



Mitigating EV Grid impacts

EV Roadmap Technical Meeting

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MJB & A

About M.J. Bradley & Associates, LLC

M.J. Bradley & Associates LLC provides strategic and technical advisory services to address critical energy and environmental matters including: energy policy, regulatory compliance, emission markets, energy efficiency, renewable energy, and advanced technologies.

About this presentation

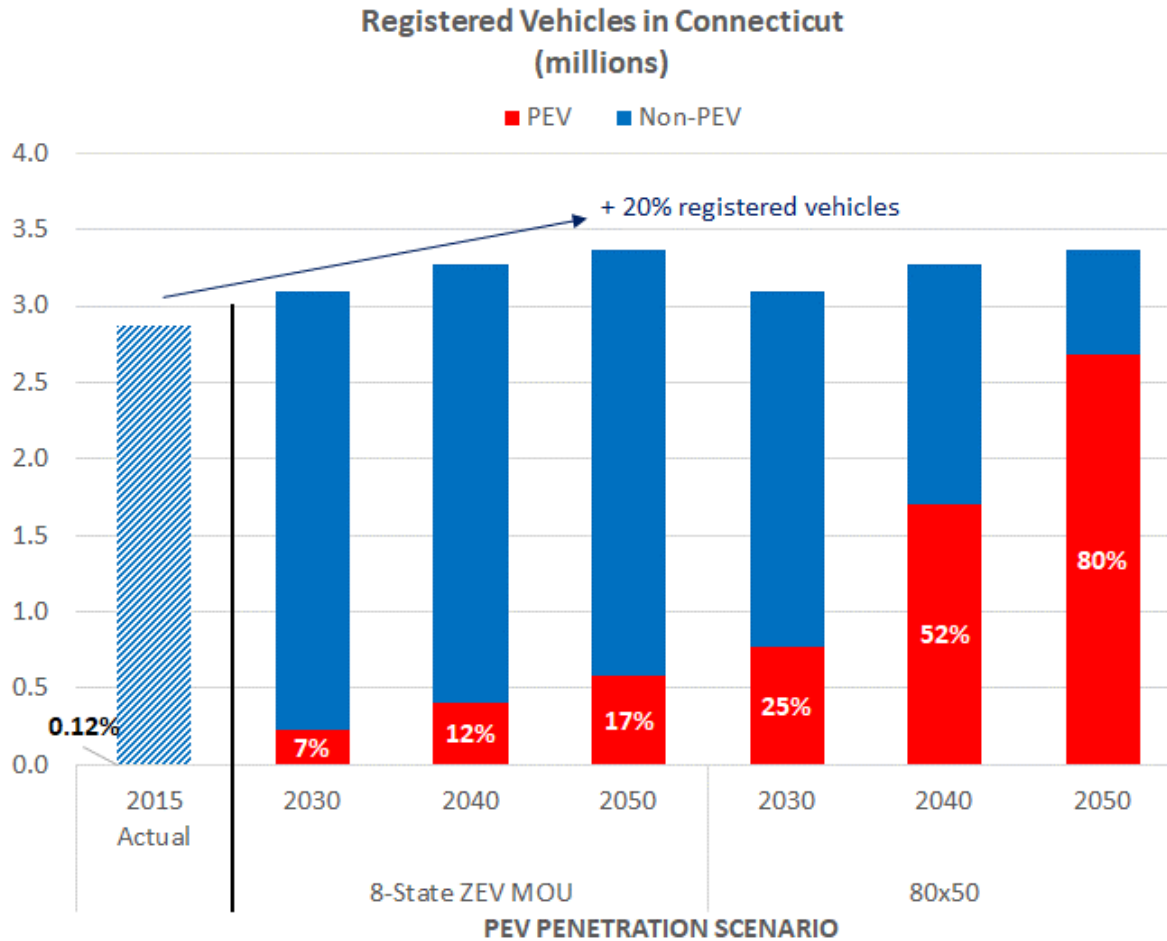
This presentation is based on the results of an analysis of plug-in electric vehicle costs and benefits for the state of Connecticut. This was one of 5 studies conducted by MJB&A for the Natural Resources Defense Council, to provide input to state policy discussions about actions required to promote further adoption of electric vehicles.

