

ENABLING VEHICLE CHARGING INFRASTRUCTURE

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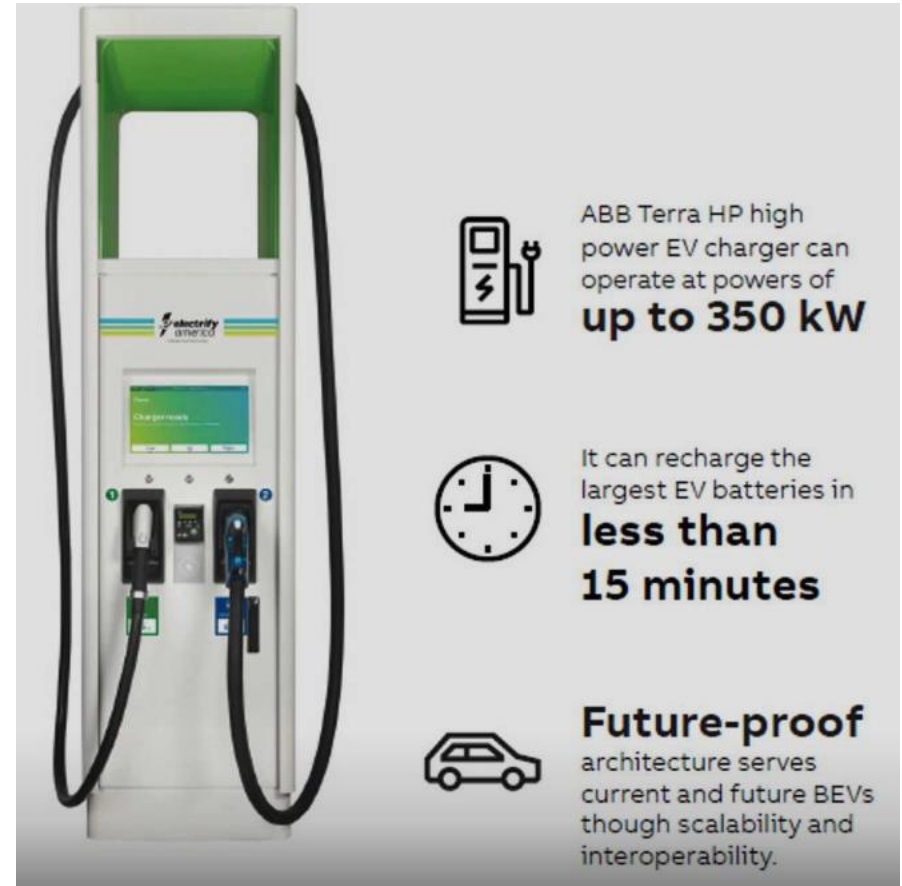
STATES SHOULD GET READY TO...

- Deploy public charging stations
- Enable utility investment in “make-ready” to accommodate EV chargers.
- Enable private sector investment in charging stations
- Streamline interconnections, permitting and compliance for EV chargers
- Manage EV charging to benefit all utility customers

CHARGING INFRASTRUCTURE: TODAY AND TOMORROW

Everything is changing...

- Home & workplace charging: **7-19 kW**
“Level 2” chargers
- Public & commercial high-speed “DCFC” chargers: **50-350 kW**
- Electrify America installing 150 kW DCFC network. Charging power levels up to 350kW will be available at every station
- Home charging is dominant now, but will not be as EV range grows and adoption moves to apartment dwellers
- Retail built up around chargers like gas station? “Mega”-chargers at truck stops?








ENABLING UTILITY INVESTMENT IN CHARGING INFRASTRUCTURE

Jurisdictions vary in their views on utility ownership of charging infrastructure.

