



The Energy Commission's Investment in Piezoelectric

**RESEARCH &
DEVELOPMENT**
DIVISION



Erik Stokes
Cleantech Meetup: Energy Generation



Piezoelectric Overview

What is the piezoelectric effect?

The ability to generate charge in response to applied mechanical stress.

Piezoelectric technology is currently used in a number of commercial and military applications

- Medical devices
- Smart phones and desktop printers
- Pressure sensors
- Sonar
- Fish finders



Piezoelectric and the Energy Connection

What is California and the Energy Commission's interest in piezoelectric technology?

The Clean Energy and Pollution Reduction Act of 2015 set new targets to decarbonize California's energy sector

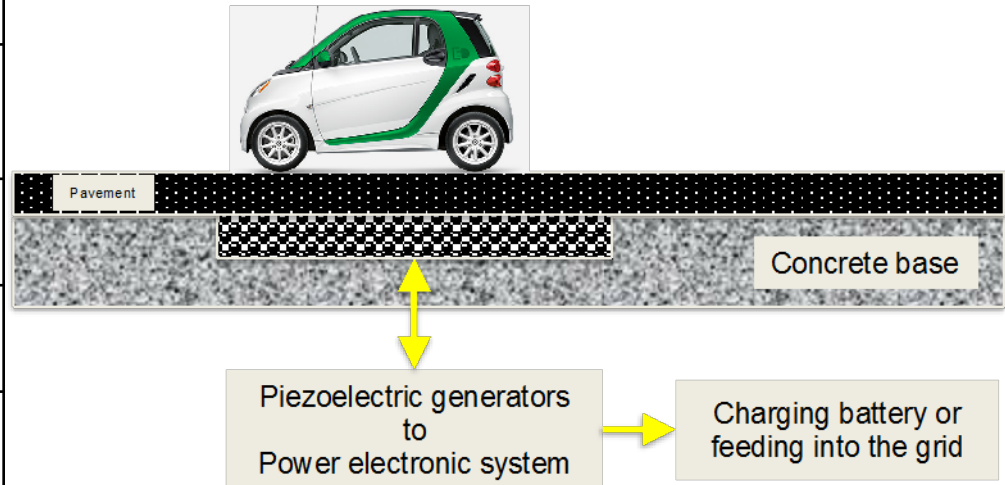
- Increase renewable electricity generation to 50% by 2030
- Double statewide energy efficiency savings by 2030

Piezoelectric technology has the potential to help the state meet both targets.

Roadway Energy Harvesting

Breakthrough advancements are needed to piezoelectric technology to enable roadway energy harvesting applications

Specification	Target
Electricity Cost (LCOE)	< \$0.10/KWh
Capital Cost	< \$10,000/kW
Power Density	> 300 W/ft ²
Lifetime	> 15 years





Current Work in Piezoelectric

Pyro-E

- Licensed a new type of piezoelectric systems through the NASA Langley Research Center
- Explore whether the technology could be used for data collection, recording traffic conditions, and aiding navigation for self-driving cars.
- Long-term goal is to power up to 5,000 homes from a half-mile of highway.

University of California, Merced

- Investigate the energy recovery potential of multi-layer piezoelectric generators to create roadway piezoelectric energy harvesting
- Will perform tests on a 200-foot span of asphalt at the edge of the UC Merced parking lot.



Next Steps for Pizeoelectric

- Validate the performance specifications proposed in the two projects.
- Identify early markets and applications where large-scale piezoelectric technologies can compete with solar PV
- Begin to scale the technology to compete in broader markets and applications
- Further R&D to increase the power output while lowering the capital costs