Summary reports for each state can be found here:

www.mjbradley.com/reports/mjba-analyzes-state-wide-costs-and-benefits-plug-vehicles-five-northeast-and-mid-atlantic

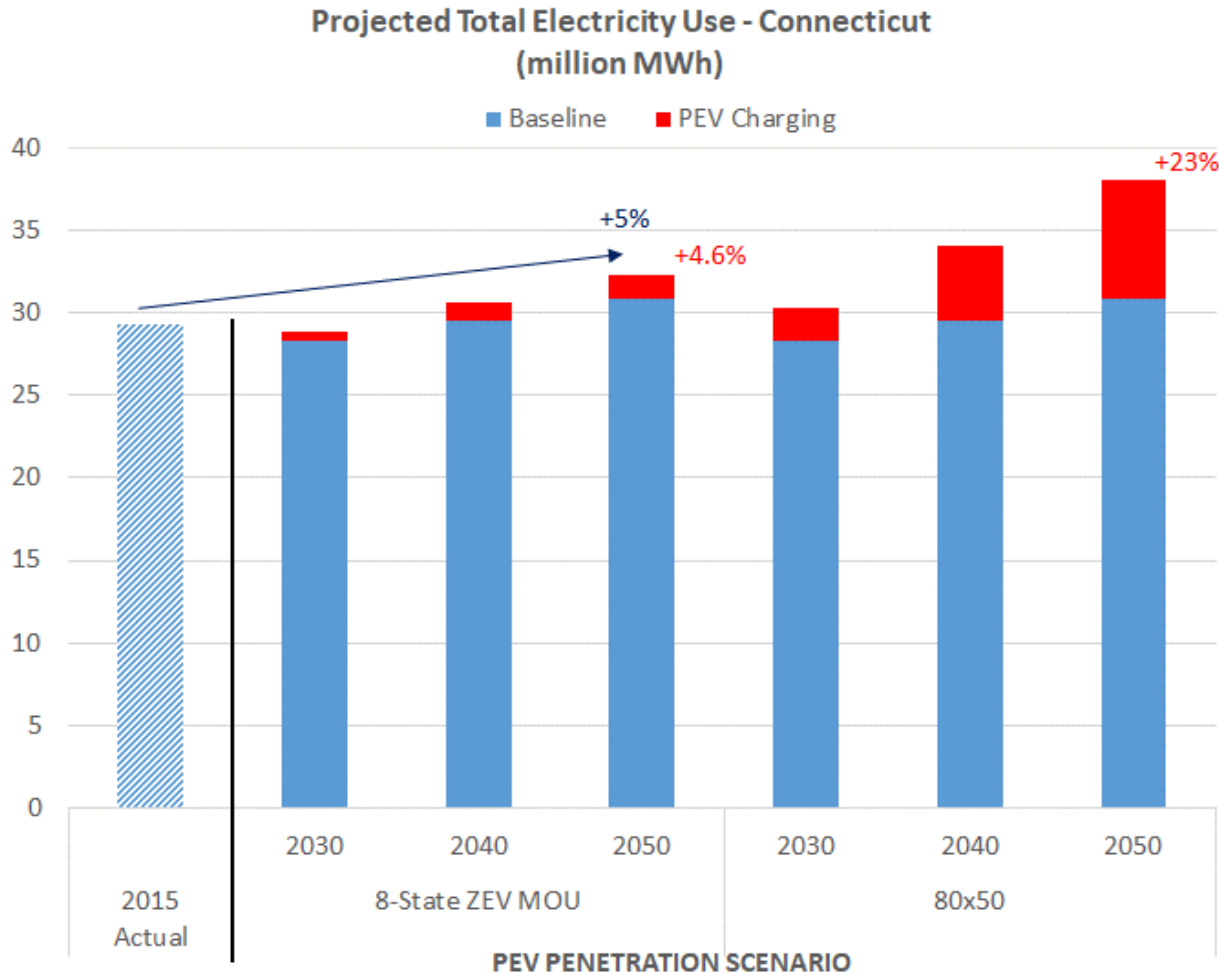


Connecticut PEV Penetration Scenarios



- If Connecticut meets its 2025 ZEV MOU goals, and PEV penetration growth continues at the same pace in future years, there would be 576,000 PEVs in the state by 2050
- In order to reduce light-duty GHG emissions by 80% from 1990 levels there would need to be 2.7 million PEVs on Connecticut roads in 2050

