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California – World leader in E-Mobility

How to use ZEVs to enhance energy resilience

July 15th, 2020

California was first to mandate the catalytic converter in 1981

Los Angeles 1948

Los Angeles 1975

Leading up to 1981 the car manufacturer said:

- Too expensive
- Adds weight
- Adds volume
- Lowers gas mileage

But they went along

Los Angeles April 6, 2020

California was first to adopt the Zero Emission Vehicle (ZEV) in 1990

The purpose of the ZEV program was to meet California's health-based air quality standards and greenhouse gas emission reduction goals and move the cars away from petroleum-based fuel.

Today approximately 750,000 EV, PHEV on the road in California

2030 goal: 5 million ZEVs in California

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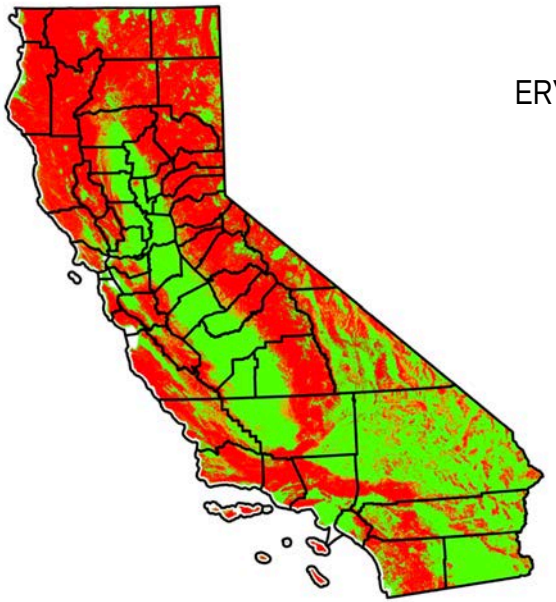
California first to introduce the Energy Resilient Vehicle (ERV) ?

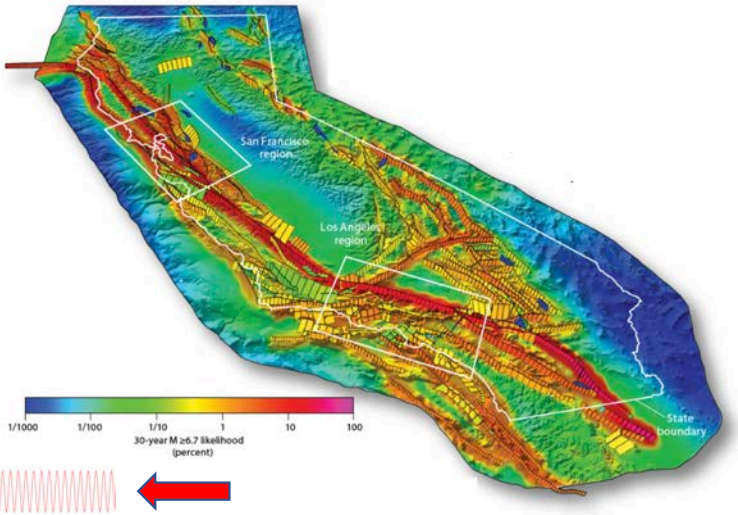
Fire Hazard



ERVs provide resilient mobile power
when and where
it is needed in disasters

through export of energy
from their batteries

Earthquake Hazard



Bi-directional EV

The ERV Idea

1. Cars sold in California must contribute to reduce air pollution and green house gases
2. Electric Vehicles (EV) could provide emergency power (technology is already available)
3. Why should EV technology not help California to provide resilience in case of natural disasters or Public Safety Power Shutoffs (PSPS)?

March 2019

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POLITICS 03/22/2019 03:37 pm ET

California Governor Declares Statewide Emergency Over Wildfires

Gavin Newsom announced an "emergency in advance of an emergency" in hopes avoiding a repeat of 2018's record-breaking fire season.

By Sarah Ruiz-Grossman

California Gov. Gavin Newsom on Friday declared a statewide emergency to immediately begin wildfire prevention efforts across the state.

The announcement, made in Northern California's Lake County, follows one of the worst fire seasons in state history. Newsom said his executive order was "a proclamation that declares an emergency in advance of an emergency."

Oct. 2019 - One million PG&E customers to lose power

The Kincade Fire burns through the Jimtown community of Sonoma County, Calif., on Thursday.

