Workshop Summary

Integrating Transportation and Electricity to Reduce Carbon Impact

July 27, 2016
Berkeley, CA

Background

New state mandates encapsulated in SB 350—increasing renewable energy generation and electrifying transportation—are each potentially significant paths to reducing greenhouse gas emissions. However, this combination may cause conflicting signals, with implementation scenarios that could increase carbon. By increasing electricity demand, transportation electrification could result in higher carbon content electricity. To date California's electricity and transportation sectors are separately planned for and regulated.

Purpose

This workshop brought together thirty stakeholders and experts, including representatives from automakers, regulatory agencies, electric vehicle charging firms, academics, energy storage firms, distributed energy firms, energy service providers, Investor-Owned Utilities, Independent System Operators (ISO), and academic researchers, to explore and identify key areas that may need to be pursued to ensure a low to no carbon electricity system. Discussion focused on four key questions:

- Which scenario might ensure that Electric Vehicle (EV) electricity demand does not increase the carbon content of electricity?
- What policies, actions might be needed for EVs to be used as a grid asset?
- What role might EVs have as a storage asset for buildings to reduce electricity demand?
- What role might smart grids, micro-grids, energy storage, distributed generation, and other strategies play?

Key Takeaways

√ **The carbon coefficient of electricity increases** if EV demand exacerbates peak load and system ramping needs, and needs are met by fossil fueled flexible resources**.**

√ **Scenarios to flatten the demand curve can avoid new fossil fuel resources,** such as dynamic load management, incentivizing daytime charging, and control systems that aggregate chargers to stagger charging times.

√ **We can reduce the need for fossil based flexible resources by increasing gridwide renewables, combined with storage and optimized with multiple level strategies** (ISO system, distribution level, and consumer level), so that demand increases during high renewable supply and decreases at peak.

√ **Distributed Energy Resource (DER) distribution level services need to be defined and monetized.** Utility rate structure does not value services that flatten load profiles, charge at variable times, or manage volatility close to the source.

√ **Difficult to design incentives/regulations without knowledge of, or influence on, EV design.** It may be beneficial to develop vehicle design parameters for original equipment manufacturers (OEMs) that could maximize vehicle-to-grid opportunity.

√ **OEMs, IOUs, and regulators need to identify the technology, communications systems, and rules needed to implement Vehicle-Grid Integration (VGI) and flatten the demand curve.**

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Discussion Summary

Which scenarios might ensure that Electric Vehicle (EV) electricity demand does not increase the carbon content of electricity?

What policies, actions might be needed for EVs to be used as a grid asset?

Avoiding Electricity Sector Carbon Increase

- Increases in systemwide renewables and energy storage, integrated with demand strategies, can avoid reliance on fossil fueled flexible resources to meet new EV demand.
- The demand curve can be flattened through dynamic load management, incentivizing daytime charging, and control systems that aggregate chargers and staffer charging times.
- Policy, strategies, and incentives should be designed to fit different actors—at the customer level to drive consumer behavior and at the utility and ISO level for grid management—because all three have a role to play in reducing system peak.
- Management of variability/volatility locally avoids ISO reliance on large, dispatchable power plants. Incentives for storage technologies, combined with solar photovoltaics and other distributed grid actions will reduce volatility exported onto the grid.
- Installation of utility scale storage at utility scale renewable sites reduces the need for flexible fossil resources.

EVs as a Grid Asset

- Not all potential value from EVs is being monetized. Revenue should be generated for services such as flattening load profiles and managing volatility/variability at the distribution level where it is most needed. DER services from EVs need to be defined and paid for.
- Rate design with dynamic pricing will allow the aggregation of EVs to serve as an asset to the grid and will provide charging station providers with a sustainable business model.
- The greatest potential for EVs as grid assets is for EV aggregations and coordinated charging.
- OEMs, IOUs, and regulators need to identify what technology, communications systems, and rules are needed to implement VGI and flatten the demand curve.
- It is difficult to design incentives/utility regulations without influencing car designs. Public Utility Commissions might consider developing a "wish list" for car designs that could maximize grid opportunity.
- Current interconnection rules are cumbersome and are not set up to handle the volume of requests.

What role might EVs have as a storage asset for buildings to reduce electricity demand?

What role might smart grids, micro-grids, energy storage, distributed generation, and other strategies play?

EVs as a Building Asset

- EVs that serve as storage assets for building energy systems can help manage demand charges, flattening building load profiles. California Energy Commission funded pilot projects may provide guidance on regulatory, rate pricing, and other changes needed.
- Net zero policies conflict with utility regulations. There is no revenue to utilities for serving net zero customers. Rules are needed to compensate delivery of energy separately from generation of energy.
- Financial incentives are needed for fleet owners and consumers to support Vehicle-to-Grid capabilities and energy grid mitigation practices.

Smart Grid, Micro-Grid, Distributed Generation Strategies

- Distribution utilities could use EV charging, load management, community storage, and micro-grids to manage variability locally; pricing and other incentives are needed to achieve this.
- Fixed charges/minimum bills are blunt instruments. Dynamic pricing and variable, bi-directional network access charges may be better signals.
- Local governments need to be brought into the energy policy conversation; engage them in local energy development, climate action plans, EV fleets, workplace charging, and innovative municipal services.
- Charging stations that combine photovoltaic storage with EV charging to create a micro-grid resource could provide services to the distribution grid and wholesale market. Rules, however, are currently inadequate.
- Rate design coupled with streamlined, lower-cost, interconnection revenue opportunities for DER operators that use EVs could benefit the grid and incentivize optimal consumer behavior. This would optimize the effects of a competitive market, while still preserving a clear boundary to the regulated utility.

This workshop was a product of the UC Davis Policy Fellow program. Special thanks to former Senior Policy Fellow Nancy Skinner.