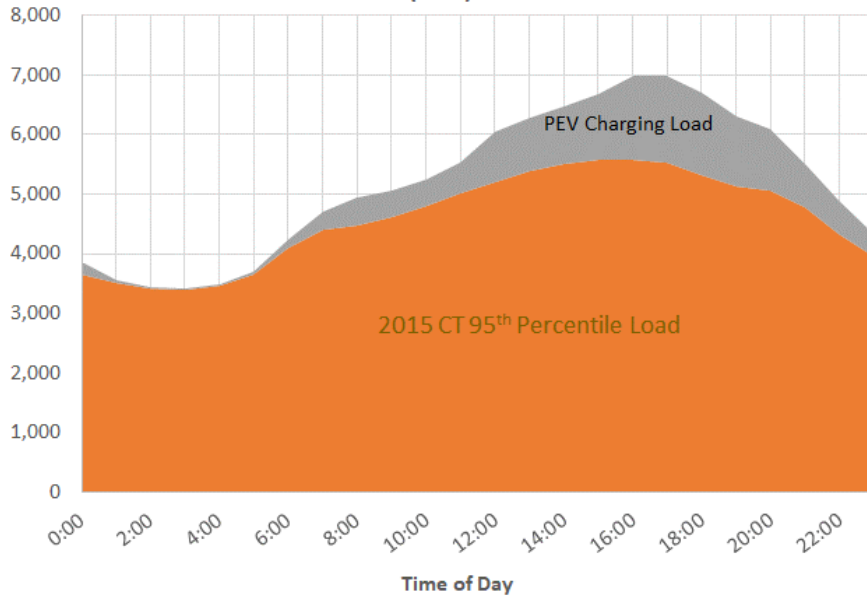
Connecticut EV Charging Energy Use



- Annual electricity use in Connecticut is projected to grow by only 5% through 2050
- PEV charging would add an additional 4.6% electricity use by 2050 under the ZEV MOU scenario, and 23% under the 80x50 scenario

Connecticut EV Charging Load

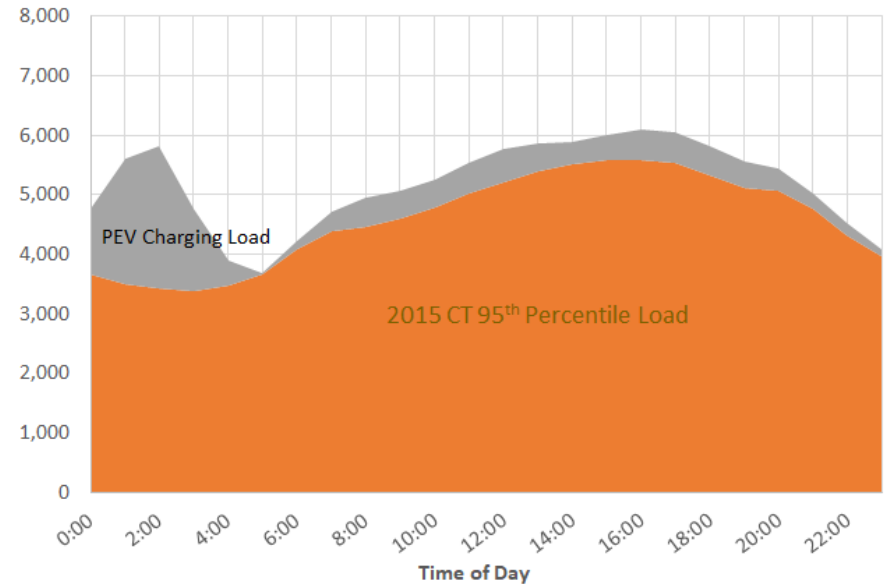
Connecticut PEV Charging Load
2040, 80x50 Scenario, Baseline Charging
(MW)



