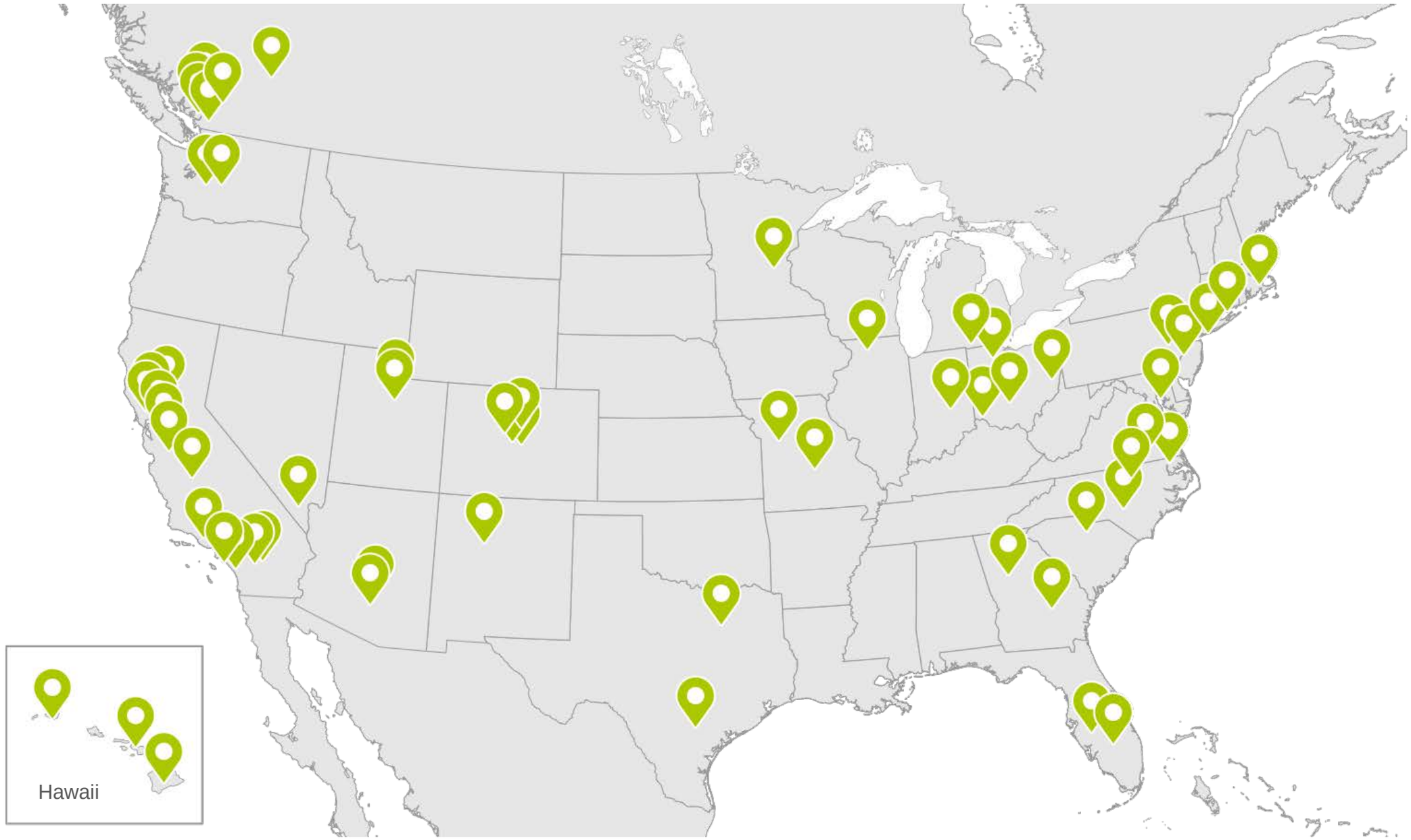


Integration of Electric Vehicles

National Town Meeting on Demand Response + Smart Grid May 28, 2015

greenlots®