- Utility investment in “**make-ready**” infrastructure is advisable everywhere, BUT...
- Utility incentives to invest in make-ready should be **performance-based**
- Utility investment in charging stations (not just make-ready) should focus on installations that are **unlikely to interest private sector** companies, like low-income multi-unit dwellings



NEEDED UTILITY INVESTMENT

Large new loads		Can require
	Residential Level 2 chargers (2.9 – 7.7 kW) <ul style="list-style-type: none"> • Each EV is like adding the load of a house 	<ul style="list-style-type: none"> • Distribution transformer upgrades
	Workplace Level 2 chargers (7.7 – 16.9 kW) <ul style="list-style-type: none"> • Up to ~1 MW 	<ul style="list-style-type: none"> • Distribution transformer upgrades • Feeders • Service panel upgrades
	Public high-speed (DCFC) charging depots <ul style="list-style-type: none"> • 50 kW – 2 MW 	<ul style="list-style-type: none"> • Distribution transformer upgrades • Feeders • Service panel upgrades • Make-ready
	Transit bus barns, fleet vehicles <ul style="list-style-type: none"> • 5 – 30+ MW 	<ul style="list-style-type: none"> • Distribution transformer upgrades • Feeders
	Interstate truck stops <ul style="list-style-type: none"> • 20 – 40 MW 	<ul style="list-style-type: none"> • Service panel upgrades • Make-ready

BEST PRACTICES: CHARGER SITING

- How many EVs will there be by 2025? 2035? 2050?
- How many chargers do we need per EV?
- When should we start building chargers? [Now.]
- Will AVs take over?
- How many vehicles do you need to sustain a 30% utilization rate on a public DCFC?
- How can you provide chargers for multi-unit dwellings?
- How can you encourage workplace charging?

Answer: Pilots, Pilots, Pilots!



