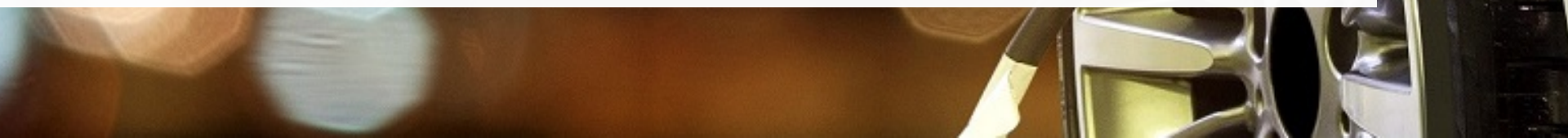
24 October 2019

Electric vehicle grid integration policies to benefit consumers

RAP Webinar

Dr. Julia Hildermeier
Associate
jhildermeier@raponline.org

Christos Kolokathis
Senior Associate
ckolokathis@raponline.org



Today's experts

Julia Hildermeier

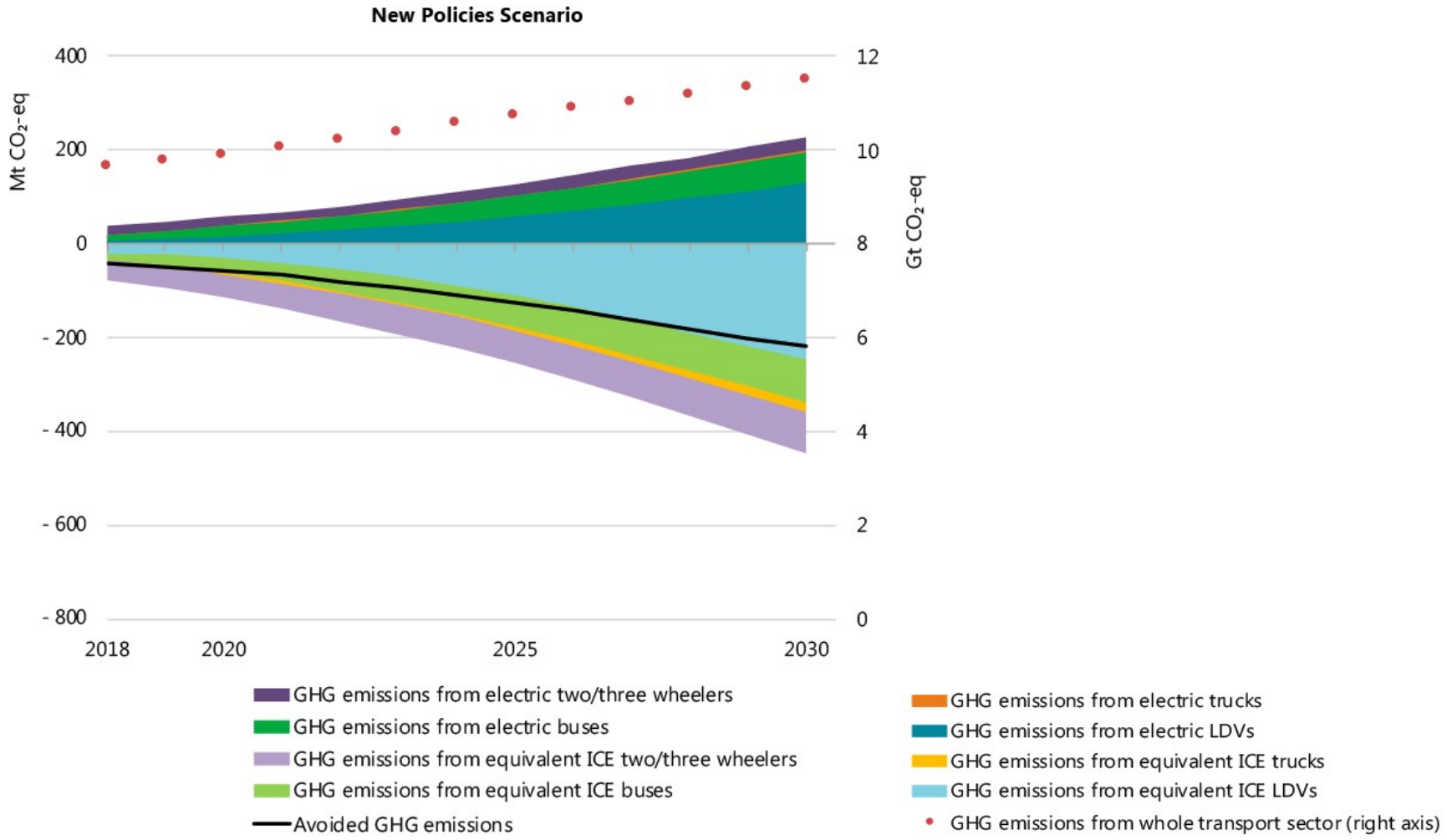
Christos Kolokathis

Agenda

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