DCFC Network: Greenlots' North American Footprint Q2 '15



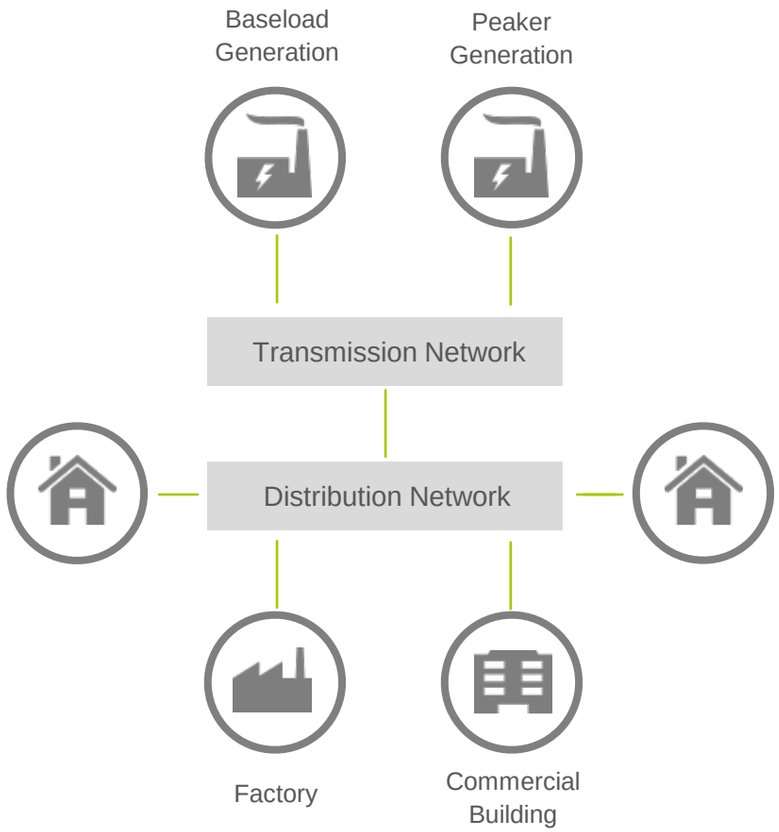
Total Public DCFC	Greenlots DCFC	Greenlots Market Share
819	373	31%

