Vehicle Electrification

Contributions to IL Transportation Sustainability

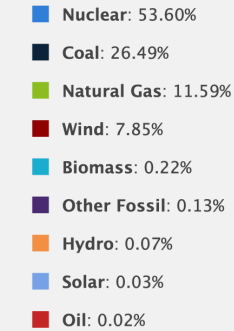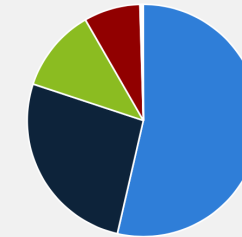## Electrification Sustainability Impacts

- **Vehicle fuel cost reduction**

- **Improvement of energy efficiency**, covering greater mileage per kWh compared to gasoline vehicle mpg

- **Reduction of carbon dioxide emissions** when the vehicle is charged with low carbon intensity electricity

- **Contributions to energy security and transport fuel diversification**, reducing oil imports and relying on electricity pricing that does not fluctuate daily

- **Reducing noise emission**

- **Opportunities to offer services** enabling greater penetration of renewable energy sources

- **Vehicle-to-everything** connectivity, offer power during outages

Emissions Reduction

- **73% annual CO_2-eq decrease per vehicle**

Electricity Sources and Vehicle Emissions

Electricity Sources in Illinois

- **Nuclear**: 53.60%
- **Coal**: 26.49%
- **Natural Gas**: 11.59%
- **Wind**: 7.85%
- **Biomass**: 0.22%
- **Other Fossil**: 0.13%
- **Hydro**: 0.07%
- **Solar**: 0.03%
- **Oil**: 0.02%

Annual Emissions per Vehicle
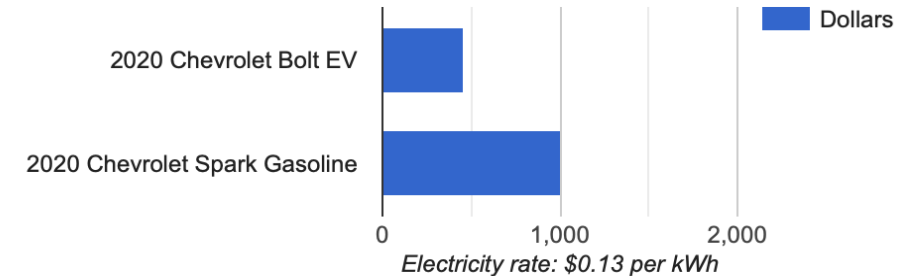
Source: Energy Information Administration, Electricity Net Generation, Open Data API. Learn more about emissions from hybrid and plug-in electric vehicles.

Fuel Cost Savings

- **54.7% annual fuel cost decrease per vehicle**

Annual Fuel Cost (Dollars)

- 2020 Chevrolet Bolt EV
- 2020 Chevrolet Spark Gasoline

Electricity rate: $0.13 per kWh

Data source: Alternative Fuel Data Center. 2021. https://afdc.energy.gov/states/il

UIUC EV Campus Update

LEVEL 2 CHARGING SPACES

Currently we have six designated parking spaces designed for Level 2 charging. The charging session fee for Level 2 charging is $1.25/hour for the first four hours of service and $2.50/hour for each additional hour.

LEVEL TWO CHARGING LOCATIONS

Locations	Number of Spaces	Level	Space Number
D-22	2	n/a	152 & 153 northeast end of hourly parking
E-14	2	n/a	center of north end
B-4	2	1	85 & 86 Goodwin entrance

