



What Does it Take to Electrify the Last Mile?



Bernie Kotlier, Executive Director, Labor Management Cooperation Committee, CA & NV

National Co-chair, Electric Vehicle Infrastructure Training Program



What Does it Take to Electrify the Last Mile?

- Best Forecast of the Scope of Solutions and Applications
- Good Vision and Good Luck
- Power Transformation (Gas & Diesel to Electricity)
- Long Range Utility Infrastructure Planning, Construction and Maintenance
- Coordinated Efforts by State, Counties, Cities, and Towns
- Adequately Skilled and Experienced Workforce
- Education and Training
- (And More)



Scope of Possible Solutions & Applications

- Tiered Fleets
- Electric Small Trucks
- Electric Mini Vans
- Electric Micro Vans
- Ride Share >>> Delivery Share Cars
- Delivery Share Micro Vans
- Autonomous Versions of Above
- Pedal and Pedal Electric Vehicles
- Drones
- Local Lockers
- Why So Much Electricity?



Decarbonization = Electrification?

Infrastructure, Infrastructure, Infrastructure:

- After all the years of development, all the money, and PR
Only 33 public hydrogen fuel cell filling stations in Calif.
- CA only state w/retail hydrogen vehicle refueling infrastructure (4 non-retail on East Coast)

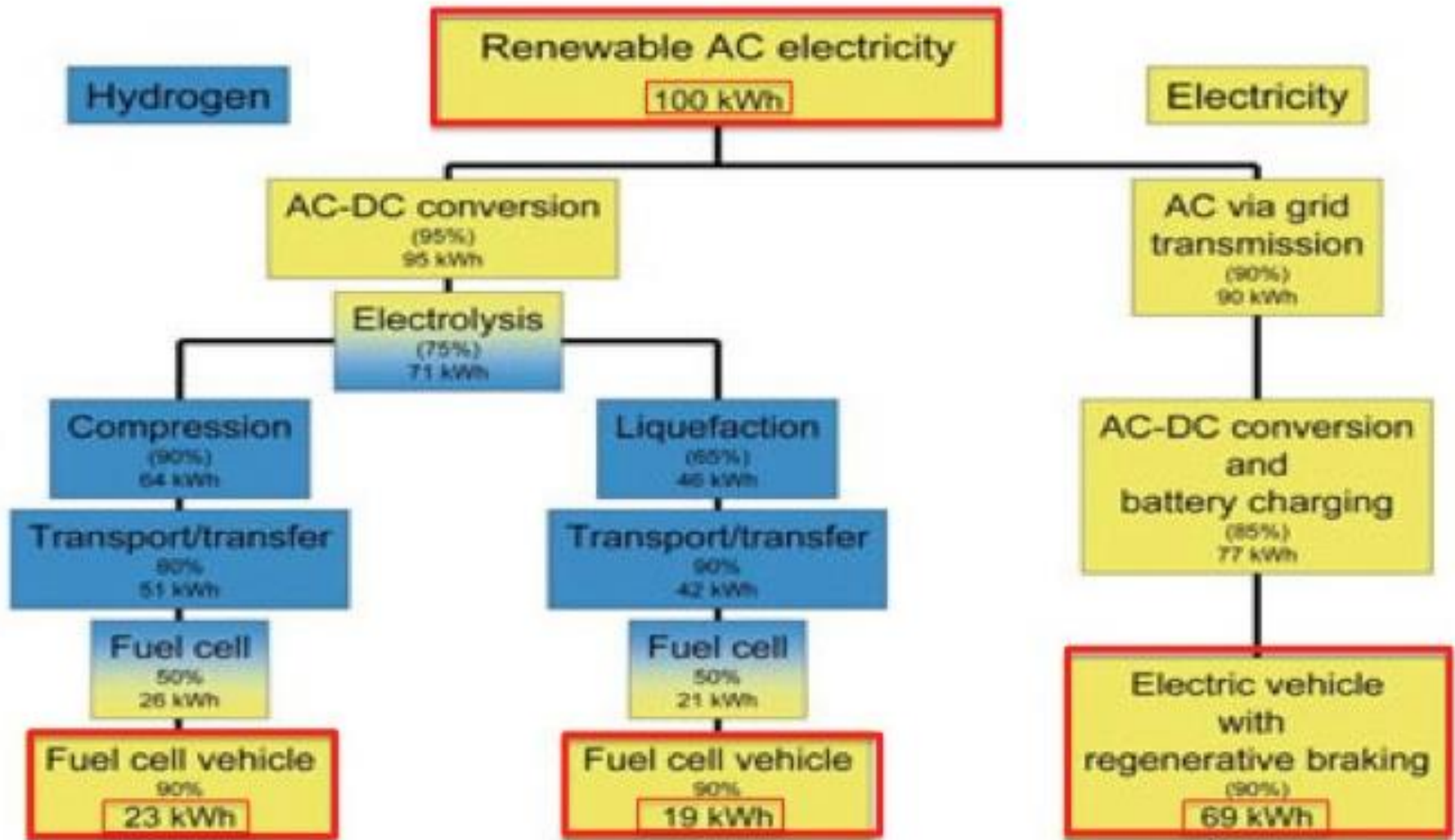
Hydrogen from?