1. Deploy pilot
2. Gather data
3. Analyze and share
4. Scale up: Pilot → Demo → Commercial

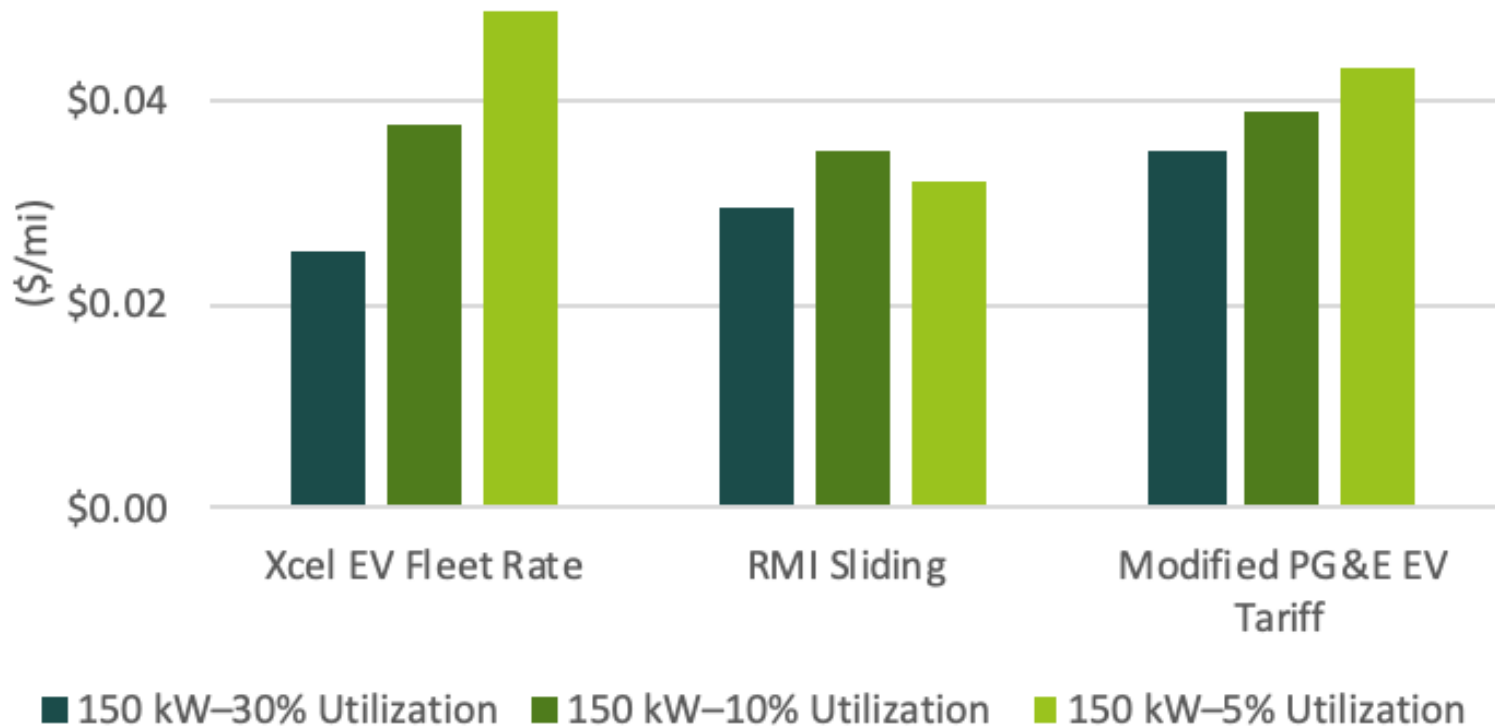
ENABLING PRIVATE SECTOR INVESTMENT

- **Public DCFC** are critical parts of the network and should be mostly built, owned & operated by the private sector.
 - Critical for MUD dwellers and interstate corridors
- Therefore it is critical that tariffs support public DCFC infrastructure.
- But **most existing tariffs destroy the business case for investing in them:**
 - Use punishing, non-coincident **demand charges**
 - Do not accurately reflect the true cost of service
 - Are not consistent across utilities
 - Lack appropriate price signals for effective integration of EVs onto the grid
- DCFC utilization varies by host type, and increasing utilization eases issues with demand charges.
 - **We need tariffs that reduce demand charges create a better business case for DCFC owners & operators.**

DCFC RATE DESIGNS COMPARED

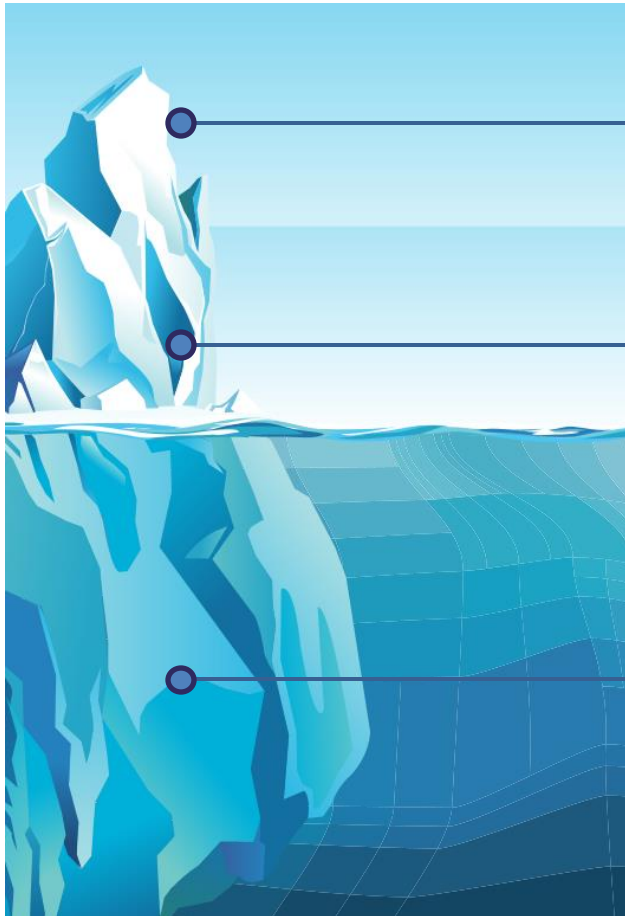
PUBLIC 150 KW DCFC

RMI tariff produces the *most consistent cost per mile* and the cheapest cost at 5% and 10% utilizations



REDUCE SOFT COSTS OF DEPLOYING CHARGERS

Streamline interconnections, permitting and compliance



Procurement

- Charger Hardware
- Managed Charging Capability
- Contracts
- Software
- Grid Hosting Capacity
- Make-Ready Infrastructure

Requirements

- Payment System
- Measurement Standards Compliance
- ADA Compliance and Parking Requirements
- Dual Plug Types for DCFC
- Open Standards

Soft Costs

- Communication Between Utilities and EVSPs
- Future-Proofing
- Easement Processes
- Complex Codes
- Complex and Inconsistent Permitting Processes

REDUCING SOFT COSTS

What can government do?