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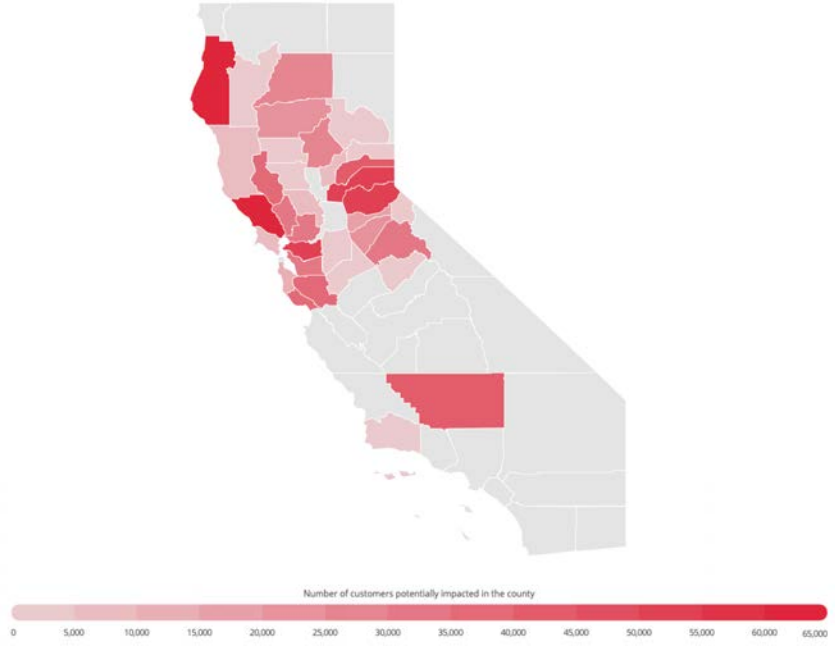
Oct 10, 2019 – Public Safety Power Shutoff (PSPS) - The New Normal? A Day in the Life of California

Customers affected by the PG&E PSPS



*Map updated as of 7:45 p.m 10/9/19

The Mercury News

PG&E begins power restoration after mass shutoffs across Bay Area

600,000 customers still without power

Oakland police officers in a police cruiser stay alert in the Montclair shopping district during the PG&E power outage in Oakland, Calif., on Thursday, Oct. 10, 2019. (Ray Chavez/Bay Area News Group)

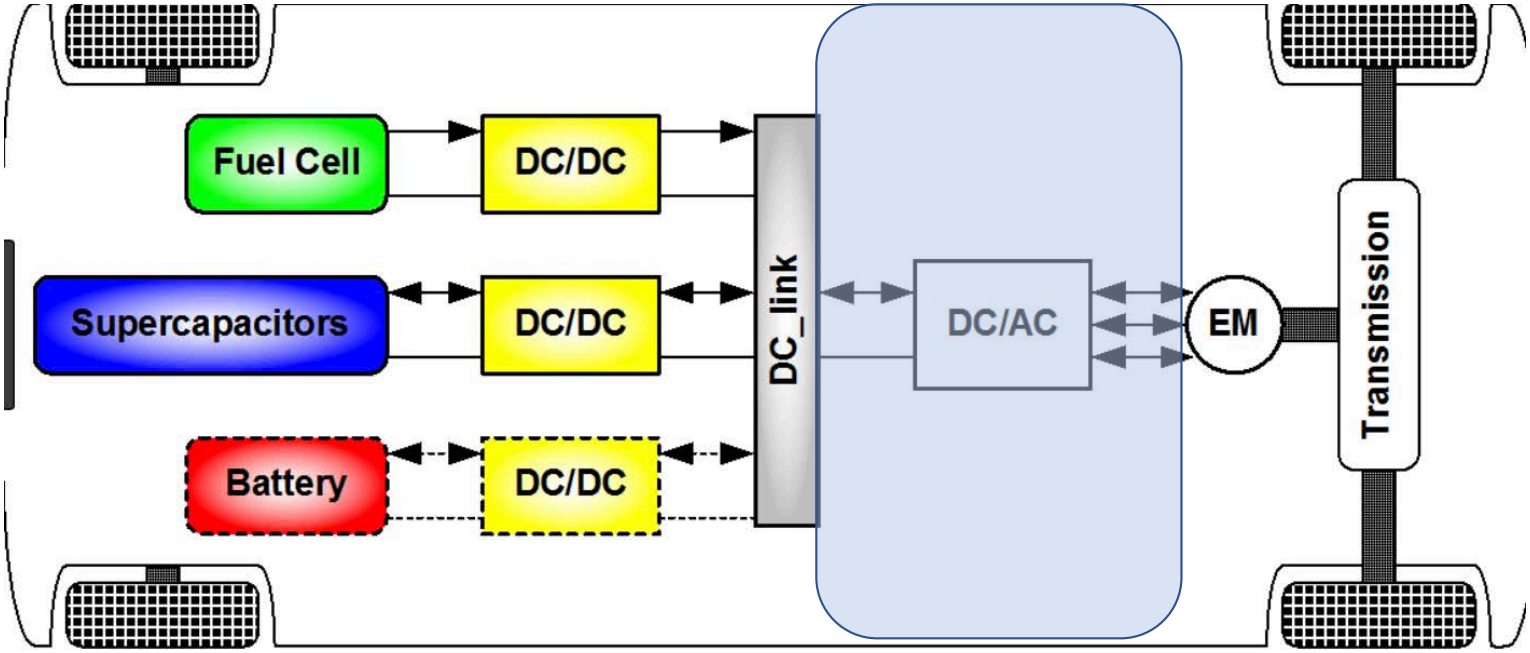
Lessons learned from Japan's Earthquake/Tsunami (9.1 magnitude)
March 11, 2011

