2019 EPIC FALL WORKSHOP

• Friday, November 8, 2019 •

9:30 am - Check-In • 10 am-3 pm Workshop

SDG&E CP East • 8680 Balboa Ave, San Diego, CA 92123

Participant Packet

Presented by:

California Energy Commission

Pacific Gas & Electric Company

Southern California Edison

San Diego Gas & Electric

STATE OF CALIFORNIA ENERGY COMMISSION

PG&E Pacific Gas and Electric Company

SOUTHERN CALIFORNIA EDISON Energy for What's Ahead

SDGE A Sempra Energy utility

2019 EPIC Fall Workshop

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Workshop Agenda

If you are interested in learning more about the EPIC administrators' investment plans for the third triennial cycle and discussing upcoming changes to EPIC programs, then please join us for our 2019 EPIC Fall Workshop in San Diego. This event is FREE and open to the public and will be structured as a working session. You can attend in person or virtually online.

Time	EPIC Sessions	Presenters, Moderators
9:30 AM	Participants Arrive, Check-In, and Pick Up Materials – Workshop starts promptly at 10 am	
10:00	Safety Message and Participant Introductions	Workshop Opening
10:15	Welcome from SDG&E	Miguel Romero Vice President - Energy Supply
10:25	CPUC: EPIC Overview and Purpose of New Policy and Innovation Coordination Group (PICG)	Amy Mesrobian, CPUC Supervisor, Emerging Procurement Strategies Energy Division
10:40	Overview, Status, and Discussion of PG&E's EPIC-3 Implementation	Dan Gilani, PG&E
11:10	Overview, Status, and Discussion of SDG&E's EPIC-3 Implementation	Frank Goodman, SDG&E
11:40	Overview, Status, and Discussion of SCE's EPIC-3 Implementation	Aaron Renfro, SCE
12:10 PM	LUNCH – please be back ***by 1:20 pm***, workshop resumes promptly at 1:25 pm	
1:25	Overview, Status, and Discussion of CEC'S EPIC-3 Implementation: Clean Energy Investments Aimed at a Zero Carbon California Grid	Fernando Pina, CEC
1:55	Overview of Research Administration Plan (RAP) and Future Stakeholder Engagement Plans	Administrator Panel Discussion CEC, PG&E, SCE, SDG&E
2:35	Summarization of EPIC Workshop Results and Actions	Frank Goodman, SDG&E Moderator
3:00	WORKSHOP ADJOURNED – Thank you for joining us	

California's Electric Program Investment Charge (EPIC) *is an electricity research, development, and demonstration (RD&D) program with three broad goals: (1) To improve the reliability of electricity service for California ratepayers; (2) To lower electricity costs for California ratepayers; and (3) To increase safety for California ratepayers.*

EPIC was created by the California Public Utilities Commission (CPUC) in 2011 and is administered by the California Energy Commission (CEC), Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison (SCE).

Attending Virtually Online?
Skype Broadcast and SLI.DO

These links and event codes were sent via a separate calendar notice to all registrants on Nov 7, 2019

SKYPE BROADCASTING LINKS:

"MORNING" SKYPE BROADCASTING SESSION #1:

Fri, Nov 8, 2019 from 10 am – 1 pm – CP East – Auditoriums A/B

Join the meeting

You can join from any PC or mobile device browser for ***BOTH*** audio and visuals

- For help joining this meeting, click here
- To learn more about Skype Meeting Broadcast for your next event, click here

"AFTERNOON" SKYPE BROADCASTING SESSION #2:

Fri, Nov 8, 2019 from 1:00 pm – 3:30 pm – CP East – Auditoriums A/B

Join the meeting

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SLI.DO – Post your questions/comments here

Please run this concurrent with the Skype Broadcasting sessions so you can submit questions and comments for the 2019 EPIC Fall Workshop.

- Go to https://www.sli.do/
- Event Code – 1EPIC
- Type in your question in the "Ask the Speaker" box – press send
- Scroll down to see what other questions have been asked and you can even vote on the questions you would like answered first

SKYPE CALL-IN PHONE # - *Audio ONLY*

The Skype Broadcasting links above provide BOTH audio and visuals via your laptop or mobile phone but if needed, here's a Skype Call-In Phone # and ID #:

- Phone - 1 (619) 676-9998
- Conference ID# - 660-470-895#
- *Please note ***Toll charges will apply***

Questions or problems accessing virtual meeting – please email:

- Donna Miyasako-Blanco, SDG&E EPIC Team - DMiyasako-Blanco@sdgecontractor.com

2019 EPIC Fall Workshop Details

Date Time Cost	**Friday, November 8, 2019 9:30 am - Check-In, 10 am-3 pm – EPIC Workshop** **No admission charge for participants**
Location Address	SDG&E's CP East Campus 8680 Balboa Ave, San Diego, CA 92123
Eventbrite Registration	https://www.eventbrite.com/e/2019-epic-fall-workshop-tickets-73038342649
Virtual Conference Link	To attend the workshop virtually, please register and you will be sent the MS Teams link closer to the workshop date.
Event Objective	To promote awareness and visibility of the current EPIC investments, facilitate stakeholder engagement, improve coordination, and provide more transparency regarding research progress and results. Stakeholder engagement is vital to the success of the EPIC program.
Security Clearance	Once registered, you will be added to the guest list. When you arrive at SDG&E's CP East campus, please check in with the lobby security.
Food & Beverages	Will not be provided at this workshop but a café is located onsite with coffee, grab & go snacks and a grill. All purchases are made with credit or debit cards at kiosks – ***no cash is accepted***. For lunch, a list of nearby restaurants will be provided. Water dispensers are also available to refill your personal water containers.
Onsite Wi-Fi	Instructions will be given on how to access SDG&E's guest wi-fi service at the workshop
Dress Code	Business casual
For More EPIC Information	More EPIC information will also be available on the public websites of the four EPIC administrators: • California Energy Commission • Pacific Gas & Electric • Southern California Edison • San Diego Gas & Electric
Event Manager	Donna Miyasako-Blanco, SDG&E EPIC Team DMiyasako-Blanco@sdgecontractor.com

Stakeholder Engagement

The ***2019 EPIC Fall Workshop*** will engage stakeholders in the execution of the EPIC-3 portfolio aimed at safety, clean energy, resiliency, affordability and equity in a zero-carbon future.

EPIC Administrator Commitments to Stakeholders

- Investing in critical areas
  - Worker and public safety
  - Clean energy
  - Ongoing power system improvements to enhance reliability and contain costs
- Supporting transparency through stakeholder engagement
  - Workshops
  - Results dissemination in final reports, annual reports, workshops and EPIC Symposium
- Investments in disadvantaged, low-income, and tribal communities

Investor Owned Utility Areas of Project Emphases in EPIC-3 Cycle

- ***Wildfires***
  - Prevention, mitigation, and supporting critical facilities during wildfire events
- ***Power System Modernization and Operations Advancement***
  - Demonstrating new capabilities to improve system operations
  - Strategic use of unmanned aircraft systems to support operations
  - Improving system reliability and resilience
  - Improving operating efficiencies
  - Demonstrating new safety capabilities
  - Advancing energy storage technologies and their system integration
  - Microgrid applications
- ***Customer Service & Enablement***
  - Provide integrated tools to allow customers to explore DER adoption & bill impacts

List of In-Flight & Upcoming EPIC-3 Projects

EPIC-3 Project Number	PG&E - Project Title
3.03	Distributed Energy Resource Management System (DERMS) and Advanced Distribution Management System (ADMS) Advanced Functionality
3.11	Location-Specific Options for Reliability and/or Resilience Upgrades
3.15	Proactive Wire Down Mitigation
3.20	Data Analytics for Predictive Maintenance
3.27	Multi-Purpose Meter (MPM)
3.29	Advanced Customer Bill Scenario Calculator
3.32	System Harmonics for Power Quality Investigations
3.43	Service Issue Identification Leveraging Momentary Outage Information

Stakeholder Engagement

EPIC-3 Project Number	SCE - Project Title
GT-18-0002	Advanced Technology for Field Safety
GT-18-0005	Smart City Demonstration
GT-18-0007	SA-3 Phase III Field Demonstrations
GT-18-0008	Distributed Cyber Threat Analysis Collaboration
GT-18-0009	Energy System Cybersecurity Posturing (ESCP)
GT-18-0011	Distribution Primary & Secondary Line Impedance
GT-18-0012	Advanced Comprehensive Hazards Tool
GT-18-0016	Distributed Plug-In Electric Vehicle Charging Resources
GT-18-0017	Service and Distribution Centers of the Future
GT-18-0018	Control and Protection for Microgrids and Virtual Power Plants
GT-18-0019	Distributed Energy Resources Dynamics Integration Demonstration
GT-18-0022	Power System Voltage and VAR Control Under High Renewables Penetration
GT-18-0035	Cybersecurity for Industrial Control Systems