*US DOE, Alternative Fuels Data Center, Mar 15

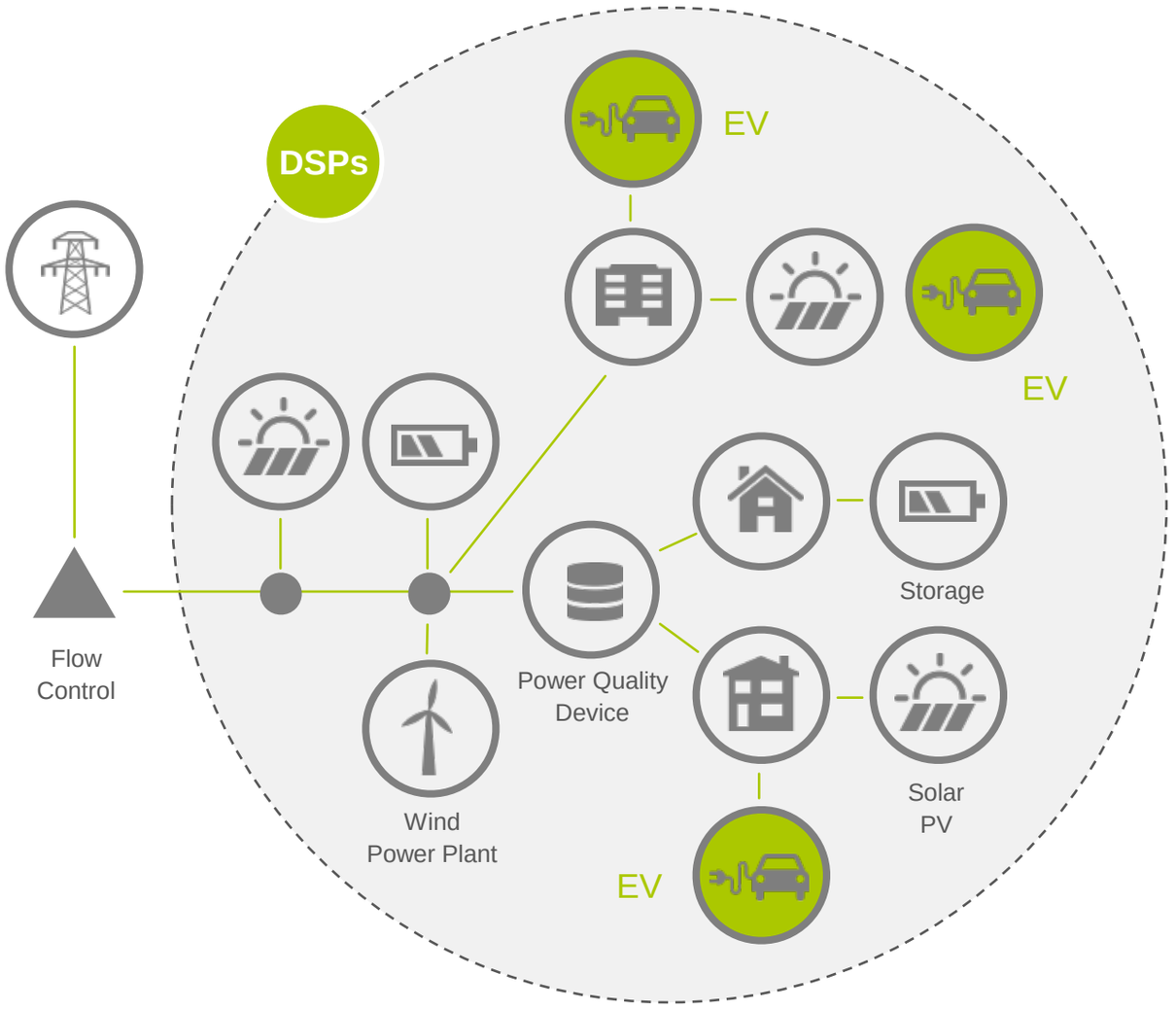
Excludes Tesla Supercharge stations

Evolving Utilities & ISOs: Developing New Models & Markets

Yesterday
Centralized Power



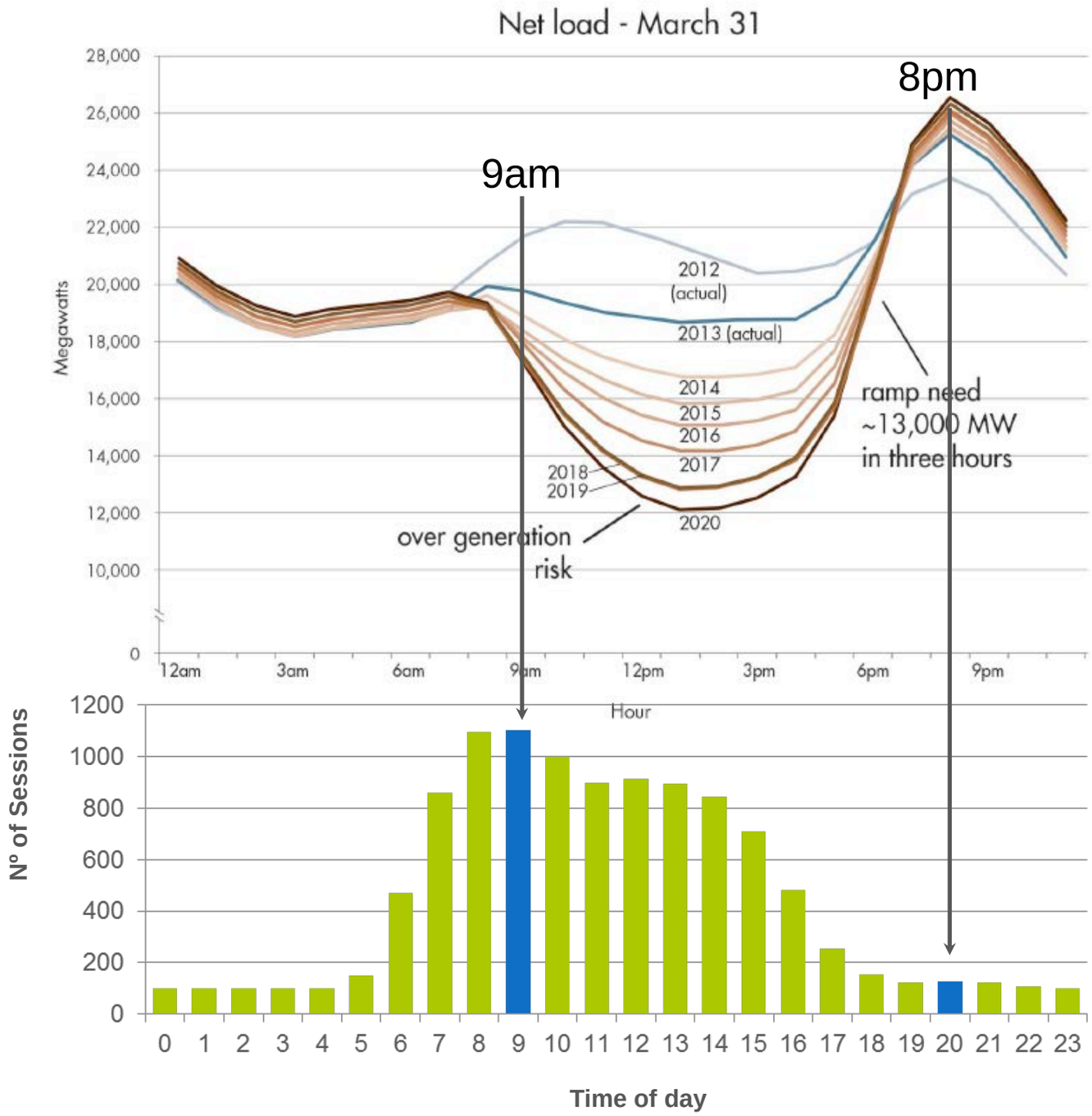
Tomorrow
Clean Distributed Resources



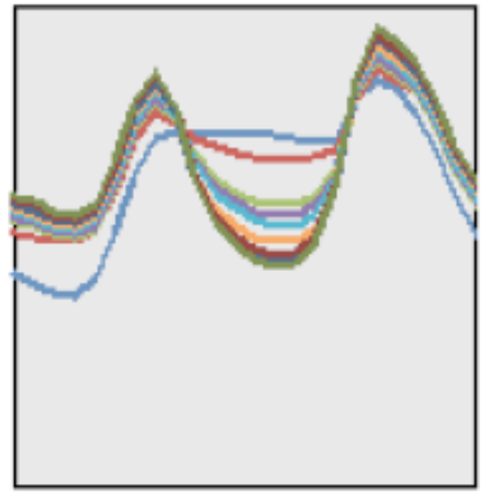
NY REV Track 1 Order:

"**DSP** markets can assist a transition to electric vehicles by turning what could be a strain on distribution systems into a valued asset. Electric vehicles present great opportunity if coordinated with grid functions to provide storage and voltage support. Electric vehicles can also increase utility sales and reduce rate pressure caused by infrastructure needs."

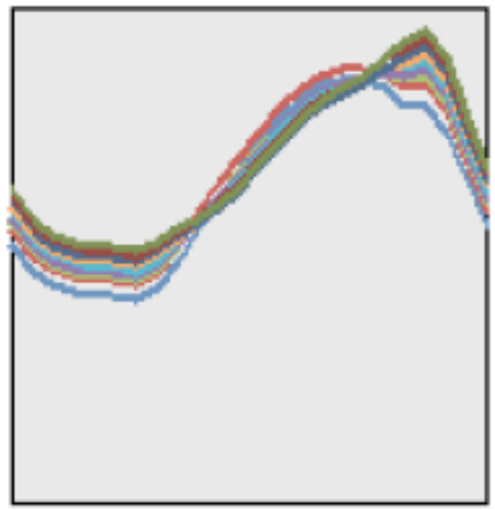
Workplace Charging: Solving the Duck Curve