- Sandia National Lab: When fuel cells use hydrogen from natural gas (methane), some emissions are the same or worse than diesel powered engines
- “The GHG emissions are worse.”
- Recent study: In S. F. Bay area, renewable hydrogen cost 1.5 - 2 times more than hydrogen from natural gas

HYDROGEN
The fuel of the future?



Hydrogen vs. Electric Efficiency



23%

19%

50-69%



What Does it Take to Electrify the Last Mile?

- **Best Forecast of the Scope of Solutions and Applications**



Tiered Fleet (U.K.): City-City; Neighborhood-Neighborhood; Street-Street





Amazon To Buy 100,000 Electric Vans From Rivian

By RYAN DENHAM • SEP 19, 2019





Renault EZ-FLEX (With Driver)





Arcimoto (With Driver)



Eugene, Oregon



Boxbot Launches Last-Mile Self-Driving Parcel Delivery



Oakland, CA



NURO Autonomous



Mt. View, CA



Ride Share To Delivery Share



1154 x 750



The Detroit Bureau

Walmart Teaming with Uber, Lyft to Deliver Groceries



**Lyft
&
Uber**

***“Walmart Groceries
Delivered at Uber Speed”***





UPS Pedal Electric



UPS driver Jake Jewett rides the new cargo e-bike, which can carry 400 pounds of cargo and go as fast as 20 mph. UPS is launching the service on a... (Steve Ringman / The Seattle Times) [More](#) ▾

The pilot project, an attempt to make downtown deliveries more efficient, will start in the Pike Place Market neighborhood and, if successful, could expand around Seattle and the nation.



Autonomous E-Van + Drone





Testing Now





(Not Now)





Volkswagen Pedal / Electric





(Not Electric)





Electric Vehicle
EVITP[™]
Infrastructure Training Program

Batteries Not included





Electric Vehicle
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What Do *Most* Have in Common? Electric Power





Where Will These Vehicles Charge?





Wireless Charging (May Also be Overhead)