EPIC-3 Project Number	SDG&E - Project Title
3	Application of Advanced Metering Infrastructure to Advanced Utility System Operations
4	Safety Training Simulators with Augmented Visualization
5	Unmanned Aircraft Systems with Advanced Image Processing for Electric Utility Inspection and Operations
7	Demonstration of Multipurpose Mobile Battery for Port of San Diego and Other Applications • Module 1: Port Area Applications • Module 2: Application at Community Resource Centers in Wildfire Risk Areas

California Energy Commission

Please see next page for the list of projects and grant funding opportunities

Energy Commission's Commitments

- Investing in Clean Energy for a Zero Carbon Future
- Supporting Transparency Through Stakeholder Engagement
    - Workshops
    - Forums
    - EPIC Symposium
- Investing in disadvantaged, low income and tribal communities

Systems Research Results and Plans to Move Innovation

- ***Microgrids – Supporting Resiliency with Clean Energy Systems***
    - High Penetration Renewable Microgrids Support Critical Facilities and Showcase Best Practices and Lessons Learned
        - Blue Lake Rancheria – Humboldt County
        - Kaiser Permanente – Richmond
        - Fremont Fire Stations
    - EPIC-3 Research to be released in 2020 with objective to inform SB 1339 to commercialize microgrids
- ***Energy Storage – Building a Portfolio of Energy Storage Options for California***
    - Advancing non-Lithium Ion Technologies
        - Eos – Zinc Hybrid
        - Amber Kinetics – Flywheel
        - UniEnergy Technologies – Flow Battery
    - Solicitations
        - Guidebook for customer side of the meter energy storage
          Released September 9th
        - Energy Storage Demonstrations – long duration storage and investments in residential, disadvantaged, low income, and tribal communities
          Anticipated Mid-November 2019
        - Advancing non-Lithium Ion technologies
          Anticipated Mid-November 2019
        - Simulation of long duration storage for California
          Anticipated Mid-November 2019
- ***Wildfire***
  In scoping phase with consideration to technologies that support critical facilities during emergencies
    - Anticipated public workshop in December 2019
- ***Connect with the CEC***
    - Facebook
    - Twitter
    - LinkedIn
    - Empower Innovation

Welcome!

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2019 EPIC FALL WORKSHOP

Info & Safety Messages

- Cafeteria
- Restrooms
- Security Desk in Lobby at main entrance
- Wi-Fi access – SDG&E email address
- Q&A Guests *must* use mics
- Emergency Procedures
  - Call 911 – Kirsten Petersen (Lobby Security)
  - Get AED – Laurence Abcede
  - CPR Volunteers – Nick Hudson, Eric Whitaker, Laurence Abcede

2019 EPIC FALL WORKSHOP

Emergency Evacuation

In case of emergency, please immediately exit and meet outside at the Red Star area of this map

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2019 EPIC FALL WORKSHOP

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Questions/Problems:
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- She can send you the official calendar notice with all the links shown on this page

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2019 EPIC FALL WORKSHOP

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2019 EPIC Fall Workshop
Welcome Comments

SDGE
A Sempra Energy utility

Miguel Romero
Vice President, Energy Supply

2019 EPIC Fall Workshop
November 8, 2019

SDG&E EPIC Public Website
www.sdge.com/epic

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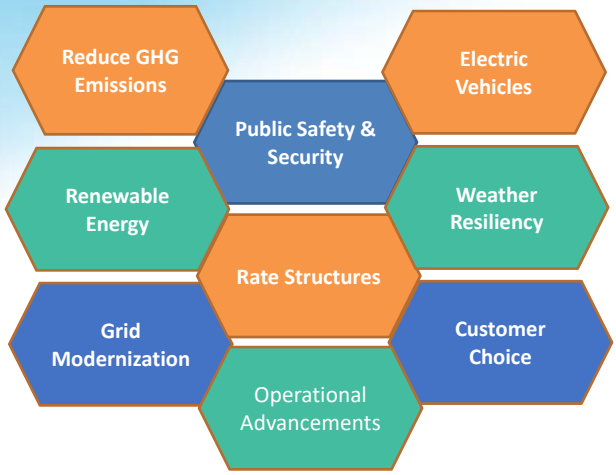
Evolving Industry



Role of the EPIC Program

- EPIC is a California Public Purpose Program that seeks to address these industry challenges [through new technology solutions]
- Workshop Purpose: Stakeholder engagement
  - Review EPIC status
  - Obtain input from stakeholders to guide the four EPIC administrators in the implementation of EPIC-3 projects
- EPIC Administrators
  - California Energy Commission
  - Pacific Gas and Electric Company
  - San Diego Gas & Electric Company
  - Southern California Edison Company

Example of Past EPIC Accomplishment

- Demonstration of software tools for analyzing large amounts of data coming from drones
- Data analysis provides significantly more information than mere visual viewing of images

- Applications
  - Avian cover identification
  - Vegetation encroachment identification
  - Cataloging and remote asset management

Thank You and Enjoy Your Time in San Diego

San Diego and vicinity are blessed with abounding recreational opportunities.

- Beaches
- Zoo and parks
- Mountains
- Hiking and biking
- Many others

Hotel and restaurant lists included in the registration packet.

Thanks for participating in the workshop and enjoy yourselves.

EPIC Overview

Amy Mesrobian, Supervisor
California Public Utilities Commission, Energy Division
EPIC Fall Workshop
San Diego, CA
November 8, 2019

CPUC Ratepayer Funded Research, Development & Deployment

Electric Program Investment Charge (EPIC)
- $555 million for 2018-2020

California Energy Systems forthe 21st Century
- $35 million for 2014-2019

Natural Gas Research and Development
- $24 million/yr

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EPIC Overview

- CPUC established in 2011, funded by electric utility customers
- Provides investments in clean energy innovation to benefit California ratepayers

Applied Research & Development

Technology Demonstration & Deployment

Market Facilitation

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EPIC Key Accomplishments

- 2017 Program Evaluation found program largely on track in meeting goals & providing ratepayer benefits
- By the end of 2018:
  - Funded 550+ projects
  - CEC $380 M in match funding
  - 32% of CEC Technology Demonstration and Deployment funds awarded to projects in low-income or disadvantaged communities
- 47 projects focused on wildfires and/or resiliency

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EPIC Recent Activity at CPUC

- January & October 2018: CPUC approved administrator investment plans for 2018-2020
- April 2019: 3 utilities jointly submitted research administration plan to CPUC
- October 2019: CPUC created new rulemaking to consider EPIC beyond 2020

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EPIC Continuous Improvement

Policy + Innovation Coordination Group

- Identify key EPIC results & CPUC needs and goals
- Identify Policy + Innovation Partnership Areas
- Support coordination, feedback, and info sharing

IOU Research Administration Plans

- Transparent program admin
- Portfolio optimization
- Stakeholder engagement, info dissemination
- Benefits quantification

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Future of EPIC

New CPUC Rulemaking opened October 2019

Program Funding

- Level of funding after 2020
- Policy priorities

Program Improvements

- Administration improvements
- Program evaluation structure

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Additional Information

http://www.cpuc.ca.gov/energyrdd/

- CPUC RD&D analyst Jonathan L. Lakey jonathan.lakey@cpuc.ca.gov or (916) 327-6786
- CPUC supervisor Amy Mesrobian amy.mesrobian@cpuc.ca.gov or (415) 703-3175

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PG&E EPIC Update

Dan Gilani
11/8/2019

Electric Operations

Together, Building a Better California

EPIC 1 & 2 Highlights

EPIC 1 & 2 Highlights

Furthering DER Integration

- Utility-scale battery capabilities for market participation & distribution peak-shaving - (*EPIC 1.01 & 1.02*)
- Foundational DER Management System (DERMS) requirements - (*EPIC 2.02*)
- Smart Inverter (SI) demonstration and support of policy & standards development - (*EPIC 2.03A*)
- Analytical & cost-effective methods for meter phase identification - (*EPIC 2.14*)

Furthering Transportation Electrification

- Optimization tool for Direct Current Fast Charger (DCFC) placement - (*EPIC 1.25*)
- Demonstration of Vehicle to Home (V2H) technology - (*EPIC 2.03B*)
- Demonstration of EV submetering and support of CPUC's position on submetering protocol - (*EPIC 1.22*)

Enhancing Distribution Planning

- Improvements to demand forecasting - (*EPIC 2.23*)
- Optimization tool to target customers for Non-Wires Alternative (NWA) solutions - (*EPIC 2.22*)

Enhancing System Restoration

- Decision support system to improve the efficiency of restoration work plan development - (*EPIC 2.10*)