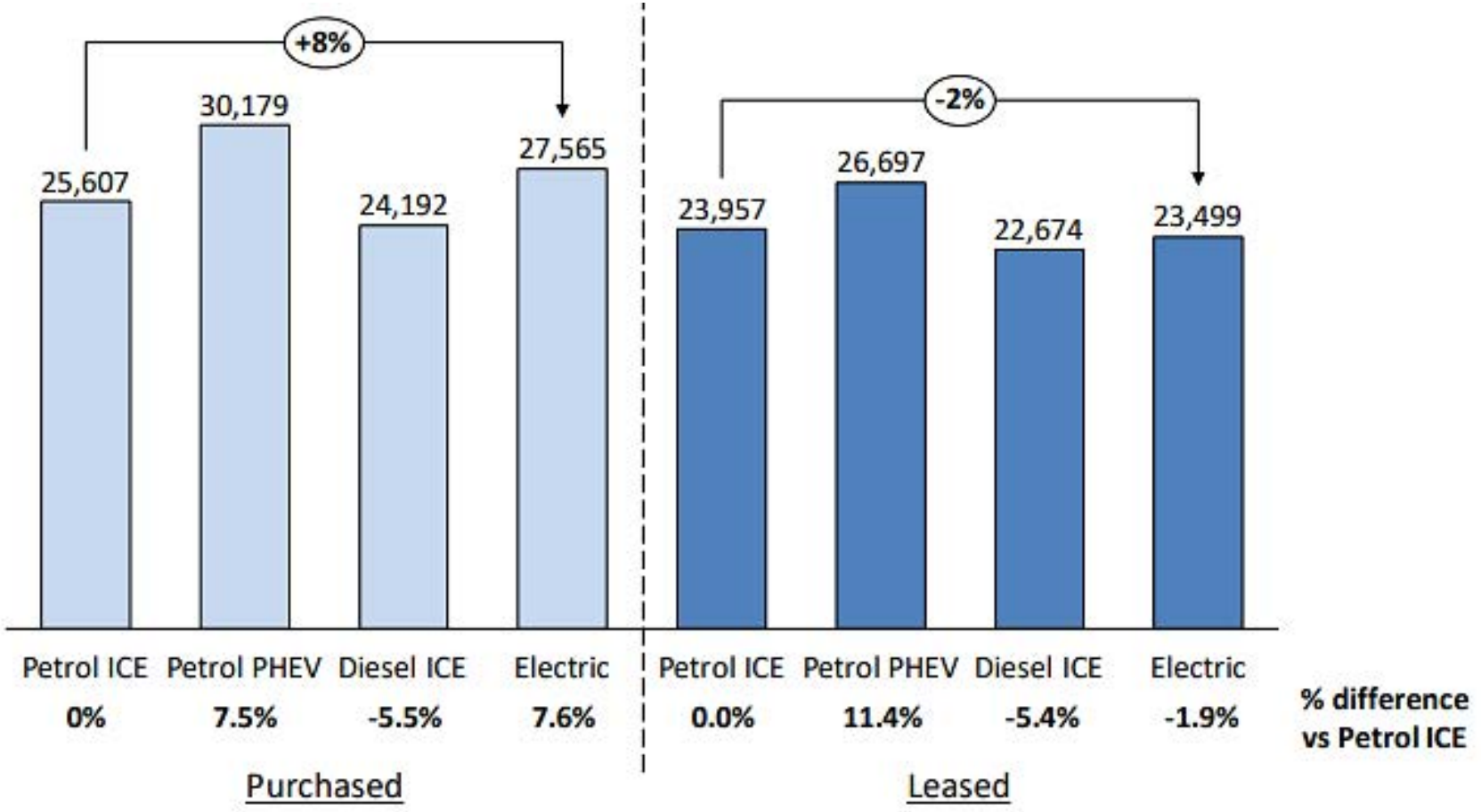
1 The opportunity

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

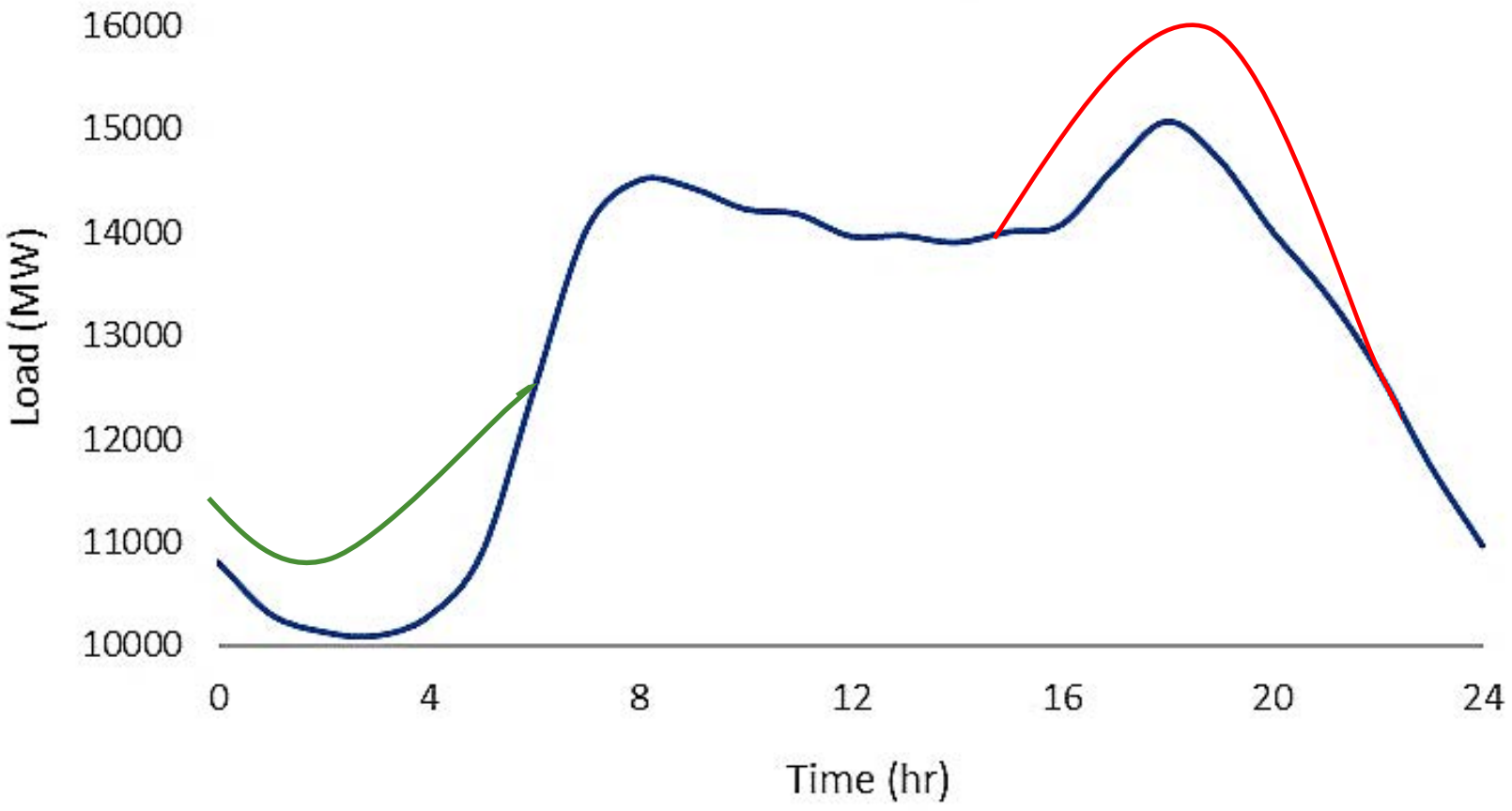
Grid benefits of EVs

- Flexibility
- Renewables
- Reduced cost

Shift charging to times when costs for electricity are lower —

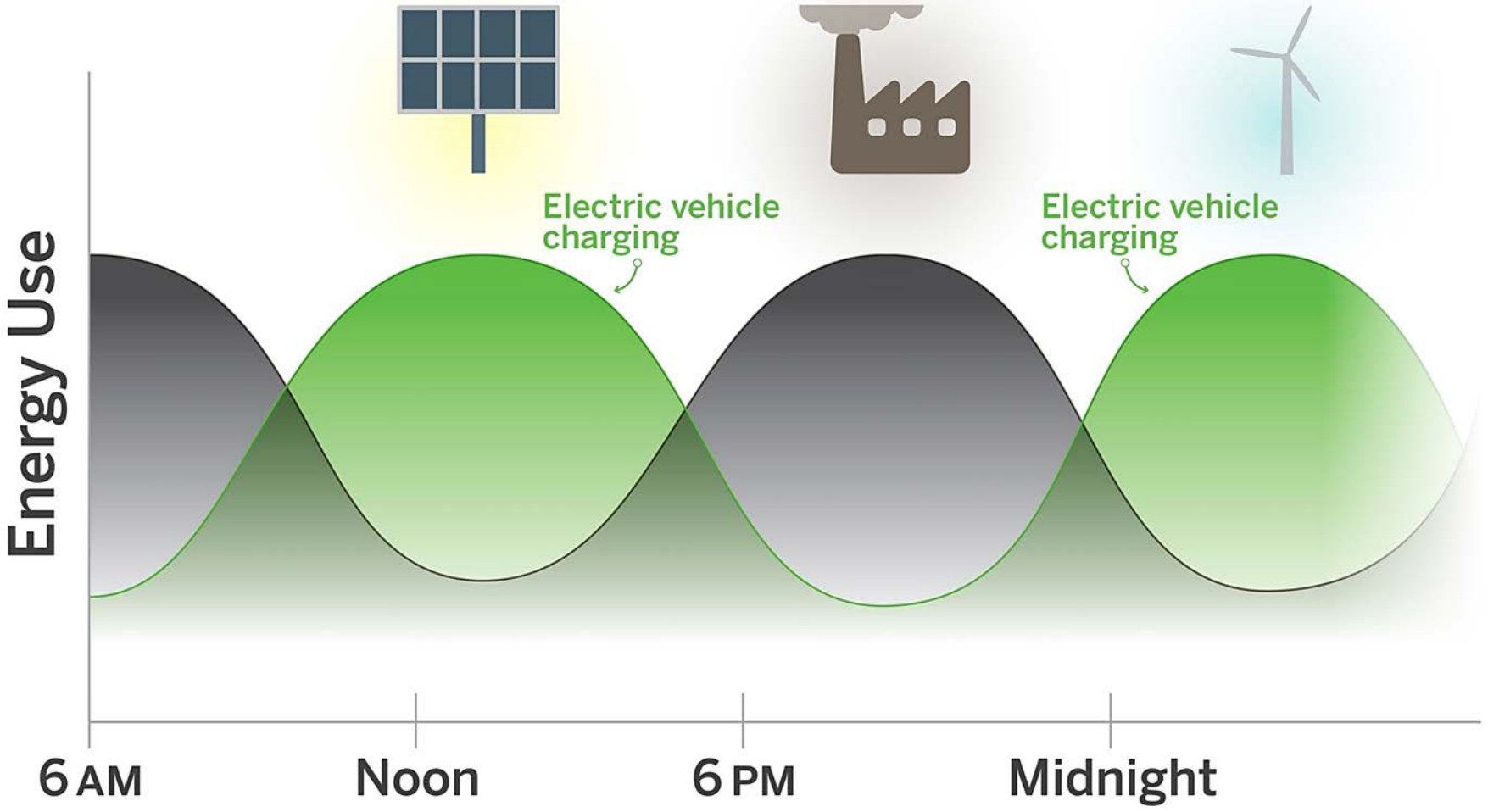
without compromising the vehicle owner's needs.