Winter - January 31st



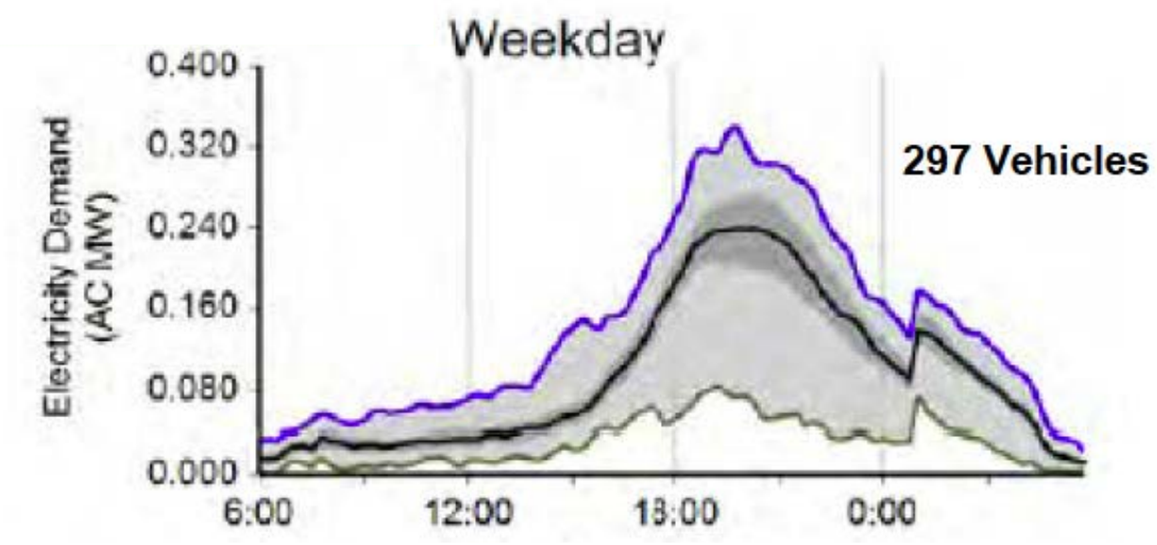
Summer - August 10th



California ISO forecasted grid load thru 2020 based on 33% renewables portfolio

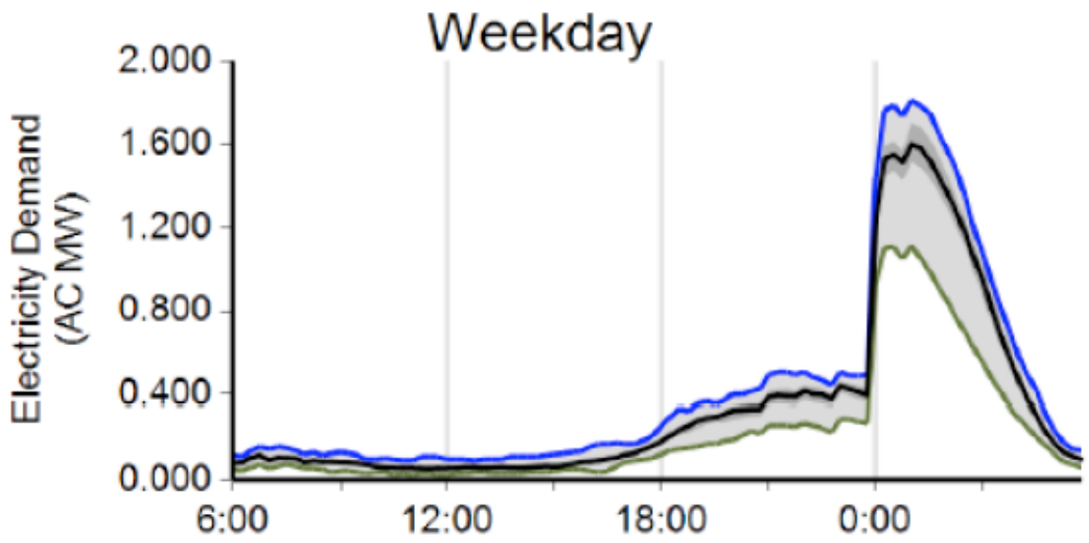
Residential Smart Charging: Beyond TOU Rates

Residential Washington, DC*



Time of Day – no TOU rates

Residential SF Bay Area



Time of Day – off-peak at midnight

- Behavior heavily influenced by time-of-use rates, but TOU alone is insufficient
- Need to manage residential charging to avoid secondary peaks
- Key is be driver/mobility focused to minimize driver impact
- Value stream to help driver pay for smart L2 charging at home?

*EV Project Q3 2013

Demand Response Workplace Charging

SOUTHERN CALIFORNIA EDISON®
An *EDISON INTERNATIONAL*® Company

Project
DRLC (demand response load control) enabled workplace charging pilot using OpenADR 2.0b with 80 Level 2 EVSE that can be curtailed to L1 with dynamic pricing at the point-of-sale across 9 SCE properties in Southern California

Objectives
1. Study real-world usage behavior in response to DR events
2. Determine price elasticity of workplace charging users
3. Observe minimum size of EV fleet for impact on DR program

Timing
Now live thru 2016



Greenlots with Control Module Industries provided the turn-key Level 2 charging system with ADR capabilities.

Upon plug-in, users choose between 3 prices: High for maximum charge, Medium for maximum charge but curtailed to L1 when called, Low for maximum charge and curtailed to zero when called. This pricing is pushed day-ahead to all payment kiosks and web software across locations. Users may also use the mobile app our check Greenlots' portal for latest pricing and information about the DR event.

When a DR event is called, users have the option to pay a fee to opt-out, unless it is an emergency event. Users are notified via SMS and email during events about the severity and duration.