BASELINE: Drivers start to charge as soon as they arrive home

- Peak charging load coincides with existing afternoon peak
- By 2040 could increase afternoon peak load by 25% under 80x50 scenario


































Connecticut PEV Charging Load
2040, 80x50 Scenario, Off-peak Charging
(MW)



OFF-PEAK: 65% of drivers delay charge start until after midnight

- Peak charging load moved to early morning when grid is under-utilized
- Cost of serving EV load reduced by \$49 million in 2040 under 80x50 scenario

EV Charging Rates – Utility Approaches

 fleetcarma	State	Special EV Rates	TOU For All Customers	Pay for Smart Meter	Separate Meter Required For EV Rate	Higher Monthly Delivery Charges	Weekday Winter Off-Peak Hours	Weekday Summer Off-Peak Hours
ComEd	IL						Hourly Pricing	Hourly Pricing
ConEd	NY						12am - 8am	12am - 8am
Dominion	VA						11pm - 5am / 11am - 5pm	10pm - 10am
DTE	MI						7pm - 11am	7pm - 11am
Duke	NC						12pm - 7am	7pm - 1pm
FP&L	FL						10pm - 6am / 10am - 6pm	9pm - 12pm
GA Power	GA						11pm - 7am	11pm - 7am
NES	TN						NA	NA
PG&E	CA			 *	 *		8pm - 5pm	9pm - 10am
Portland GE	OR						10pm - 6am	10pm - 6am
PSE&G	NJ						9pm - 7am	9pm - 7am
SCE	CA						6pm - 12pm	6pm - 12pm
SCL	WA						NA	NA
TXU**	TX						10pm - 6am	10pm - 6am

* PG&E offers two EV rates, only one of which requires paying for a separate meter.

** TXU offers either free nights or free weekends.

- Most utilities offer “whole house” time of use rates that have lower \$/kWh charge for energy used during off-peak hours
- Some utilities offer EV-specific TOU rates, but generally this requires a separate meter
- Other utilities are experimenting with different approaches to incentivize off-peak charging

EV Programs: Free EVSE & Fixed Monthly Charging Fee

Program Type: Free residential EVSE & Fixed Fee for EV charging

Utility: Green Mountain Power

Location: Vermont



- Free Level 2 charger with new EV purchase; \$9.99/month to provide same charger for existing EVs
- GMP supplied chargers eligible for *off-peak charging program*
- GMP is also providing \$5,000 discount on new 2019 Nissan Leaf, and \$600 purchase incentive (any EV) to low income households

Off-Peak Charging Program

- Fixed monthly fee of \$29.99 (plus tax) gives:
 - ✓ Unlimited charging any time, unless GMP declares a “peaking event”
 - ✓ Participants are notified 24-hours in advance for peaking events, to include exact time (i.e. 5 PM – 9 PM), which generally will not exceed 4 hours
 - ✓ Participants can charge during peaking events, but will be charged a “critical peak price (\$0.60/kWh) for all charging during the duration of the event

Sector: Light-Duty Vehicles

EV Programs: Free EVSE & Scheduled Charge Program

Program Type: Free residential EVSE for allowing limited utility control of charging