Why smart charging is crucial

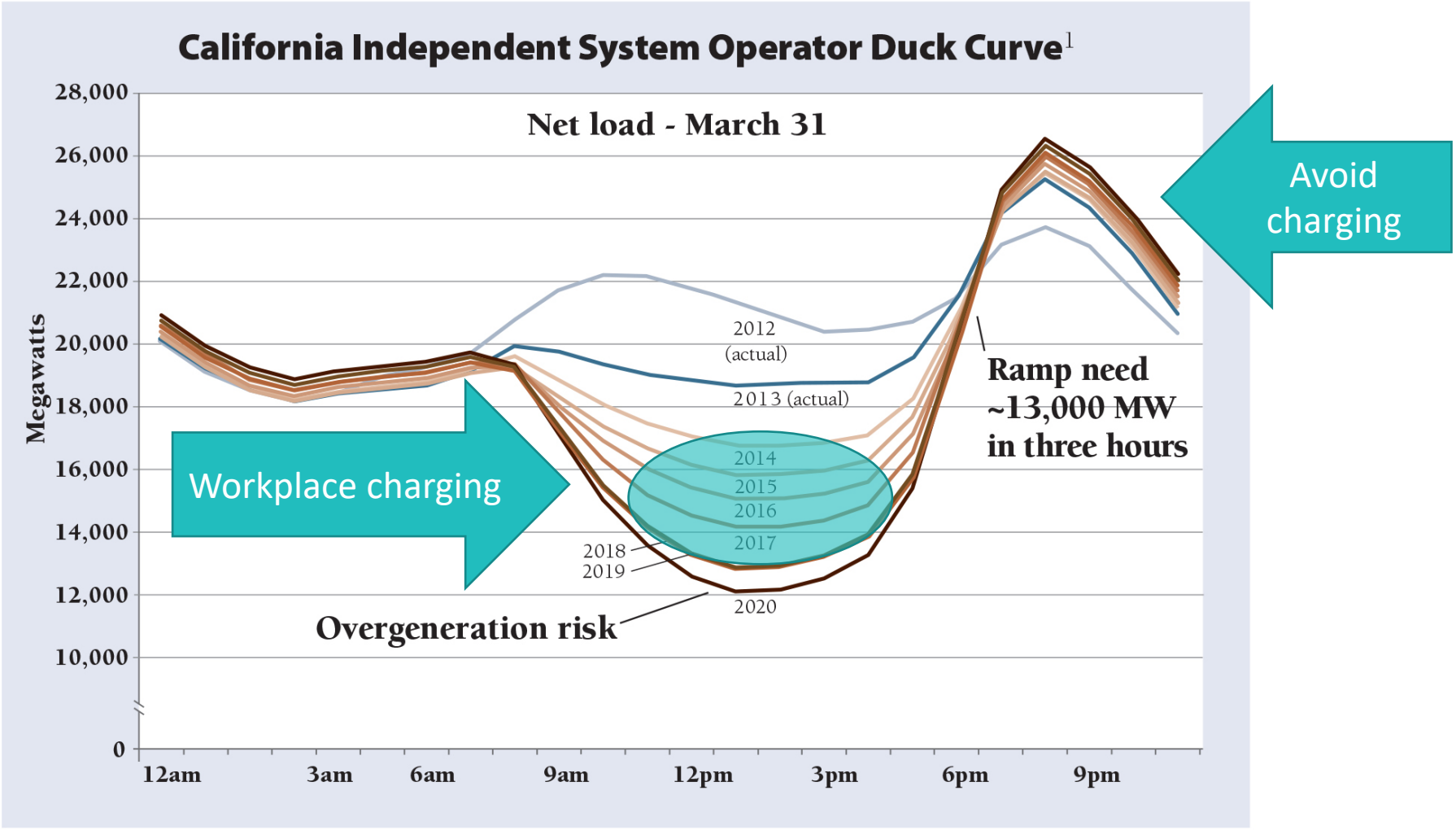


Source: own compilation based on Westnetz, peak day 2017; red/green curves illustrative

EVs' flexibility helps renewables



Value of flexibility for system operators



California Independent System Operation, used with permission (figure 2, page 3): http://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