Furthering Wildfire Resiliency

- Solutions that use radio frequency data to predict asset failures - *(EPIC 2.34)*

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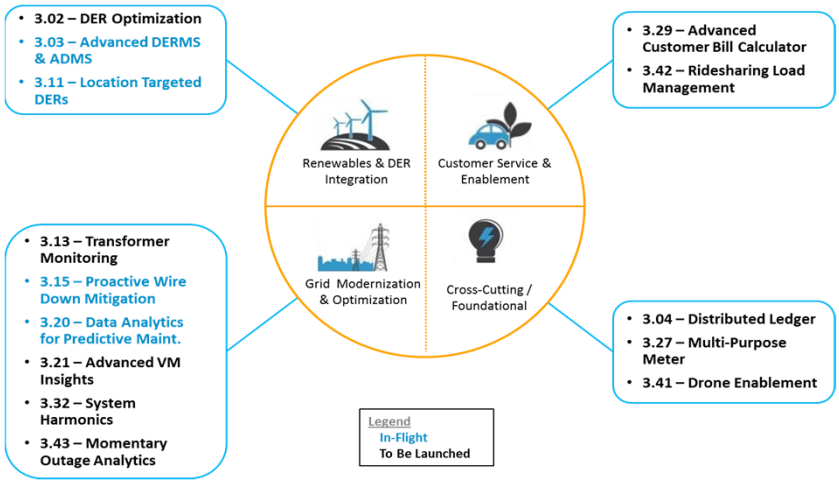
EPIC 3 – Wave 1

- **PG&E's EPIC 3 Application included 43 projects**
- **14 projects were identified for the first wave of execution (details below)**
- **Launch of wave 1 projects began in Dec 2018; remaining wave 1 projects to be launched by Q1 2020**



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In-Flight EPIC 3 Projects

3.03 – Advanced DERMS & ADMS

1 Issue / Gap Addressed

As Distributed Energy Resource (DER) penetration increases, the development and deployment of a centralized DER Management System (DERMS) will be required to monitor, control and optimize the dispatch of DERs to support utility efforts to safely and efficiently manage the grid.

2 Objective

Develop a DERMS head-end system and associated interfaces for DER telemetry & control and demonstrate this system on: 1) an operational remote grid and 2) on-grid DERs participating in a Non-Wire Alternative (NWA) project.

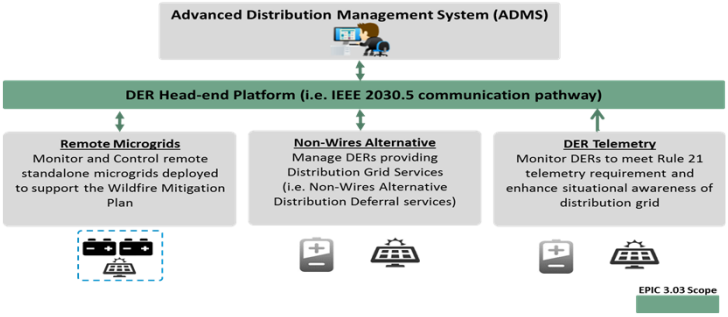
3 Profile

Timing
Launched Q2 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | *Value Chain*
Renewables & DER Integration |
Grid Operations / Market Design, Distribution, Demand-Side Management, Transmission



3.11 – Location Targeted DERs

1 Issue / Gap Addressed

Demand for microgrids is increasing. While Behind-the-Meter (BTM) microgrids are well-understood, there have not been Front-of-the-Meter (FTM), multi-customer microgrids enabled through PG&E-owned distribution assets. There is a need to develop standards for integrating multi-customer microgrids.

2 Objective

Configure the Arcata-Eureka airport's local microgrid controller to integrate the microgrid into PG&E's distribution network and enable Distribution Control Center visibility and control of the microgrid. Develop scalable and replicable approaches to planning, designing, deploying and operating multi-customer microgrids.

3 Profile

Timing
Launched Q1 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | *Value Chain*
Renewables & DER Integration |
Grid Operations / Market Design, Distribution, Demand-Side Management

Schatz Energy Research Center, Humboldt State University; PG&E; County of Humboldt; State of California Energy Commission; Redwood Coast Energy Authority; SEL Schweitzer Engineering Laboratories; Tesla; TRC; GHD; TEA The Energy Authority

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3.15 – Proactive Wire Down Mitigation

1 Issue / Gap Addressed

Energized wires down events have the potential to cause fire ignition.

2 Objective

Demonstrate Rapid Earth Fault Current Limiter (REFCL) technology at a PG&E substation serving a high fire-risk area, to assess its effectiveness at automatic current reduction in wires down events, with the goal of drastically reducing the likelihood of wires down events causing wildfires.

3 Profile

Timing
Launched Q4 2018

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	

Project Type | *Value Chain*
Grid Modernization and Optimization |
Grid Operations / Market Design, Distribution

Normal Ground Fault

With REFCL Technology

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3.20 – Data Analytics for Predictive Maintenance

1 Issue / Gap Addressed

Assets experience wear and tear, and eventually break down. Heuristics regarding expected useful life and level of utilization are currently applied in maintenance scheduling. There is opportunity to improve current practices by leveraging existing data sources to help detect signs of near-failure equipment.

2 Objective

Leverage GIS, weather, SmartMeter™, SCADA and other data to develop and demonstrate analytical models that predict when maintenance will be needed for distribution assets.

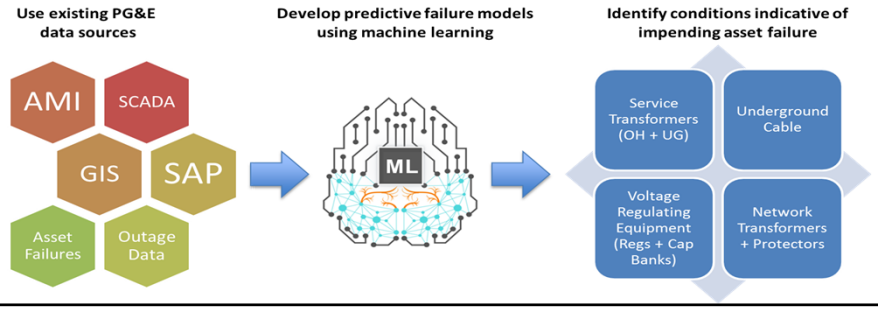
3 Profile

Timing
Launched Q2 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | *Value Chain*
Grid Modernization and Optimization |
Grid Operations / Market Design, Distribution



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Upcoming EPIC 3 Projects

(Planned Q4 2019 Launch)

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3.27 – Multi-Purpose Meter

1 Issue / Gap Addressed

PG&E has over 5 million SmartMeters™ deployed in the field and anticipates to replace 2.4M meters over the next 30 years. Existing SmartMeters™ have functional limitations for modern day applications (i.e. sub-metering) and have high replacement costs due to failure of meter components and associated truck rolls for individual meters.

2 Objective

Develop the "docking station" for PG&E's Next Generation Meter that demonstrates the capability of modularizing hardware components and measuring energy consumption of multiple customers or multiple uses at the same premise.

3 Profile

Timing
Expected to Launch Q4 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
	✓	✓

Project Type | *Value Chain*
Customer Service and Enablement | *Grid Operations / Market Design, Distribution*

Today

Future

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3.29 – Advanced Customer Bill Calculator

1 Issue / Gap Addressed

As DER penetration continues to increase, more customers will become increasingly engaged and want to optimize their bills. Currently, multiple stand-alone single-purpose tools are available, and these tools are targeted towards mass-market and only allow for simple rate analyses.

2 Objective

Develop an integrated online tool with a streamlined graphical user interface to allow customers to more easily understand how behavioral changes and technology investments may affect their energy bills.

3 Profile

Timing
Expected to Launch Q4 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
		✓

Project Type | *Value Chain*
Customer Service and Enablement | *Grid Operations / Market Design*

	Customizable	Interactive	Customer Friendly	Personalized / Historical-based	Integrated	Best Rate Analysis
Current Calculators	✓	✓	✓			✓
	✓		✓			
				✓		✓
EPIC 3.29	✓	✓	✓	✓	✓	✓

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3.32 – System Harmonics for Power Quality Investigations

1 Issue / Gap Addressed

Harmonics issues on the grid negatively impact customer equipment operation and can also damage utility assets. Higher incidence of harmonics issues is anticipated with increased DER penetration. Currently, PG&E is notified of potential issues through customer complaints, and dispatches troublemen/engineers to install monitors on-site and collect data.

2 Objective

Demonstrate the use of modern SmartMeters™ to detect, investigate and mitigate harmonic issues on the distribution system.