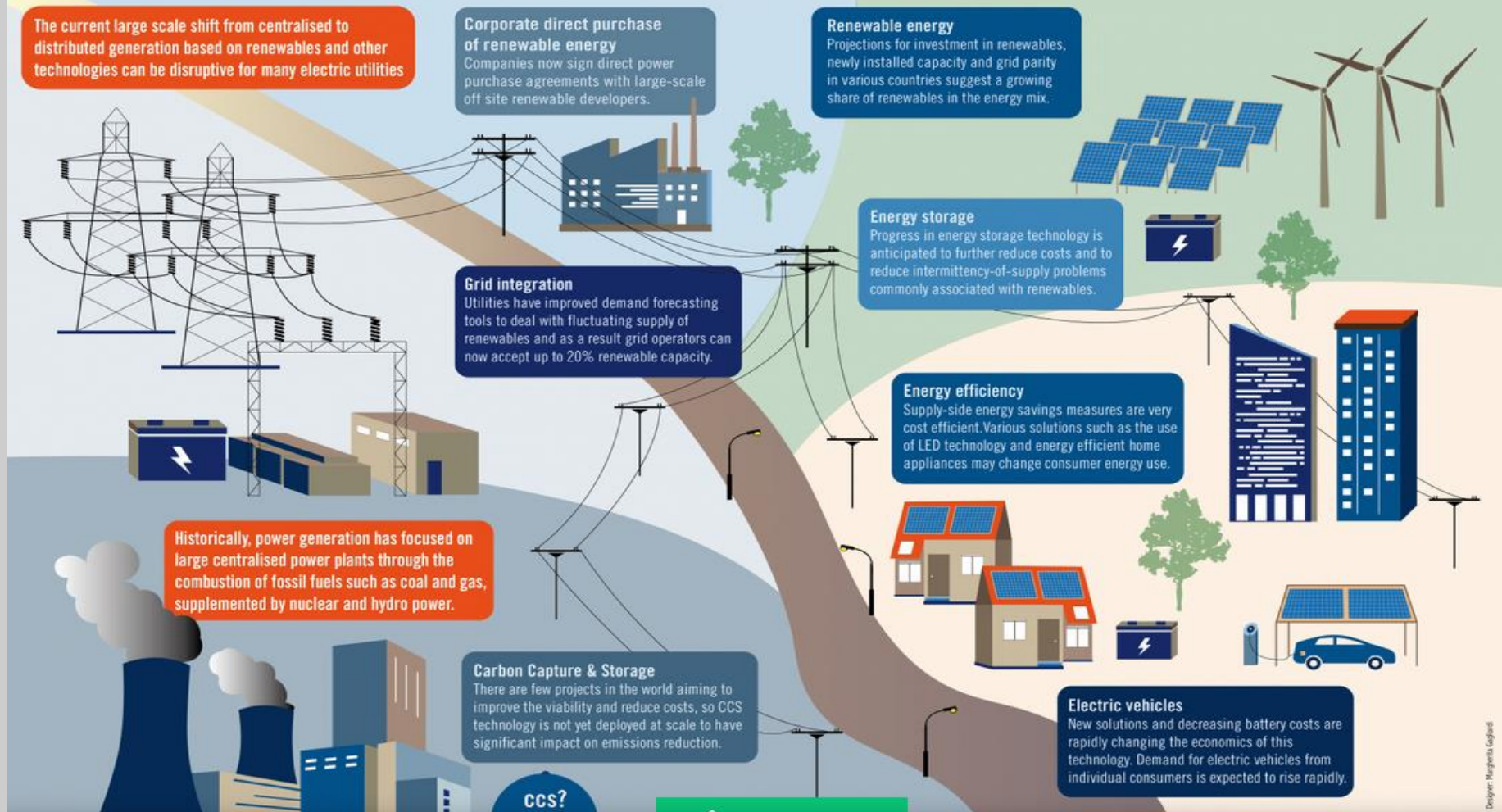
What Does it Take to Electrify the Last Mile?

- **Long Range Planning, Construction, and Maintenance of Utility Infrastructure**



Utilities Must Adapt to ...

Technology dynamics and disruptive change in the utilities sector



Designer: Margherita Gelfand

Distrib. Gen, DER, EE, Microgrids, 2 Way Power, & EVs ...



Utility Challenges

- Oncor, the largest utility in Texas says growth of large EVs — like electric delivery vans and semi trucks — could necessitate "major investments" to its distribution grid.
- For just one logistics company, Oncor calculated that charging its **325 fleet vehicles would add 40 MW to the customer's power demand — a huge increase over the 0.5 MW load the utility typically sees from a commercial ratepayer. (80 x's!)**
- *"What do you see when you fly into Dallas? A sea of warehouses as far as you can see," he said. "Every one of them has a fleet."*
- Calif. Utility: Two EVs, or one long range EV can double a typical household load – overnight!



Utility Tracking & Power Management

Utility Notification

EV charging can negatively impact the grid if not properly tracked and managed

- Clustering in certain areas
- Want to avoid transformer overload/failure

Local government and the utility will benefit from collaboration

Local governments can help!

- Incorporate checkbox into application to give permission to share data with the utility
- Provide utility contact information so applicant can follow up
 - Special rate programs may be available



What Does it Take to Electrify the Last Mile?

- **Coordinated Efforts by State, Counties, Cities, and Towns**



Coordinated Efforts

"It Takes a Village" to Become PEV Ready: Stakeholders and Roles



PEV Drivers
 Encourage PEV
 Ready communities



Electric Utilities
 Offer special rates for
 PEVs. Advice on best
 rate options. Grid reliability



Automakers
 Roll out and
 market PEVs



Employers
 Encourage employees
 to drive PEVs. Offer
 workplace charging



State Government
 Regulations, policies,
 guidance, incentives to
 spur PEV market.
 Resources to local
 governments



**Electric Vehicle
 Supply Equipment
 (EVSE) Manufacturers**
 Offer charging solutions



**Residential Property
 Managers**
 Respond promptly and
 positively to PEV charging
 requests. Develop strategy
 to include PEV charging in
 Multi-unit Dwellings



**Local & Regional
 Governments**
 Lead by example.
 Adopt a PEV
 Readiness Plan



Fleets
 Purchase PEVs.
 Support PEV car
 sharing, rentals,
 loans



**Environmental
 Advocates**
 Advocate for PEVs.
 Scientific studies on
 health impacts of air
 pollution



CALIFORNIA LOCAL LEADERSHIP

SAN FRANCISCO



- Comprehensive plan to upgrade, and expand, hundreds of public charging sites.
- Innovative solutions for curbside charging and charging at Multi-unit Dwellings.
- Battery switching demonstration program with PEV taxicab fleet.
- City Department Workshops to encourage city-wide PEV adoption.