- 20,000 people dead
- 138,000 buildings destroyed
- Millions of people without power
- $360 billion costs

This experience lead to:

- Nissan and MMC developing bi-directional EV/PHEVs for energy resilience in case of natural disasters
- Vehicle-to-Home applications in Japan

The EVs are already born bi-directional
Acceleration and regenerative breaking



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Vehicle-to-Home Technology is already in EVs

Mitsubishi Motor Corporation

Nissan
V2H Microgrid

How to incentivize the car manufacturers to adopt ERVs*

A "CARB analogy" on Zero Emission Vehicles (ZEV)

CALIFORNIA
AIR RESOURCES BOARD

The California Air Resources Board

The California Air Resources Board (CARB) is charged with protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change. From requirements for clean cars and fuels to adopting innovative solutions to reduce greenhouse gas emissions, California has pioneered a range of effective approaches that have set the standard for effective air and climate programs for the nation, and the world.

including making communities more energy resilient.

The Zero Emission Vehicle (ZEV) program is a California state regulation that requires automakers to sell electric cars and trucks in California and 9 other states. The exact number of vehicles is linked to the automaker's overall sales within the state.

The program's objective is to ensure that automakers research, develop, and market electric vehicles (EVs), which generate fewer global warming emissions than gas-powered cars, and which don't produce tailpipe pollution (hence the term: "zero emission vehicle").

The California Air Resources Board (CARB) manages the ZEV program, although it has also been adopted by nine other states (Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont). By directly requiring that automakers invest in clean technology, the ZEV program is considered one of the nation's most forward-looking climate policies, and a driving force behind an expanding market with a current offer of over 30 zero emission models available to the U.S. public.

What is a zero emission vehicle?
Under the ZEV regulation, three distinct vehicle designs are considered "zero emission," though to varying degrees.

Plug-in hybrid vehicles combine a conventional gasoline-powered engine with a battery that can be recharged from the electrical grid.

Battery electric vehicles run entirely on electricity and can be recharged from the electricity grid.

Hydrogen fuel cell vehicles run on electricity produced from a fuel cell using hydrogen gas.

.. Add ERV Energy Resilient Vehicle

What is an Energy Resilient Vehicle?

Under the ERV regulation distinct vehicle designs are considered "energy resilient" if the vehicle can provide emergency power in case of natural disasters like earthquakes or wildfires or as a result of power cuts to prevent wildfires.

* Bi-directional chargers should be considered also

All the players must come together to help California adopt the Energy Resilient Vehicle

Regulation

Car Manufacturers

Utilities

Emergency Responders

- **Bi-directional EVs**
- **Ease of micro-gridding**

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Summary - ERV need to get buy-in from all the players

1. California faces dual existential crises: wildfires and earthquakes.
2. ERVs will mitigate the damage caused from natural disasters by providing emergency backup power and transportation.
3. Currently there are only a few EV* brands that support bi-directional power flow. Nissan and Mitsubishi Motors are the two Japanese OEMs that support it.
4. The automotive OEMs are unlikely to move towards bi-directionality because they are preoccupied with the transition to EV.
5. The California ERV approach should be tied to the car incentive for ZEV.
6. It is important to establish a regulatory framework required for automotive OEMs to justify the business case for EV bi-directionality.

* Bi-directional chargers with emergency power option should also be covered by the initiative