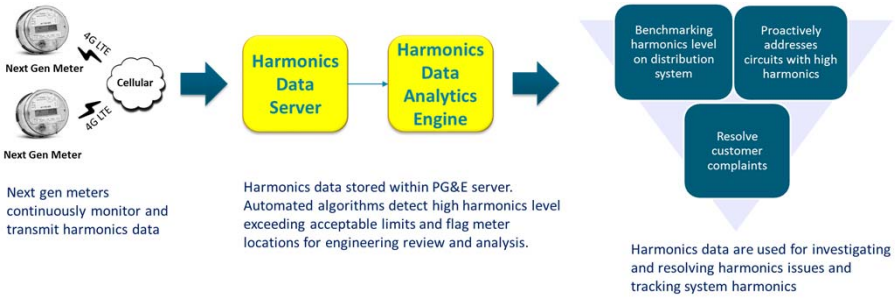
3 Profile

Timing
Expected to Launch Q4 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	

Project Type | *Value Chain*
Customer Service and Enablement | *Grid Operations / Market Design, Distribution, Transmission*



Next gen meters continuously monitor and transmit harmonics data

Harmonics data stored within PG&E server. Automated algorithms detect high harmonics level exceeding acceptable limits and flag meter locations for engineering review and analysis.

Harmonics data are used for investigating and resolving harmonics issues and tracking system harmonics

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3.43 – Momentary Outage Analytics

1 Issue / Gap Addressed

PG&E SmartMeters™ provide alarm traps related to the meter's health and status during abnormal system conditions. This information is currently only used to troubleshoot individual meters. There is an opportunity to utilize this semi-real time data to develop algorithms that can potentially identify the sources of the momentary outages to enable predictive maintenance.

2 Objective

Develop analytical models that use AMI momentary events and trap alarms to identify issues with customer service drops, distribution equipment, and intermittent vegetation contact.

3 Profile

Timing
Expected to Launch Q4 2019

Customer Benefits

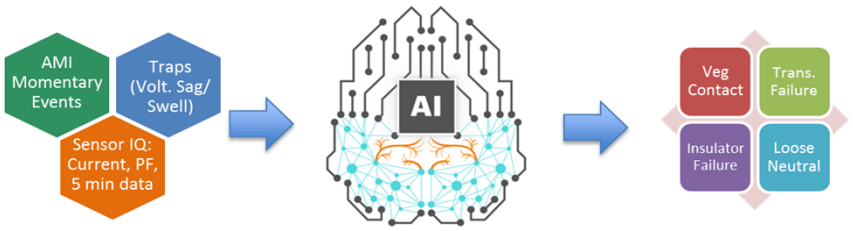
Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | *Value Chain*
Grid Modernization and Optimization | *Grid Operations / Market Design, Distribution*

Use existing PG&E data sources

Develop predictive failure models using machine learning

Identify conditions indicative of impending asset failure



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Next Steps

- Continue Execution of EPIC 3 Wave 1
  - Bid opportunities will be posted on PG&E's website here
- Potentially Launch EPIC 3 Wave 2
  - Launch of Wave 2 contingent on CPUC approval to access the remaining 1/3 of program funds
  - 29 projects remaining from PG&E's EPIC 3 Investment Plan
  - Short list of candidate projects will be presented at a public workshop, to gather stakeholder input and further flesh out plans before projects are selected and launched
  - ~4-6 projects will be selected

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Discussion

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San Diego Gas & Electric Company
EPIC Update

Frank Goodman, Program Manager

2019 EPIC Fall Workshop
November 8, 2019

SDG&E EPIC Public Website
www.sdge.com/epic

Overview

- Highlights of EPIC-1 and EPIC-2 Accomplishments
- Overall EPIC-3 Implementation Status
- EPIC-3 Project Overviews and Accomplishments to Date
- Discussion

EPIC-1 Highlights

Accomplishment: Demonstrated tools and operating capabilities for advanced distribution system automation to support grid modernization and integration of distributed energy resources.

Project	Primary Strategy and Policy Touchpoints
Smart Grid Architecture Demonstrations	Distribution System Modernization, DER Integration
Visualization and Situational Awareness Demonstrations	Distribution System Modernization, DER Integration
Distributed Control for Smart Grids	Distribution System Modernization, DER Integration
Demonstration of DER Grid Support Functions	Distribution System Modernization, DER Integration
Smart Distribution Circuit Demonstrations	Distribution System Modernization, DER Integration

Comprehensive final project reports on www.sdge.com/epic

EPIC-2 Highlights

Accomplishment: Demonstrated and evaluated capabilities for data analytics, interoperability of new technologies, emerging standards for communications infrastructure.

Project	Primary Strategy and Policy Touchpoints
Modernization of Distribution System and Integration of DER	Substation and Distribution System Modernization, DER Integration
Data Analytics in Support of Advanced Planning and System Operations	Distribution System Modernization, Asset Management
Monitoring, Communication, and Control Infrastructure for Power System Modernization	Distribution System Modernization, DER Integration
System Operations Development and Advancement	Distribution System Modernization, DER Integration
Integration of Customer Systems into Electric Utility Infrastructure	Customer-Focused Services, Distribution System Modernization

Comprehensive final project reports on www.sdge.com/epic

EPIC-3 Wave 1: In Progress
Mapping to EPIC Framework

Mobile Battery Storage

Renewables & DER Integration

Customer Service & Enablement

Mobile Battery Storage

Grid Modernization & Optimization

Cross-Cutting/ Foundational

- **Meter Data to Support System Operations**
- **Safety Training Simulators**

- **Advanced Applications on Unmanned Aircraft Systems**
- **Safety Training Simulators**

EPIC-3 Project Life Cycle

Past
- Vetting and submission of application to CPUC (2016-2017)
- Approval of project in application (2017-2018)

Past
- Engage champion Director and form project team (Starting in Q4, 2018)
- Write project plan and add to team as needed

Past
- Site identification and basic fact finding
- Initial benefits assessment and metrics setting

Now
- Contractor and equipment procurement
- Use case definition and test planning

Future
- Perform pre-commercial demonstration
- Perform data analysis; revise benefits analysis; determine value proposition

Future
- Develop findings, conclusions, and recommendation on commercial adoption
- Prepare and submit comprehensive final report

EPIC-3 In-Flight Projects
Key Focus Issues-1

- **AMI for Operations Demonstration (Lead: Amin Salmani)**
  - Reliability, resiliency, and improved system operations
- **Safety Training Simulator Demonstration (Lead: Mike Colburn)**
  - Customer and employee safety
  - Wildfire mitigation and response
- **UAS-Related Demonstrations (Lead: Christine Asaro)**
  - Asset life and asset management
  - Vegetation management
  - Wildfire mitigation and response
  - Support for power system operations

EPIC-3 In-Flight Projects
Key Focus Issues-2

- **Mobile Battery Demonstrations (Lead: Chequala Fuller)**
  - **Module 1**: Port and related applications
    - Customer demand management
    - Reliability and resiliency
    - GHG emissions reduction
  - **Module 2**: Application at community resource centers
    - Customer support during wildfire and other high-risk events
    - Reliability and resiliency
  - **Both Modules**:
    - Safety and transportability issues (weight, size, toxicity of battery chemistry)
    - Simple and safe docking capability
    - Costs and benefits: Valuation proposition

Application of AMI Data to Advanced Utility System Operations

1 Objective

- Demonstrate capabilities for leveraging advanced metering infrastructure (AMI) to provide actionable secondary voltage data and analysis to support utility operations.
- Provide improved operating practices that contribute to better power quality, higher reliability, reduced electrical losses in the power system, increased safety, and reduced cost.

2 Overview

AMI is a rich source of data that could be of significant value in enhancing distribution system operating practices. Capabilities for accessing and applying the data to solving operating problems need to be demonstrated. This project will demonstrate critical capabilities of the AMI system, such as use as a voltage sensor network and as a phase identification tool.

3 Profile

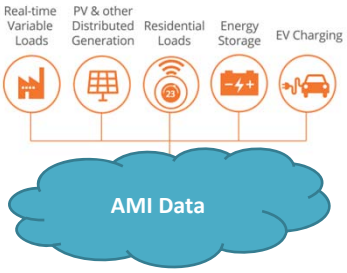
Timing
Launched Q1 2019

Primary Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | Value Chain
Grid Modernization & Optimization | Distribution

Demonstrating a data-driven paradigm for power system operations



Application of AMI Data to Advanced Utility System Operations

Module 1

Leverage existing AMI infrastructure to provide a secondary voltage monitoring network solution (Collaborative funding with NREL).

- Identify network model discrepancies
- Develop AMI data-based insights
- Demonstrate novel visualization tools
- Enable AMI-based controls

Possible EV Locations

Module 2

Application of AMI data to automatically identify phasing information within the distribution system.

