



WORLD  
RESOURCES  
INSTITUTE

# PAIRING ELECTRIC VEHICLES AND RENEWABLES: A REVIEW OF PROGRAMS AND RATES

Lori Bird, World Resources Institute  
ASES Conference June 24, 2020

---

# WORLD RESOURCES INSTITUTE (WRI) OVERVIEW

- WRI is global sustainability non-profit
- Approximately 1000 employees
- Offices in the U.S. and 10 other countries
- History of working with large energy buyers including corporates and cities
- Electric vehicle work focuses on grid integration and linkages with renewable energy
- The work presented is derived from our Clean Power Council, a group of electric utilities and large corporate clean energy buyers
- CPC members include:
  - Adobe, American Electric Power, American Honda Motor Co., Berkshire Hathaway Energy, Best Buy, Consumers Energy, General Motors, IBM, Levi Strauss & Co., Southern Company, Target, Tennessee Valley Authority, Walmart and Xcel Energy.
- Clean Power Council website: <https://www.wri.org/our-work/project/clean-energy/clean-power-council>

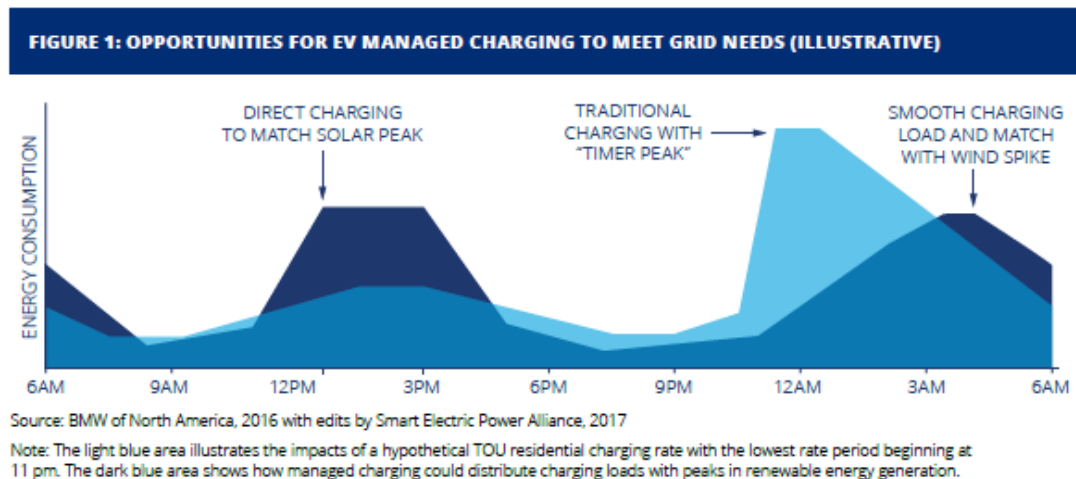


WORLD  
RESOURCES  
INSTITUTE



# PAIRING EV & RENEWABLES

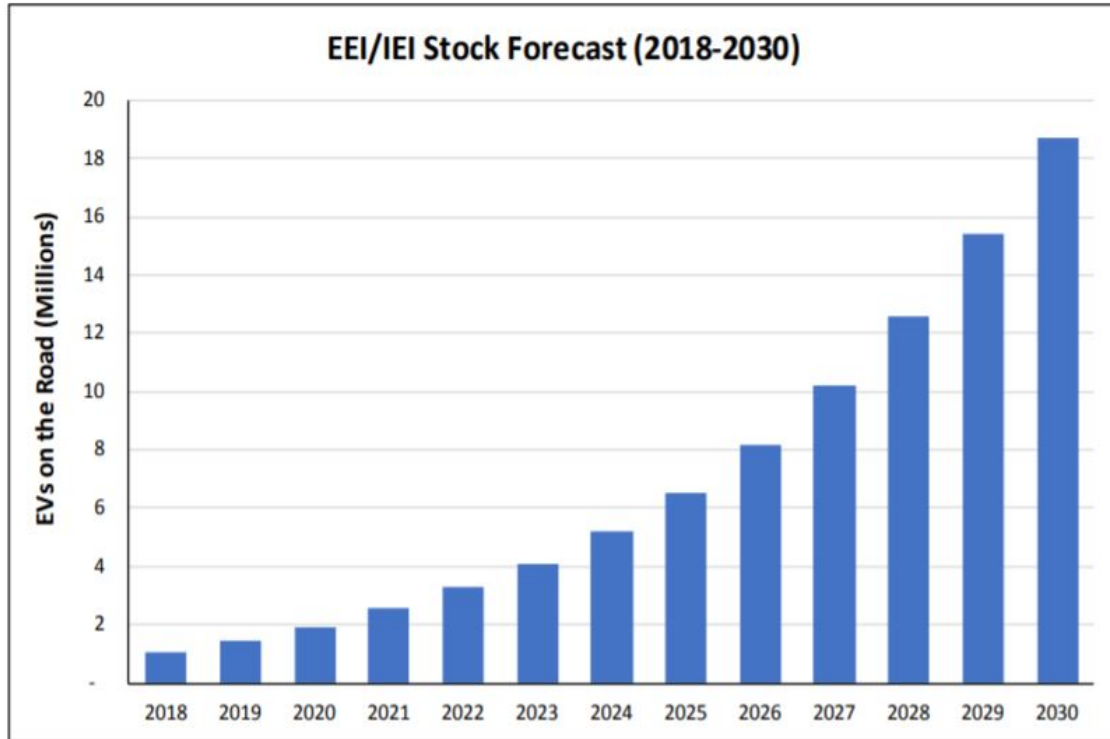
- **Rationale for pairing EVs and Renewables:**
  - EV charging is only as clean as electricity used to charge it; although EVs are more efficient than conventional vehicles
  - Many customers want to charge with renewables, have established 100% clean energy goals including transportation
  - Linking EV charging with availability of renewables can have grid benefits, by timing electricity use with solar and wind availability
- **Objective of research:**
  - Explore range of approaches available for customers to use renewable energy to charge EVs
  - Examine rate structures and approaches that benefit customers and the grid
- **Report: Using Renewables for Electric Vehicle Demand: A Review of Utility Program Designs and Implementation**  
<https://files.wri.org/s3fs-public/renewables-for-ev-demand.pdf>