EV stations map on campus

ELECTRIC VEHICLE CHARGING STATIONS
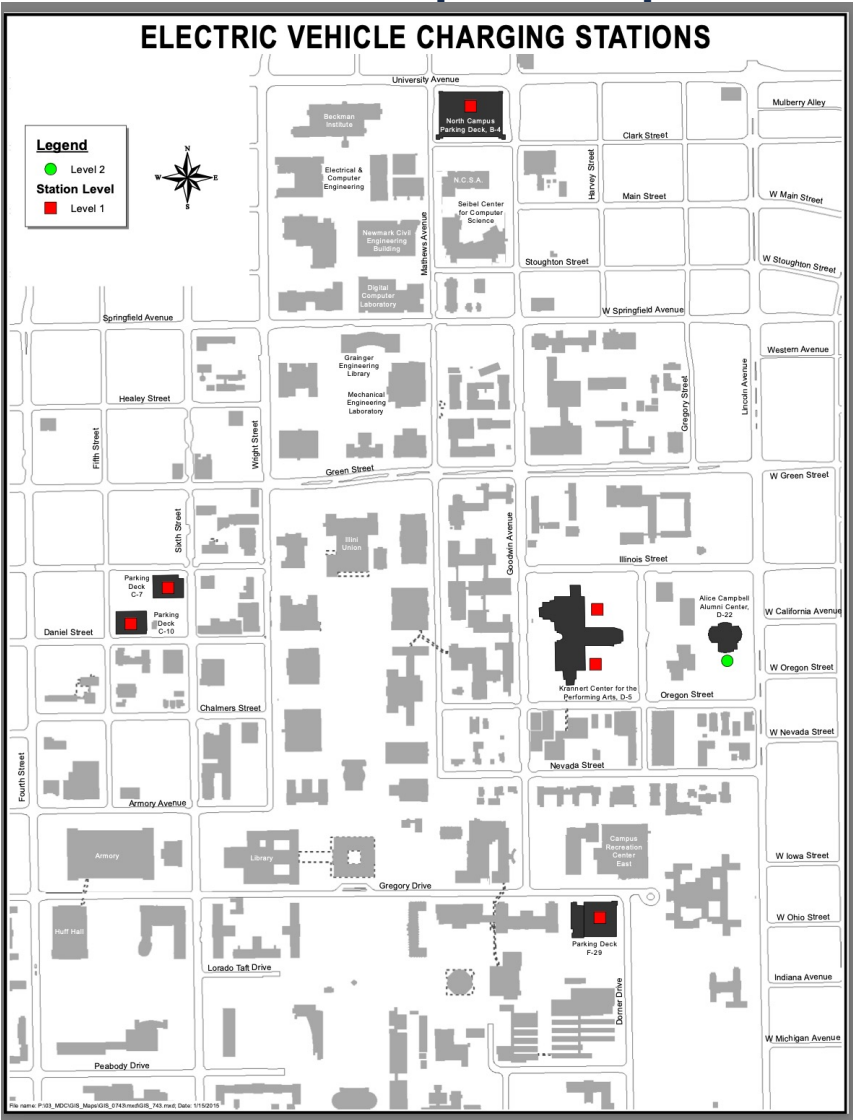
On Campus Charging Demand

Proposed Sustainability Student Council Project

- Survey mechanism to track electric vehicle (EV) ownership – current levels and prospects – across faculty, staff, students, frequently visiting alumni

- Survey including questions related to charging behaviors:
    - Charging locations
    - Charging energy
    - Average cost per session
    - Attitudes toward charging availability and visibility
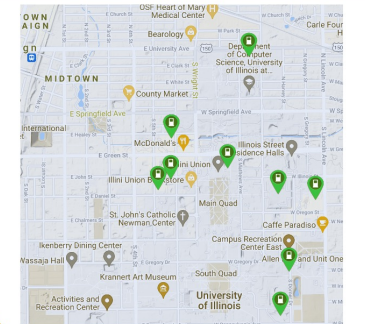   - Attitudes toward charging occupancy and sharing etiquette

Potential living lab concept

participatory UIUC campus data collection for charging infrastructure placement

pinpoint new locations for deployment of charging infrastructure

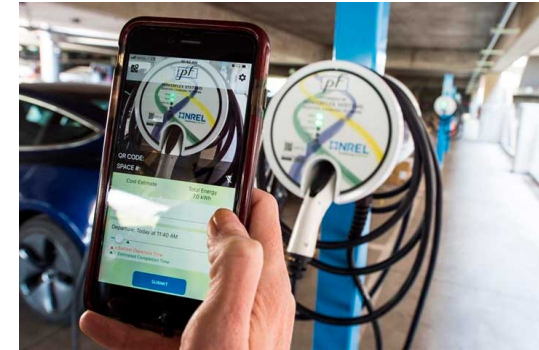e.g., XY coordinates, charging demand, dwell time

equitable infrastructure deployment models capturing unobserved demand

Electric Vehicles Integrated Planning and Research

Future Objectives

- Learning EV drivers' behaviors – implementing real-time algorithms on campus chargers

- Large-scale energy systems management – vehicle-to-building assessments and control algorithms testing!

UC Berkeley smart learning pilot for EV charging
Source:
https://sites.google.com/berkeley.edu/slrpev/home

Living lab of EV charging technology integration at NREL
Source: https://www.nrel.gov/transportation/workplace-electric-vehicle-charging.html