2 Realising the opportunity: Three key strategies

Strategies for smart EV integration

Smart pricing

Smart technology

Smart infrastructure

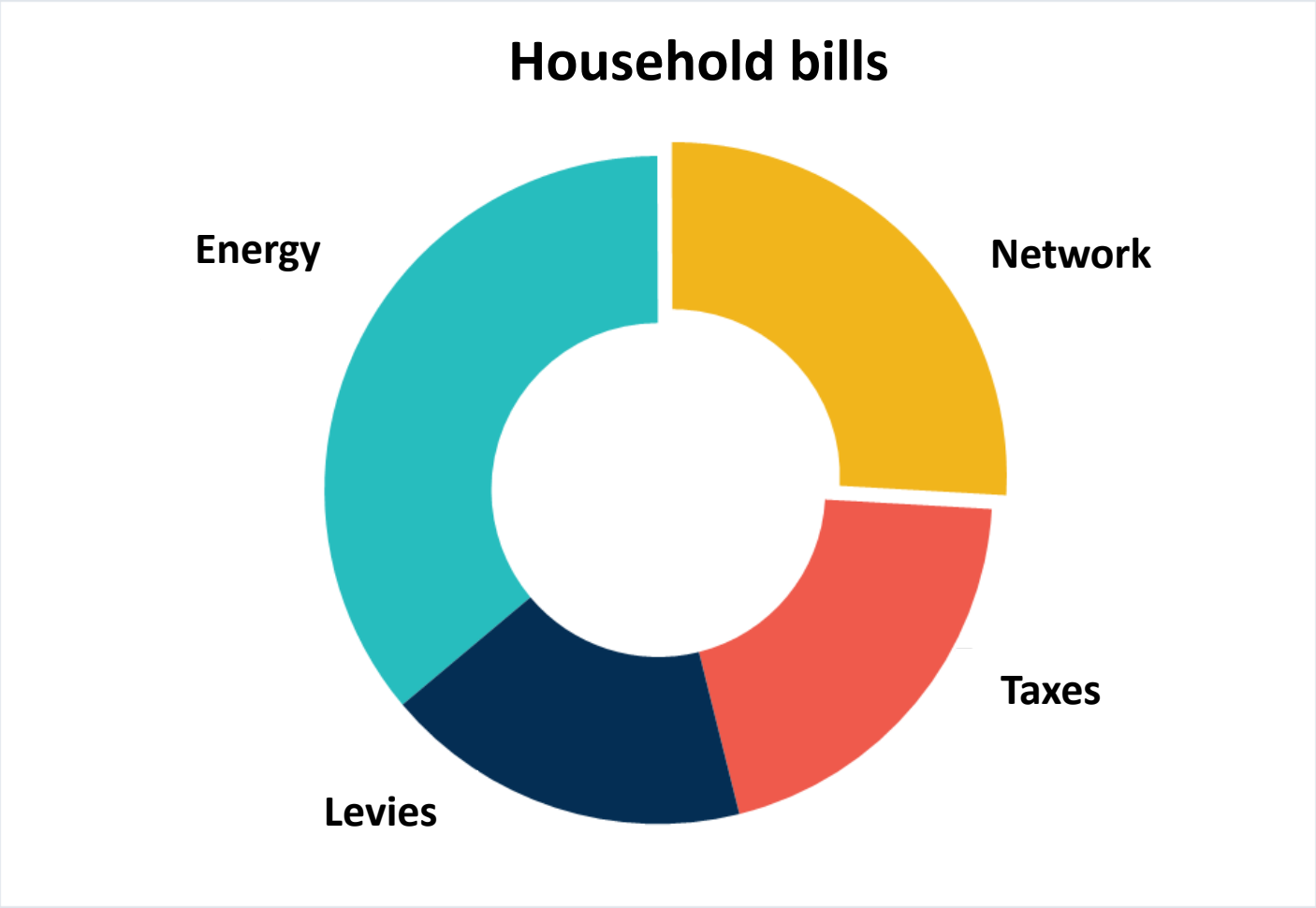
Strategies for smart EV integration

Smart pricing

Smart Pricing

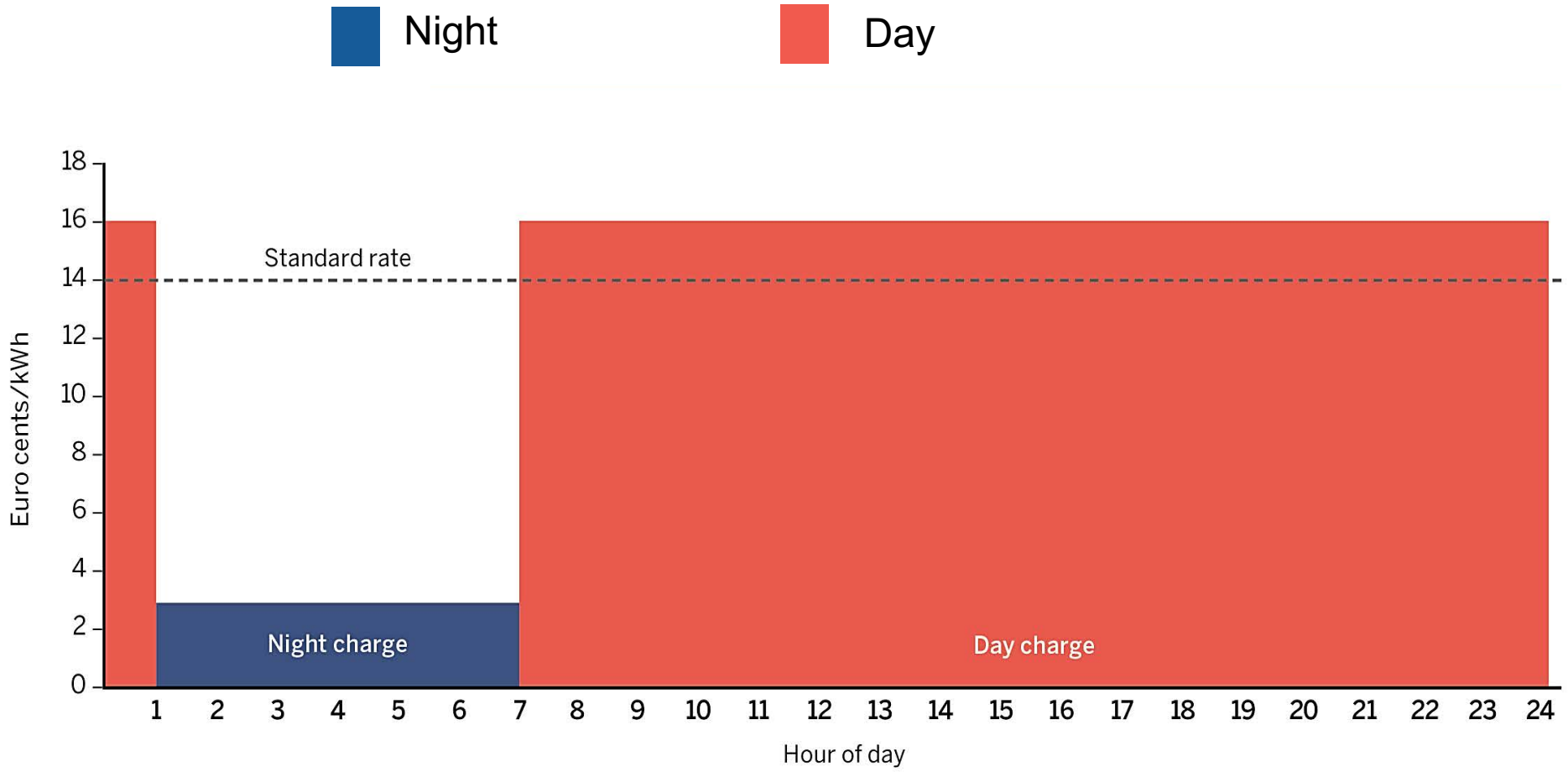
- Time-varying electricity prices
- Shift charging to “cheaper” hours
- Wider benefits for all electricity users
- Avoid unnecessary investments

The electricity bill



Source: European Commission (2016), 2015 Energy prices and costs in Europe.