Utility: Shrewsbury Electric and Cable Operations (SELCO)

Location: Massachusetts



EV Scheduled Charging Program

- Free Wi-Fi enabled Level 2 charger for any EV owner
- Regular residential electric rates
- Between 5 PM and 9 PM on weekdays, charger is locked to provide maximum charge rate of 1.25 kW
- At other times charger can charge at full Level 2 capability
- Emergency Scheduling: during emergency events, SELCO can use Wi-Fi connection to limit charge rate, to reduce over-all system demand

Sector: Light-Duty and Medium-/Heavy-Duty Vehicles

SmartCharge NY Incentive Program



Program Type: Off-bill Incentives for off peak charging – home and public

Location: New York

Utility: Con Edison

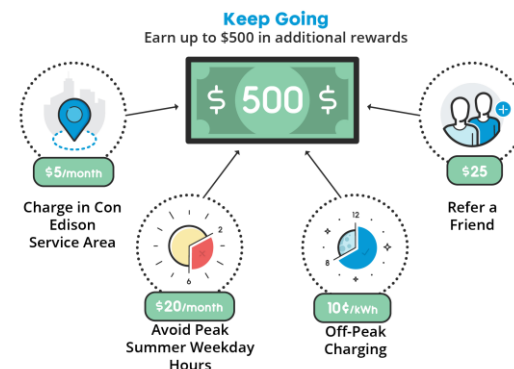
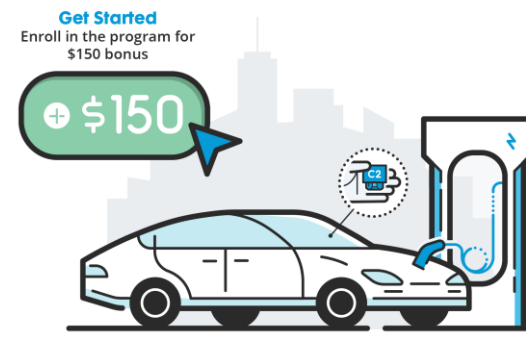
Size: \$2.5 million (2019) program budget

Program Details

- ConEd provides a free C2 device that plugs-in to car's OBD port, which monitors charge times
- ConEd charges regular rates on customer bills for all charging, but gives off-bill incentive payments:
 - ✓ \$150 to sign up, plus \$5/month for keeping the C2 device connected and charging in ConEd service territory
 - ✓ \$20/month for no-charging during summer peak hours (2PM – 6PM)
 - ✓ \$0.10/kWh for all charging during off-peak hours (between 12 midnight – 8 am). This incentive is given for all off-peak charging whether at home or at a public charger, even if charging is outside of ConEd territory.

SmartCharge New York

Unlock valuable charging and driving data with a FREE and easy to install C2 connected car device. Earn up to \$500 annually on a per-vehicle basis.





Pilot Program: TOU Rate Schedule for EV Charging

Program Type: TOU Rate (without demand charge)

Utility: Hawaiian Electric

Location: Hawaii

Size: Oahu: 100 customers; Maui County: 40 customers; Hawaii Island: 40 customers

Hawaii Electric's Pilot Rate Schedule: TOU Rate without a Demand Charge			
Eligibility	<ul style="list-style-type: none"> Commercial customers with high EV charging demands (up to 100 kW) 		
Offering	<ul style="list-style-type: none"> Time-of-use (TOU) rate for EV charging on a separate meter No demand charge during any of the time-of-use periods Lowest rates offered from 9am to 5pm 		
Requirements	<ul style="list-style-type: none"> Maximum of 5 kW ancillary load to allow for lighting, monitoring, point of sale equipment for charging station Monthly \$5.00 metering charge 		
Rate Schedule	Rate	Time of Day	Cost/kilowatt-hour
	Off-Peak rates	10pm to 9am	14 cents above typical rates
	Mid-Day rates	9am to 5pm	9 cents above typical rates
	Rate Schedule	5pm to 10pm	17 cents above typical rates