DC Fast Charging with Dynamic Load Control

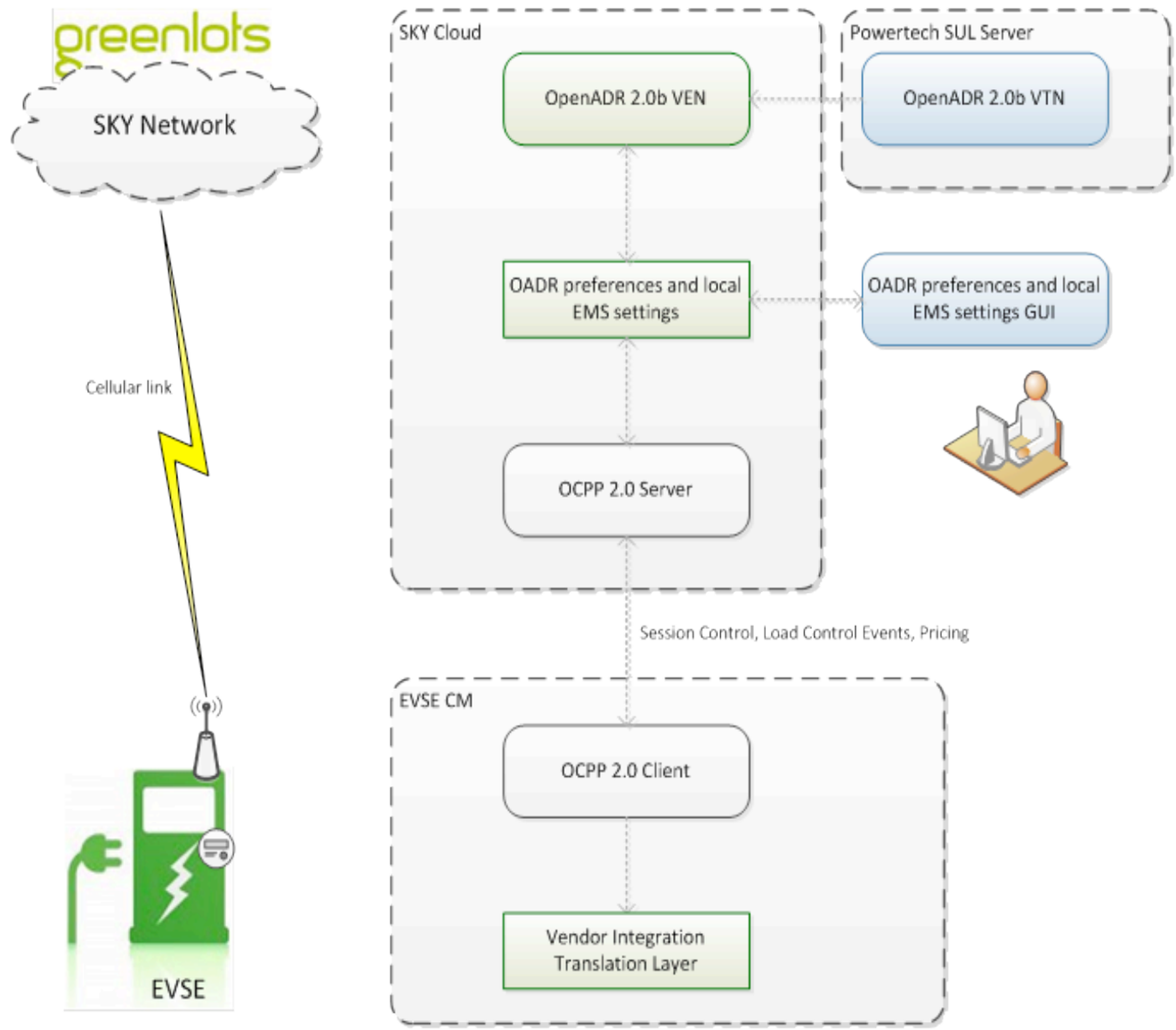
Project
In-depth demonstration and testing of charging stations with Smart Energy 2.0 (SEP2), OpenADR for local load management

Objective
To pilot multiple DCFCs or Level 2 stations with load management operating on a feeder with limited capacity. The use of automated load management will ensure the total demand stays below the capacity limit of the feeder, whilst minimizing user inconvenience