LOS ANGELES



- Goal: 7-day permitting, inspection and approval process for home PEV charging installations. Moved permitting online.
- Incentives of up to \$2,000 per household for charging installation.
- Free PEV parking at Los Angeles International Airport.
- Building code amendments to require PEV charging in new construction.

SAN DIEGO



- U.S. D.O.E. EV Project award – ECOtality, Nissan, and SDG&E partnership will place hundreds of public access stations, including some DC Fast Charging.
- First all-electric car sharing program in North America.
- Smart City San Diego consortium will foster greater PEV public charging.
- SDG&E leadership in Multi-unit Dwelling charging outreach, options.



Building Permit Process

A CUSTOMER'S GUIDE TO THE BUILDING PERMIT PROCESS



- Permits can be downloaded online at: http://ci.guadalupe.ca.us/residents-mainmenu-34/document-center/doc_download/715-building-permit-application
- Completed applications must be submitted with three (3) sets of plans

- All additions must be reviewed by the Planning Department
- All additions over 500 Sq. Ft. require school fees to be paid

- Parties will be notified when permit has been issued and is ready for pick up
- Payment must be paid in the Finance Department

Note: The City does not accept credit cards. Permit fees must be paid in case or check.

- All permitted projects must undergo onsite inspections to ensure that the work is being done safely and to code
- Yellow inspection cards must e posted onsite

To schedule an inspection, call 356-3903.

- When the project is complete, the Building Inspector must conduct a final inspection. If the final inspection passes, the project is complete.

Frequently Asked Questions:

- **What type of projects require a permit?**
 Any building or interior that is being erected, constructed, enlarged, altered, repaired, moved, improved, removed, converted or demolished requires a permit.
- **Why do I need a permit?**
 Permit fees cover the cost of inspections, which are required to ensure projects are done safely and according to code.

Contact Information

City of Guadalupe
 Building & Fire Safety Dept.
 918 Obispo Street
 Guadalupe, CA 93434

Alice Saucedo
 Permit Technician

(Guadalupe, CA)



What Does it Take to Electrify the Last Mile?

- **Adequately Skilled and Experienced Workforce**
- **Education and Training**



This





Not This





What/Who is EVITP?

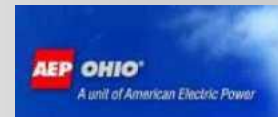
A not-profit, volunteer, brand neutral, EV industry collaborative training program that addresses the technical requirements, safety imperatives, and performance integrity of industry partners and stakeholders including:

- Automobile Manufacturers
- Investor-Owned and Municipal Utilities
- Electric Vehicle Supply Equipment Manufacturers
- Electrical Energy Storage Device Manufacturers
- State and Local Electrical Inspectors
- Electrical Contractors
- Electrical Workers
- First Responders



Electric Vehicle
EVITPTM
 Infrastructure Training Program

EVITP Partner Advisors





EVITP 4.0 Curriculum (2019)

Comprehensive Residential, Commercial, Industrial Charging Infrastructure Training

- Level 1 and Level 2 Residential Charging
- Commercial / Institutional Level 2 Charging
- DC Fast Charging
- Medium Duty (MD) Commercial / Institutional
- Heavy Duty (MD) Commercial & Industrial
- Site assessment and load calculations
- Maintenance, Troubleshooting and Repair
- Wireless Conductive Energy Transfer

EVITP 4.0 - Syllabus

1. Electric Vehicles (EVs)

- 1.1 Introduction to EVs
- 1.2 The History of EVs
- 1.3 EV Types and Technology
- 1.4 Modern EVs
- 1.5 Heavy Vehicles - commercial/industrial delivery including transit, delivery, port transport, etc.