Charge Ready Transport



Program Type: Rebate + Make Ready infrastructure

Utility: Southern California Edison

Location: California

Size: \$343 million

Key Components:

- 870 sites by 2024; supports $\geq 8,490$ M/HDV
- Transit agencies, ports/warehouses, forklift support, DACs

Program Details

- Make ready infrastructure
- Customers have choice to own, operate, and maintain infrastructure
- Three TOU rates for commercial customers
- No demand charge for the first five years rates are available (costs recovered through a volumetric energy charge)

Tariff	Monthly Max Demand	Application of Demand Charges
TOU-EV-7	20 kW	Option A: No demand charges Option B: Phased in beginning in year 6
TOU-EV-8	21-500 kW	Phased in beginning in year 6
TOU-EV-9	500 kW	Phased in beginning in year 6

Fleet EV Service Pilot



Program Type: Make ready

Utility: Xcel Energy

Location: Minnesota

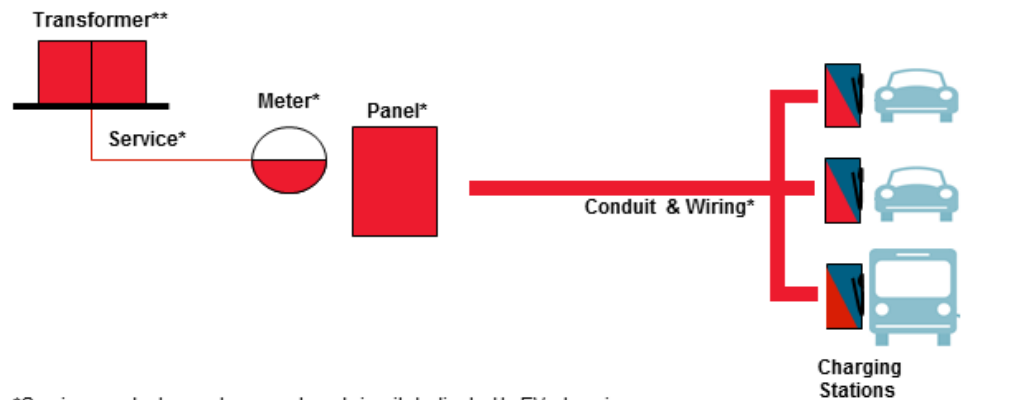
Size: Pilot – \$14.4 million over 3 years
(Estimated at 700 charging ports)

Key Components:

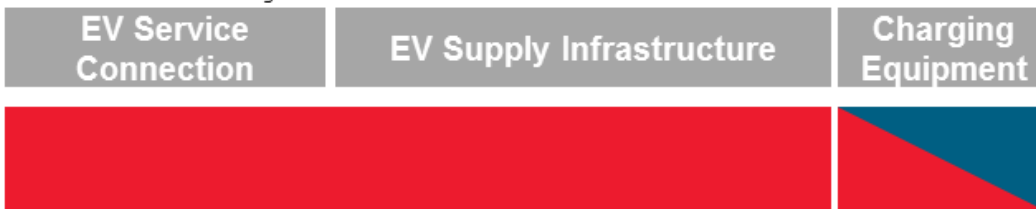
- Optional No-cost Make Ready and EVSE

Program Details

- The Fleet EV Service Pilot will be available to non-residential customers who operate fleets that include LDV, MDV, or HDV
- Participating fleet operators required to take service under TOU rates for EV charging
- Xcel would provide advisory services



*Service conductor, meter, panel, and circuit dedicated to EV charging
**Can be overhead or underground



Fleet EV Services Pilot

■ Infrastructure installed, owned, and maintained by the utility
 ■ Infrastructure owned and maintained by participating customers
 ■ Customer can choose between utility installing, owning, and maintaining or installing, owning and maintaining themselves



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