Timing
Q2 – Q4 2015

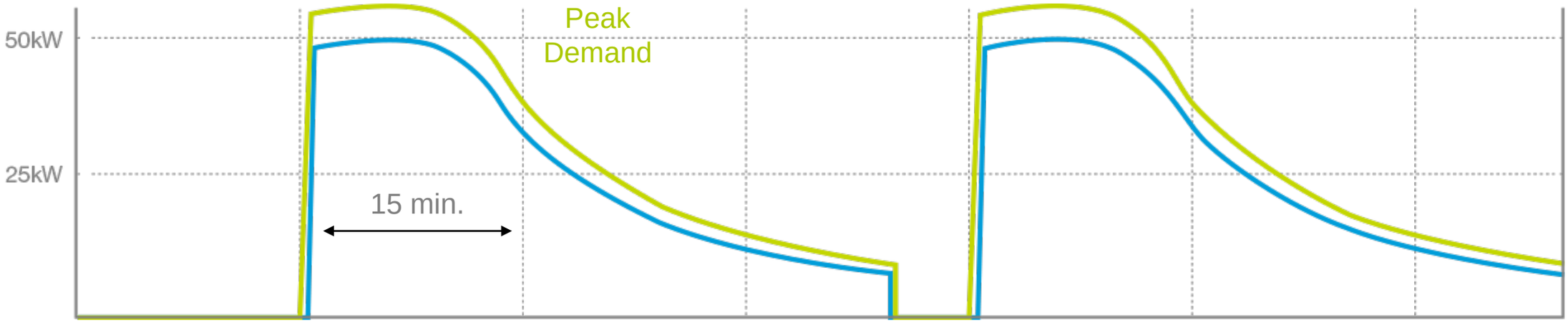
A subsidiary of BC Hydro, Powertech Labs has been working with Greenlots to demonstrate one of the most comprehensive open standards smart charging systems.

Greenlots is developing a platform for Powertech which takes multiple energy management standards and protocols (SEP2, OpenADR, OCPP) to create a network with the EV as a central load. The other major utility interest that the project will satisfy is the concept of assets on the grid that can manage themselves according to local constraints without the need for the utility to get involved (“set and forget”). This project will demonstrate the load management functionality using an EMS in the cloud instead of a physical device making smart charging decisions on-site.

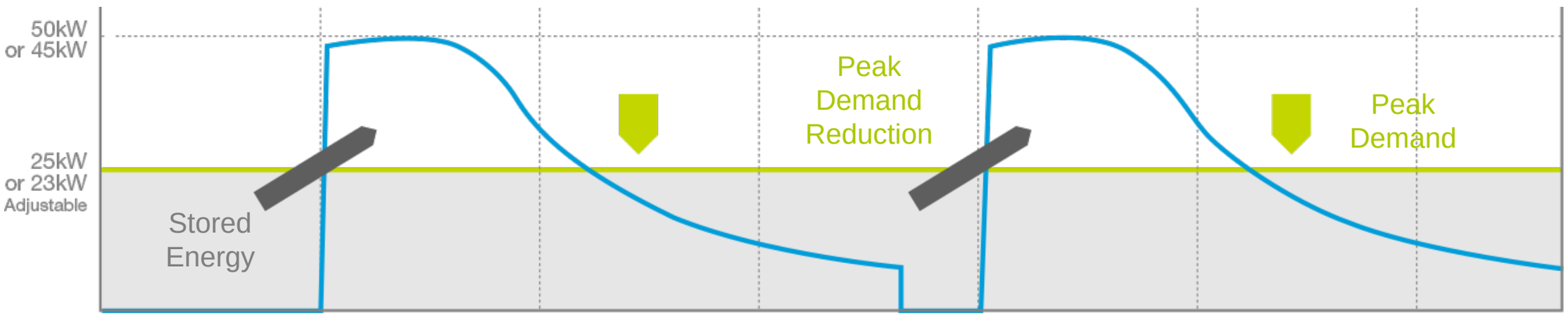


DC Fast Charging with Battery Storage

DCFC without internal battery



DCFC with internal buffer battery

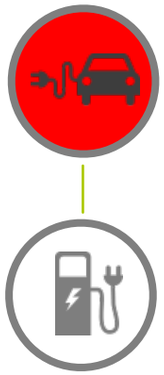


AC Input from the Grid = Demand Charges

DC output to the EV (10% AC/DC conv. Loss)

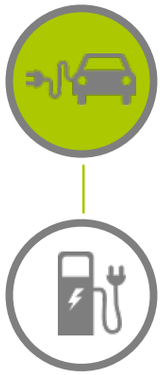
Integrated Charging System: Today

Charging scheduled to begin 11 am



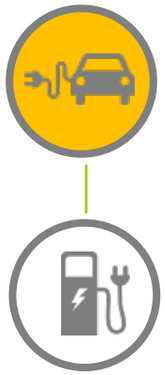
Charging stations

11 am charging begins



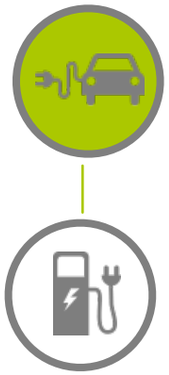
Charging stations

Charging curtailed to L1



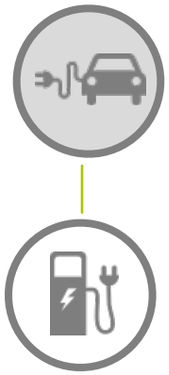
Charging stations

5 pm complete



Charging stations

Charging complete. User notified



Charging stations



Solar



Energy Storage

Greenlots SKY

Solar Following	User Payments / Billing	Open standards (OCPP, OpenADR)	Charge Optimization	Demand Charge reduction & off-peak charging



