Electric vehicle grid integration policies to benefit consumers

RAP Webinar

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Today’s experts

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Agenda

1. The opportunity: Benefits of EVs
2. Promising practices for EV grid integration
3. Policy recommendations
1 The opportunity
Environmental benefits of EVs

Source: IEA EV outlook 2019
EVs are becoming cost competitive

Source: Element Energy (2018): Availability and Affordability of ZEVs Final Report for BEUC and ECF August 2018
Grid benefits of EVs

- Flexibility
- Renewables
- Reduced cost
Shift charging to times when costs for electricity are lower — without compromising the vehicle owner’s needs.
Why smart charging is crucial

Source: own compilation based on Westnetz, peak day 2017; red/green curves illustrative
EVs’ flexibility helps renewables
Value of flexibility for system operators

California Independent System Operator Duck Curve

Net load - March 31

- Workplace charging
- Overgeneration risk
- Ramp need ~13,000 MW in three hours

Avoid charging

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California Independent System Operation, used with permission (figure 2, page 3):
2 Realising the opportunity: Three key strategies
Strategies for smart EV integration

Smart pricing

Smart technology

Smart infrastructure
Strategies for smart EV integration
Smart Pricing

- Time-varying electricity prices
- Shift charging to “cheaper” hours
- Wider benefits for all electricity users
- Avoid unnecessary investments
The electricity bill

Simple time-of-use tariffs

- **Night**
- **Day**

Source: Based on Iberdrola. *Electric vehicle plan.*
More dynamic tariffs

Electric vehicle owners’ charging habits on dynamic tariff

Tinted areas show the range of variation of usage.

TOU-based network tariffs

Source: Denmark (Radius), TOU network tariff for households (winter season)
Strategies for smart EV integration
Smart technology maximises benefits of smart pricing

- Monitor and communicate
- Automatically control and optimise consumption
Average peak reduction under time-varying tariff pilot programmes


Pricing pilots (109 combinations of time-varying rates and smart technologies)
Automated, optimised charging

• Provide info about driver’s needs
• Lower consumer’s bill
• Charge with sustainable energy

Photo: Jedlix
Strategies for smart EV integration
Workplace & multi-unit dwellings
Use existing infrastructure
Demand-driven planning
Battery-based fast-charging
3 Policy recommendations
Smart pricing

• Prioritise implementation of CE4All package.
• Energy component: Regulators to set EV tariff if needed.
• Network component: Require time-varying tariffs.
• Monitor effectiveness of tariffs.
Smart technology

- Require smart functionality in all electric charging solutions.
- In particular, require technology that enables the application of smart retail tariffs.
- Define technical requirements to drive deployment of appropriate technologies.
Smart infrastructure

• Accelerate equipment at workplaces and MUDs.
• Set ambitious and differentiated target requirements for future charging infrastructure.
• Use existing transport and grid assets through joint planning.
• Anticipate future charging needs for different use cases (electric HDV) via pilots.
• Seek to increase the use of renewables.
Conclusions

1. EV grid integration advances the clean power and transport transitions in parallel.

2. Policymakers on European, national and local level can address this opportunity jointly.

3. Start with smart tariffs, smart technology and smart infrastructure.
Resources

- Start with Smart. Promising practices for integrating EVs into the grid
- Beneficial electrification of transportation
- Treasure Hiding in Plain Sight. Launching electric transport with the grid we already have
About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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4 More information
Time-of-use tariff in Hawaii

![Hawaii Time of Use Rate Over 24-hour Period]

- Price ($/kWh)
- Midnight to Noon

- 12:00 AM to 11:59 PM: Low price
- 12:00 PM to 11:59 PM: High price

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Sacramento Municipal Utility District summer residential time-of-use tariff

Source: Sacramento Municipal Utility District. Get to know our time-of-day rates.
Pacific Gas & Electric time-of-use proposal for shared and commercial EV charging

Typical EU demand curves

Figure 1. Electricity demand curve on typical day in selected European countries (7 November 2018)

EV cost comparison per country

Source: BEUC (2019): *When will electric cars be an affordable option for European Consumers?*