At the **federal** level, requirements for ADA compliance and building permitting can be clarified and standardized.



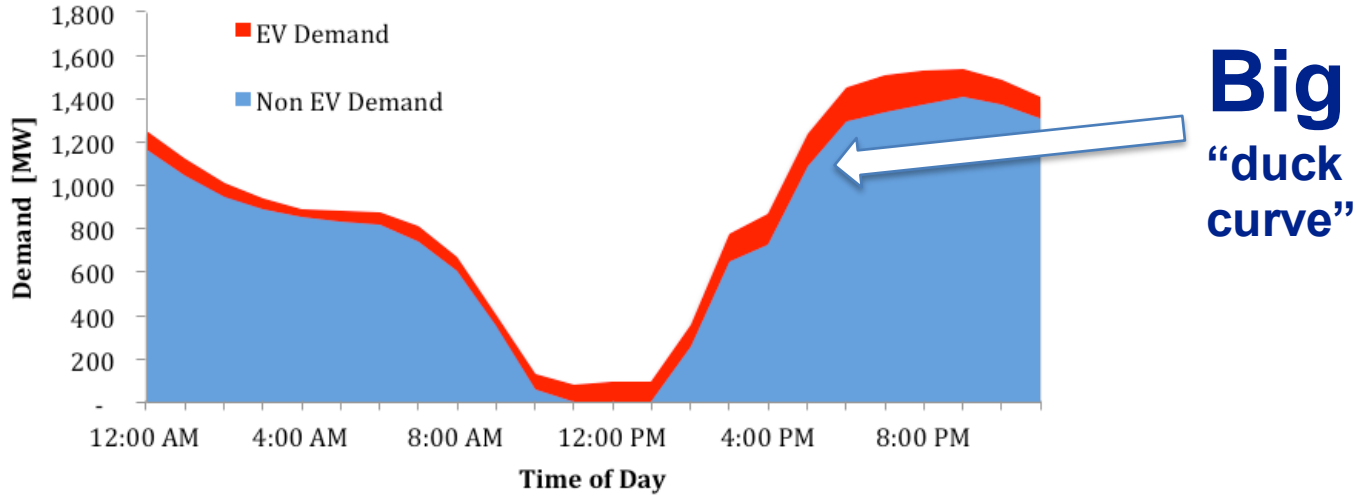
At the **state** level, permitting & utility interconnection can be streamlined (e.g., CA AB 2188) and ADA compliance can be clarified.