# BACKGROUND: EV GROWTH, CLEAN ENERGY GOALS

## EV Growth Projections 2030



EVs projected to reach nearly 19 million by 2030 (EEI)

## Example Goals for Charging EVs with RE

- **Cambridge, Massachusetts.**
  - Cambridge has committed to transition to 100 percent renewable energy community-wide, including energy for buildings and transportation, by 2035.
- **Honolulu, Hawaii.**
  - Honolulu has committed to a 100 percent renewable-fueled municipal fleet by 2035, in addition to a goal to power the city's entire public and private ground transportation system with 100 percent renewables by 2045.
- **Portland, Oregon.**
  - Portland has committed to using 100 percent renewable energy to power communitywide transportation needs by 2050

# EV CHARGING WITH RE: PROGRAM DESIGNS & RATES

Approach/Program Design	Examples	Description
<b>1. Utility Offerings Linking EV Charging Time and Renewables</b>	Great River SMUD	EV charging encouraged during off-peak periods or at times when renewable energy generation is high.
<b>2. EV Network Charging using Renewables</b>	Austin Energy; EVGo	Network Charging model; customers pay per use or monthly flat fee to charge EV with renewables.
<b>3. Rates Matching Charging with Timing of Excess Renewables</b>	HECO; SDG&E	Discounted rates encourage customers to charge EVs when excess renewables are on the grid.
<b>4. Workplace Charging and Managed Charging</b>	PG&E/ BMW Google,	Employee workplace EV charging with renewables; managed charging programs can align with grid needs or demand charge management.
<b>5. Coupling EV Charging with On-Site Renewables</b>	San Diego, Tesla	On-site solar and batteries charge EVs; can incorporate communication between the charger and the PV system.

# 1. UTILITY OFFERINGS LINKING EV CHARGING TIME TO RENEWABLES

## *How it Works:*

Programs offer renewables while encouraging charging at preferential times: off-peak periods or when renewable energy is high. Customer receives financial benefits.

## Two Models:

- Integrated Programs to Enable EV Charging with Renewables
  - Great River
- Coupling EV Time-of-Use (TOU) Rates with Renewable Energy Options
  - SMUD

## **Great River Energy (GRE)**

In 2015, *Revolt* launched, which allows 100% wind charging, at no extra cost and offers special night-time rates to switch over.

Available to 400 EV owners and retires customer's Renewable Energy Credits (REC).

50,000 kWh of RECs for purchased EVs and approximately 15,000 kWh of RECs for leased vehicles have been retired.

The program was slated to last one year, but was extended each year, through the end of 2018, due to popularity.

## 2. NETWORK CHARGING WITH RENEWABLES

### *How it Works:*

Charging EVs with renewables under a network charging agreement.

Customers participate under several cost models:

- Pay-as-you-go
- Fixed monthly subscription
- Free network access

### **Austin Energy Plug-in EVerywhere™ Network**

In 2012, 100% wind-powered *Plug-in EVerywhere™ Network* launched.