- Demonstrate use cases to support the following analytical work
- Compare analytical methods and other potential alternatives for phase identification
- Demonstrate analytical algorithms that use SCADA, Geographic Information System (GIS), and AMI data for automated phase identification
- Identify challenges for commercial deployment of the proposed methods
- Make recommendations regarding prospective commercial adoption

Example Application of AMI Data to Advanced Utility System Operations

Location of Voltage Exceedances (Duration >10 min.)

Safety Training Simulators with Augmented Visualization

1 Objective

Demonstrate and evaluate training capabilities for field focused design, operations, and asset monitoring and management solutions.

Demonstrate the ability of the latest simulator technologies to train utility industry **personnel** on safety related issues, such as electric potential zones and wildfire risks.

2 Overview

Safety training is important to every job, and its importance is elevated when dealing with high voltage power equipment used by utilities.

Advanced training simulators can help electric utility crews train and improve worker safety, proficiency, and productivity.

3 Profile

Timing
Launched Q1 2019

Primary Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

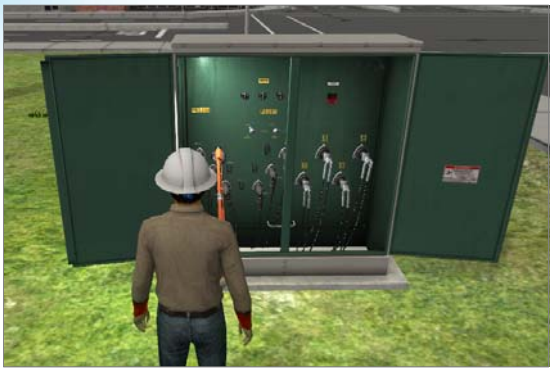
Project Type | Value Chain
Grid Modernization & Optimization | Distribution

Project Consists of Two Modules:

- Personal Protective Grounding/Equipotential Zone Work Methods
- Focused Patrol for Distribution Line Outages

Module for Personal Protective Grounding/Equipotential Zone Work Methods Simulator Demonstration

- A key safety element for utility lineworkers
- Effective initial and refresher training is key for competency
- Special attention is required for underground



Module on Personal Protective Grounding/Equipotential Zone Work Methods

- Use virtual reality goggles and other visual and tactile feedback devices in training
  - Available from multiple vendors, at various levels of maturity
  - No vendor is known that has fully developed this particular use case
- Build a physical "test yard", as the basis for performing the precommercial demonstration

Project approach – test the student before and after the completion of simulator-based training.

The improvement in work performance is a metric on the effectiveness on the training

Compare to conventional training methods

"Focused Patrol" Demonstration Module

There are many potential causes of faults!

- Animal Contact
- Severe Weather
- Party Balloons
- Customer Problem
- Wire Slap
- Vehicle Contact
- Tree/Vegetation Contact
- Undetermined
- Equipment Failure
- Human Error
- Foreign Object in Lines
- High Winds

"Focused Patrol" Demonstration Module

Finding Where the Fault Has Occurred Can be a Challenge!

Often, in rural settings, nobody sees the fault occur, so no initial reports arrive

- Some circuits are over 100 miles long
- Physical access is sometimes a problem
- These things can delay restoration of customers

Need to use all available data to locate faults

- Fault distance data from relays
- Wireless fault indicator targets
- Targets from contemporary SCADA equipment
- Possible use of contingency voltage from AMI
- Apply algorithm to narrow the search
- Assess accuracy compared to conventional "divide and conquer" approach

Unmanned Aircraft Systems (UAS) with Advanced Image Processing for Electric Utility Inspection and Operations

1 Objective

Define, demonstrate, and evaluate concepts for instrumentation and monitoring of power system equipment using enhanced imaging and sensor technologies on UAS.

Determine the potential to increase reliability, safety, and cost efficiency to improve power system operations.

2 Overview

SDG&E has done extensive past work on UAS applications. Analysis of high quality images and data from UAS has been effective in aiding time-sensitive decisions in operations in many applications.

This project seeks to expand capabilities of UAS in asset aging issues and wildfire mitigation.

3 Profile

Timing
Launched Q1 2019

Primary Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | Value Chain
Grid Modernization & Optimization | Distribution

Supports and increases staff efficiencies of 7 departments including:

- Aviation Services Department
- Electric Distribution Engineering
- Distributed Energy Resources
- Fire Risk Mitigation
- Fire Science and Coordination
- Transmission, Construction & Maintenance
- District Operations & Engineering

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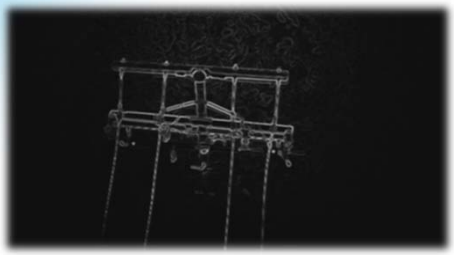
Example: UAS Application after Public Safety Power Shutoff (PSPS)

- During extreme weather events, to mitigate the risk of a potential ignition source, SDG&E has implemented PSPS.
- Created a red flag UAS operations procedure to include duty day schedule due to the PSPS.
- After the PSPS, UAS crews will support inspecting overhead power lines to check for debris on infrastructure and equipment damage prior to re-energizing lines.



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Example: UAS-Based Corona Camera

- SDG&E is the first company in the US to fly a corona camera on a UAS
- Completed 5 successful test flights on Aug 19 & 20, 2019

UAS Test Team in Action: Christine Asaro, Brian Yates & Teena Deering

Image captured from UAS flight on Aug 20, 2019

Demonstration of Multipurpose Mobile Battery for Port of San Diego and Other Applications--Module 1

1 Objective

Demonstrate a mobile battery system at the Port of San Diego's cruise ship terminal during the peak cruise ship season and in other applications at other locations during nonpeak season

Evaluate stacking of various benefits that can be derived from the mobile battery at multiple locations.

2 Overview

Pre-commercial demonstration, showcasing the concept of utilization of a containerized, mobile battery energy storage system for various locations and use cases.

Evaluate the stacking of benefits when rotated between applications, identifying preferred applications and feasibility for commercialization.

3 Profile

Timing
Launched Q1 2019

Primary Customer Benefits

Demand Charge ↓	GHG Emissions ↓	Back Up Power
✓	✓	✓

Project Type | Value Chain
Renewables & DER Integration/Customer Service & Enablement | Distribution

Mobile Battery - Use Cases and Prospective Benefits

EPIC-3 Second Wave

Requires CPUC release of remaining EPIC-3 funds

Module 2 of Mobile Battery Project

- Powering critical loads at Community Resource Centers (CRCs)
- CRCs activated during emergencies
- Reliable power need to support vital activities in the CRCs
- Batteries provide an emission-free alternative to diesel generation
- Batteries can be moved to other applications, when there is no emergency event

Discussion

SDG&E EPIC Website: www.sdge.com/epic

Thank you for your participation

Southern California Edison
EPIC Update

November 8, 2019

Energy for What's Ahead℠

Highlights from EPIC 1 & 2

SOUTHERN CALIFORNIA EDISON®

EPIC 1 & 2 have helped with our analytics and transportation electrification efforts

Analytics

1. **Storm Impact Prediction Demonstration** to predict estimated asset damage by district to pre-stage resources.
   - Technology transferred to Grid Ops & Business Resiliency
2. **Distribution Transformer Early Failure Detection** analyzes customer meter voltage data to identify transformers with internal damage that will lead to premature failure and allow for proactive planned replacement.
   - Technology transferred to the Reliability Operations Center
3. **Transmission Volt-VAR Optimization (VVO)** developed to assist grid operators to eliminate voltage violations on the transmission system, reduce the total system losses, and improve the overall voltage profile.
   - The tool resides on a server at the SCE's grid control center and interacts with the energy management system (EMS) to monitor the transmission system.

Transportation Electrification

1. **DC Fast Charger Impact Demonstration** assessed the grid impacts of 13 DC fast charger sites to validate compliance with standards, determined SCE infrastructure supports current demand, and informed development of future demand management.