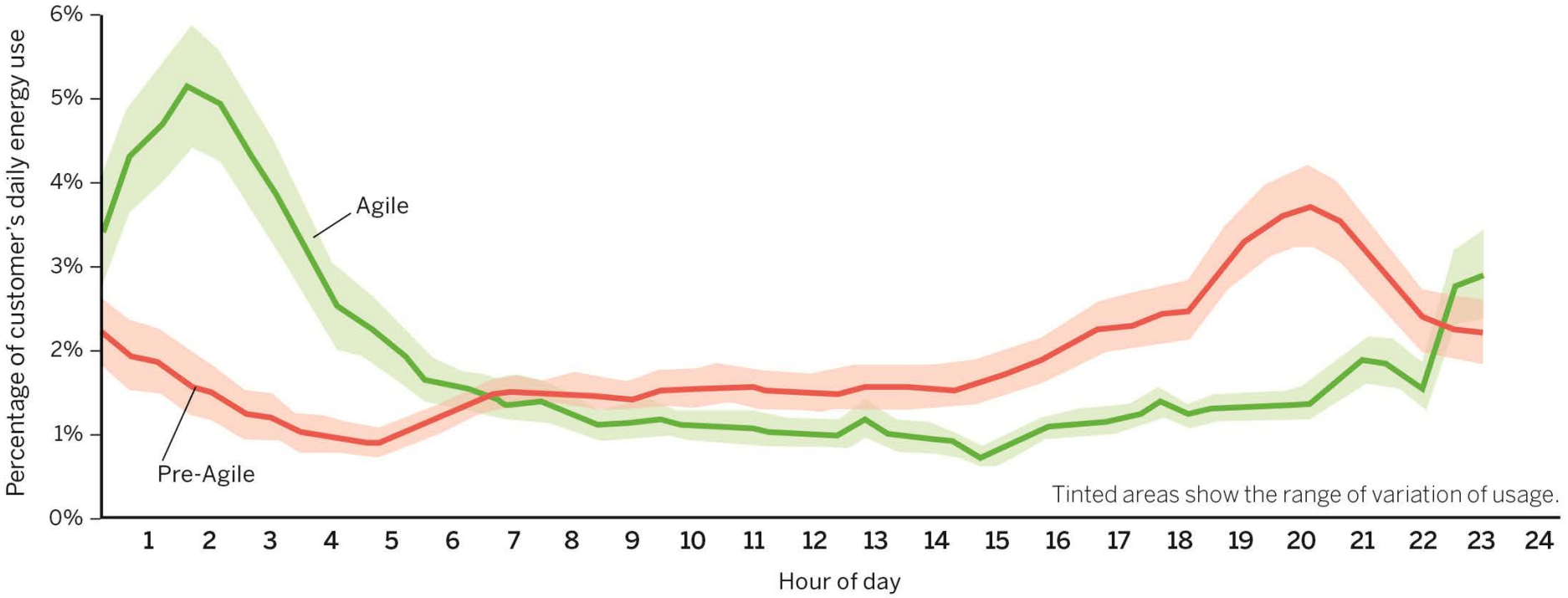
Simple time-of-use tariffs



Source: Based on Iberdrola. *Electric vehicle plan.*

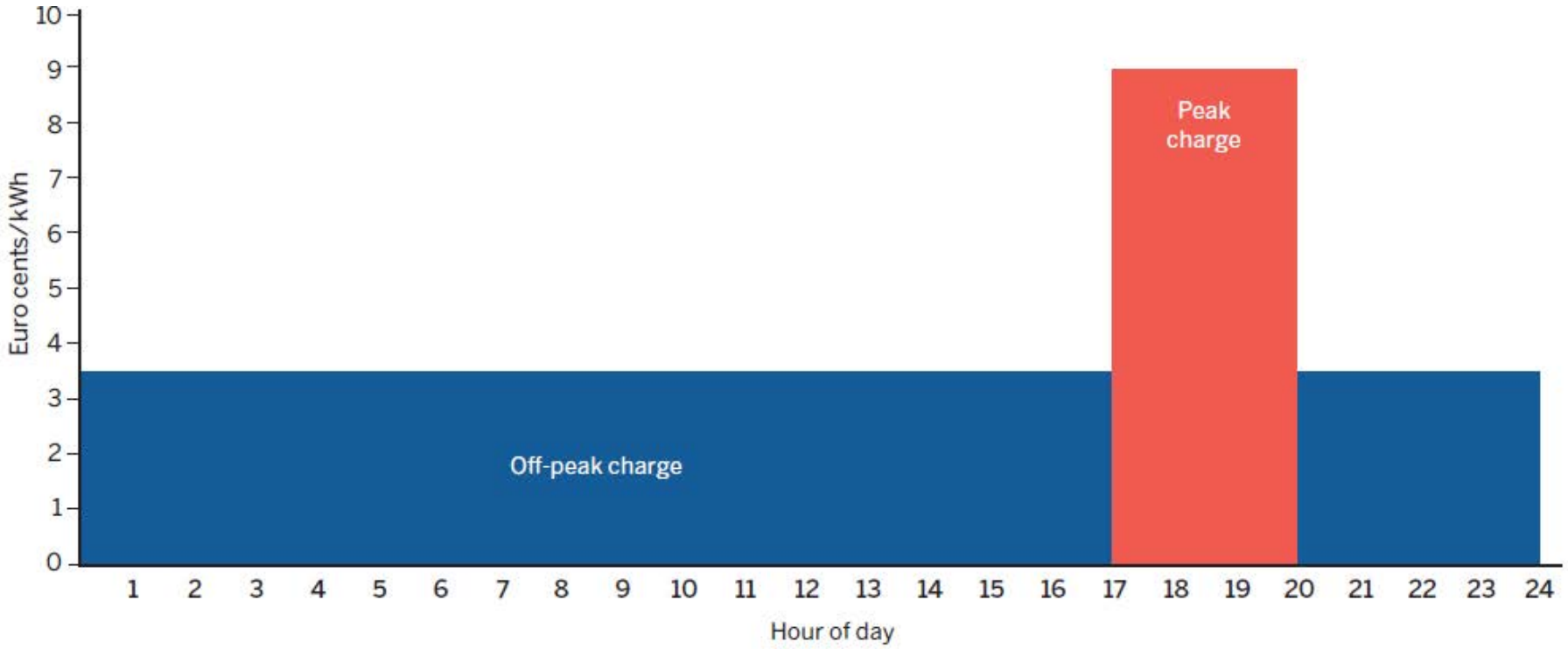
More dynamic tariffs

Electric vehicle owners' charging habits on dynamic tariff



Source: Octopus Energy. (2018). *Agile Octopus: A consumer-led shift to a low carbon future.*

TOU-based network tariffs



Source: Based on Radius. *Tariffer og netabonnement* [Tariffs and network subscriptions].

