

Electrification & decarbonization

Health & Comfort

Local generation

Customer Economics

Health, Comfort and cost all impact “quality of life” in affordable housing communities.

Decarbonization through comprehensive efficiency, electrification and community solar could significantly improve quality of life in affordable housing.
Ongoing initiatives in affordable housing

Comprehensive whole building retrofits with efficiency and electrification to create low carbon affordable housing communities

Zero Carbon mixed use affordable housing in Fresno

Addressing the “digital divide” in conjunction with the lifeline program

Resilient communities with Solar + Storage+ DC power in transitional housing

Job training offered as part of PV installation
Enhancing Existing Communities

Existing Community

- Inefficient gas wall heating
- Old Evaporative Cooler Ducting
- Outdoor water heater
- Inefficient lighting

Updated Systems

- Heat Pump Replacements
- Community PV
- LED lighting replacements
Electrification learnings in existing communities

- Affordable housing solar programs such as SOMAH increase customer benefits with electrification
- Customer costs for infrastructure upgrades can be a barrier to electrification
Enabling property owners for community upgrades

- **Property Owner**
  - Low Income Weatherization Program
  - SOMAH program
  - CARE program
  - ESA program
  - Multifamily Upgrade Program

**Financing Options**

- **Step 1: Utility Direct Install Programs**
  - These programs cover full retrofit costs, but require individual tenant agreements.

- **Step 2: Multifamily Affordable Solar**
  - These programs offset cost of solar and set the path for electrification while reducing customer costs.

- **Step 3: Low Income Weatherization Programs**
  - These programs are based on carbon metrics and enable electrification, but electrification needs solar in many multifamily locations to offset electrification cost burden.

- **Step 4: Multifamily Upgrade Programs**
  - These programs are rebates and are post install to cover some of the costs not covered by other programs.

**OBF, PPA, loans, etc.**
Together...Shaping the Future of Electricity