EPIC 1 & 2 have advanced our Grid Modernization efforts

Technical Findings

1. Informed **Advanced Distribution Management System** (ADMS) technical requirements and **DER Management System** (DERMS) contract plan
2. Identified best approach for **grid controls** and **communications**
   - Informed SCE's thinking on the right mix of centralized and decentralized approach
3. Developed SCE standards for **substation IT network design**
4. Advanced development of **Distribution Automation** devices and **High Impedance Fault Detection**
   - Informing Grid Modernization capital deployment decisions and supporting wildfire mitigation

Process Findings

5. Determined that **DER contracts** need to allow resource dispatch both at the individual and aggregate level
   - Engagement with DER acquisition organizations to ensure feasibility and viability of DER services
6. Demonstrated that **cyber assessments** and methodologies are not standard
   - Engagement with IT needed to ensure cyber and IT/OT integration challenges can be mitigated

EPIC 3

SOUTHERN CALIFORNIA EDISON®

EPIC 3 Overview

Portfolio Highlights

1. EPIC 3 application included 24 projects
2. Proposed 2 replacement projects in the RAP filing (*May 1, 2019*)

Cancelled Projects	Replacement Projects
1. Reliability Dashboard Tools 2. Beyond the Meter Phase 2	1. Wildfire Prevention & Resiliency Technology Demonstration 2. Beyond Lithium-Ion Energy Storage Demonstration

3. Portfolio is balanced across project types[1] and electric utility value chain

	Renewables & DER Integration	Grid Modernization & Optimization	Customer-focused Products & Services	Cross Cutting/ Foundational
Grid Operations/ Market Design				4
Generation	*Generation projects are only performed by the CEC*			
Transmission		1		
Distribution	9	9		
Demand-side Management	1			

Highest Priority Projects

1. SCE identified 13 projects for the first wave of execution[2]
2. All 13 are currently in planning and expected to commence in Q1 2020

1. Many projects span multiple project types and positions within the value chain. This table identifies the primary categories for each.
2. These projects have the highest alignment with the joint IOU framework and potential to create customer benefits.

Smart City Demonstration

❶ Overview
What does the project consist of?

Partner with a city to deploy a front-of-the-meter microgrid that supports a significant portion of the city's essential facilities (e.g., fire and police stations, community and senior centers, and emergency shelter) using SCE-owned energy storage and customer-owned DERs.

❷ Objective
What is the project trying to achieve?

Demonstrate how a utility could use customer- and utility-owned DERs to operate a microgrid to enhance resiliency while maintaining safety and reliability through minimally-disruptive islanding and reconnection.

❸ Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	

Project Type | ***Value Chain***
Renewables & DER Integration | *Distribution*

Power System Voltage & VAR Control Under High Renewables Penetration

1 Overview
What does the project consist of?

Perform hardware-in-the-loop simulation and demonstration of volt/VAR management and system restoration plans following a blackout event utilizing grid-forming inverter-based resources (BESS, PV or wind).

2 Objective
What is the project trying to achieve?

Demonstrate the capabilities and features of a blackstart-capable BESS on the SCE system and analyze new control methods to enable inverter-based resources to address inertia loss issues, and grid-forming controls through the blackout and subsequent restoration.

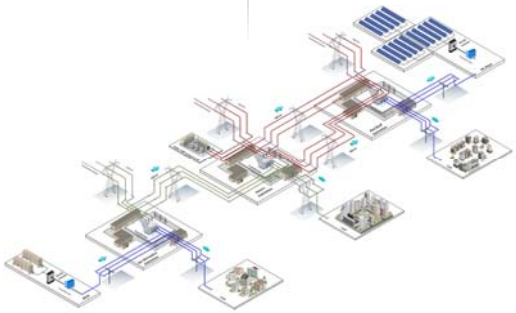
3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | ***Value Chain***
Renewables & DER Integration | *Distribution*



DER Dynamics Integration Demonstration

1 Overview
What does the project consist of?

Engage utility partners, inverter manufacturers and software vendors to demonstrate and validate DER dynamics using real-time hardware in-the-loop testing (distribution circuit and substation level testing). Lab testing data will be validated against field measurements.

2 Objective
What is the project trying to achieve?

Better understand the impacts of high DER penetration on the distribution and bulk power system. This should help to optimize SCE's integration capacity analysis (for bulk system constraints) and inform technical requirements and standards discussions in the industry.

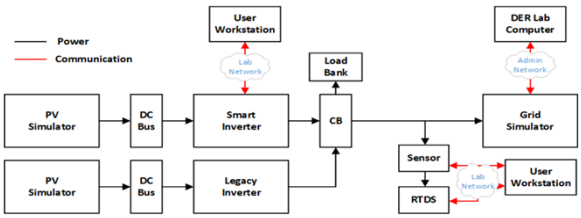
3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | ***Value Chain***
Renewables & DER Integration | *Distribution*



Control and Protection for Microgrids and Virtual Power Plants

1 Overview
What does the project consist of?

Evaluate control and protection schemes for behind-the-meter microgrids and virtual power plants at the distribution level. This will include assembling a microgrid testbed using a real-time simulator and performing hardware-in-the-loop testing. This testbed will be used for design, testing, and for an eventual field demonstration.

2 Objective
What is the project trying to achieve?

Identify control and protection schemes that can ensure the safe and reliable operation of distribution systems with behind-the-meter microgrids and virtual power plants (VPP). Such methods could also support system operations under high renewables penetration and highly variable grid topology. Cybersecurity testing is another primary goal.

3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | ***Value Chain***
Renewables & DER Integration | *Distribution*

Distributed Plug-in Electric Vehicle Charging Resources

1 Overview
What does the project consist of?

Pair plug-in electric vehicle (PEV) fast charging stations with energy storage to mitigate the grid impacts of fast charging. The project will also evaluate using energy storage for grid services.

2 Objective
What is the project trying to achieve?

Demonstrate how fast charging stations and energy storage can be used to improve grid reliability while supporting customer PEV adoption and fast charging. The project also aims to demonstrate the use of second-life PHEV batteries to support fast charging by reducing demand.

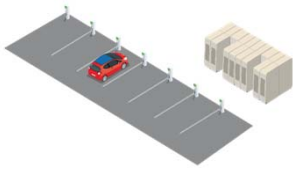
3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | ***Value Chain***
Renewables & DER Integration | *Distribution*



SA-3 Phase III Field Demonstrations

1 Overview
What does the project consist of?

Perform field demonstration of SA-3 technologies at SCE's Viejo Substation (220/66/12 kV). This will introduce IP-based communications to a transmission substation (for the first time). This project will also evaluate new substation technologies at other distribution substations.[1]

2 Objective
What is the project trying to achieve?

Demonstrate a modern substation automation system that meets the high availability needed for SCE's critical bulk power (>220 kV) substations, and demonstrate and evaluate the benefits of new substation automation technologies.

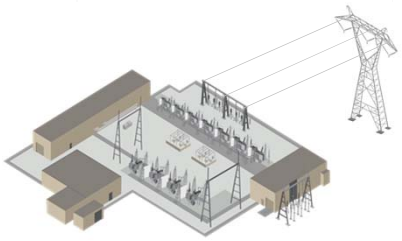
3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | ***Value Chain***
Grid Modernization & Optimization | *Transmission*



1. SCE will demonstrate a resonant ground fault interrupter, an IEC 61850 protection automation controller, process bus (in a field demonstration, and a virtualized protection system.

Distribution Primary & Secondary Line Impedance

1 Overview
What does the project consist of?

Advance SCE's data validation for its grid network connectivity model using data-driven techniques based on machine learning and artificial intelligence. This project will identify data gaps and provide recommendations to correct problems for network phasing, meter-to-transformer connectivity, and primary impedances.

2 Objective
What is the project trying to achieve?

Improve the accuracy of load flow and distribution state estimation results and improve real-time distribution grid management with more accurate distribution grid impedance models

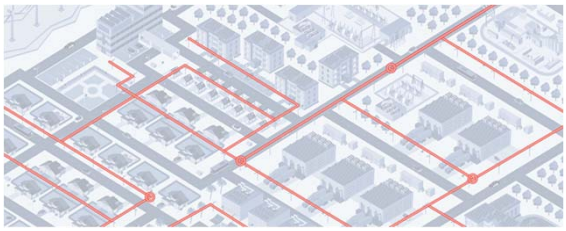
3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | ***Value Chain***
Grid Modernization & Optimization | *Distribution*



Cybersecurity for Industrial Control Systems

1 Overview
What does the project consist of?

Test adaptive security controls and dynamic re-zoning of operational data networks while the Industrial Control System (ICS) is either under cyberattack or subject to an increased threat level.

2 Objective
What is the project trying to achieve?

Demonstrate the ability to isolate affected grid sections from ongoing cyber attacks through multiple approaches. Success would include being able to clearly define a response to a cyber attack and to automate isolation of affected grid communications.

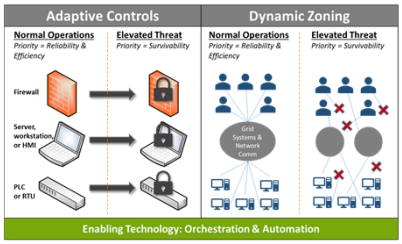
3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	

Project Type | ***Value Chain***
Cross Cutting/Foundational Strategies & Technologies |
Grid Operations



Distributed Cyber Threat Analysis Collaboration

1 Overview
What does the project consist of?

Collaborate with utility peers and notational analysis centers to consume internal and external sourcing cybersecurity threat feeds, process them for legitimacy, determine risk impacts, and potential responses

2 Objective
What is the project trying to achieve?

Demonstrate the ability to standardize and automate cyber-threat feeds across security operations centers, utilities and government agencies to shorten the time needed to analyze and respond to cybersecurity events.