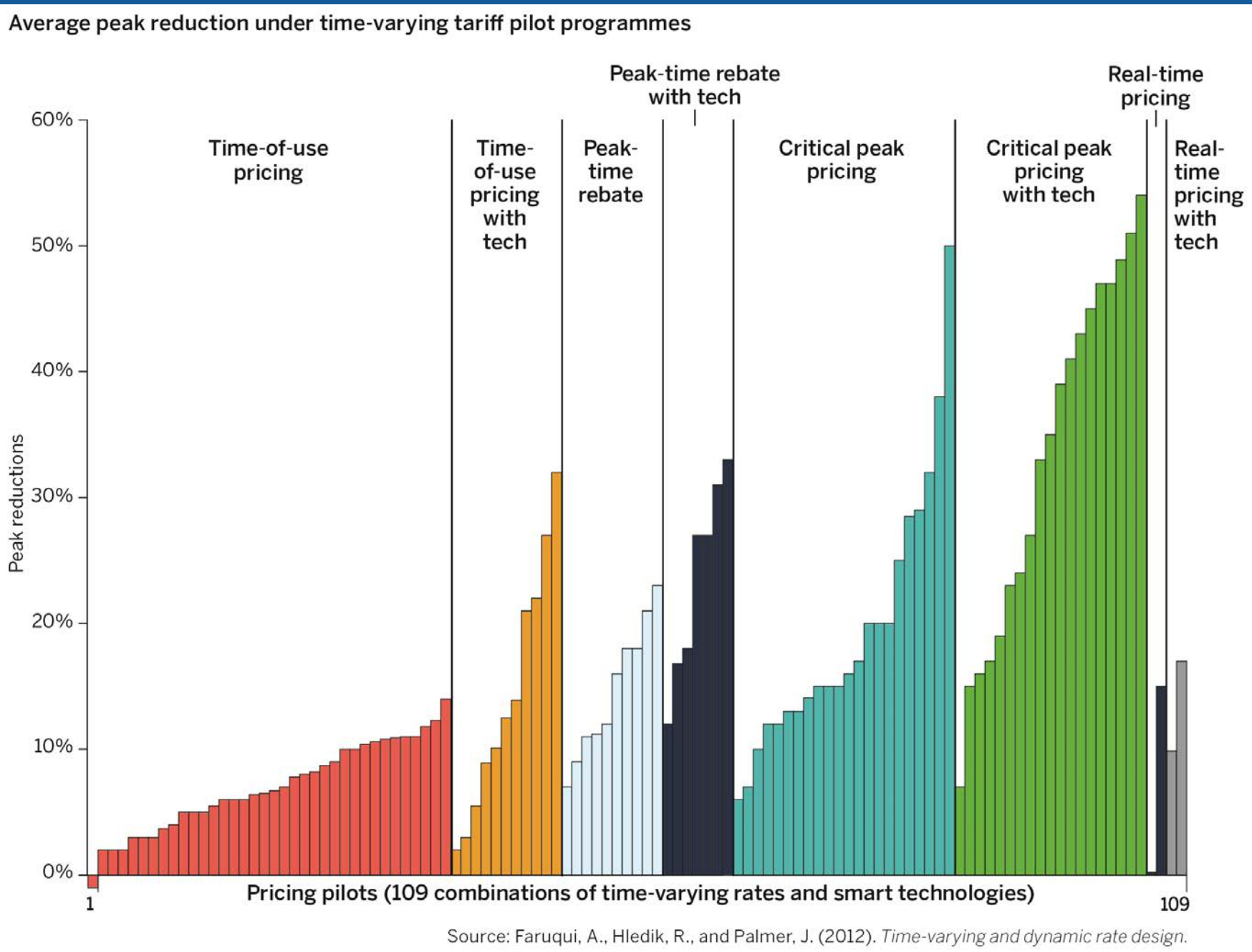
Source: Denmark (Radius), TOU network tariff for households (winter season)

Strategies for smart EV integration

Smart
technology

Smart technology maximises benefits of smart pricing

- Monitor and communicate
- Automatically control and optimise consumption


Average peak reduction under time-varying tariff pilot programmes
Peak-time rebate with tech
Real-time pricing
Time-of-use pricing
Time-of-use pricing with tech
Peak-time rebate
Critical peak pricing
Critical peak pricing with tech
Real-time pricing with tech
60%
50%
40%
30%
20%
10%
0%
Peak reductions
1
Pricing pilots (109 combinations of time-varying rates and smart technologies)
109
Source: Faruqui, A., Hledik, R., and Palmer, J. (2012). Time-varying and dynamic rate design.

Automated, optimised charging

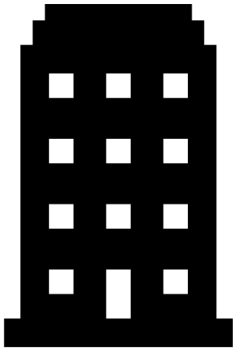
- Provide info about driver's needs
- Lower consumer's bill
- Charge with sustainable energy

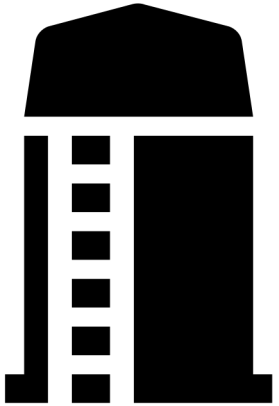
Photo: Jedlix

Strategies for smart EV integration

Smart infrastructure

Workplace & multi-unit dwellings





Use existing infrastructure

Photo credit: Ubitricity

Demand-driven planning

Battery-based fast-charging

Photo: Havyard Group ASA

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

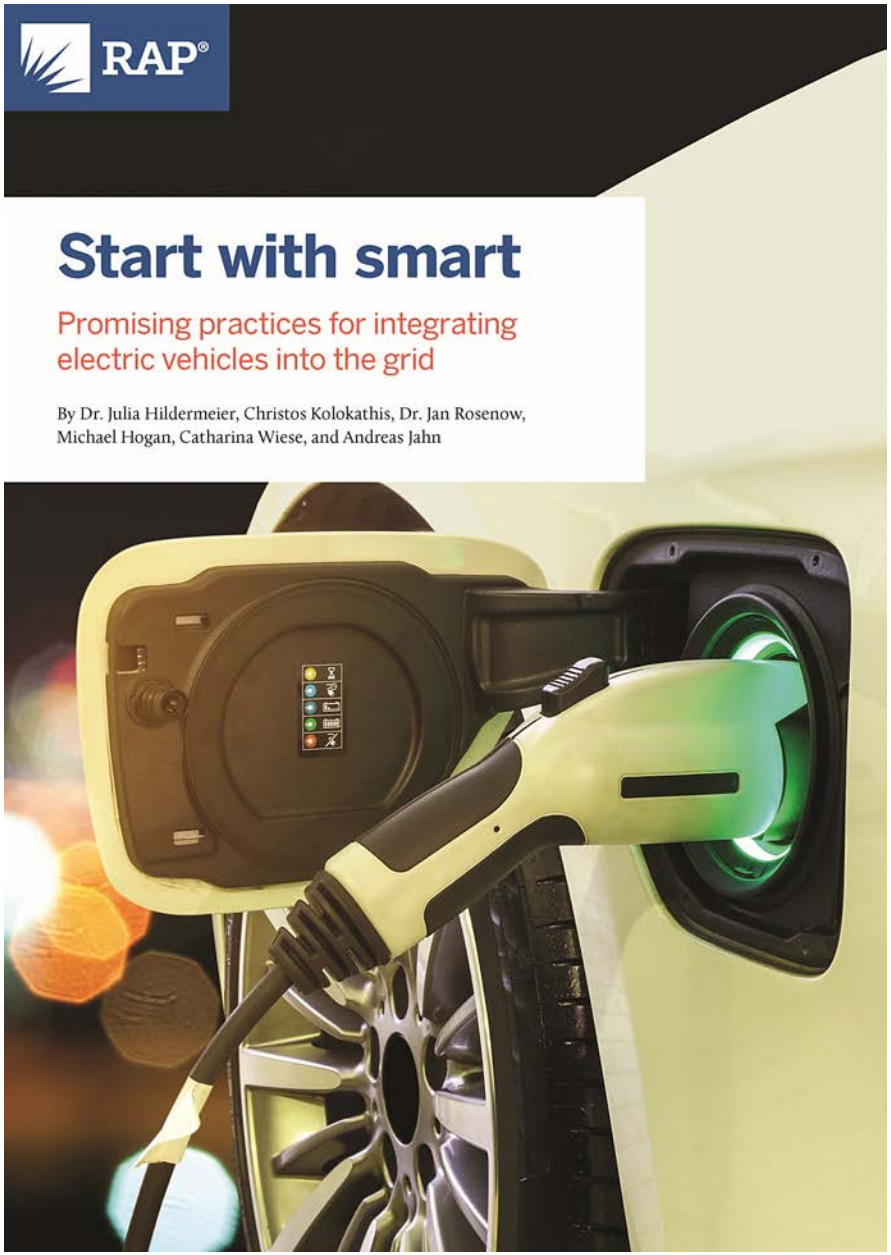
- Accelerate equipment at workplaces and MUDs.
- Set ambitious and differentiated target requirements for future charging infrastructure.
- Use existing transport and grid assets through joint planning.
- Anticipate future charging needs for different use cases (electric HDV) via pilots.
- Seek to increase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