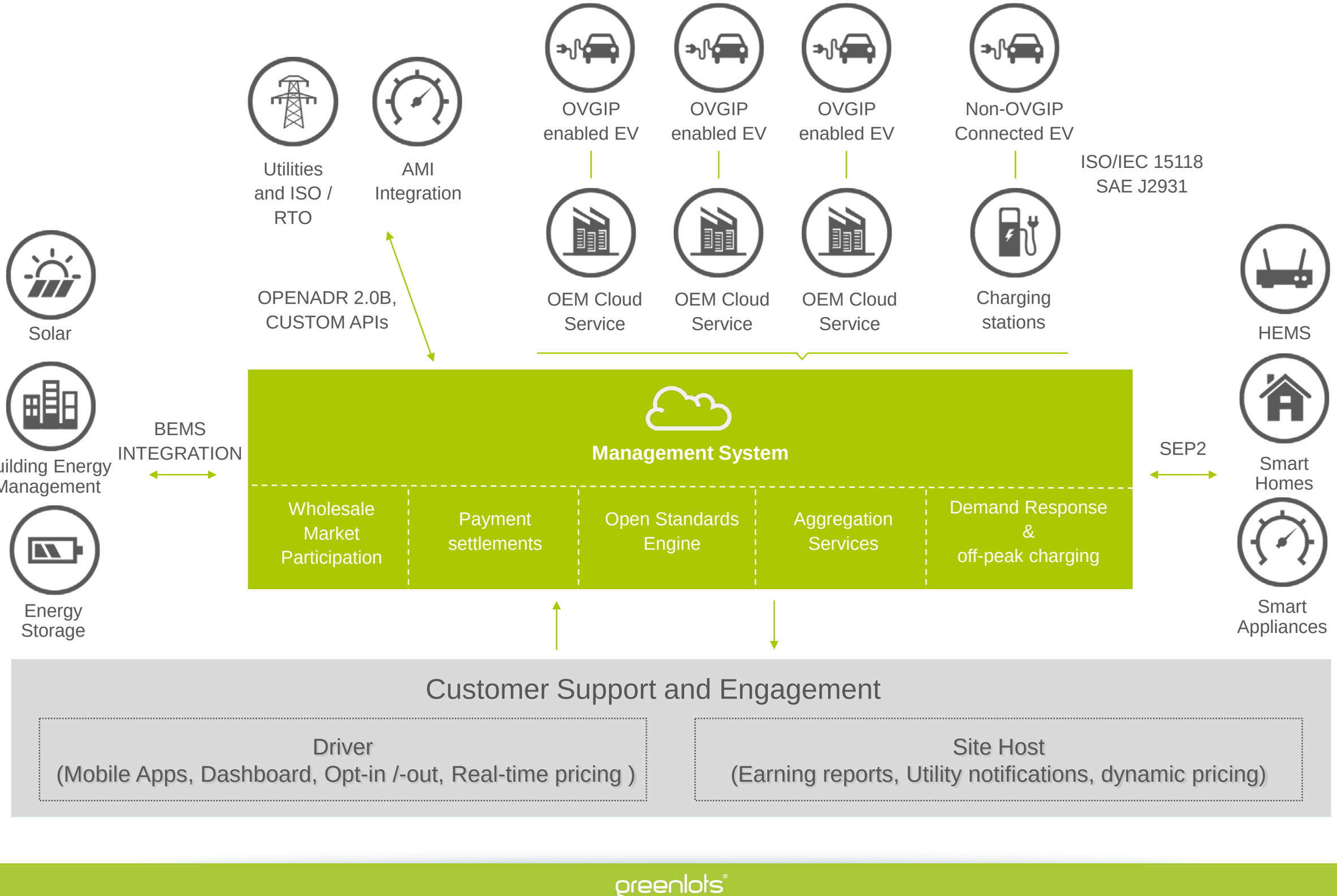
Building Energy Management

Customer Support and Engagement

Driver
(Mobile Apps, Dashboard, Opt-in /-out, Real-time pricing)

Site Host
(Earning reports, Utility notifications,, dynamic pricing)

Integrated Charging System: Tomorrow





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