3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	

Project Type | ***Value Chain***
Cross Cutting/Foundational Strategies & Technologies |
Grid Operations

Advanced Comprehensive Hazards Tool

1 Overview
What does the project consist of?

Demonstrate the use of geospatial analysis and risk assessment to identify high-risk hazard areas, asset specific vulnerabilities, and the impact of mitigations to enhance overall grid resilience. The analyses will be based on asset information, fragility analysis, and natural hazard data.

2 Objective
What is the project trying to achieve?

Determine the potential for configuring an extendible platform to determine the overall hazard risk of an asset (or area) by combining several hazard assessment features into a single tool. This would inform long term hazard mitigations and prove integrated situational awareness capabilities.

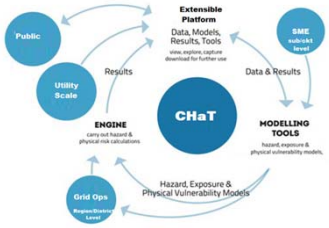
3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓		

Project Type | ***Value Chain***
Cross Cutting/Foundational Strategies & Technologies | *Grid Operations*



Service and Distribution Centers of the Future

1 Overview
What does the project consist of?

Deploy building electrification technologies and electric vehicle supply equipment (EVSE) with advanced communications and controls, and manage a commercial customer fleet of PEVs through demand response grid signals to help ensure reliable charging, support system voltage and balance demand (both at the service center and across the local service area).

2 Objective
What is the project trying to achieve?

Evaluate the ability to fully electrify a fleet service center with building electrification technologies (e.g., space and water heating), EVSEs and employee charging while managing any associated impacts to the local grid system. The results could inform future efforts to electrify other service centers, while also supporting commercial customer electric vehicle loads.

3 Profile
What are some relevant project details?

Timing
Expected to launch Q1 2020

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
	✓	✓

Project Type | ***Value Chain***
Cross Cutting/Foundational Strategies & Technologies | *Demand-side Management*

2019 EPIC FALL WORKSHOP

Lunch Break:

- Please be back by 1:20 pm
- Workshop resumes promptly at 1:25 pm

Online Guests:

- **sli.do** – stay signed into this app all day
- **Skype Broadcasting**
  - Sign into the "***Afternoon***" session

2019 EPIC FALL WORKSHOP

ATTENDING VIRTUALLY?

SKYPE BROADCASTING LINKS:

"AFTERNOON" SKYPE BROADCASTING SESSION #2:
Fri, Nov 8, 2019 from 1:00 pm – 3:30 pm
Join the meeting
You can join from any PC or mobile device browser for ***BOTH*** audio and visuals
- For help joining this meeting, click here
- To learn more about Skype Meeting Broadcast for your next event, click here

Sli.Do – Post your questions/comments here
Please run this concurrent with the Skype Broadcasting sessions so you can submit questions and comments for the 2019 EPIC Fall Workshop.
- Go to https://www.sli.do/
- Event Code – 1EPIC
- ***This SLIDO session runs 9:30 am – 3:30 pm***
- Type in your question in the "Ask the Speaker" box – press send
- Scroll down to see what other questions have been asked and you can even vote on the questions you would like answered first

SKYPE PHONE # - *Audio ONLY*
The Skype Broadcasting links above provide BOTH audio and visuals via your laptop or mobile phone but if needed, here's a Skype Call-In Phone # and ID #:
- Phone - 1 (619) 676-9998
- Conference ID# - 660-470-895#
- *Please note ***Toll charges will apply***

Questions/Problems:
- Donna Miyasako-Blanco, SDG&E EPIC Team
  DMiyasako-Blanco@sdgecontractor.com

- She can send you the official calendar notice with all the links shown on this page

2019 EPIC FALL WORKSHOP

Energy Commission
Enabling a 100% Clean Energy Future

Energy Commission's Commitments

Decarbonization

Achieve a decarbonized electricity system and economy by 2045

- Advance clean energy supply
- Increase efficiency and load flexibility
- Electrify energy end uses

Affordability & Equity

Lower energy burden and support vulnerable communities

- Address the challenges of low-income and disadvantaged communities
- Reduce costs and increase access to clean energy technologies

Resiliency

Increase the responsiveness of the grid in the face of risks

- Understand and anticipate grid risks
- Develop technologies and strategies to manage risks

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Research and Development for California's Clean Energy Future


Efficiency and Flexible Load


Renewable Generation


Storage & Grid Integration


Electrification


Climate Research


Entrepreneurship

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Benefiting Disadvantaged and Low-income Communities

Scalable Retrofits in Lancaster Disadvantaged Community


Village at Beechwood, Lancaster


Blower door testing of units


Solar thermal heat exchanger piping

EPIC Demonstration Funding:

- **32%** in **disadvantaged** communities
- **34%** in **low-income** communities

- Comprehensive retrofit solutions in 32 apartments
- Documenting technical and financial value
  - ≈**27%** annual electricity savings for units
  - ≈**30%** annual natural gas savings for the complex
- Learnings applied to two EPIC-funded multifamily retrofits in disadvantaged communities in Fresno and Ontario, CA.

Recipient: Electric Power Research Institute

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Storage & Grid Integration

HIGHLIGHTS

Solving Intermittency and Building Resilience with Storage

Storage Research Priorities:

- Reduce cost
- Improve functionality
- Demonstrate performance
- Ensure safety
- Diversify storage types

Benefits:

- Providing grid support
- Increasing resiliency to utilities and customers to prevent outages
- Enabling integration of renewables

Alternate Chemistry Aimed at Lower Cost

Eos Energy Storage

- Zynth™: Novel aqueous, zinc-based battery
- Abundant, non-toxic, fully recyclable, and lower-cost materials
- Critical data on energy response time, peak shaving, load following, cost savings
- Reduced system cost by **54%** as a result of EPIC funding
- Eos became the 1st company to accept orders below $100 per kWh for a DC battery system
- **$95M+** in follow-on investment

CEC Awarded: $2.1 M

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Flywheel Achieves 50% Cost Reduction

Amber Kinetics Inc.

- Demonstration of a 8 kW, 32 kWh flywheel system with a 4-hr discharge duration
- Established a baseline record for the reliability of the FESS for utility scale storage
- Advanced the commercial and technological viability of flywheels
- **50%+** cost reduction
- **$50M** in follow-on investment

CEC Awarded: $2 M

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Energy Storage Solicitations

2019-2020

- Developing Lessons Learned, Best Practices, Training Materials and Guidebooks for Customer Side of the Meter Energy Storage, $1M, released September 9 & proposals due Today
- Energy Storage Demonstrations, $20M, Anticipated by December 31
- Developing Emerging non-Lithium Ion Technologies, $11M, Anticipated by December 31
- Simulation of Long Duration Energy Storage in CA, $3M, Anticipated in December or January 2020

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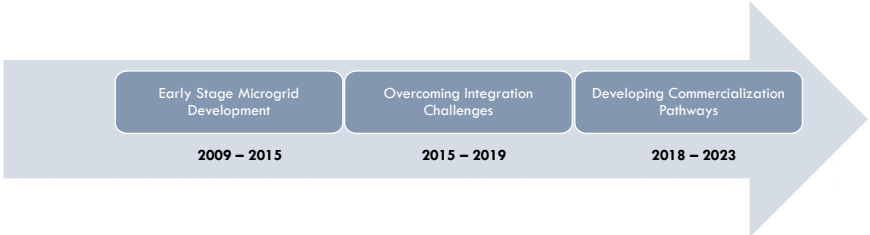
A Decade of Microgrid Research



- Supported controllers development
- Developed approaches to integrating multiple resources

- Demonstrated resiliency value of microgrids for critical facilities
- Integrated large number of resources and refined controller designs

- Creating business plans and commercialization pathways for microgrids in California

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Example Microgrid Demonstrations

Critical Facilities

Shelter

Medical Center

Fire Stations

City Hall, Police HQ, Community Centers

Waste Water Treatment Plant

Airport

Ports

Military

Communities

Industrial

Digester

Distribution Center

Microgrids on the Frontline of PSPS Resilience

Blue Lake Rancheria

Fremont Fire Station

Kaiser Permanente Richmond

Los Positas Community College

In an October 17, 2019 North Coast Journal article, Jana Ganion, Sustainability Director at the Blue Lake Rancheria said, "They credit us with saving lives. That's one of the things we get a little emotional about."