\$4.17/month (\$2/hour service charge) for unlimited access to 600+ charging ports installed at 172 locations.

As of 2017, 1400 customers, 40%+ of EV owners, were subscribed.

Program has offset 1.317 GWh through 185,995 charging sessions.

Austin Energy also jointly launched a time-of-use (TOU) pilot program which gave 100 customers unlimited charging at any station and unlimited off-peak charging at home (7:00 p.m. to 2:00 p.m. during weekdays and weekends).

### 3. COUPLING EV CHARGING WITH ON-SITE RENEWABLES

*How it Works:*

EV charging can be linked with on-site solar directly or indirectly. Batteries can also be used to match with charging needs.

Integrated PV chargers have been used in some jurisdictions.

Others have installed PV on parking garages or near chargers without a direct tie of usage.

#### **San Diego EV and Solar Pilot**

In 2012, a Solar-to-EV pilot project was launched by the City of San Diego, the U. of California San Diego, General Electric, CleanTECH and SDG&E. The project installed 10 solar PV canopies, with 90kW of capacity, in the San Diego Zoo parking lot.

The Solar-to-EV program allows residents to use 5 charging stations at \$0.59/kWh, or \$0.49/kWh if subscribed to an EV Network membership, Blink. When cars were not being charged, the system stores solar energy in a 100-kW system which is used by SDG&E to offset power demand on the grid during peak times.

**Google** currently offers 450+ charging stations to employees on the Mountain View campus, free of cost. A number of these are charged with the on-site PV systems installed on the company's roof.

Similarly, **DirecTV** offers employees 30+ charging stations, 4 of which are entirely powered by solar energy.



# 4. MANAGED EV CHARGING WITH RENEWABLES

## *How it Works:*

Managed charging allows EV charging to be controlled remotely to better align with grid needs.

Managed charging can be used in workplace charging to optimize EV charging for:

- Aligning EV charging timing with renewables
- Shifting EV charge time for utility grid benefits
- Avoid demand charge impacts

Commercial customers could use managed charging for fleets or employees.

## **San Diego Gas & Electric (SDG&E)**

In 2016, SDG&E launched a 3-year managed charging pilot program, Power Your Drive.

3,500 Level 2 chargers were installed at 350 apartments, condominiums and workplaces to test real-time pricing via an app. During times with high renewable energy generation, lower electricity costs are offered.

To participate, customers are asked to set a maximum electricity price and charging stations automatically stop charging once it reaches that point.

Hourly rates are posted a day in advance and reflect system and local grid conditions. Pricing ranges from US\$0.18/kWh in "super off-peak" summer rates (midnight to 05:00) to \$0.46 during on-peak hours (noon-18:00, summer).

# EV CUSTOMER OPT-IN FOR RENEWABLES

Customer Response to Programs Enabling Charging EVs with Renewables			
Utility	Program	Participation	Cost of RE
Austin Energy	Plug-In Everywhere	As of 2017, 1,400 customers, or more than 40% of EV owners in service territory subscribed to network, which supplies 100% wind	\$4.17/mo. or \$2/hour
Potomac Electric Power Company	EV Pilot in Maryland	34% of customers enrolled in the utility's EV-specific charging TOU rate opted to pay \$0.02/kWh more for renewable energy	\$0.02/kWh more for RE
Great River Energy	Revolt (2015 pilot)	Available to 400 EV customers in utility area, customers can charge with 100% wind at no extra cost; extended thru 2018	No extra cost for wind
Pacific Gas & Electric/BMW	iCharge Forward Pilot	68% of customers interested in option to charge with renewables; dropped to 41% when charging limited to 9-4:00pm to match solar generation; increased to 41%-83% with financial incentives	Cost varied by pilot
Xcel Energy	Windsor (used for EVs)	35% of EV owners in the utility's service area subscribe to Xcel's Windsor program, enables 100% wind charging	Varies: 0.9-1.5/kWh

***In a handful of programs for which we obtained data, roughly 1/3 or more customers opted for renewables.***

# PATH FORWARD – NEW OFFERINGS NEEDED

- **A variety of approaches can be used** to serve EV customers and fleets with clean energy; more offerings are needed
- Program structures that **share savings with customers who provide grid benefits** are likely to yield greater uptake and more effectively address grid challenges.
- **Managed charging approaches can be used to maximize utility and customer benefits** including through workplace charging programs.
- **Time-based elements of EV charging** could be incorporated into **existing renewable energy offerings** for large customers.





WORLD  
RESOURCES  
INSTITUTE

# THANK YOU

Lori Bird, World Resources Institute  
ASES Conference June 24, 2020

---