2. EVSE

- 2.1 What is EVSE & types
- 2.2 AC EVSE – level 1, 2, and High Power
- 2.3 DC Charging – High Power and Overhead
- 2.4 Wireless charging
- 2.5 EVSE Communications and Networks

EVITP 4.0 - Syllabus

3. 2017 National Electrical Code (NEC)

- 3.1 NEC Art. 90
- 3.2 NEC Chapter #1
- 3.3 NEC Chapter #2
- 3.4 NEC Chapter #3
- 3.5 NEC Art. 625 + add notes on 702 and 705
- 3.6 NECA 413-2012 Standards for EVSE Installation

4. Load Calculations, based on the 2017 NEC

- 4.1 Planning and Installing EVSE (introductory materials)
- 4.2 Load considerations
- 4.3 Ampacity considerations including conductors, temperature ratings, and OCPD.
- 4.4 BC, Feeder, and Service Calculations
- 4.5 Voltage Drop
- 4.6 Examples

EVITP 4.0 - Syllabus

5. Site Assessment

- 5.1 Customer service / considerations / and facility tour (meet and greet)
- 5.2 EVSE market drivers – incentives, LEED
- 5.3 Locating
- 5.4 Signage
- 5.5 ADA – accessibility
- 5.6 Installation
- 5.7 Shawbell's Hardware case study

6. Commissioning

- 6.1 Why commission?
- 6.2 Documentation
- 6.3 Municipality and Utility considerations
- 6.4 Equipment and cord management
- 6.5 EVSE communications and networking, customer interface, network interface (cards and RFID)

EVITP 4.0 - Syllabus

7. Troubleshooting

- 7.1 Common EVSE failure point
- 7.2 Troubleshooting examples
- 7.3 EVITP troubleshooting flow chart
- 7.4 Troubleshooting tips
- 7.5 EV simulators

Comprehensive Exam including Residential, Commercial and Industrial applications, the National Electrical Code by category, Site Assessment, Load Calculations, and Troubleshooting Problems



Eligibility: State Certified Electricians

Minimum Requirement for EVITP Certification:
California State Certified General Electricians who have completed 8,000 hours of on-the-job training and pass the state exam.

A key to EVITP success is that the training builds on the platform of state certified electrician's extensive knowledge, skills, and experience.



Utility MD/HD Charging Infrastructure

- EVITP curriculum addresses these electric vehicle types and the equipment used in charging them. (Typical voltage levels of equipment)
- **Light-duty and medium-duty Passenger Vehicles**
(120/208/240VAC)
- **Light, medium, and heavy Light-duty Trucks**
(120/208/240/480VAC)
- **Heavy Duty vehicles** (480VAC, up to 600VAC)







Inductive Charging





Why EVITP?

EV Infrastructure

- Training
- Education
- Safety, Safety, Safety
- Performance
- Reliability
- Risk and Liability Reduction based on Safety