Microgrids on Frontline of PSPS Resilience

Blue Lake Rancheria Microgrid

- Integration of solar electric power with battery energy storage and conventional generators
- Seamlessly "islanded" during a wildfire-caused power outage and maintained critical operations and services during wildfires
- Reduced power costs **$160k+** per year – a **25%+** reduction – and **158** metric tons of CO2 per year

Source: Siemens USA

First commercial project to test Siemen's Advanced Microgrid Software

CEC Awarded: $5M

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Equipping Firefighters with Reliable Energy

Fremont Fire Station Microgrid

- Microgrids achieved **4 – 12 hours** of islanding for three fire stations
- 1st solar microgrid with battery back-up for fire stations
- **$250,000** savings over the 10-year PPA term
- Decreases GHGs by 142,000 lb annually

CEC Awarded: $1.45 M

Recipient: Gridscape Solutions, Inc.

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Anticipated Solicitations

2019-2020

- Microgrids – In scoping phase: Learn more about nine active microgrids and provide critical information to CPUC for SB 1339 efforts to commercialize microgrids, Anticipated 2020
- Wildfires – In scoping phase: Considering solar + storage, mobile microgrids and other technologies to help manage grid risks, Anticipated 2020

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Find a Partner on EmpowerInnovation.net

- Empower Innovation strives to accelerate your cleantech journey with easy access to funding opportunities from the Energy Commission and other funding providers, curated resources and events, and connections to people and organizations.

FIND A PARTNER
Announce your interest in this funding opportunity and message other interested parties to find potential partners.

RESOURCES & TOOLS
Browse the collection of resources for cleantech innovators including Resource Libraries, Funding Sources, Tools, and Databases.

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Video

Questions

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Energy Systems Research Office
Research and Development Division
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2019 EPIC FALL WORKSHOP

Overview of Research Administration Plan (RAP) and Future Stakeholder Engagement Plans

Administrator Panel Discussion

- CEC – Fernando Pina
- PG&E – Dan Gilani
- SCE - Aaron Renfro
- SDG&E – Frank Goodman

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2019 EPIC FALL WORKSHOP

Summarization of EPIC Workshop Results & Actions

Frank Goodman, SDG&E
Moderator


2019 EPIC FALL WORKSHOP
Upcoming EPIC Events
2020 EPIC Symposium
April 1-2, Wed–Thu
Sacramento State University
6000 J St, Sacramento, CA
Pacific Gas and Electric Company
EDISON
SDGE


2019 EPIC FALL WORKSHOP
Thank You
For
Participating
Pacific Gas and Electric Company
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San Diego – Nearby Restaurants

**Lunch is limited to 1 hour:15 mins - Many restaurants take online or phone orders for pick-up*

#	RESTAURANT	Mins from SDG&E	Phone	Address	City	Zip	Est. Cost	Google Rtg	Restaurant Type	Description
1	SDG&E CP East Cafeteria	On Site	Kiosk - credit or debit card required	8680 Balboa Ave	San Diego	92123	$$	na	On Site	On Site - Coffee, grab and go snacks, sandwiches, salads and grill
2	94th Aero Squadron	1 min	(858) 560-6771	8885 Balboa Ave	San Diego	92123	$$	4.3	American	Can walk across street - has a buffet - Aviation-themed spot for surf 'n' turf
3	Bud's Louisiana Café	4 mins	(858) 573-2837	4320 Viewridge Ave, San Diego, CA 92123	San Diego	92123	$$	4.6	Creole	Creole & Cajun classics with basic decor
4	Chopstix Too	4 mins	(858) 565-1288	4380 Kearny Mesa Rd #300	San Diego	92111	$	4.1	Japanese	Laid-back stop for familiar sushi rolls, specialty bowls & classic mains such as teriyaki.
5	Tajima Japanese Restaurant	4 mins	(858) 278-5367	4411 Mercury St #110	San Diego	92111	$$	4.5	Ramen	Sleek spot for ramen & small plates.
6	Elbowroom Bar & Grill	4 mins	(858) 874-3526	5225 Kearny Villa Rd	San Diego	92123	$$	4.2	Bar & Grill	Neighborhood bar & grill with games on TV, craft brews, pub eats & a pet-friendly patio
7	Sonic Drive-In	4 mins	(858) 694-0388	5247 Kearny Villa Rd	San Diego	92123	$	3.9	Fast Food	Old-school fast-food chain offering drive-in service & made-to-order burgers, sides & shakes.
8	Filippi's Pizza Grotto	4 mins	(858) 279-7240	5353 Kearny Villa Rd	San Diego	92123	$$	4.3	Italian	Chain outpost offering pizza & red-sauce Italian staples in generous portions.
9	Nishiki Ramen	4 mins	(858) 987-0222	8055 Armour St #201a	San Diego	92111	$$	4.6	Ramen	Bright, modern offshoot of a Japanese chain serving ramen & an assortment of small plates& snacks.
10	Nishiki Ramen	4 mins	(858) 987-0222	8055 Armour St #201a	San Diego	92111	$$	4.6	Ramen	Bright, modern offshoot of a Japanese chain serving ramen & an assortment of small plates& snacks.
11	Lil' Farmers Café	5 mins	(858) 430-6553	4240 Kearny Mesa Rd #113	San Diego	92111	$	4.5	Organic comfort food	Organic comfort food
12	Anny's Fine Burger	5 mins	(858) 278-0618	5375 Kearny Villa Rd	San Diego	92123	$$	4.4	Hamburgers	Health-conscious hangout featuring gourmet burgers, hot dogs & wings, plus weekday happy hour deals.
13	Greek Palace	5 mins	(858) 573-0155	8878 Clairemont Mesa Blvd	San Diego	92123	$$	4.2	Greek	Traditional Greek eats including spanikopita & souvlaki for dine-in or free delivery

San Diego – Nearby Restaurants

**Lunch is limited to 1 hr 15 mins - Many restaurants take online or phone orders for pick-up*

#	RESTAURANT	Mins from SDG&E	Phone	Address	City	Zip	Est. Cost	Google Rtg	Restaurant Type	Description
14	**Koon Thai Kitchen**	6 mins	(858) 514-8111	3860 Convoy St	San Diego	92111	$$	4.3	Thai	Modern Thai restaurant serving traditional dishes in striking, colorful surrounds
15	**Lit'l Pepper Gourmet Deli**	6 mins	(858) 565-6552	8911 Complex Dr # C	San Diego	92123	$$	4.6	Gourmet Deli	Upbeat counter-serve spot offering breakfasts & a long list of sandwiches, from classic to creative
16	**McDonald's**	6 mins	(858) 569-8386	8929 Clairemont Mesa Blvd	San Diego	92123	$	3.7	Fast Food	Classic, long-running fast-food chain known for its burgers, fries& shakes
17	**Rubio's Coastal Grill**	6 mins	(858) 278-0726	9187 Clairemont Mesa Blvd	San Diego	92123	$	4.3	Seafood	Chain spot for Mexican fare & fish tacos - small parking lot
18	**Taco Bell**	7 mins	(858) 576-0865	5335 Overland Ave	San Diego	92123	$	3.6	Fast Food	Fast-food chain serving Mexican-inspired fare such as tacos, quesadillas & nachos
19	Pho T Cali	7 mins	(858) 565-6997	7351 Clairemont Mesa Blvd	San Diego	92111	$	4.2	Vietnamese Pho	Locals return for familiar Vietnamese soups & dishes amongst a sleek decor inside a shopping center
20	**Wendy's**	7 mins	(858) 278-8530	9290 Clairemont Mesa Blvd	San Diego	92123	$	4.1	Fast Food	Fast-food burger chain serving sides such as chili & baked potatoes
21	**Casa Machado Restaurant**	8 mins	(858) 292-4716	3750 John J Montgomery Dr, San Diego, CA 92123	San Diego	92123	$$	4.4	Mexican	Mexican fare, cocktails & runway views
22	**Jersey Mike's Subs**	8 mins	(858) 279-6453	7420 Clairemont Mesa Blvd	San Diego	92111	$	4.4	Sandwich Shop	New Jersey-based counter-serve sandwich chain serving jumbo subs filled with cold cuts & toppings
23	**Homestyle Hawaiian**	8 mins	(858) 571-5828	7524 Mesa College Dr	San Diego	92111	$$	4.3	Hawaiian	No-frills spot for island-inspired eats
24	**Carl's Jr**	8 mins	(858) 560-8279	9355 Clairemont Mesa Blvd	San Diego	92123	$	4.1	Fast Food	Fast-food chain known for its variety of piled-high burgers & meal combos, plus shakes
25	**Subway**	8 mins	(858) 569-4109	9363 Clairemont Mesa Blvd	San Diego	92123	$	4.1	Sandwich Shop	Casual counter-serve chain for build-your-own sandwiches & salads, with health-conscious options