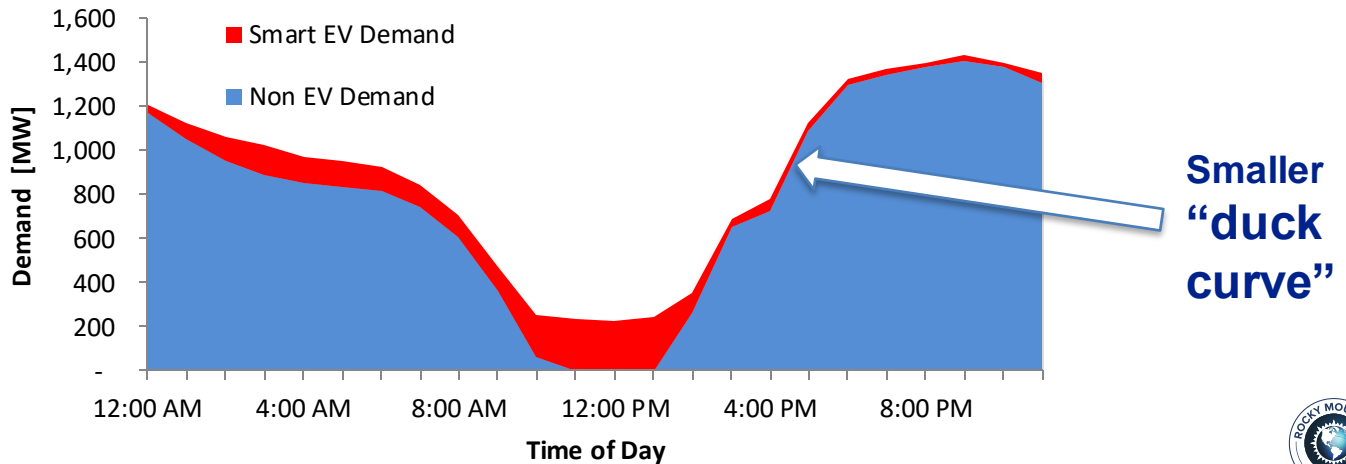
At the **municipal** level, building and planning departments can standardize codes and permitting requirements across jurisdictions, offer simple checklists for required documentation, and offer online permits.

MANAGED CHARGING

- Projected HECO demand with 23% EV penetration with uncontrolled EV charging



- Projected HECO demand with 23% EV penetration with managed EV charging



MANAGED CHARGING

Managed charging of electric vehicles (G2V not V2G) can deliver many benefits:

- Put downward pressure on utility rates for all ratepayers
- Optimize existing grid assets and extend their useful life
- Avoid new investment in grid infrastructure
- Supply ancillary services, such as frequency regulation and power factor correction.
- Absorb excess wind and solar generation
- Reduce emissions
- Reduce electricity and transportation costs
- Reduce petroleum consumption

RATE DESIGN IS KEY

But: Managed charging is difficult and costly with DCFC depots

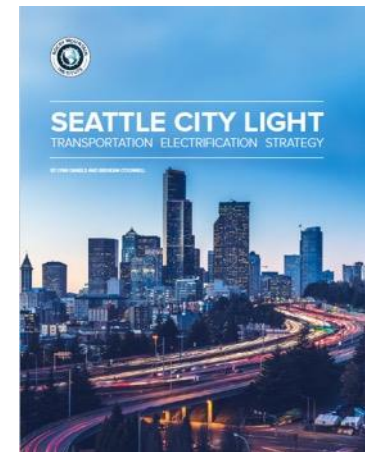
RMI EV-GRID REPORTS



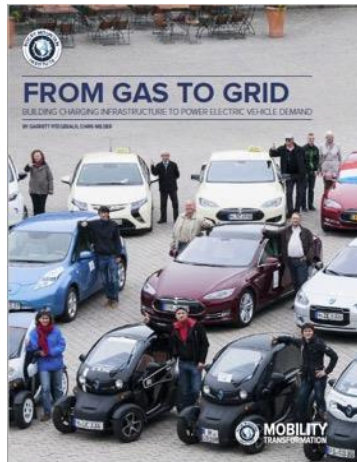
Reducing EV Charging Infrastructure Costs
(January 2020)



DCFC Rate Design Study
(Sept 2019)



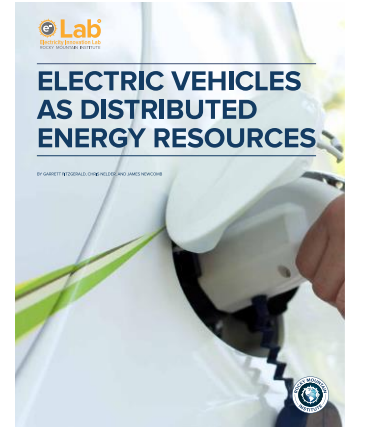
Seattle City Light TE Strategy
(Aug 2019)



From Gas to Grid
(October 2017)



EVgo Fleet and Tariff Analysis
(March 2017)



Electric Vehicles as Distributed Energy Resources
(June 2016)



Thank you!



Transforming global energy use to create a clean, prosperous, and secure low-carbon future.