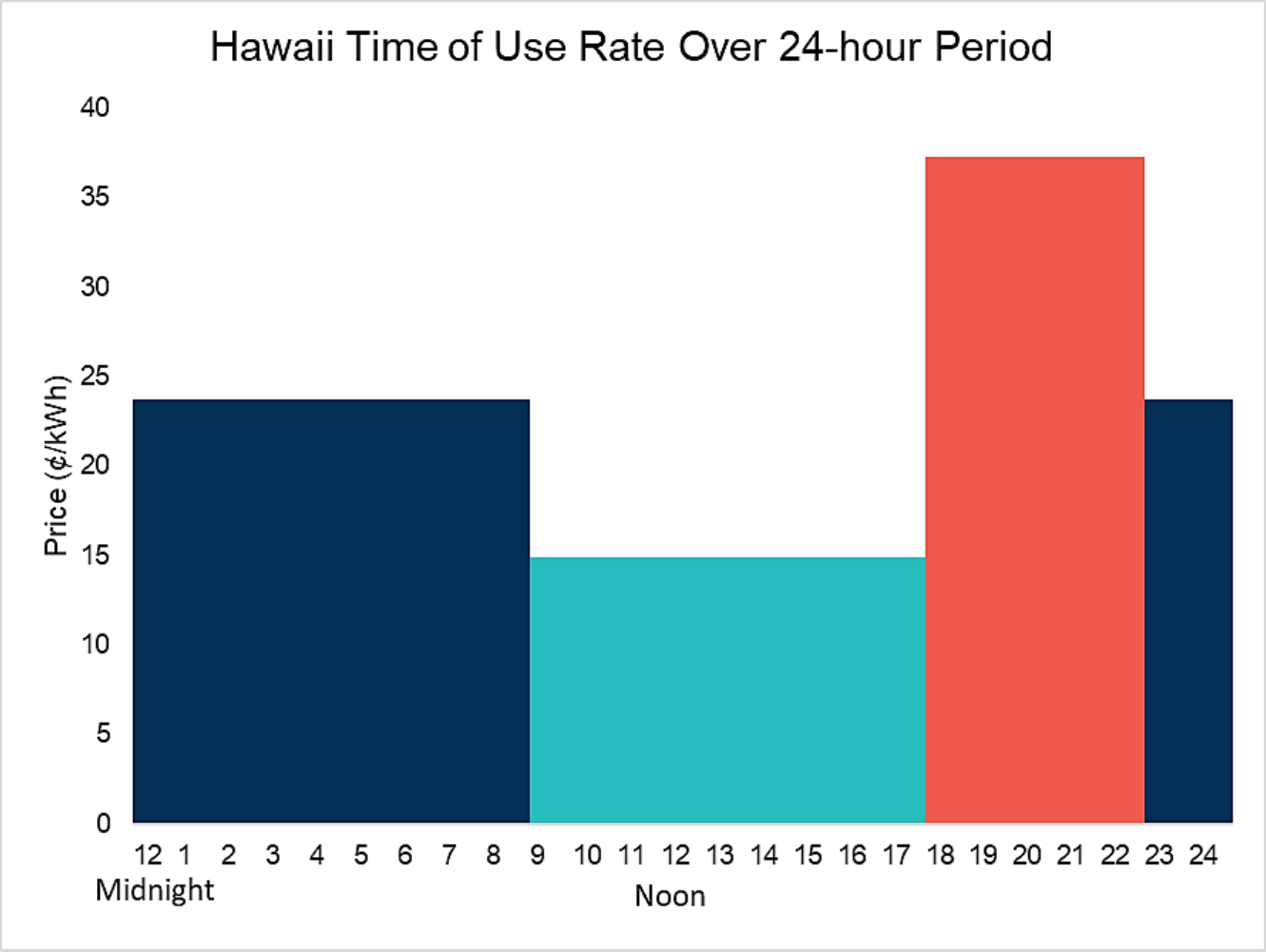
Learn more about our work at raponline.org

Dr. Julia Hildermeier
Associate
jhildermeier@raponline.org

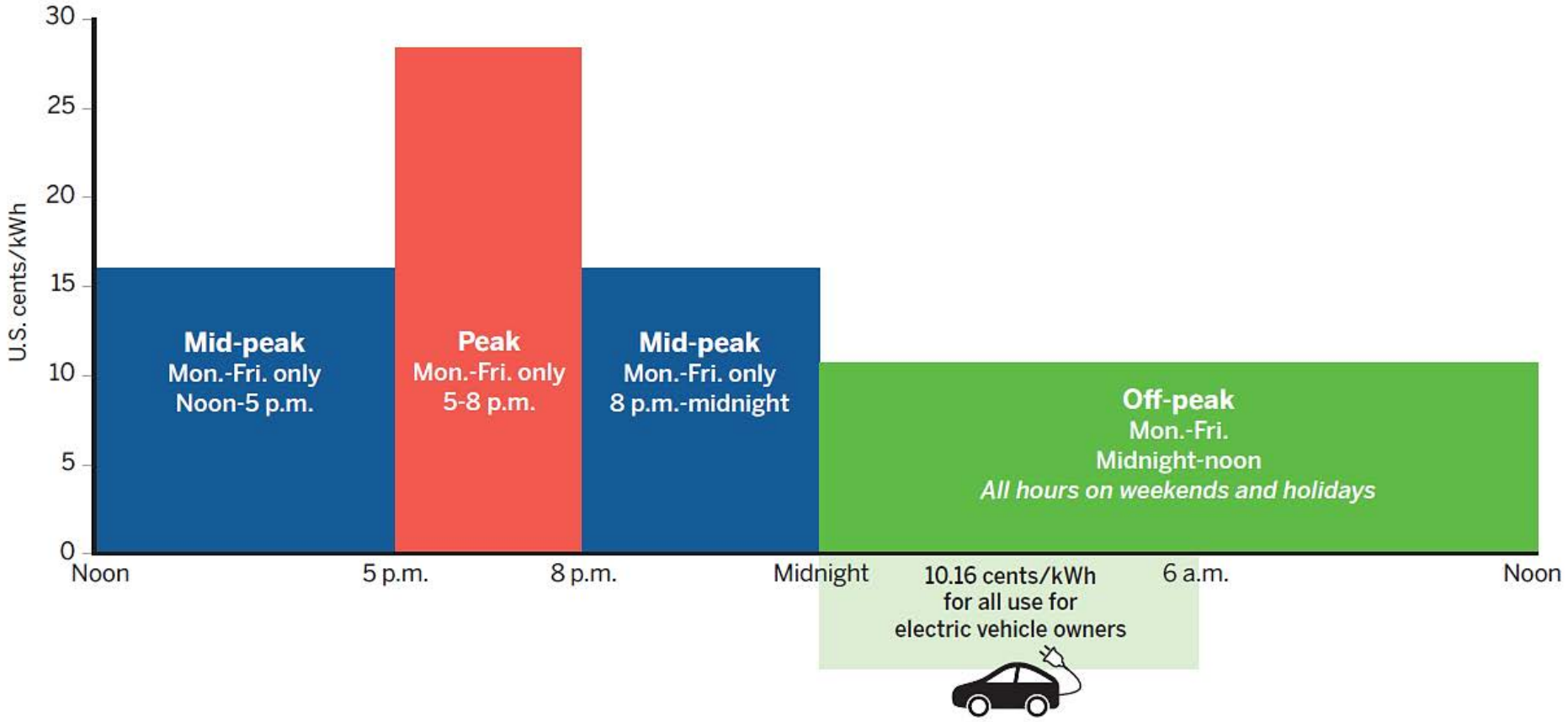
Christos Kolokathis
Senior Associate
ckolokathis@raponline.org