EVITP Requirements/Precedents

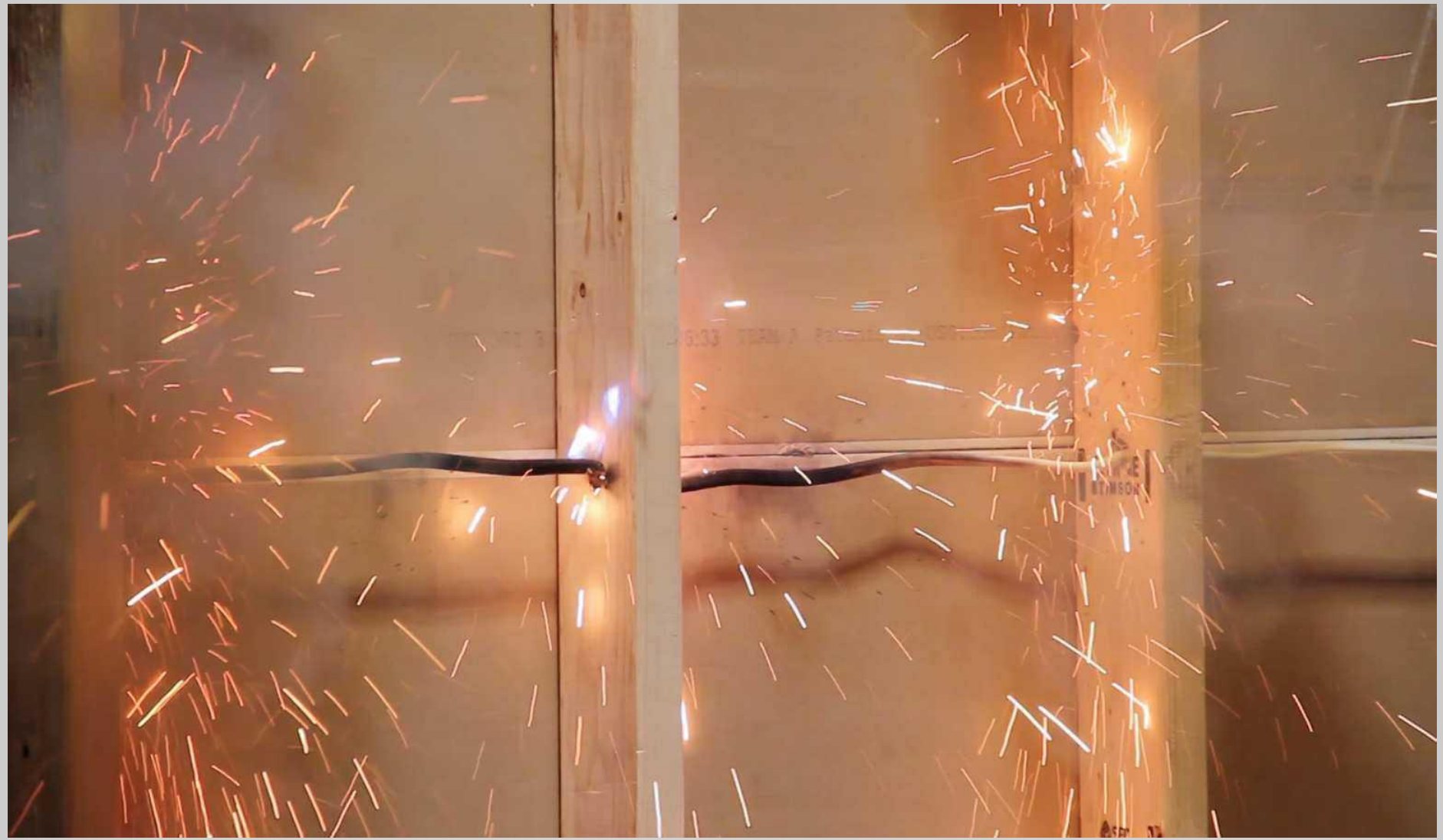
- CA Public Utilities Commission (CPUC) Safety Language Requirements
 - SDG&E, So. Cal. Edison, PG&E
- California Energy Commission: Port of Long Beach
- Nevada Utility: NV Energy, Electric Highway
- National Smart Cities Award: Columbus, OH
- City of Carson, CA
- City of Pico Rivera, CA
- City of Long Beach, CA
- Seven More Under consideration