4 More information

Time-of-use tariff in Hawaii

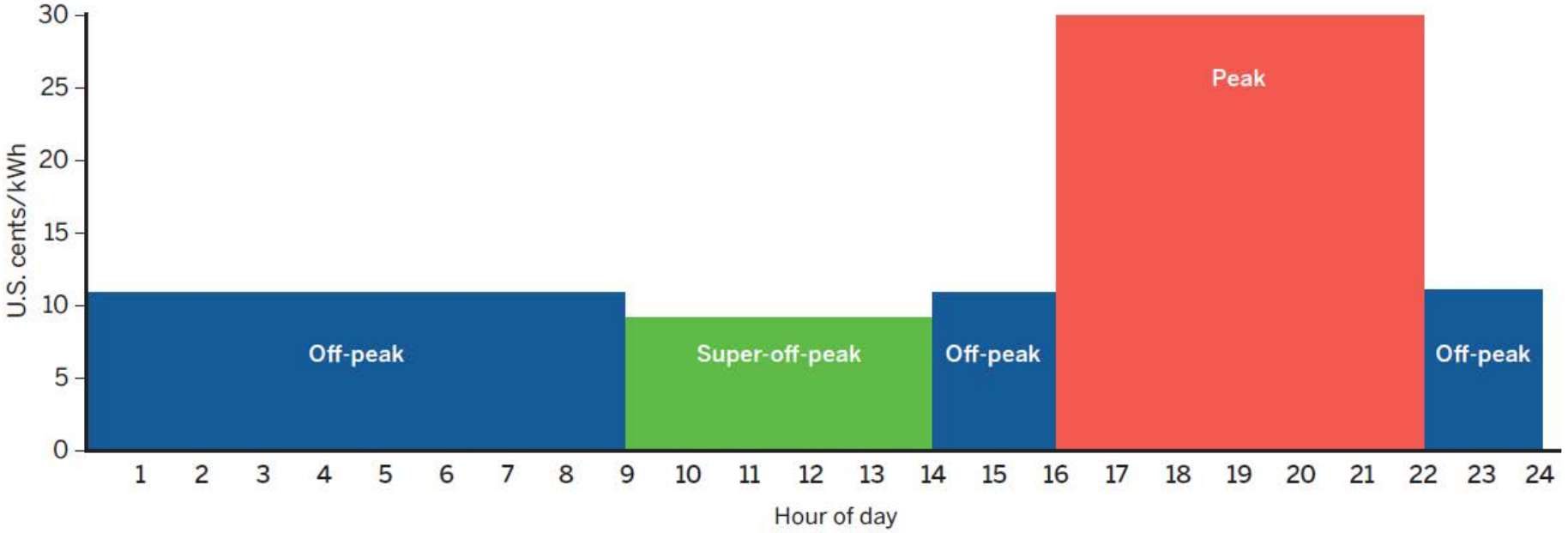


Sacramento Municipal Utility District summer residential time-of-use tariff



Source: Sacramento Municipal Utility District. *Get to know our time-of-day rates.*

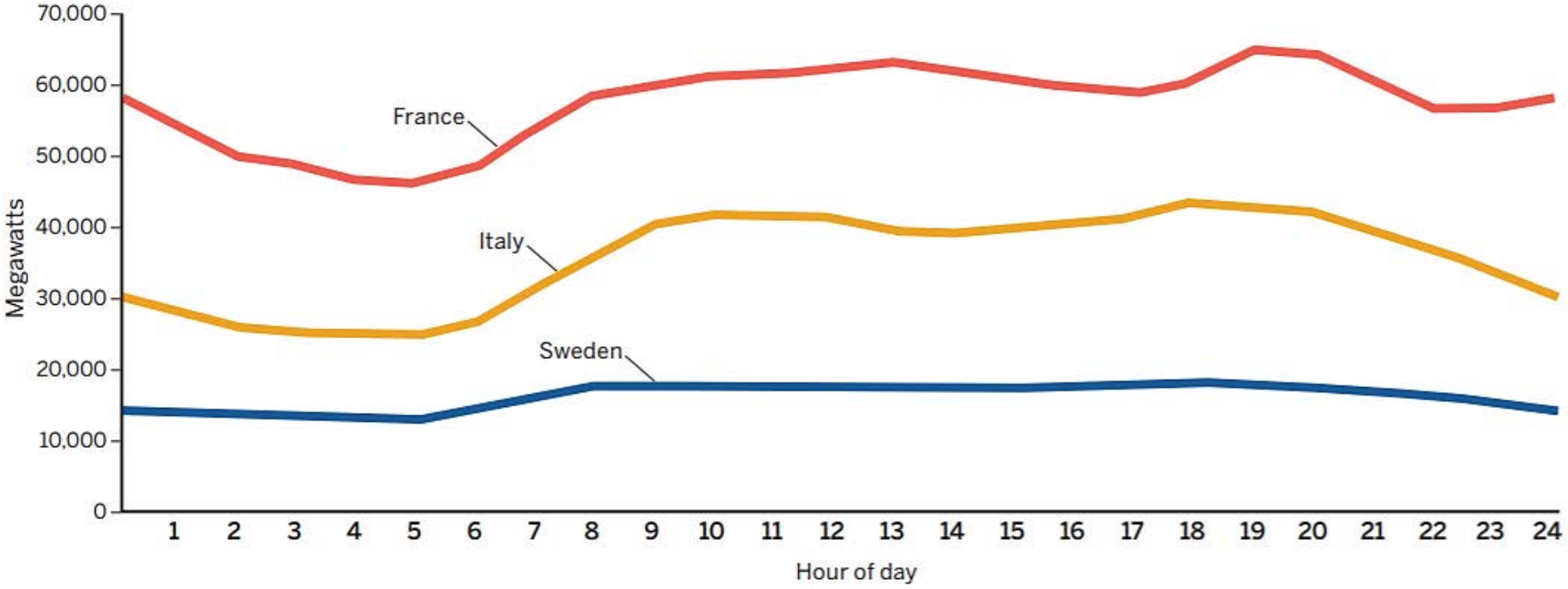
Pacific Gas & Electric time-of-use proposal for shared and commercial EV charging



Source: Pacific Gas & Electric Co. (2018, 5 November). *Application of Pacific Gas and Electric Company (U 39 E) for approval of its commercial electric vehicle rates.*

Typical EU demand curves

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



Source: European Network of Transmission System Operators for Electricity. *Transparency platform.*

EV cost comparison per country

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