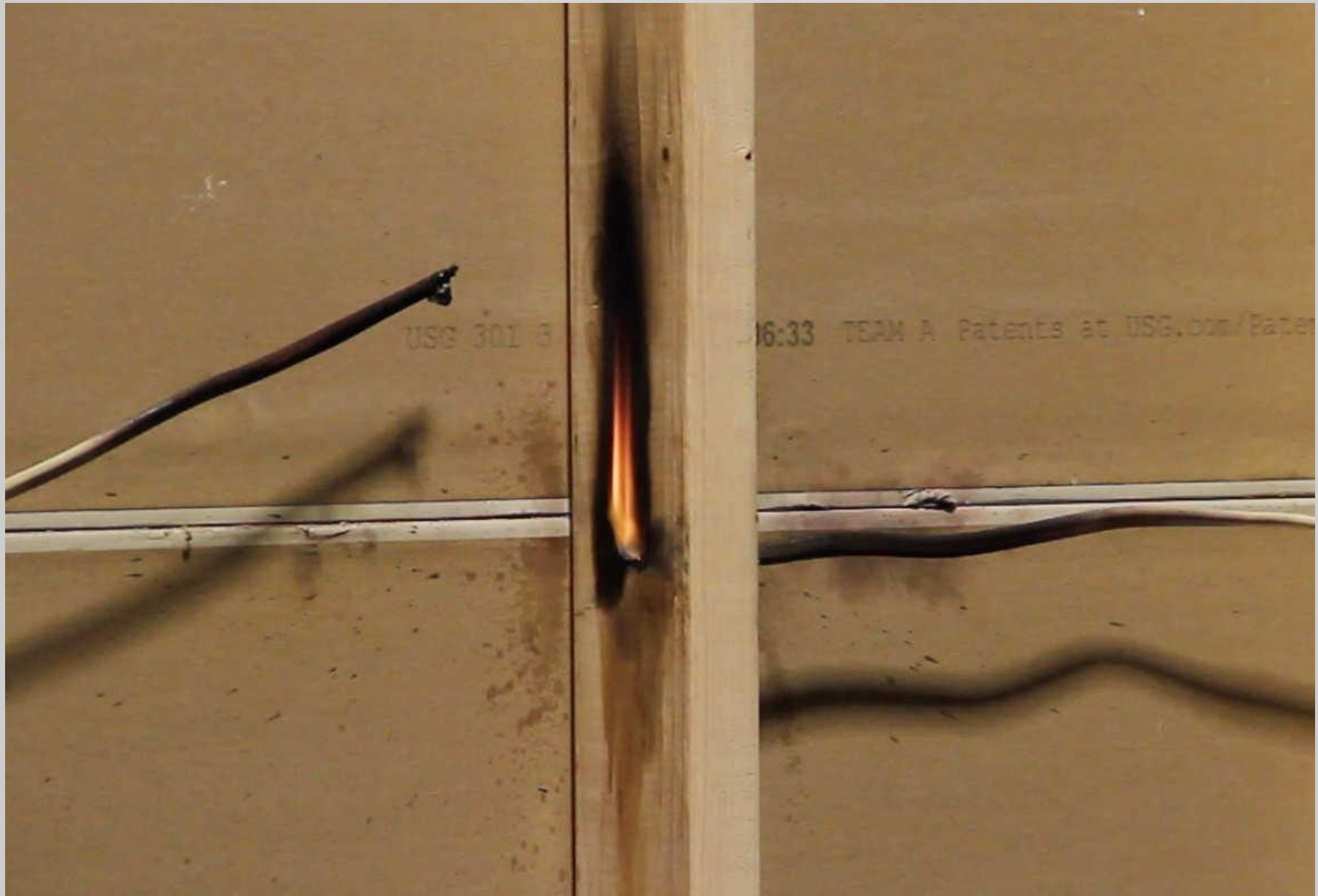


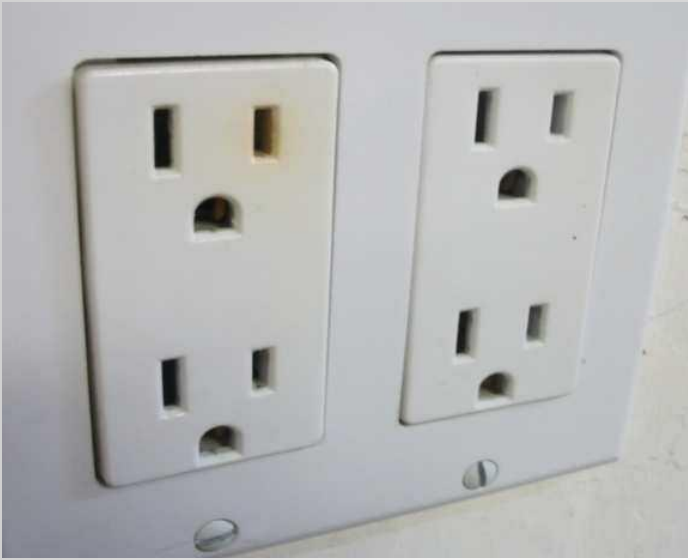
Electric Vehicle
EVITP[™]
Infrastructure Training Program

Safety is not an accident













Conductor Calculation Formulas

$$V_d = \frac{2 * K * I * L}{cm \ a}$$

$$cm \ a = \frac{2 * K * I * L}{V_d}$$

$$V_d = \frac{1.732 * K * I * L}{cm \ a}$$

$$cm \ a = \frac{1.732 * K * I * L}{V_d}$$

$$V_d \% = \frac{V_d}{V_{source}} * 100$$

- cma = conductor size from Chapter 9, T8
- K = 12.9 for Cu, K = 21.2 for Al
- L = length from supply to load



<https://evitp.org/>



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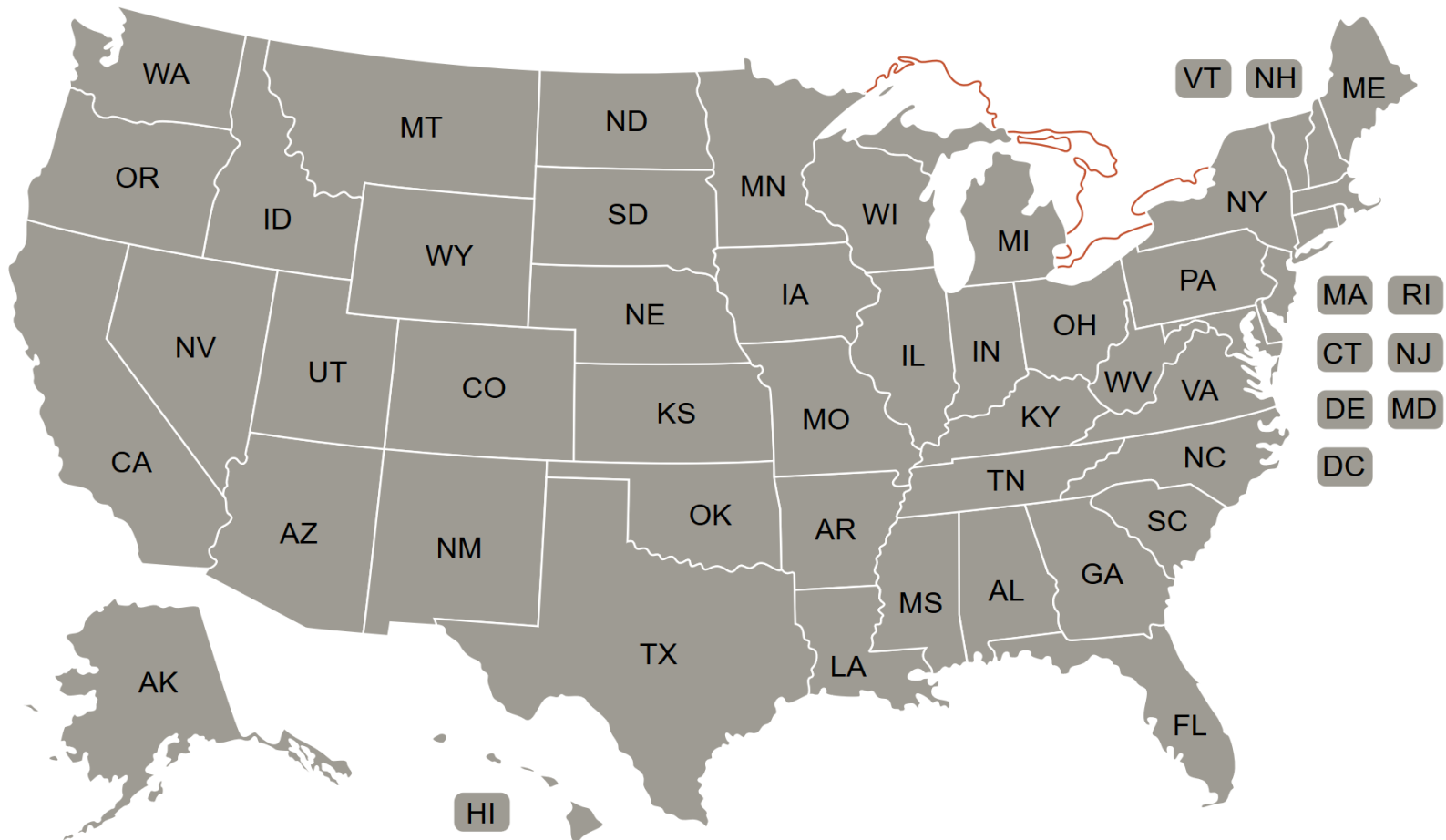
EVITP



  <https://evitp.org/find-a-contractor/>

Find A Contractor

Find a contractor in your area that utilizes EVITP certified installers for your next Residential, Commercial, Public or Fleet project.





In CA: 1,200+ Electricians

https://evitp.org/california

Enter contractor name Enter a location **Q**

Filter List Map

Absolut Electric Inc.

📍 2791 Del Monte St # B, West Sacramento, CA 95691, USA

☎ (916) 333 - 3825

📠 (916) 915 - 4398

✉ yuriy@absolutedelectricinc.com

🌐 <http://www.absolutedelectricinc.com>

Contact: Yuriy Fox

AM Ortega Construction

📍 10125 Channel Rd, Lakeside, CA 92040, USA

☎ (619) 390-1988

📠 (619) 390-1941

✉ mortega@amortega.com

🌐 <http://www.amortega.com>

Contact: Maurice Ortega

Baker Electric

📍 1298 Pacific Oaks Place, Escondido, CA 92029, USA

☎ (760) 745-2001

Map

Google

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Showing 67 results




67 Electrical Contractors




U.S. DoE Clean Cities

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

Plug-In Electric Vehicle Handbook for Public Charging Station Hosts





Installing and Maintaining Charging St



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U.S. DoE Clean Cities

The Electric Vehicle Infrastructure Training Program is one of the organizations that trains electrical contractors in EVSE installation. *Photo from Electric Vehicle Infrastructure*

Energ



Thank You

Questions?